



## **CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY**

### **Criteria 3**

#### **Research, Innovations and Extension**

<b>Metric 3.4.6</b>	<b>Number of books and chapters in edited volumes published per teacher during the last five years</b>
<b>3.4.6.1</b>	Total number of books and chapters in edited volumes / books published, and papers in national/international conference-proceedings year wise during the last five years

### **Supporting Documents**

<b>1</b>	Books and Chapters in Edited Volumes , Books Published, and Papers in National/International Conference Proceedings <b>(Year : 2020)</b>
----------	---

# **Faculty of Technology & Engineering**



Articles & Issues ▾

About ▾

Publish ▾



Search in this journal

# 10th International Conference of Materials Processing and Characterization

Edited by Swadesh Kumar Singh, Esther Titilayo Akinlabi, Kaushik Kumar, J. Paulo Davim, Kuldeep Kumar Saxena

Volume 26, Part 2,

Pages 173-3326 (2020)

[◀ Previous vol/issue](#)

[Next vol/issue ▶](#)

Receive an update when the latest issues in this journal are published

Sign in to set up alerts

Research article ○ Abstract only

FEEDBACK 

Articles & Issues ▾

About ▾

Publish ▾



Search in this journal

---

Pages 2425-2431

[Download PDF](#)    Article preview ▾

Research article ○ Abstract only

## GMAW cladding on metals to impart anti-corrosiveness: Machine, processes and materials

Tejendra Singh Singhal, Jinesh Kumar Jain

Pages 2432-2441

[Download PDF](#)    Article preview ▾

Research article ○ Abstract only

## Effect of indentation load on mechanical properties and evaluation of tribological properties for zirconia toughened alumina

Ayush Pratap, Piyush Kumar, G.P singh, Nilrudra Mandal, B.K. Singh

Pages 2442-2446

[Download PDF](#)    Article preview ▾

Research article ○ Abstract only

## Experimental investigation of wettability properties for zirconia based coatings by RF magnetron sputtering

Kamlesh V. Chauhan, Dattatraya G. Subhedar, Riddhi Prajapati, Divyeshkumar Dave

Pages 2447-2451

[Download PDF](#)    Article preview ▾

FEEDBACK



## Experimental investigation of wettability properties for zirconia based coatings by RF magnetron sputtering

Kamlesh V. Chauhan<sup>a</sup>, Dattatraya G. Subhedar<sup>a</sup>, Riddhi Prajapati<sup>a</sup>, Divyeshkumar Dave<sup>b</sup>

<sup>a</sup> CHAMOS Matrusanstha Department of Mechanical Engineering, Chandubhai S. Patel Institute of Technology (CSPIT), Charotar University of Science and Technology (CHARUSAT), Changa 388421, Gujarat, India

<sup>b</sup> Department of Mechanical Engineering, G.H.Patel College of Engineering & Technology, Bakrol, Anand 388001, Gujarat, India

### ARTICLE INFO

#### Article history:

Received 9 January 2020

Accepted 13 February 2020

Available online 26 March 2020

#### Keywords:

Zirconia

XRD

Coatings

Wettability

### ABSTRACT

Zirconia (Zirconium oxide) thin films were deposited on silicon and corning glass substrates by physical vapor deposition technique. In this experiment the influence of substrate temperature was investigated. The structural and Wettability properties characterized by X-ray diffraction (XRD), Atomic force microscopy and contact angle measurement system. The zirconia films crystallized in the monoclinic phases with (111) orientation, for different sputtering parameters. Average grain size found to be in range of 10–19 nm for different temperature. Surface roughness increases with change in substrate temperature. The surface energy and contact angle measured by contact angle measuring system, exhibited hydrophobic behaviour of zirconium oxide thin films.

© 2019 Elsevier Ltd. All rights reserved.

Selection and peer-review under responsibility of the scientific committee of the 10th International Conference of Materials Processing and Characterization.

## 1. Introduction

Surface engineering consists of mainly two branches, first is coatings and second is surface modification. Surface modification is the phenomena changing the surface of a material by bringing physical, chemical or biological characteristics diverse from the ones originally found on the surface of a material. Thin films are thin coating with thickness ranging from fractions of a nanometer to several micrometers grown on substrate. Thin films play a vital role in virtually every micro- and nanostructure. Thin films made by a variety of means. Over the years various processes have been developed for the deposition of metal oxide thin films. A thin film consists of one homogeneous composition, crystalline phase composition and microstructure, or have an inhomogeneous multilayer or composite structure. e.g. Antiglare coatings for eye glasses. In Many industries there are many occasions when the properties demanded for an engineering application involves different features that are different for the surface than that are for the bulk. Moreover, rare material like Zirconium, Tantalum, Niobium, Vanadium, etc. are too costly to use directly for a specific application. Hence to reduce the cost and to get desired property from this rare material, the technique used is deposition of thin film or coating. In the recent, the coatings techniques are classified into two different

ways, physical vapor deposition (PVD) and chemical vapor deposition (CVD). Comparing this two different coatings techniques cannot control stoichiometry of coating using more than one material because different materials have different evaporation rates [1]. Jameel (2015) studied different thin film deposition processes and concluded that PVD is the most efficient method [2]. Mahendrakumar (2015) also concluded that sputtering technique is reliable for development of coating for polycrystalline [3]. Likewise, as per the analyses of numerous research for fabrication of coatings PVD is more promising than CVD coating. Also, PVD is used to increase oxidation resistance, hardness and resistance of wear for the application of automotive, aerospace, surgical/medical, dies and shapes for all types of material processing, cutting tools.

Zirconia coatings has been many industrial application like thermal barrier coatings, optical filters, laser mirrors, alternative gate dielectrics in microelectronics, a buffer layer or a high temperature ceramic superconductor on Si, high temperature oxygen separation, oxygen sensors and fuel cells due to its heat resistance, low thermal conductivity, a relative high dielectric constant, high refractive index, high transparency in the visible and near infrared region, extreme chemical inertness, and a high laser damage threshold [4,5]. Hence certain parameters need to be maintained to achieve desirable properties those are suitable for application.



# 10th International Conference of Materials Processing and Characterization

Edited by Swadesh Kumar Singh, Esther Titilayo Akinlabi, Kaushik Kumar, J. Paulo Davim, Kuldeep Kumar Saxena

Volume 26, Part 2,


Pages 173-3326 (2020)

[< Previous vol/issue](#)

[Next vol/issue >](#)

Receive an update when the latest issues in this journal are published

[Sign in to set up alerts](#)

 [Download PDF](#)   Article preview ▾

Research article ○ Abstract only

## Experimental investigation of wettability properties for zirconia based coatings by RF magnetron sputtering

Kamlesh V. Chauhan, Dattatraya G. Subhedar, Riddhi Prajapati, Divyeshkumar Dave

Pages 2447-2451

 [Download PDF](#)   Article preview ▾

Research article ○ Abstract only

## Investigation on reactive wetting during investment casting of magnesium alloy AZ91

A.V. Vyas, V.S. Ayar, M.P. Sutaria

Pages 2452-2457

 [Download PDF](#)   Article preview ▾

Research article ○ Abstract only

## Optimization of surface roughness in EDM of pure magnesium (Mg) using TLBO

Soni Kumari, Pankaj Sonia, Bharat Singh, Kumar Abhishek, Kuldeep K. Saxena

Pages 2458-2461

 [Download PDF](#)   Article preview ▾

Research article ○ Abstract only



Contents lists available at ScienceDirect

## Materials Today: Proceedings

journal homepage: [www.elsevier.com/locate/matpr](http://www.elsevier.com/locate/matpr)

## Investigation on reactive wetting during investment casting of magnesium alloy AZ91

A.V. Vyas, V.S. Ayar\*, M.P. Sutaria

Department of Mechanical Engineering, Chandubhai S. Patel Institute of Technology, Charotar University of Science and Technology (CHARUSAT), Changa, Gujarat, India

## ARTICLE INFO

## Article history:

Received 9 January 2020

Accepted 13 February 2020

Available online xxxx

## Keywords:

Alumina

AZ91

Contact angle

Investment casting

Mould-metal reactions

Zircon

## ABSTRACT

During investment casting of Magnesium alloys, the melt contacts with ceramic mould after pouring. The surface quality of the casting is directly affected by the wettability between the melt and ceramic mould material as the Mg melt is reactive to oxygen and moulds are mainly made of ceramic oxides. As the melt wets the wall of ceramic mould, the melt can infiltrate into ceramic mould through the capillaries on the mould surface and then metal can penetrate in the mould that may results in poor surface finish on the surface of the casting. When the temperature of casting and alloy composition fulfill the thermodynamic conditions of interfacial reaction, reaction occurs between melted metal and ceramic materials, leading to development of reactive layers on the surface of casting and deteriorating the surface quality of the casting. Therefore, there is great interest in the industry to minimize or elimination of interface reaction. Ceramic oxides with higher thermal stability found to resist the reactions to some extent. Use of protective gas also helps to overcome the reaction. Wettability has significant effect on the resultant interfacial properties of casting at high temperature liquid metal/solid ceramic systems. The present research focused on mould materials and mould development for suppression of mould-metal reaction in investment castings of magnesium alloy AZ91. An attempt was made to evaluate wetting kinetics for two different mould materials which are Zircon Flour and Fused Alumina. XRD analysis was done on the surface of Mg AZ91 and mould material to find the reaction products for the casting with both mould materials. Fused Alumina was found more suitable over conventional zircon flour for suppressing reaction based on the contact angle and surface roughness.

© 2020 Elsevier Ltd. All rights reserved.

Selection and of the scientific committee of the 10th International Conference of Materials Processing and Characterization.

## 1. Introduction

An excellent mechanical property at reduced weight of magnesium alloys demands the development of its castings for automobile and aircraft applications. Investment casting process is the most preferable for producing near net shape precision components for this type of applications.

Higher reactivity of magnesium with oxygen at elevated temperature restricts its processing through investment casting as ceramic oxides based mould materials reacts with Mg melt. These reactions at interface of mould and metal deteriorate the surface properties of casting. Modification is needed in conventional investment casting process for successful production of quality magnesium castings.

In US the increased use of Mg casting in automotive pushes the casting shipments to historic heights in 2007–2008. In 2008, 121,000 tons of Mg castings were produced in the US for all market segments with projections showing growth of 166,000 tons by 2019 [1]. According to 7th census of world casting production published by AFS [2], annual Mg casting production was about 226,673 metric tons which contributes only 0.225% in total ferrous & non-ferrous annual casting production and that also represents 21% growth rate from the previous year. Thermal stability of mould is the main factor influencing the interfacial reactions. Hong et al. [3] have evaluated the thermal stability of ceramic oxides by pouring Mg AZ91 melt in different ceramic moulds. Kim and Kim [4] investigated the effects of mould preheating temperature and mould material for interfacial reaction, which shows that casting produced with  $Al_2O_3$  mould found with lesser mould metal reaction at interface. Dube et al. [5] have performed experiments with Calcium Sulphate ( $CaSO_4$ ) in investment casting of Mg AZ91 alloy

\* Corresponding author.

E-mail address: [vivekahir17@yahoo.com](mailto:vivekahir17@yahoo.com) (V.S. Ayar).<https://doi.org/10.1016/j.matpr.2020.02.521>

2214-7853/© 2020 Elsevier Ltd. All rights reserved.

Selection and of the scientific committee of the 10th International Conference of Materials Processing and Characterization.





materialstoday:  
PROCEEDINGS

& Issues ▾

About ▾

Publish ▾

Submit your article ↗

Guide for authors

Search in this journal



# International Conference of Materials Processing and Characterization

< Previous vol/issue

Next vol/issue

Swadesh Kumar Singh, Esther Titilayo Akinlabi, Kaushik Kumar, J. Paulo Davim, Kuldeep Kumar Saxena  
6, Part 2,  
1-3826 (2020)

Menu

Q Search in this journal


Pages 1455-1460

[Download PDF](#) [Article preview](#) Research article  Abstract only

Performance analysis of paraffin wax as PCM by using hybrid zinc-cobalt-iron oxide nano-fluid on latent heat energy storage system

Harish Kumar Sharma, Sujit Kumar Verma, Pradeep Kumar Singh, Satish Kumar, ... Piyush Singhal

Pages 1461-1464

[Download PDF](#) [Article preview](#) Research article  Abstract only

Impact of various reinforcement particles on the density of AA7050 graded aluminium fabricated through stir casting

R. Ranjith, B. Karthick, M. Sindhu Kavi, C. Somu, T. Pravin


Pages 1465-1468

[Download PDF](#) [Article preview](#) Research article  Abstract only

Influence of TiC thin film growth morphology deposited by RF magnetron sputtering on the mechanical and tribology properties of Ti6Al4V

Olayinka Abegunde, Esther Akinlabi, Philip Oladijo


Pages 1469-1472

[Download PDF](#) [Article preview](#) Research article  Abstract only

Experimental evaluation of influence of temperature on nature of fracture in formability test of alpha-beta titanium alloy

Anoop Kumar Shukla, T. Mohandas


Pages 1473-1477

[Download PDF](#) [Article preview](#) Research article  Abstract only

Performance improvement of a conventional single slope single basin passive solar still by integrating with nanofluid-based parabolic trough collector: An experimental study

Dattatraya G. Subhedar, Kamlesh V. Chauhan, Krunal Patel, Bharat M. Ramani

Pages 1478-1481

[Download PDF](#) [Article preview](#) Research article  Abstract only

A review on optimization techniques used in civil engineering material and structure design

Sarvesh P.S. Rajput, Supra beet Datta

Pages 1482-1491





Contents lists available at ScienceDirect

Materials Today: Proceedings

journal homepage: [www.elsevier.com/locate/matpr](http://www.elsevier.com/locate/matpr)

# Performance improvement of a conventional single slope single basin passive solar still by integrating with nanofluid-based parabolic trough collector: An experimental study

Dattatraya G. Subhedar<sup>a,\*</sup>, Kamlesh V. Chauhan<sup>a</sup>, Krunal Patel<sup>a</sup>, Bharat M. Ramani<sup>b</sup>

<sup>a</sup> Chandubhai S. Patel Institute of Technology, CHARUSAT, Changa, Anand, Gujarat 388120, India

<sup>b</sup> The Shri Lathubhai Trivedi Institute of Engineering and Technology, Rajkot, Gujarat 360005, India

## ARTICLE INFO

### Article history:

Received 9 January 2020

Received in revised form 19 January 2020

Accepted 14 February 2020

Available online xxxx

### Keywords:

Nanofluid

Solar still

Parabolic trough collector

Potable water

Desalination

Productivity

## ABSTRACT

Nowadays due to advancement in nanotechnology, it is possible to prepare nanoparticles, which is very much useful to enhance the thermal properties of heat transfer fluids. A Nanofluid is advanced heat transfer fluid with dispersed nanoparticles in base fluid. This paper is about the experimental study carried out to study the effectiveness of conventional single slope solar still plant (CSP) integrated with parabolic trough collector (PTC) using Nanofluid. Experiments were carried for water and  $\text{Al}_2\text{O}_3/\text{Water}$  nanofluid with 0.05% and 0.1% volume fraction as a working fluid in the integrated system. The results show that pure water yield is remarkably increase using the integrated still plant. It is observed that maximum yield is found 1741 ml with 0.1% volume fraction  $\text{Al}_2\text{O}_3/\text{Water}$  nanofluid as working fluid for 2.5 cm saline water depth in 1 m<sup>2</sup> basin. This shows approximately 66% and 70% rise in the yield and thermal efficiency respectively using  $\text{Al}_2\text{O}_3/\text{Water}$  nanofluid integrated solar still system than CSP.

© 2020 Elsevier Ltd. All rights reserved.

Selection and of the scientific committee of the 10th International Conference of Materials Processing and Characterization.

## 1. Introduction

Heat transfer is a major area of investigation in Thermal Engineering applications. Heat transfer fluid plays an vital role to enhance the performance of many applications as well as the size of the system. The conventional heat transfer fluids like water, oil, Ethylene Glycol etc. are having very low thermal conductivity. The modern nanoscience makes possible to manufacture nanoparticles which are having good thermal properties make possible to enhance the thermal properties of conventional heat transfer fluid. Nanofluid is a fluid having suspended nanoparticles which enhance the thermal properties as compare to the base fluid [1]. Rapidly Increasing population facing crucial issue of clean potable water to survive their life as availability of sources of fresh water on earth are not matching with the requirement. So, many researchers are focusing their work to find out the alternative ways to get clean water for life on earth using nanofluid.

As on earth ample quantity of salt water sources like sea and ocean are available, people started to design a system which will

produce the potable water from salty water using thermal energy or electrical energy. As the Sun energy is easily available on the earth, Desalination is the most economical way of converting saline water into fresh water by using thermal Energy from the Sun. In this process the excess minerals from the salty water can be removed using sun energy. Due to addition of heat into salty water, evaporation of water takes place which after condensation gives fresh water. Solar Still is the system, required to get potable water using solar energy.

Though the process of getting fresh water using solar still is economical and simple, the major disadvantage is the production rate is poor. So, to meet the requirement of fresh water need to use solar still having huge surface area. That requires heavy initial investment on construction of solar still plant and land required to install that. As availability of land for increasing population is another issue. For this reason, many researchers are trying to enhance the productivity of compact solar still. People had studied performance of Single slope, double slope solar still plant using proper insulation, Phase Change Material, Nanofluid in basin, corrugated basin surface, absorbent etc. Tiwari et al. observed increase in the yield from 1.14 Litters to 3.08 Litters after coupling the Flat plate collector (FPC) to CSP [2]. In this system productivity of CSP

\* Corresponding author. Tel.: +91 9712624320.

E-mail address: [dattatraya.me@charusat.ac.in](mailto:dattatraya.me@charusat.ac.in) (D.G. Subhedar).

<https://doi.org/10.1016/j.matpr.2020.02.304>

2214-7853/© 2020 Elsevier Ltd. All rights reserved.

Selection and of the scientific committee of the 10th International Conference of Materials Processing and Characterization.

## IOP Conference Series: Materials Science and Engineering

### Table of contents

Volume 872

2020

[Previous issue](#)

[Next issue](#)

Second International Conference on Materials Science and Manufacturing Technology 9-10 April 2020,  
Hotel Aloft, Coimbatore, Tamil Nadu, India

Accepted papers received: 06 March 2020

Published online: 26 June 2020

[Open all abstracts](#)

### Preface

OPEN ACCESS

Preface

[+ Open abstract](#)

[View article](#)

[PDF](#)

011001

OPEN ACCESS

Peer review statement

[+ Open abstract](#)

[View article](#)

[PDF](#)

011002

### Information & Communication Systems

OPEN ACCESS

Digital picture watermarking technique for security applications

012001



## OPEN ACCESS

012088

Study on rectification of issues faced by ultrasonic welding of medical "e-stethoscope" by adhesive bonding technique

S C Bhopi, V B R Miriyala, S V Parab, A S Haldankar and S P Pandey

[+ Open abstract](#)[View article](#)[PDF](#)

## OPEN ACCESS

012089

Mechatronic approach in hydraulic braking system

Rajesh Boorla, Mohammed Moizuddin, Gankidi Gangadhar Reddy and Syed Faisal Nouman

[+ Open abstract](#)[View article](#)[PDF](#)

## OPEN ACCESS

012090

Turned AISI 4340 Heat-Treated Steel Surface Quality Investigations in Dry and MQL Cooling Conditions

Hiraman N Sikdar, M VeeraBhadra Rao, Bhushan T Patil, Vasim A Shaikh and DSS Sudhakar

[+ Open abstract](#)[View article](#)[PDF](#)

## OPEN ACCESS

012091

Productivity improvement through identifying hazardous conditions in steel foundry

Edward Bernard and Gajanan Shankarrao Patange

[+ Open abstract](#)[View article](#)[PDF](#)

## OPEN ACCESS

012092

Hot corrosion behaviour of plasma and d-gun sprayed coatings on t91 steel used in boiler applications

C Sundaresan, B Rajasekaran, G Sivakumar and D S Rao

[+ Open abstract](#)[View article](#)[PDF](#)

## OPEN ACCESS

012093

Experimental investigation of performance and emission characteristics of diesel engine with use of rape seed oil as biodiesel

Bhavin Mehta, Dattatraya Subhedar, Gaurang Patel and Abhishek Swarnkar

[+ Open abstract](#)[View article](#)[PDF](#)

## OPEN ACCESS

012094

Effect of mixing proportion and mixing time on primary slurry retention and surface roughness of investment casting shells

A V Vyas, M P Pandya and M P Sutaria

[+ Open abstract](#)[View article](#)[PDF](#)

# Effect of mixing proportion and mixing time on primary slurry retention and surface roughness of investment casting shells

A V Vyas\*, M P Pandya and M P Sutaria

*Department of Mechanical Engineering, Chandubhai S Patel Institute of Technology, CHARUSAT University, Changa, Gujarat, India.*

E-mail : [akashvyas.me@charusat.ac.in](mailto:akashvyas.me@charusat.ac.in)

**Abstract :** Surface quality of investment cast parts are mainly depends upon primary slurry condition which is used to make face coat. Zircon flour ( $\text{ZrSiO}_4$ ) is widely used to make primary slurry. In this work different composition (75% - 25%, 70% - 30% and 65% - 35%) of zircon flour and colloidal silica is analyzed at different mixing time (at 24hrs, 48hrs and 72hrs). Viscosity, wettability, slurry retention, and surface roughness are measured and analysed. From the experimental work conclusion derived that composition with 75% zircon and 25% colloidal silica at mixing time of 72 hour gives best result in surface finish.

## 1. INTRODUCTION

Investment casting process is used to make casting products for many centuries. It is known as near-net shape process due to higher surface finish and good dimensional accuracy even in complex shapes. It is used for making of complex shapes of expansive metals where post processing is not affordable [1]. Principle of investment casting has been found to be used for rudimental items like jewellery, arts and idols in 5000 BC. Archaeologists investigated that Mesopotamia was the location of a civilised society who have skills in metallurgy and engineering, and also having knowledge to produce gold, silver and copper artefacts by investment casting. Investment casting process is widely used to make nozzles, turbine blades, vanes, valves and pumps and other items. In recent years, this process is found to be the most suitable to make body implants, due to its higher accuracy and surface finish [2, 3]. Due to poor machinability of Al metal matrix composite, investment casting is a potential option for making composite products [4].

Primary slurries to apply face coat are prepared by mixing flours with binder solution. Among the various primary coats applied with flours like  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ , and  $\text{ZrSiO}_4$ , shell made with zircon flour ( $\text{ZrSiO}_4$ ) exhibits excellent surface morphology [5]. It was observed that with higher viscosity, thicker layer of primary coat was developed [6]. The ceramic retention (plate weight) of slurries increases with the increase in flour loading. The retention of slurry with higher flour to binder ratio provides thicker and smoother primary coat. Higher flour to binder ratio also improves the shell surface leading to better surface finish [7]. Higher viscosity binder with same ceramic flour to binder ratio provides higher viscosity of slurry, leading to higher suspensibility and retention. Optimal flour to binder ratio gives better surface finish [8].

Mixing proportion of flour with binder solution and mixing time while preparing primary slurry governs the slurry retention and surface finish of ceramic shell. In the present work zircon flour is



Content from this work may be used under the terms of the Creative Commons Attribution 3.0 licence. Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

## IOP Conference Series: Materials Science and Engineering

### Table of contents

Volume 872

2020

[Previous issue](#)

[Next issue](#)

Second International Conference on Materials Science and Manufacturing Technology 9-10 April 2020,  
Hotel Aloft, Coimbatore, Tamil Nadu, India

Accepted papers received: 06 March 2020

Published online: 26 June 2020

[Open all abstracts](#)

### Preface

OPEN ACCESS

Preface

[+ Open abstract](#)



[View article](#)



011001

OPEN ACCESS

Peer review statement

[+ Open abstract](#)



[View article](#)



011002

### Information & Communication Systems

OPEN ACCESS

Digital picture watermarking technique for security applications

012001



## Free vibration analysis of functionally graded plates using four parameter power law in Abaqus

R Wangdus and H D Chalak

[+ Open abstract](#) [View article](#) [PDF](#)

## OPEN ACCESS

## Recent Developments of Materials used in Air breathing and Advanced Air breathing Engines

012082

Krishnam Suhrutha and G Srinivas

[+ Open abstract](#) [View article](#) [PDF](#)

## OPEN ACCESS

## Investigations on the effect of nozzle angle and air flow rate during nanofluid Minimum Quantity Lubrication milling of Aerospace alloy Al7075-T6

012083

Harshit B Kulkarni, Pratik P Khandare, Pranesh G Parvatikar, Pranil G Pawar, Rajanikant Tiwari, Mahantesh M Nadakatti, Anand S Deshpande and Raviraj M Kulkarni

[+ Open abstract](#) [View article](#) [PDF](#)

## OPEN ACCESS

## Low cost and open source software-based CNC router for machining contours

012084

Aniket T Suryawanshi, D S S Sudhakar and Bhushan T Patil

[+ Open abstract](#) [View article](#) [PDF](#)

## OPEN ACCESS

## Numerical analysis of surface integrity in parallel turning process Part I: Influence of cutting tool parting distance

012085

Veldi Kanakaraju, Faisal Hassan, Kalidasan Rathinam and Gavendra Norkey

[+ Open abstract](#) [View article](#) [PDF](#)

## OPEN ACCESS

## Thermal barrier coating system for Internal Combustion Engine application-A review

012086

Chauhan Nilesh and Chauhan Kamlesh

[+ Open abstract](#) [View article](#) [PDF](#)

## OPEN ACCESS

## Flow modeling and simulation study of vacuum assisted resin transfer molding (VARTM) process: A review

012087

M Shah and V Chaudhary

[+ Open abstract](#) [View article](#) [PDF](#)

# Thermal barrier coating system for Internal Combustion Engine application-A review

Chauhan Nilesh and Chauhan Kamlesh

CHAMOS Matrusanstha Department of Mechanical Engineering, Chandubhai S. Patel Institute of Technology, Charotar University of Science and Technology (CHARUSAT), Changa, 388421, India

E-mail : nilesh131113@gmail.com

**Abstract:** This paper discusses various TBC materials, its properties and its effect on IC engine performance. Ceramics, in contrast to metals, are often more resistant to oxidation, corrosion and wear, as well as being better thermal insulators. Except for yttria-stabilized zirconia, other materials such as lanthanum zirconate and rare earth oxides are also promising materials for thermal barrier coatings. Thermal barrier coatings enhanced the performance of the IC engine. Applied the TBC on the surface of the piston with the help of various deposition techniques. The coating system has affected the many operating parameters of an engine like fuel consumption, power, and the combustion efficiency, pollution contents and the fatigue lifetime of engine components. The help of coating in the automotive industry has been found to yield a significant effect on the efficiency of engines, higher the operating temperature more will be the efficiency of the system.

**Keywords:** Thermal barrier coating, ceramic material, IC engine.

## 1. INTRODUCTION

The first use of Thermal barrier coating (TBC) was for aircraft engine performance. The concept of thermal barrier coating for diesel engines began in the 1980s. The petroleum crisis and the subsequent increase in the cost of fuels, the improvement of fuels and the improvement of fuel economy of the I.C Engines have become a high priority to the researchers [1]. Thermal barrier coatings (TBCs), which protect metallic components from high-temperature environments, have been widely applied to the fields of high-temperature and corrosion-resistant structural parts such as gas turbine engines, diesel engines, and power generation systems. In any engine, the piston is the most useful element among them all. Say that it's the heart of the IC engine. The work for the piston is to compressing the fuel throughout the compression stroke and transmit the power to the connecting rod through the crankshaft. During the expansion stroke in the petrol engine, 1/3 of total energy is wasted from the coolant, 1/3 from the exhaust. Only 1/3 of it is used to produced power, so if it increases the efficiency of the engine so for that to reduce the heat losses. Theoretically if reduced the heat loss from the engine wall then efficiency will be increased. The overall efficiency of the engine is near around 40-42%. For the engineer it's a major problem, solve that problem helps with thermal barrier coatings. The Material used in coating is Yttria Stabilized Zirconia (YSZ), Partially Stabilized Zirconia (PSZ), Garnets, Spinel, Mullite, Alumina, etc. The properties of this material which is desirable for having very low conductivity while remaining stable at nominal operating temperatures typically seen in applications.[1] is shown in figure 1. The Importance of coated piston is to Reduce Friction, enhanced Thermal efficiency, Specific fuel consumption is reduced, Engine power



Content from this work may be used under the terms of the Creative Commons Attribution 3.0 licence. Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.



## IOP Conference Series: Materials Science and Engineering

### Table of contents

Volume 872

2020

◀ Previous issue

Next issue ▶

Second International Conference on Materials Science and Manufacturing Technology 9-10 April 2020,  
Hotel Aloft, Coimbatore, Tamil Nadu, India

Accepted papers received: 06 March 2020

Published online: 26 June 2020

Open all abstracts

### Preface

OPEN ACCESS

Preface

+ Open abstract



View article



PDF

011001

OPEN ACCESS

Peer review statement

+ Open abstract



View article



PDF

011002

### Information & Communication Systems

OPEN ACCESS

Digital picture watermarking technique for security applications

012001



## OPEN ACCESS

012088

Study on rectification of issues faced by ultrasonic welding of medical "e-stethoscope" by adhesive bonding technique

S C Bhopi, V B R Miriyala, S V Parab, A S Haldankar and S P Pandey

[+ Open abstract](#)[View article](#)[PDF](#)

## OPEN ACCESS

012089

Mechatronic approach in hydraulic braking system

Rajesh Boorla, Mohammed Moizuddin, Gankidi Gangadhar Reddy and Syed Faisal Nouman

[+ Open abstract](#)[View article](#)[PDF](#)

## OPEN ACCESS

012090

Turned AISI 4340 Heat-Treated Steel Surface Quality Investigations in Dry and MQL Cooling Conditions

Hiraman N Sikdar, M VeeraBhadra Rao, Bhushan T Patil, Vasim A Shaikh and DSS Sudhakar

[+ Open abstract](#)[View article](#)[PDF](#)

## OPEN ACCESS

012091

Productivity improvement through identifying hazardous conditions in steel foundry

Edward Bernard and Gajanan Shankarrao Patange

[+ Open abstract](#)[View article](#)[PDF](#)

## OPEN ACCESS

012092

Hot corrosion behaviour of plasma and d-gun sprayed coatings on t91 steel used in boiler applications

C Sundaresan, B Rajasekaran, G Sivakumar and D S Rao

[+ Open abstract](#)[View article](#)[PDF](#)

## OPEN ACCESS

012093

Experimental investigation of performance and emission characteristics of diesel engine with use of rape seed oil as biodiesel

Bhavin Mehta, Dattatraya Subhedar, Gaurang Patel and Abhishek Swarnkar

[+ Open abstract](#)[View article](#)[PDF](#)

## OPEN ACCESS

012094

Effect of mixing proportion and mixing time on primary slurry retention and surface roughness of investment casting shells

A V Vyas, M P Pandya and M P Sutaria

[+ Open abstract](#)[View article](#)[PDF](#)

## Productivity improvement through identifying hazardous conditions in steel foundry

Edward Bernard<sup>1</sup> and Gajanan Shankarrao Patange<sup>2</sup>

<sup>1</sup>CHAMOS, Matrusanstha Department of Mechanical Engineering, CSPIT, CHARUSAT, Anand, Gujarat, India

E-mail: edwardbernard001@gmail.com

**Abstract:** Steel production from past decade shows prominent growth in Indian economy. Rapid strides have also made towards further growth and commissioning of new capacities. One of the prominent Productivity measurement tool in any company is the labor cost and its safety. In this paper, we discuss and identify the core hazardous conditions in steel foundry which may directly effects the productivity of steel industries. We also suggested the measures taken from technologies advancement, and to improve the occupational conditions of foundry.

### 1. Introduction

Steel plays a very important role in our day to day life. Steel and its alloys can be used in many mechanical and electrical applications. Product of steel plays a very important in sharing market shares as well as increasing development of the country. Steel is the main source of product in many micro and macro industries which cover almost 88% of the total industries of India. Steel will directly improve the social-economic status of the workers and the industries associated with it. Steel is easily available which makes industries to improve their productivity, also makes them flexible to try new products as per the market demands. [1]

Countries GDP shows growth in real time, hence to enhance the GDP of our country, Indian steel industries plays a vital role. More the export of the steel from the country which directly provide fund to the government hence provide better opportunity to become well developed nation. India stood 4<sup>th</sup> in global map on producing steel and its alloys. Our countries growth mainly depends upon the consumption and utilization of steel also on the growth of export quality of steel.[2]Micro and macro steel production capacity must be enhance in order to increase the profit. Production cannot be increase as provided the safer environment to the workers working in it. Even the lesser the accidents more the workers will feel safe in industry. So to increase the productivity of the industries we must provide a safer work place to the workers. Figure 1 shows main industries that are directly producing steel in larger quantity.[3]



## IOP Conference Series: Materials Science and Engineering

### Table of contents

Volume 872

2020

[Previous issue](#)

[Next issue](#)

Second International Conference on Materials Science and Manufacturing Technology 9-10 April 2020,  
Hotel Aloft, Coimbatore, Tamil Nadu, India

Accepted papers received: 06 March 2020

Published online: 26 June 2020

[Open all abstracts](#)

### Preface

OPEN ACCESS

Preface

[+ Open abstract](#)

[View article](#)

[PDF](#)

011001

OPEN ACCESS

Peer review statement

[+ Open abstract](#)

[View article](#)

[PDF](#)

011002

### Information & Communication Systems

OPEN ACCESS

Digital picture watermarking technique for security applications

012001



## OPEN ACCESS

012095

Influence of Al-3Ti-0.15C and Ce on Microstructure and Tensile Properties of Al-Si-Cu 319 alloy

D N Patel, J Joseph and M P Sutaria

+ Open abstract  View article  PDF

## OPEN ACCESS

012096

Design and analysis of multi-angular gearless transmission system

R P Barot and D M Patel

+ Open abstract  View article  PDF

## OPEN ACCESS

012097

Inquiry of inclined magnetic field effects on Walter –B nanofluid flow with heat generation / absorption

K Loganathan, N Nithyadevi, P Boopathi and K Mohana

+ Open abstract  View article  PDF


## Materials Science

## OPEN ACCESS

012098

Experimental investigation on characteristics of resole based phenolic resin

CH Joseph S Raju, T Ramalingam and P Srinivas Yadav

+ Open abstract  View article  PDF

## OPEN ACCESS

012099

Synthesis, characterization and impedance studies of novel nanocomposites of gadolinium titanate

Vinayak Adimule, Anusha Suryavanshi and Santosh Nandi

+ Open abstract  View article  PDF

## OPEN ACCESS

012100

Electrochemical performance of 2-mercaptobenzothiazole on the corrosion inhibition of selected metallic alloys in dilute acid media

Roland Tolulope Loto, Temitayo Morenikeji and Idowu Ayodeji Charles

+ Open abstract  View article  PDF

## OPEN ACCESS

012101

A review on concrete filled tubular sections using self compacting concrete

Smeet Faldu and Nanak Pamnani

## Design and analysis of multi-angular gearless transmission system

R P Barot\* and D M Patel

*Department of Mechanical Engineering, Chandubhai S Patel Institute of Technology, CHARUSAT University, Changa, Gujarat, India.*

*E-mail: ravibarot886@gmail.com*

**Abstract:** The present work mainly focuses on finding an alternate option of gear drives for various power transmitting applications in different sectors. In this study, the gearless power transmission mechanism created to transmit the power at various angles between the driving shaft and driven shaft, ranging from  $0^\circ$  to  $180^\circ$ . The system is modeled and analyzed in CREO5.0 to check the feasibility of the system. The speed analysis revealed that the speed ratio of the output shaft to the input shaft remained 1:1 during operation. The von mises stress analysis indicated that the design is safe under specific loading criteria. It observed from deformation analysis that the maximum displacement has occurred at the corner of the elbow link. The failure index analysis of the elbow link revealed that the inner curvature of a link is subjected to the maximum possibility of failure.

**Keywords:** Analysis, Design, Failure index, Gearless mechanism, Speed ratio

### 1. INTRODUCTION

The gear drives are extensively used for accurate and variable power transmission in various sectors like Automobile, Aerospace, Marine and Defence, Industrial cutting and machine tools, Lifting and hoisting devices, etc. The main drawback of gear drive is less efficient due to errors like backlash, resulting in the vibrations during operations and decrement in product life due to more wear rate of components [1].

Selby, 1917 developed an innovative gearless mechanism in which speed was varied by forwarding and backward movement by applied shaft-hub assembly [2]. Johnson, 1966 established the apparatus especially for automobile and aerospace industries in which the power was transferred in terms of increasing or decreasing speed through rotating frictionless balls [3]. Chakradhar, et al., 2019 showed advantages like less floor space area, simple working, lower friction and smooth operation, interchangeability of components, reduction in production cost, etc. of gearless mechanisms over gear equipped mechanisms [4]. Wu & Dong, 2014 analyzed the gearless reducer mechanism by introducing frictionless balls for unilateral and bilateral transmission. The trial experiments for both types of transmission revealed smooth operations and effective working efficiency [5]. Pramesh, et al., 2017 performed design and analysis of gearless elbow mechanism in Ansys software by a varying number of pins. It was proved from a simulation that the deformation and developed stress values were raised with an increasing number of pins [6]. The greater number of pins will be increasing the friction loss and weight of setup which results in power transmitting efficiency. Pawar, et al., 2018 designed a gearless elbow mechanism with three pins situated at  $120^\circ$  each for right angle ( $90^\circ$ ) power transmission [7].



Content from this work may be used under the terms of the Creative Commons Attribution 3.0 licence. Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

Published under licence by IOP Publishing Ltd

## IOP Conference Series: Materials Science and Engineering

### Table of contents

Volume 872

2020

[Previous issue](#)

[Next issue](#)

Second International Conference on Materials Science and Manufacturing Technology 9-10 April 2020,  
Hotel Aloft, Coimbatore, Tamil Nadu, India

Accepted papers received: 06 March 2020

Published online: 26 June 2020

[Open all abstracts](#)

### Preface

OPEN ACCESS

Preface

[+ Open abstract](#)

[View article](#)

[PDF](#)

011001

OPEN ACCESS

Peer review statement

[+ Open abstract](#)

[View article](#)

[PDF](#)

011002

### Information & Communication Systems

OPEN ACCESS

Digital picture watermarking technique for security applications

012001



## OPEN ACCESS

012088

Study on rectification of issues faced by ultrasonic welding of medical "e-stethoscope" by adhesive bonding technique

S C Bhopi, V B R Miriyala, S V Parab, A S Haldankar and S P Pandey

[+ Open abstract](#)[View article](#)[PDF](#)

## OPEN ACCESS

012089

Mechatronic approach in hydraulic braking system

Rajesh Boorla, Mohammed Moizuddin, Gankidi Gangadhar Reddy and Syed Faisal Nouman

[+ Open abstract](#)[View article](#)[PDF](#)

## OPEN ACCESS

012090

Turned AISI 4340 Heat-Treated Steel Surface Quality Investigations in Dry and MQL Cooling Conditions

Hiraman N Sikdar, M VeeraBhadra Rao, Bhushan T Patil, Vasim A Shaikh and DSS Sudhakar

[+ Open abstract](#)[View article](#)[PDF](#)

## OPEN ACCESS

012091

Productivity improvement through identifying hazardous conditions in steel foundry

Edward Bernard and Gajanan Shankarrao Patange

[+ Open abstract](#)[View article](#)[PDF](#)

## OPEN ACCESS

012092

Hot corrosion behaviour of plasma and d-gun sprayed coatings on t91 steel used in boiler applications

C Sundaresan, B Rajasekaran, G Sivakumar and D S Rao

[+ Open abstract](#)[View article](#)[PDF](#)

## OPEN ACCESS

012093

Experimental investigation of performance and emission characteristics of diesel engine with use of rape seed oil as biodiesel

Bhavin Mehta, Dattatraya Subhedar, Gaurang Patel and Abhishek Swarnkar

[+ Open abstract](#)[View article](#)[PDF](#)

## OPEN ACCESS

012094

Effect of mixing proportion and mixing time on primary slurry retention and surface roughness of investment casting shells

A V Vyas, M P Pandya and M P Sutaria

[+ Open abstract](#)[View article](#)[PDF](#)

## Experimental investigation of performance and emission characteristics of diesel engine with use of rape seed oil as biodiesel

Bhavin Mehta<sup>\*</sup>, Dattatraya Subhedar, Gaurang Patel and Abhishek Swarnkar

Department of Mechanical Engineering, C.S. Patel Institute of Technology, CHARUSAT, Changa, Gujarat, India

E-mail : \*bhavinmehta.me@charusat.ac.in

**Abstract :** In this paper, emission and performance characteristics of diesel fuel-engine was investigated using blending of diesel with bio diesel under steady state. Rape-seed oil was used as biodiesel and blended in diesel with different proportions of 10%, 20% and 30% by volume. The engine used in experiment was single cylinder 4-stroke diesel fuel-engine having water cooling system. Result shows that BTE decreases with more addition of bio-diesel in % fraction. For 10% blend, BTE of engine is almost same compared to diesel. The emission characteristics were remarkably improved by increasing volume fraction of rape seed oil except NO<sub>x</sub> emission. NO<sub>x</sub> emission was found maximum for 30% diesel-bio diesel blend.

**KEYWORDS:** Rape seed oil, Bio-diesel, Volume fraction, NO<sub>x</sub> emission

### Nomenclatures:

BTE	Brake Thermal Efficiency
BSFC	Brake Specific Fuel Consumption
CRDI	Common Rail Diesel Injection
VCRDE	Variable Compression Ratio Engine
CO	Carbon Monoxide
HC	Hydrocarbon
NO <sub>x</sub>	Nitrogen Oxide

## 1. INTRODUCTION

Fossil fuels are most popular as source of heat energy in automobiles, power generation, industries and agricultural sector. With increase in living standard of mankind, requirement of energy generation also increases day by day. On other side, reserve of petroleum resources is also limited and getting depleted progressively. In continuation with that, environmental pollution is one of the biggest challenge in current scenario. It is a high time to solve the issues related to reserve of fossil fuel and environmental pollution. The most convincing solution of above mentioned problem is use of alternative fuels along with conventional fuels. Bio-diesels are widely preferred among all the alternative fuels. Researchers around the globe proposed different techniques for use of vegetable oils in I.C. Engines includes esterification, direct blending with diesel, emulsification and pyrolysis. [1-2].

Sarvanan et al. have experimented on VCRDE using duel bio-diesel (Rape-seed oil and Mahua) blends. They concluded that BTE of engine decreases with increase in volume fraction of bio-diesel in diesel while emission characteristics got improved with increase in bio-diesel concentration. Raman et



Content from this work may be used under the terms of the Creative Commons Attribution 3.0 licence. Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.



## IOP Conference Series: Materials Science and Engineering

### Table of contents

Volume 872

2020

[Previous issue](#)

[Next issue](#)

Second International Conference on Materials Science and Manufacturing Technology 9-10 April 2020,  
Hotel Aloft, Coimbatore, Tamil Nadu, India

Accepted papers received: 06 March 2020

Published online: 26 June 2020

[Open all abstracts](#)

### Preface

OPEN ACCESS

Preface

[+ Open abstract](#)

[View article](#)

[PDF](#)

011001

OPEN ACCESS

Peer review statement

[+ Open abstract](#)

[View article](#)

[PDF](#)

011002

### Information & Communication Systems

OPEN ACCESS

Digital picture watermarking technique for security applications

012001

## Free vibration analysis of functionally graded plates using four parameter power law in Abaqus

R Wangdus and H D Chalak

[+ Open abstract](#) [View article](#) [PDF](#)

## OPEN ACCESS

## Recent Developments of Materials used in Air breathing and Advanced Air breathing Engines

012082

Krishnam Suhrutha and G Srinivas

[+ Open abstract](#) [View article](#) [PDF](#)

## OPEN ACCESS

## Investigations on the effect of nozzle angle and air flow rate during nanofluid Minimum Quantity Lubrication milling of Aerospace alloy Al7075-T6

012083

Harshit B Kulkarni, Pratik P Khandare, Pranesh G Parvatikar, Pranil G Pawar, Rajanikant Tiwari, Mahantesh M Nadakatti, Anand S Deshpande and Raviraj M Kulkarni

[+ Open abstract](#) [View article](#) [PDF](#)

## OPEN ACCESS

## Low cost and open source software-based CNC router for machining contours

012084

Aniket T Suryawanshi, D S S Sudhakar and Bhushan T Patil

[+ Open abstract](#) [View article](#) [PDF](#)

## OPEN ACCESS

## Numerical analysis of surface integrity in parallel turning process Part I: Influence of cutting tool parting distance

012085

Veldi Kanakaraju, Faisal Hassan, Kalidasan Rathinam and Gavendra Norkey

[+ Open abstract](#) [View article](#) [PDF](#)

## OPEN ACCESS

## Thermal barrier coating system for Internal Combustion Engine application-A review

012086

Chauhan Nilesh and Chauhan Kamlesh

[+ Open abstract](#) [View article](#) [PDF](#)

## OPEN ACCESS

## Flow modeling and simulation study of vacuum assisted resin transfer molding (VARTM) process: A review

012087

M Shah and V Chaudhary

[+ Open abstract](#) [View article](#) [PDF](#)



## Flow modeling and simulation study of vacuum assisted resin transfer molding (VARTM) process: A review

**M Shah and V Chaudhary**

*Department of Mechanical Engineering, Chandubhai S. Patel Institute of Technology, Charotar University of Science and Technology, CHARUSAT Campus Changa-388421, Gujarat, India.*

*maulikshah.me@charusat.ac.in*

**Abstract:** In recent times, vacuum-assisted resin transfer molding (VARTM) has become a promising technique for the processing of large composite structures. On the contrary, there are few issues related to VARTM processing as many process parameters are involved and required to optimize them to achieve high fiber volume fraction containing composite material. These issues can be addressed and resolved by an understanding of various flow modeling techniques and simulation methods. In this present study, a review of different approaches in flow modeling and simulation of the VARTM process is presented. The processing technology of VARTM along with the fundamental and constitutive models for mold filling stage as well as curing stage such as permeability, compaction, resin viscosity and cure kinetics are presented. The numerical simulation methods adopted by various researchers used to simulate the filling processes with their specific applications and simulation software are also reported and reviewed. As an outcome, identification of permeability of various fibers and simulation processing time are more predominant factors to perform accurate VARTM simulation.

### 1. INTRODUCTION

Polymer matrix composites (PMC) are becoming the prime choice in the category of material to replace metals and other materials in numerous sectors such as aeronautics, automotive, sports industry, construction, and marine structures. Composite structure also gives benefits in terms of reproducibility, quality, performances, environment friendliness and cost reduction, which are the indication of increasing the demand in the recent market. Among the various primary manufacturing processes for composites, Liquid Composite Molding (LCM) processes, for instance Resin Transfer Molding (RTM) and Vacuum Assisted Resin Transfer Molding (VARTM) are more suitable for processing complex shaped composite with a good surface finish and quality. Unlike the RTM process, VARTM provides significant reduction in the tooling cost as it requires a mold and a vacuum bag is used to close the mold. Therefore, manufacturing large composite structure such as ship hulls, windmill components and turbine blades, etc., VARTM is considered as the most cost-effective manufacturing method [1,2].

However, VARTM process can be critical, as it is required to complete the mold filling with adequate wetting of the fiber mat to achieve high fiber volume fraction in the composite. Incomplete resin infusion in the mold causes dry spots and resulted in defective parts. To accomplish good quality product, processing parameters, such as the locations and numbers of injections and vents need to be correctly set [3]. This problem can be addressed and understood by using mold filling simulation tool, allows the prediction of mold filling time, air trapped zones, resin flow around the inserts which probably lead to unfilled regions, etc [4]. Based on this, the VARTM process technology is discussed and formulated the VARTM model. In the present work, VARTM model and its implementation in the numerical simulation tool for creating a variety of real part by the contribution of various







**BITS Pilani**  
Dubai Campus

# Abstract Book

# IMMT 2019

## 2<sup>nd</sup> International Conference on Recent Advances in **M**aterials & **M**anufacturing **T**echnologies

November 20-22, 2019,  
Dubai, UAE

### Conveners

Dr. Vincent Shantha Kumar

Dr. Priyank Upadhyaya

### Organized by

Department of Mechanical Engineering  
Birla Institute of Technology and Science, Dubai campus  
United Arab Emirates

**innovate**

**achieve**

**lead**

so we do the tests like thermo gravimetric analysis (TGA), heat deflection analysis (HDA), water absorption test (WAT), scanning electron microscope (SEM) are conducted and analysis the results in various combinations. Natural fibre-reinforced hybrid composites can be a better replacement for plastic materials.

**Experimental Investigations of Bamboo, Cotton and Viscose Rayon  
Fiber Reinforced Unidirectional Composites  
Sagar Chokshi<sup>1</sup>, Darshan Patel<sup>1</sup>, Piyush Gohil<sup>2</sup>**

IMMT6091

<sup>1</sup>Department of Mechanical Engineering, C. S. Patel Institute of Technology,  
Changa, Charotar University of Science and Technology, Education Campus  
, Changa-388421, Gujarat, India.

<sup>2</sup>Department of Mechanical Engineering, Faculty of Technology and  
Engineering, M S University, Vadodara-390001, Gujarat, India.

\*Corresponding Email: [sagarchokshi.me@charusat.ac.in](mailto:sagarchokshi.me@charusat.ac.in)

Composite material occupies major part in the modern era due to it has good stiffness and high specific strength, lightweight, eco-friendly behavior and wide range of applications. Hence, composite material is chosen as a scope of research. In the present study, experimental investigations are carried out to find the tensile and flexural strength of unidirectional composites. For these, fabrication of composites are carried out using hand layup technique by selecting fibers: bamboo fiber, cotton fiber and viscous fiber as a reinforcement and polyesterresin as a matrix. The weight fraction of fiber is varied in the range 20%, 25%, 30%, 35% during fabrication of composite. Tensile testing and flexural testing of composites are carried out using the universal testing machine (UTM) as per the ASTM D3039/3039M-08 and ASTM D790-10 to measure tensile strength and flexural strength respectively. The simulation is also carried out for the prediction of tensile strength using ANSYS 15.0. The comparison of experimental results with simulation results is carried out to check the deviation of simulation results with experimental results. The paper signifies outcomes as: the tensile and flexural strength of the unidirectional composite increases with increase in weight fraction of fiber; the simulation results are good in agreement with experimental results.





ELSEVIER

Contents lists available at ScienceDirect

Materials Today: Proceedings

journal homepage: [www.elsevier.com/locate/matpr](http://www.elsevier.com/locate/matpr)

# Experimental investigations of bamboo, cotton and viscose rayon fiber reinforced Unidirectional composites

Sagar Chokshi<sup>a,\*</sup>, Piyush Gohil<sup>b</sup>, Darshan Patel<sup>a</sup>

<sup>a</sup>Department of Mechanical Engineering, Chandubhai S. Patel Institute of Technology, Changa, Charotar University of Science and Technology, Education Campus, Changa 388421, Gujarat, India

<sup>b</sup>Department of Mechanical Engineering, Faculty of Technology and Engineering, M S University, Vadodara 390001, Gujarat, India

## ARTICLE INFO

### Article history:

Received 7 September 2019

Received in revised form 19 October 2019

Accepted 23 December 2019

Available online xxxx

### Keywords:

Unidirectional Composites

Fabrication

Testing

Simulation

Modeling

## ABSTRACT

In the present study, the experimental investigations are carried out to find the tensile strength (TS) and flexural strength (FS) of unidirectional composites (UDC). For these, fabrication of composite (FOC) is carried out using hand layup technique by selecting fibers: bamboo fiber, cotton fiber and viscose rayon fiber as a reinforcement and polyester resin as a matrix. The weight fraction of fiber ( $w_f$ ) is varied in the range of 20%, 25%, 30% and 35% during FOC. Tensile testing and flexural testing of composites are carried out using the universal testing machine (UTM) to measure TS and FS. Tensile testing and flexural testing of composites are carried out as per the ASTM D3039/3039M-08 as per the ASTM D790-10 respectively. The FEA simulation is also carried out for the prediction of TS using ANSYS 15.0. The comparison of experimental results with simulation results is carried out to check the deviation of simulation results with experimental results. The paper signifies outcomes as the TS of the UDC rises with increase in  $w_f$ ; the FS of the UDC rises with increase in  $w_f$ ; the simulation results are good in consistence with experimental results.

© 2019 Elsevier Ltd. All rights reserved.

Selection and peer-review under responsibility of the scientific committee of the 2nd International Conference on Recent Advances in Materials & Manufacturing Technologies.

## 1. Introduction

Composite material becomes vigorous part of today's material due to it has various advantages such as of low weight, high fatigue strength, high specific strength, high specific stiffness, corrosion resistance, faster assembly, etc. [1–4]. Numerous composite products are used in industries across the world [5]. Hence, composite material is chosen as an area of the present study. In composite, the strength and stiffness are provided through the fibers and binding is made through the resin [6]. Hence, selection of fiber and resin is important parameter in composite. Natural fiber gives several benefits over traditional fibers such as low cost, low density, biodegradable, recyclable, no skin irritation, relatively high strength and stiffness and eco-friendly behavior to the environment, easily processed, etc. [7–17]. Hence, natural fiber is selected as a reinforcement. Here, bamboo fiber and cotton fibers are selected as fibers in natural fiber category due to it has good strength and easily availability from the market. One semi-synthetic fiber: viscose rayon fiber is also chosen as reinforcement due to it has advantages such

as versatile, comfortable, soft, very smooth, breathable, relatively light, strong, robust, and inexpensive [18].

Fibers and fillers are reinforced in polymeric composite material due to it is a multi-phase material and as a result synergistic mechanical properties can be achieved that cannot be achieved from either component alone [19]. Hence, polyester resin is selected as a matrix from polymeric resin. Mechanical characterization of composite generates tremendous amount of interest in students and researchers in the field of composites. Hence, in present study, experimental investigations are carried out to discover the mechanical properties: tensile property and flexural property of UDC. For these, the FOC is carried out using hand lay-up technique and testing: tensile testing and flexural testing are carried out. The FEA simulation is also carried out to find the TS of UDC.

## 2. Experimental investigations

### 2.1. Materials procurement

Natural fiber: bamboo fiber and cotton fiber are procured in the specific grade of 7 yarn counts and 10 yarn counts respectively from the local market of Ahmedabad, Gujarat, India. Semi-

\* Corresponding author.

E-mail address: [sagarchokshi.me@charusat.ac.in](mailto:sagarchokshi.me@charusat.ac.in) (S. Chokshi).

<https://doi.org/10.1016/j.matpr.2019.12.208>

2214-7853/© 2019 Elsevier Ltd. All rights reserved.

Selection and peer-review under responsibility of the scientific committee of the 2nd International Conference on Recent Advances in Materials & Manufacturing Technologies.

# Table of contents

Volume 1706

**2020**

◀ Previous issue      Next issue ▶

**First International Conference on Advances in Physical Sciences and Materials 13-14 August 2020, Coimbatore, India**

Accepted papers received: 13 November 2020

Published online: 22 December 2020

Open all abstracts

---

## Preface

---

**OPEN ACCESS**

011001

Preface

**+** Open abstract

 View article

 PDF

---

**OPEN ACCESS**

011002

Peer review declaration

**+** Open abstract

 View article

 PDF



**+** [Open abstract](#)

 [View article](#)

 [PDF](#)

---

**OPEN ACCESS**

012124

Tribological behaviour of PA6/diborontrioxide composites

Kawaljit singh Randhawa and Ashwin D Patel

**+** [Open abstract](#)

 [View article](#)

 [PDF](#)

---

**OPEN ACCESS**

012125

Seismic vibrations of complex relief of the surface of the naryn canyon (on the Norin river in Kyrgyzstan) during large-scale underground explosions

I I Safarov, F F Homidov, B S Rakhmonov and Sh N Almuratov

**+** [Open abstract](#)

 [View article](#)

 [PDF](#)

---

**OPEN ACCESS**

012126

Application of time and motion study to increase the productivity and efficiency

Chandra Prakash, B Prakash Rao, Dheeraj Vishwanatha Shetty and S Vaibhava

**+** [Open abstract](#)

 [View article](#)

 [PDF](#)

---

**OPEN ACCESS**

012127

Strength and durability studies of waste nylon cable ties concrete

Virabhadra Tiwari, Harshad R Parate and Nayana N Patil

**+** [Open abstract](#)

 [View article](#)

 [PDF](#)

# Tribological behaviour of PA6/diborontrioxide composites

**Kawaljit singh Randhawa and Ashwin D Patel**

Chandubhai S Patel Institute of Technology, CHARUSAT University, Changa- 388421,  
Anand, Gujarat, India.

**E-mail:** Kawaljitrandhawa.me@charusat.ac.in

**Abstract.** PA6 micro composites with different weight percentage of diboron trioxide ( $B_2O_3$ ) were fabricated by a twin-screw extruder and analysed for tribological behaviour. The weight percentage of  $B_2O_3$  were 2, 4, and 8wt% of PA6 matrix. Tribological tests were performed on pin-on-disc apparatus under different loads, sliding distances, and sliding velocities. Results were shown for individual varying parameter as well as with the combination of two and all three varying parameters conditions. Results of the tribological study shows that the PA6 composite with 2wt% diboron trioxide fillers exhibits lowest friction coefficient (COF) and wear rate compare to others and followed by PA6 with 4wt% diboron trioxide filler composite. PA6 with 8wt% diboron trioxide fillers were not found effective in reducing COF and wear rate, infect it increased the COF and wear rate of PA6 and found maximum compare to pure PA6 and PA6 with 2 and 4wt% diboron trioxide fillers.

**Keywords:** PA6 composite; Diboron Trioxide; Friction; Wear; Solid Lubricant; Tribology

## 1. Introduction

Polyamides (PA) are having vast application areas like in automobile, electronics, electrical components, and household appliances. PA6 is one of the common subtypes of polyamide family and having pleasant mechanical properties. Lots of research have already done on PA family for further improving their mechanical and tribological properties. According to one research, fibres and particulate reinforcements are advantageous in reducing friction and wear in only dry conditions when rubbing with the smooth surfaces[1]. According to Lalit Guglani and T.C. Gupta's research, wear, and COF of PA66 was reduced when titanium dioxide fillers were used less than 6wt% and they got the best tribological results for 2wt% fillers [2]. According to the research of Abdullah, Unal, and Yetgin, addition of nano clay in PA6/PP blend improved tribological properties of blended material. COF with wear rates of PA6/PP blend reduced by the addition of nano clay fillers [3]. Sathees Kumar and Kanagaraj found that the 20wt% graphite enhanced the wear resistance and tribological properties when encompassed in PA6. The addition of 20wt% graphite fillers enhanced the life of pure PA6 by a greater extent according to their research [4]. Yi-Lan You et al. investigated the influence of various fillers on tribological behaviour of PA6. In their results, they found that the glass fibres are more efficient in reducing COF and wear rate compare to talc when used as 15wt% and the COF and wear rate found increased with increasing the load [5]. To achieve better tribological properties of polyamides, various metal oxides were used by the researchers like copper oxide, calcium oxide, zinc



Content from this work may be used under the terms of the [Creative Commons Attribution 3.0 licence](https://creativecommons.org/licenses/by/3.0/). Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.



**BITS Pilani**  
Dubai Campus

# Abstract Book

# IMMT 2019

## 2<sup>nd</sup> International Conference on Recent Advances in **M**aterials & **M**anufacturing **T**echnologies

November 20-22, 2019,  
Dubai, UAE

### Conveners

Dr. Vincent Shantha Kumar

Dr. Priyank Upadhyaya

### Organized by

Department of Mechanical Engineering  
Birla Institute of Technology and Science, Dubai campus  
United Arab Emirates

**innovate**

**achieve**

**lead**



so we do the tests like thermo gravimetric analysis (TGA), heat deflection analysis (HDA), water absorption test (WAT), scanning electron microscope (SEM) are conducted and analysis the results in various combinations. Natural fibre-reinforced hybrid composites can be a better replacement for plastic materials.

**Experimental Investigations of Bamboo, Cotton and Viscose Rayon  
Fiber Reinforced Unidirectional Composites**

**Sagar Chokshi<sup>\*1</sup>, Darshan Patel<sup>1</sup>, Piyush Gohil<sup>2</sup>**

IMMT6091

<sup>1</sup>Department of Mechanical Engineering, C. S. Patel Institute of Technology,  
Changa, Charotar University of Science and Technology, Education Campus  
, Changa-388421, Gujarat, India.

<sup>2</sup>Department of Mechanical Engineering, Faculty of Technology and  
Engineering, M S University, Vadodara-390001, Gujarat, India.

\*Corresponding Email: [sagarchokshi.me@charusat.ac.in](mailto:sagarchokshi.me@charusat.ac.in)

Composite material occupies major part in the modern era due to it has good stiffness and high specific strength, lightweight, eco-friendly behavior and wide range of applications. Hence, composite material is chosen as a scope of research. In the present study, experimental investigations are carried out to find the tensile and flexural strength of unidirectional composites. For these, fabrication of composites are carried out using hand layup technique by selecting fibers: bamboo fiber, cotton fiber and viscous fiber as a reinforcement and polyesterresin as a matrix. The weight fraction of fiber is varied in the range 20%, 25%, 30%, 35% during fabrication of composite. Tensile testing and flexural testing of composites are carried out using the universal testing machine (UTM) as per the ASTM D3039/3039M-08 and ASTM D790-10 to measure tensile strength and flexural strength respectively. The simulation is also carried out for the prediction of tensile strength using ANSYS 15.0. The comparison of experimental results with simulation results is carried out to check the deviation of simulation results with experimental results. The paper signifies outcomes as: the tensile and flexural strength of the unidirectional composite increases with increase in weight fraction of fiber; the simulation results are good in agreement with experimental results.





Contents lists available at ScienceDirect

Materials Today: Proceedings

journal homepage: [www.elsevier.com/locate/matpr](http://www.elsevier.com/locate/matpr)

# Experimental investigations of bamboo, cotton and viscose rayon fiber reinforced Unidirectional composites

Sagar Chokshi<sup>a,\*</sup>, Piyush Gohil<sup>b</sup>, Darshan Patel<sup>a</sup>

<sup>a</sup> Department of Mechanical Engineering, Chandubhai S. Patel Institute of Technology, Changa, Charotar University of Science and Technology, Education Campus, Changa 388421, Gujarat, India

<sup>b</sup> Department of Mechanical Engineering, Faculty of Technology and Engineering, M S University, Vadodra 390001, Gujarat, India

## ARTICLE INFO

### Article history:

Received 7 September 2019

Received in revised form 19 October 2019

Accepted 23 December 2019

Available online xxxx

### Keywords:

Unidirectional Composites

Fabrication

Testing

Simulation

Modeling

## ABSTRACT

In the present study, the experimental investigations are carried out to find the tensile strength (TS) and flexural strength (FS) of unidirectional composites (UDC). For these, fabrication of composite (FOC) is carried out using hand layup technique by selecting fibers: bamboo fiber, cotton fiber and viscose rayon fiber as a reinforcement and polyester resin as a matrix. The weight fraction of fiber ( $w_f$ ) is varied in the range of 20%, 25%, 30%, and 35% during FOC. Tensile testing and flexural testing of composites are carried out using the universal testing machine (UTM) to measure TS and FS. Tensile testing and flexural testing of composites are carried out as per the ASTM D3039/3039M-08 as per the ASTM D790-10 respectively. The FEA simulation is also carried out for the prediction of TS using ANSYS 15.0. The comparison of experimental results with simulation results is carried out to check the deviation of simulation results with experimental results. The paper signifies outcomes as the TS of the UDC rises with increase in  $w_f$ ; the FS of the UDC rises with increase in  $w_f$ ; the simulation results are good in consistence with experimental results.

© 2019 Elsevier Ltd. All rights reserved.

Selection and peer-review under responsibility of the scientific committee of the 2nd International Conference on Recent Advances in Materials & Manufacturing Technologies.

## 1. Introduction

Composite material becomes vigorous part of today's material due to it has various advantages such as of low weight, high fatigue strength, high specific strength, high specific stiffness, corrosion resistance, faster assembly, etc. [1–4]. Numerous composite products are used in industries across the world [5]. Hence, composite material is chosen as an area of the present study. In composite, the strength and stiffness are provided through the fibers and binding is made through the resin [6]. Hence, selection of fiber and resin is important parameter in composite. Natural fiber gives several benefits over traditional fibers such as low cost, low density, biodegradable, recyclable, no skin irritation, relatively high strength and stiffness and eco-friendly behavior to the environment, easily processed, etc. [7–17]. Hence, natural fiber is selected as a reinforcement. Here, bamboo fiber and cotton fibers are selected as fibers in natural fiber category due to it has good strength and easily availability from the market. One semi-synthetic fiber: viscose rayon fiber is also chosen as reinforcement due to it has advantages such

as versatile, comfortable, soft, very smooth, breathable, relatively light, strong, robust, and inexpensive [18].

Fibers and fillers are reinforced in polymeric composite material due to it is a multi-phase material and as a result synergistic mechanical properties can be achieved that cannot be achieved from either component alone [19]. Hence, polyester resin is selected as a matrix from polymeric resin. Mechanical characterization of composite generates tremendous amount of interest in students and researchers in the field of composites. Hence, in present study, experimental investigations are carried out to discover the mechanical properties: tensile property and flexural property of UDC. For these, the FOC is carried out using hand lay-up technique and testing: tensile testing and flexural testing are carried out. The FEA simulation is also carried out to find the TS of UDC.

## 2. Experimental investigations

### 2.1. Materials procurement

Natural fiber: bamboo fiber and cotton fiber are procured in the specific grade of 7 yarn counts and 10 yarn counts respectively from the local market of Ahmedabad, Gujarat, India. Semi-

\* Corresponding author.

E-mail address: [sagarchokshi.me@charusat.ac.in](mailto:sagarchokshi.me@charusat.ac.in) (S. Chokshi).

<https://doi.org/10.1016/j.matpr.2019.12.208>

2214-7853/© 2019 Elsevier Ltd. All rights reserved.

Selection and peer-review under responsibility of the scientific committee of the 2nd International Conference on Recent Advances in Materials & Manufacturing Technologies.





Brought to you by Charotar University of Science and Technology

## Table of contents

Volume 992

2020

◀ Previous issue    Next issue ▶

4 th International Conference on Design, Analysis, Manufacturing and Simulation ( ICDAMS 2020)  
16-17 September, Chennai, India.

Accepted papers received: 11 October 2020

Published online: 30 November 2020

Open all abstracts

### Preface

OPEN ACCESS

Preface 011001

+ Open abstract    View article    PDF

OPEN ACCESS

Peer review declaration 011002

+ Open abstract    View article    PDF

### Papers

OPEN ACCESS

Optical analysis of T-shaped stiffened plate under compressive loading using central composite design scheme 012001

M T Letsatsi and A Agarwal

+ Open abstract    View article    PDF

OPEN ACCESS

Feasibility study of using permanent magnets as indirect temperature monitor in irradiation capsule of nuclear research reactor 012002

Suman Saurav, M. Muthuganesh, P. K. Chaurasia and S. Murugan



[+ Open abstract](#) [View article](#) [PDF](#)

**OPEN ACCESS**

Theoretical and experimental modal analysis of centrifugal pump radial flow impeller

012003

M N Oza and D S Shah

[+ Open abstract](#) [View article](#) [PDF](#)

**OPEN ACCESS**

Design optimization of magnetorheological brake using structural parameter: evaluation and validation

012004

S Patel, R Upadhyay and D Patel

[+ Open abstract](#) [View article](#) [PDF](#)

**OPEN ACCESS**

Design, fabrication and analysis of compaction die for powder processing

012005

Avadesh K Sharma, Rajeev Singh, Arun K Tiwari and Ajay K Sharma

[+ Open abstract](#) [View article](#) [PDF](#)

**OPEN ACCESS**

Onset of detonation through a cold flow analysis using metallic diaphragms – an experimental approach

012006

S Srikrishnan, T Shaafi and P K Dash

[+ Open abstract](#) [View article](#) [PDF](#)

**OPEN ACCESS**

Design of multistage forging processes by numerical simulation and experimental verification

012007

P Ruban, J Jayaprakash and S Surendarnath

[+ Open abstract](#) [View article](#) [PDF](#)

**OPEN ACCESS**

Use of animal fat methyl ester blend as a fuel in a CI engine

012008

G. Dinesh Babu and T. Shaafi

[+ Open abstract](#) [View article](#) [PDF](#)

**OPEN ACCESS**

Experimental investigation on the mechanical properties of wood sawdust and plaster of paris reinforced composite

012009

Avinash Singh and A Muniappan



## Theoretical and experimental modal analysis of centrifugal pump radial flow impeller

M N Oza<sup>1</sup>, Dr D S Shah<sup>2</sup>

<sup>1</sup>C S Patel Institute of Technology, Department of Mechanical Engineering, Faculty of Technology and Engineering, Charotar University of Science and Technology, Anand – 388421, Gujarat, India

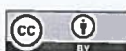
<sup>2</sup>Mechanical Engineering Department, Sardar Vallabhbhai Patel Institute of Technology, Anand, Gujarat, India

E-mail: madhavoza.me@charusat.ac.in

**Abstract.** Modal analysis is extensively used to identify the dynamic properties of a structure in terms of the dynamic characteristics: natural frequency, damping factor and mode shape. In this research, modal analysis has been carried out on a radial flow impeller of a centrifugal pump. The 3-D model of the impeller was built in CAD software Creo Parametric 1.0 from a 2-D drawing and that model was imported in FEA software package ANSYS for conducting modal analysis. The model was meshed effectively using SOLID187 elements. The first twenty natural frequency and mode shapes were extracted and nodal diameter was identified for each mode shape. The experimental modal analysis was conducted using impact hammer and the first twenty natural frequencies were identified using FFT analyzer. The natural frequencies of both the methods were compared and it was found that there is a good agreement between these results, thus the FE model is validated. The results are discussed and conclusions drawn.

### 1. Introduction

A centrifugal pump radial impeller is the rotating part transforming driver energy of the fluid into the kinetic energy. Due to the uncertain pattern of flow generated by the volute inside the radial impeller and whirling of impeller shaft, many dynamic forces are developed, leading to vibrations in the pump. The fatigue failure of the impeller is caused by fluctuating forces in combination with steady forces. The blades of the impeller are very critical components and they are exposed to very turbulent conditions. The blades of an impeller are frequently under very hostile operating conditions and damage the machine [1]. Reliability of impellers is very important parameter affecting the effective operation of the pump as well as environmental safety [2]. To design reliable impellers, the blade and disk modal analyses are of the utmost important. The evaluation of an impeller design is made by combining the dynamic behaviour with the nature of the fluctuating forces. Greater knowledge of the vibration behaviour of radial-flow impellers will be useful for optimizing their fatigue-life and efficiency, possibly resulting in increased performance and applicability. Modal analysis is the method







Brought to you by Charotar University of Science and Technology

## Table of contents

Volume 1004

2020

[◀ Previous issue](#)   [Next issue ▶](#)**1st International Conference on Recent Advancements in Design and Manufacturing (ICRADM 2020) 16-17 July 2020; SVNIT, Surat, India**

Accepted papers received: 17 November 2020

Published online: 23 December 2020

[Open all abstracts](#)

### Preface

---

**OPEN ACCESS**

Preface

011001

[+ Open abstract](#)   [View article](#)   [PDF](#)

---

**OPEN ACCESS**

Peer review declaration

011002

[+ Open abstract](#)   [View article](#)   [PDF](#)

### Papers

---

**OPEN ACCESS**

To Study effect of VARTM process parameters for composite strength: Taguchi approach

012001

A T Bhatt and P P Gohil

[+ Open abstract](#)   [View article](#)   [PDF](#)

---

**OPEN ACCESS**

Patch shape and size effect on performance of in-situ scarf patch repair in aircraft panel

012002

Kishan Dwivedi and Himanshu Pathak

[+ Open abstract](#)   [View article](#)   [PDF](#)



## OPEN ACCESS

## Modeling and Simulation of a Semi-active Vehicle Suspension system using PID Controller

012003

Prashant Narwade, Ravindra Deshmukh, Mahesh Nagarkar and Milind Bankar

+ Open abstract

 View article PDF


## OPEN ACCESS

## Role of thickness variation on the tailored bistability of unsymmetric composite laminates

012004

P M Anilkumar, A Phanendra Kumar, A Haldar and B N Rao

+ Open abstract

 View article PDF

## OPEN ACCESS

## A Comparative Study on Vibration-Based Damage Identification and Localization Methods

012005

A J Shah, V Jayprakash and G R Vesmawala

+ Open abstract

 View article PDF

## OPEN ACCESS

## CFD Investigation of Impact of Vessel configuration and Different Impeller Types in Stirred Tank

012006

Mohit Pathak and Thiyam Tamphasna Devi

+ Open abstract

 View article PDF


## OPEN ACCESS

## Challenges in joining of metallic pipes using microwave hybrid heating

012007

D N Gamit and M K Chudasama

+ Open abstract

 View article PDF


## OPEN ACCESS

## Effectiveness of Seismically Resistant Braced Frames to Blast Loading

012008

Akshay Kapoor and Saraswati Setia

+ Open abstract

 View article PDF


## OPEN ACCESS

## Shear Mode Damper Testing Using Flake Shape Based Magnetorheological Fluids

012009

D. M. Patel, D. V. Bhatt and R. V. Upadhyay

+ Open abstract

 View article PDF

## OPEN ACCESS

## Artificial Intelligence for Compressive Strength Prediction of Concrete

012010

S. J. Goutham and V. P. Singh



## Shear Mode Damper Testing Using Flake Shape Based Magnetorheological Fluids

D. M. Patel<sup>1\*</sup>, D. V. Bhatt<sup>2</sup> and R. V. Upadhyay<sup>3</sup>

<sup>1</sup>C S Patel Institute of Technology, Department of Mechanical Engineering, Charotar University of Science and Technology, CHARUSAT-Campus, Changa-388421, India.

<sup>2</sup>Department of Mechanical Engineering, S.V.N.I.T., Surat-395007, Gujarat, India.

<sup>3</sup>P D Patel Institute of Applied Science, Charotar University of Science and Technology, CHARUSAT-Campus, Changa-388421, India

\*E-Mail: dipalpatel.me@charusat.ac.in

**Abstract:** Use of anisotropic iron particles in the magnetorheological (MR) fluid having a high yield stress is a challenge as it increases the viscosity of the fluid in off-state. In this clause, a novel flake shaped iron powder based MR fluid with high yield stress is synthesized and used in shear mode MR damper (SMMD). MR damper design is optimized using fluid properties and Bingham model. Damping performance of newly synthesized MR fluid damper is at par with the available friction based damper used in front loaded washing machine. The unique feature of this design is minimal volume of the fluid (1.5 ml) required to achieve damping force of 50N. Effect of different volume percentage of particles in MR fluid is evaluated in terms of damping force. Effect of testing parameters like displacement and frequency of excitation on damping force was evaluated. Effect of settling of particle on damper performance is discussed in this work. It shows that the flakes shaped-based MR fluid show better stability against gravity. The smaller quantity of present flake shaped-based MR fluid will reduce the cost of shear mode damper.

### 1. Introduction

By using passive damper between structure and delicate equipment, it is possible to take in either shock (high damping) or vibration (low damping) during normal operation. Therefore, research was concentrated on developing active dampers for vibration isolation [1]. Semi-active damper utilizing Magnetorheological (MR) fluids also can be used for this requirement. The MR fluids are combinations of carrier oil, iron particles (micron-Sized). It's rheological properties are tune due to magnetic particles in presence of magnetic field [2,3]. MR effects (rheological properties) in the MR fluid has found numerous applications like MR shock absorbers [4], MR mounts [5], clutches, brakes [5,6], recoil system [7-9] etc.

In all these applications, the maximum effect is limited by the saturation magnetization of the dispersed magnetic particles. The performance of MR fluid in applications is judged by three parameters called figure of merits [10]. These are; (i)  $F_1 = \tau_2/\eta$ , where  $\tau$  is yield stress and  $\eta$  is the viscosity of MR fluid at zero magnetic field, maximizing this figure of merit, helps in minimizing the device size and electrical power consumption. (ii)  $F_2 = \tau_2/\eta\rho$ , here  $\rho$  is the density of MR fluid. This is an important term, when one deals with weight-sensitive applications and (iii)  $F_3 = \tau/BH$ , here  $B$  and  $H$  are magnetic flux density and intensity of the fluid. Minimization of this figure of merit will help to reduce current requirement, and it is usually required for high bandwidth applications. Then all these virtues are to be optimized for the MR fluid properties. While the suitability of an MR fluid for a particular use depends on factors such as stability, durability and temperature range, therefore, it becomes very significant to design new MR fluids, which can enhance the MR effect.



# Table of contents

Volume 1706

**2020**

◀ Previous issue      Next issue ▶

**First International Conference on Advances in Physical Sciences  
and Materials 13-14 August 2020, Coimbatore, India**

Accepted papers received: 13 November 2020

Published online: 22 December 2020

Open all abstracts

---

## Preface

---

**OPEN ACCESS**

011001

Preface

+ Open abstract



View article



PDF

---

**OPEN ACCESS**

011002

Peer review declaration

+ Open abstract



View article



PDF



## Effect of nano TiO<sub>2</sub>-epoxy composite in bond strength and corrosion resistance of rebar embedded in micro-silica modified concrete

V Ramganes, M Ananth Kumar, KM Mini, Vaishno Vignesh and R Karthikeyan

**+** Open abstract



View article



PDF

## Investigating the effect of biological material on the property of concrete

Santosh Ashok Kadapure

**+** Open abstract



View article



PDF

## Tribological behaviour of PA6/diborontrioxide composites

Kawaljit singh Randhawa and Ashwin D Patel

**+** Open abstract



View article



PDF

## Seismic vibrations of complex relief of the surface of the naryn canyon (on the Norin river in Kyrgyzstan) during large-scale underground explosions

I I Safarov, F F Homidov, B S Rakhmonov and Sh N Almuratov

**+** Open abstract



View article



PDF

---

## Tribological behaviour of PA6/diborontrioxide composites

**Kawaljit singh Randhawa and Ashwin D Patel**

Chandubhai S Patel Institute of Technology, CHARUSAT University, Changa- 388421,  
Anand, Gujarat, India.

**E-mail:** Kawaljitrandhawa.me@charusat.ac.in

**Abstract.** PA6 micro composites with different weight percentage of diboron trioxide ( $B_2O_3$ ) were fabricated by a twin-screw extruder and analysed for tribological behaviour. The weight percentage of  $B_2O_3$  were 2, 4, and 8wt% of PA6 matrix. Tribological tests were performed on pin-on-disc apparatus under different loads, sliding distances, and sliding velocities. Results were shown for individual varying parameter as well as with the combination of two and all three varying parameters conditions. Results of the tribological study shows that the PA6 composite with 2wt% diboron trioxide fillers exhibits lowest friction coefficient (COF) and wear rate compare to others and followed by PA6 with 4wt% diboron trioxide filler composite. PA6 with 8wt% diboron trioxide fillers were not found effective in reducing COF and wear rate, infact it increased the COF and wear rate of PA6 and found maximum compare to pure PA6 and PA6 with 2 and 4wt% diboron trioxide fillers.

**Keywords:** PA6 composite; Diboron Trioxide; Friction; Wear; Solid Lubricant; Tribology

### 1. Introduction

Polyamides (PA) are having vast application areas like in automobile, electronics, electrical components, and household appliances. PA6 is one of the common subtypes of polyamide family and having pleasant mechanical properties. Lots of research have already done on PA family for further improving their mechanical and tribological properties. According to one research, fibres and particulate reinforcements are advantageous in reducing friction and wear in only dry conditions when rubbing with the smooth surfaces[1]. According to Lalit Guglani and T.C. Gupta's research, wear, and COF of PA66 was reduced when titanium dioxide fillers were used less than 6wt% and they got the best tribological results for 2wt% fillers [2]. According to the research of Abdullah, Unal, and Yetgin, addition of nano clay in PA6/PP blend improved tribological properties of blended material. COF with wear rates of PA6/PP blend reduced by the addition of nano clay fillers [3]. Sathees Kumar and Kanagaraj found that the 20wt% graphite enhanced the wear resistance and tribological properties when encompassed in PA6. The addition of 20wt% graphite fillers enhanced the life of pure PA6 by a greater extent according to their research [4]. Yi-Lan You et al. investigated the influence of various fillers on tribological behaviour of PA6. In their results, they found that the glass fibres are more efficient in reducing COF and wear rate compare to talc when used as 15wt% and the COF and wear rate found increased with increasing the load [5]. To achieve better tribological properties of polyamides, various metal oxides were used by the researchers like copper oxide, calcium oxide, zinc



Content from this work may be used under the terms of the [Creative Commons Attribution 3.0 licence](https://creativecommons.org/licenses/by/3.0/). Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

Mrinmoy Majumder  
Ganesh D. Kale *Editors*

# Water and Energy Management in India

Artificial Neural Networks and  
Multi-Criteria Decision Making  
Approaches

 Springer



# Contents

## Water Management

<b>A Review of Multiple Criteria Decision-Making Methods in Reference to Water Resources and Climate Science Applications</b> . . . .	3
<u>Hiteshri Shastri, Kaustubh Salvi, Shashikanth Kulkarni, and Saptarshi Misra</u>	
<b>Development of Spatial Cognitive Model for Estimation of Ungauged Runoff for Mesoscale Rivers</b> . . . . .	23
Tilottama Chakraborty	
<b>Indicator Based Impact Analysis of Urbanization with Respect to Evapo-Transpiration</b> . . . . .	55
Ashesh Rudra Paul and Apu K. Saha	
<b>Trend Analyses in Groundwater Levels of the Bikaner District, Rajasthan</b> . . . . .	91
Sanju R. Phulpagar, Ganesh D. Kale, Sagar Patel, and Sudhansu Mohanta	
<b>Climate Change Impact on Virtual Water Availability: A Categorized Polynomial Neural Network Approach</b> . . . . .	109
Mrinmoy Majumder, Apu K. Saha, Prachi D. Khobragade, Deepjyoti Deb, and Khakachang Tripura	
<b>Development of ANN Model for Simulation of the Runoff as Affected by Climatic Factors on the Jamuna River, Assam, India</b> . . . .	127
Mridusmita Debnath, Arup Kumar Sarma, and Chandan Mahanta	
<b>Modelling of Reference Evapotranspiration for Semi-arid Climates Using Artificial Neural Network</b> . . . . .	141
Adeeba Ayaz, Sharath Chandra, Pratik Mandlecha, and Rehana Shaik	
<b>Verifying Storm Water Drainage System Capacity for Vadodara Airport</b> . . . . .	161
Nayana D. Mathasoliya and S. S. Mujumdar	

# A Review of Multiple Criteria Decision-Making Methods in Reference to Water Resources and Climate Science Applications



**Hiteshri Shastri, Kaustubh Salvi, Shashikanth Kulkarni,  
and Saptarshi Misra**

**Abstract** This chapter provides a review of the literature on multiple criteria decision-making (MCDM) applications to water resources and climate science problems. Inputs from these fields are extremely important for effective policy formulations, especially for agro-economy of India. However, characterized by uncertainties originating from different sources and complex governing physics, the outcomes of these fields are required to be applied to a constrained based system. Hence, a robust decision making tool is required to augment the policy formations against the systems with conflicting constraints. MCDM techniques are devised mainly to evaluate such problems with conflicting constraints and provide solutions. These methods reveal the credibility to deal with such situations. Seventy references describing eleven different MCDM approaches have been evaluated in this paper. This provides a unified source of references that could be useful for researchers and practitioners. Based on the review, some recent trends and future research directions are also highlighted.

**Keywords** MCDM · Climate change · Decision-making

---

H. Shastri  
Department of Civil Engineering, Charotar University of Science and Technology, Anand,  
Gujarat, India  
e-mail: [hiteshrishastri.cv@charusat.ac.in](mailto:hiteshrishastri.cv@charusat.ac.in)

K. Salvi (✉)  
Alabama Transportation Institute, University of Alabama, Tuscaloosa, USA  
e-mail: [kaustubh.iitm@gmail.com](mailto:kaustubh.iitm@gmail.com)

S. Kulkarni  
Department of Civil Engineering, Osmania University, Hyderabad, Telangana, India  
e-mail: [kulkarni.shashikanth@gmail.com](mailto:kulkarni.shashikanth@gmail.com)

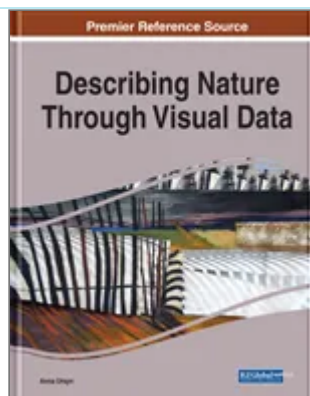
S. Misra  
Department of Computer Science and Engineering, IIT Kharagpur, Kharagpur, West Bengal, India

To Support Customers in Easily and Affordably Obtaining the Latest Peer-Reviewed Research,  
**Receive a 20% Discount on ALL Publications and Free Worldwide Shipping on Orders Over US\$ 295**

Additionally, Enjoy an Additional 5% Pre-Publication Discount on all Forthcoming Reference Books



[Browse Titles \(https://www.igi-global.com/search/?p=&ctid=1%2c2\)](https://www.igi-global.com/search/?p=&ctid=1%2c2)



## Describing Nature Through Visual Data

Anna Ursyn (/affiliate/anna-ursyn/199797/) (University of Northern Colorado, USA)

Release Date: July, 2020

Copyright: © 2021

Pages: 367

DOI: 10.4018/978-1-7998-5753-2

ISBN13: 9781799857532

ISBN10: 1799857530

EISBN13: 9781799857549

ISBN13 Softcover: 9781799857563

### Hardcover:

**\$156.00**

List Price: ~~\$195.00~~

[Available \(https://www.igi-global.com/book/describing-nature-through-visual-data/252572?f=hardcover\)](https://www.igi-global.com/book/describing-nature-through-visual-data/252572?f=hardcover)



[Current Special Offers](#)

### E-Book:

**\$156.00**

List Price: ~~\$195.00~~

[Available \(https://www.igi-global.com/book/describing-nature-through-visual-data/252572?f=e-book\)](https://www.igi-global.com/book/describing-nature-through-visual-data/252572?f=e-book)



[Current Special Offers](#)

### Hardcover + E-Book:

**\$188.00**

List Price: ~~\$235.00~~

[Available \(https://www.igi-global.com/book/describing-nature-through-visual-data/252572?f=hardcover-e-book\)](https://www.igi-global.com/book/describing-nature-through-visual-data/252572?f=hardcover-e-book)



[Current Special Offers](#)



**Preface**
[View Full PDF \(/pdf.aspx?tid=259675&ptid=252572&ctid=15&t=Preface&isxn=9781799857532\)](/pdf.aspx?tid=259675&ptid=252572&ctid=15&t=Preface&isxn=9781799857532)
**Acknowledgment**
[View Full PDF \(/pdf.aspx?tid=259676&ptid=252572&ctid=15&t=Acknowledgment&isxn=9781799857532\)](/pdf.aspx?tid=259676&ptid=252572&ctid=15&t=Acknowledgment&isxn=9781799857532)
**Chapter 1****\$37.50**

Advances in Describing and Managing Our Environment (/chapter/advances-in-describing-and-managing-our-environment/259678) (pages 1-57)

Anna Ursyn

This chapter examines links between the developments in selected technologies and our ways of teaching and learning. The focus is on some domains...

Sample PDF (/viewtitlesample.aspx?id=259678&ptid=252572&t=Advances in Describing and Managing Our Environment&isxn=9781799857532)

**Chapter 2****\$37.50**

Random Processes and Visual Perception: Stochastic Art (/chapter/random-processes-and-visual-perception/259679) (pages 58-72)

Jean Constant

The aim of this chapter is to explore a classic stochastic problem using the tools of the graphics environment. Stochastic processes are associated...

Sample PDF (/viewtitlesample.aspx?id=259679&ptid=252572&t=Random Processes and Visual Perception: Stochastic Art&isxn=9781799857532)

**Chapter 3****\$37.50**

Visualisation of Mathematical Thinking (/chapter/visualisation-of-mathematical-thinking/259680) (pages 73-98)

Hervé Lehning

Drawing is not proving. For a long time, this argument has been used to avoid the use of visualisation in mathematics. Nevertheless, a number of...

Sample PDF (/viewtitlesample.aspx?id=259680&ptid=252572&t=Visualisation of Mathematical Thinking&isxn=9781799857532)

**Chapter 4****\$37.50**

Connecting Art, Culture, Science, and Technology (/chapter/connecting-art-culture-science-and-technology/259682) (pages 100-113)

Jing Zhou

This chapter presents the motivation, background, and implementation of “Living Mandala: The Cosmic of Being 1,” an interactive graphics...

Sample PDF (/viewtitlesample.aspx?id=259682&ptid=252572&t=Connecting Art, Culture, Science, and Technology&isxn=9781799857532)

**Chapter 5****\$37.50**

Depicting the Nature of Nature: A Contemporary Approach to Developing Aesthetically-Driven Visual Data Derived From Primary Sources (/chapter/depicting-the-nature-of-nature/259683) (pages 114-138)

John Antoine Labadie

The term “visual data” is often connected with strategies related to developing graphs or other types of quantitative visual data arrays. Visual...

Sample PDF (/viewtitlesample.aspx?id=259683&ptid=252572&t=Depicting the Nature of Nature: A Contemporary Approach to Developing Aesthetically-Driven Visual Data Derived From Primary Sources&isxn=9781799857532)

**Chapter 6****\$37.50**

Vachanamrut Visualization (/chapter/vachanamrut-visualization/259684) (pages 139-157)

Chintan M. Bhatt, Bhishm Daslaniya, Ghanshyam Patel, Divyesh Patel

The authors discuss their interaction with data using various data visualization techniques, which are a quick, easy way to convey concepts...

Sample PDF (/viewtitlesample.aspx?id=259684&ptid=252572&t=Vachanamrut Visualization&isxn=9781799857532)

**Chapter 7****\$37.50**

Alphabets and Characters (/chapter/alphabets-and-characters/259686) (pages 159-177)

Anna Ursyn

This chapter examines visual-verbal connections that can be perceived in individual letters. Cultural patterns that build our visual literacy...

Sample PDF (/viewtitlesample.aspx?id=259686&ptid=252572&t=Alphabets and Characters&isxn=9781799857532)

**Chapter 8****\$37.50**

Cultural Considerations of Chinese Calligraphy Using Characters as Visual Language (/chapter/cultural-considerations-of-chinese-calligraphy-using-characters-as-visual-language/259687) (pages 178-212)

Jingying Zhen

Chinese writing language originated from hieroglyphics. Chinese characters, changing with the development of writing instruments, became pure...

Sample PDF (/viewtitlesample.aspx?id=259687&ptid=252572&t=Cultural Considerations of Chinese Calligraphy Using Characters as Visual Language&isxn=9781799857532)

**Chapter 9****\$37.50**

Arabic Language as Arab Characters Related to Arabic Language Alphabet (/chapter/arabic-language-as-arab-characters-related-to-arabic-language-alphabet/259688) (pages 213-227)

Adel Alanmi

All languages in this universe have a rich history behind them and culture among the people who speak them. Arabic calligraphy is a timeless craft...

Sample PDF (/viewtitlesample.aspx?id=259688&ptid=252572&t=Arabic Language as Arab Characters Related to Arabic Language Alphabet&isxn=9781799857532)

**Chapter 10****\$37.50**

Jazz and Jazz Theory (/chapter/jazz-and-jazz-theory/259689) (pages 228-309)

Stuart Smith

The question “what is jazz?” has been asked regularly since the origins of this music in the early 20th century. Over this time, jazz has undergone...

Sample PDF (/viewtitlesample.aspx?id=259689&ptid=252572&t=Jazz and Jazz Theory&isxn=9781799857532)

**Chapter 11****\$37.50**

Music and the Mind: How to Have a Brilliant Child (/chapter/music-and-the-mind/259691) (pages 311-329)

Robert C. Ehle

This chapter ponders answers to several questions asked by music listeners not having direct experience with the sounds: How does the brain perceive...

Sample PDF (/viewtitlesample.aspx?id=259691&ptid=252572&t=Music and the Mind: How to Have a Brilliant Child&isxn=9781799857532)

**Chapter 12****\$37.50**

Simultaneous Perception of Parallel Streams of Visual Data (/chapter/simultaneous-perception-of-parallel-streams-of-visual-data/259692) (pages 330-347)

Marcin Brzezicki

This chapter presents a study of the perceptual processes that condition the parallel processing of visual data, and thus could become a design tool...

Sample PDF (/viewtitlesample.aspx?id=259692&ptid=252572&t=Simultaneous Perception of Parallel Streams of Visual Data&isxn=9781799857532)

**About the Contributors**

View Full PDF (/pdf.aspx?tid=259694&ptid=252572&ctid=17&t=About the Contributors&isxn=9781799857532)

**Index**

View Full PDF (/pdf.aspx?tid=259695&ptid=252572&ctid=17&t=Index&isxn=9781799857532)

**Author(s)/Editor(s) Biography**

**Anna Ursyn**, PhD, is a professor and Computer Graphics/Digital Media Area Head at the University of Northern Colorado. She combines programming, software and various media. Ursyn had over 40 single juried and invitational art shows, over 200 fine art exhibitions, such as over dozen times at SIGGRAPH Art Galleries, travelling shows Louvre, Paris, NTT Museum in Tokyo (5000 texts and 2000 images representing XX Century), and Virtual Media Network, the largest moving image outdoor display) Dallas Texas. Her work was selected to be sent by NASA to the Moon Museum MoonArk project. Research and pedagogy interests include integrated instruction in art, science, and computer art graphics. She published articles and artwork in books and journals. Since 1987 she serves as a Liaison, Organizing and Program Committee member of International IEEE Conferences on Information Visualization (iV) London, UK, and (CGIV), and as a Chair of the Symposium and Digital Art Gallery D-ART For iV. She serves as a chair of the SpaceTime International Student Competition for the ACM SIGGRAPH Conference. Anna has published six books with IGI-Global and book chapters. Website: Ursyn.com. ursyn@unco.edu



# Chapter 6

## Vachanamrut Visualization

**Chintan Bhatt**

*Charotar University of Science and Technology, India*

**Bhishm Daslaniya**

*Charotar University of Science and Technology, India*

**Ghanshyam Patel**

*Charotar University of Science and Technology, India*

**Divyesh Patel**

*Charotar University of Science and Technology, India*

### ABSTRACT

*The authors discuss their interaction with data using various data visualization techniques, which are a quick, easy way to convey concepts universally. Currently, data has become more and more important; it is also important how one can visualize that data in the mind. This chapter is based on extracting important information from one of the holy Swaminarayan scriptures. The authors explore the content of the Vachanamrut, a unique work of prose in the Gujarati language, which contains discourses of Lord Swaminarayan and his conversation with saints and devotees. They convert the data in graphical interface using some libraries of the R tool. So, one can get the main idea of that data quickly, without a need to explain more about that data. Summing it up, this chapter examines the techniques of describing data of any ancient scripture or ancient text in any language by visualizing that data.*

### INTRODUCTION

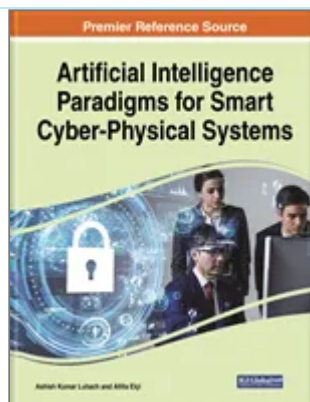
If we observe today's generation and previous generations, one can find it obvious that most of the decisions of life depend mainly on the previous historical experience of other people. So, in today's era, every person relates to something called data, that means Data is equal to understanding. Every single information contains data; how to treat data that is different from person to person. "You can have data without information, but you cannot have information without data"—Daniel Keys Moran. (Marr, n.d.)

DOI: 10.4018/978-1-7998-5753-2.ch006

To Support Customers in Easily and Affordably Obtaining the Latest Peer-Reviewed Research,  
**Receive a 20% Discount on ALL Publications and Free Worldwide Shipping on  
 Orders Over US\$ 295**

Additionally, Enjoy an Additional 5% Pre-Publication Discount on all Forthcoming Reference  
 Books

[Browse Titles \(https://www.igi-global.com/search/?p=&ctid=1%2c2\)](https://www.igi-global.com/search/?p=&ctid=1%2c2)



## Artificial Intelligence Paradigms for Smart Cyber-Physical Systems

Ashish Kumar Luhach (The PNG University of Technology, Papua New Guinea) and Atilla Elçi (/affiliate/atilla-eli/240624/) (Hasan Kalyoncu University, Turkey)

Release Date: November, 2020

Copyright: © 2021

Pages: 392

DOI: 10.4018/978-1-7998-5101-1

ISBN13: 9781799851011

ISBN10: 179985101X

EISBN13: 9781799851028

ISBN13 Softcover: 9781799858461

### Hardcover:

**\$180.00**

List Price: ~~\$225.00~~

[Book artificial-intelligence-paradigms-smart-cyber/244677?f=hardcover](https://www.igi-global.com/book/artificial-intelligence-paradigms-smart-cyber/244677?f=hardcover)

[Current Special Offers](#)

### E-Book:

**\$180.00**

List Price: ~~\$225.00~~

[Book artificial-intelligence-paradigms-smart-cyber/244677?f=e-book](https://www.igi-global.com/book/artificial-intelligence-paradigms-smart-cyber/244677?f=e-book)

[Current Special Offers](#)

### Hardcover + E-Book:

**\$216.00**

List Price: ~~\$270.00~~

[Book artificial-intelligence-paradigms-smart-cyber/244677?f=hardcover-e-book](https://www.igi-global.com/book/artificial-intelligence-paradigms-smart-cyber/244677?f=hardcover-e-book)

[Current Special Offers](#)

## Table of Contents

[View Full PDF \(/pdf.aspx?tid=266126&ptid=244677&ctid=15&t=Table of Contents&isxn=9781799851011\)](#)

## Detailed Table of Contents

[View Full PDF \(/pdf.aspx?tid=266127&ptid=244677&ctid=15&t=Detailed Table of Contents&isxn=9781799851011\)](#)

## Preface

Ashish Kumar Luhach, Atilla Elçi

[View Full PDF \(/pdf.aspx?tid=266128&ptid=244677&ctid=15&t=Preface&isxn=9781799851011\)](#)

## Chapter 1

**\$37.50**

Engineering AI Systems: A Research Agenda (/chapter/engineering-ai-systems/266130) (pages 1-19)

Jan Bosch, Helena Holmström Olsson, Ivica Crnkovic

Artificial intelligence (AI) and machine learning (ML) are increasingly broadly adopted in industry. However, based on well over a dozen case...

Sample PDF (/viewtitlesample.aspx?id=266130&ptid=244677&t=Engineering AI Systems: A Research Agenda&isxn=9781799851011)

## Chapter 2

**\$37.50**

Machine Learning in Cyber-Physical Systems in Industry 4.0 (/chapter/machine-learning-in-cyber-physical-systems-in-industry-40/266131) (pages 20-41)

Rania Salih Ahmed, Elmustafa Sayed Ali Ahmed, Rashid A. Saeed

Cyber-physical systems (CPS) have emerged with development of most great applications in the modern world due to their ability to integrate...

Sample PDF (/viewtitlesample.aspx?id=266131&ptid=244677&t=Machine Learning in Cyber-Physical Systems in Industry 4.0&isxn=9781799851011)

## Chapter 3

**\$37.50**

Explainable Artificial Intelligence (xAI) Approaches and Deep Meta-Learning Models for Cyber-Physical Systems (/chapter/explainable-artificial-intelligence-xai-approaches-and-deep-meta-learning-models-for-cyber-physical-systems/266132) (pages 42-67)

Evren Daglarli

Today, the effects of promising technologies such as explainable artificial intelligence (xAI) and meta-learning (ML) on the internet of things...

Sample PDF (/viewtitlesample.aspx?id=266132&ptid=244677&t=Explainable Artificial Intelligence (xAI) Approaches and Deep Meta-Learning Models for Cyber-Physical Systems&isxn=9781799851011)

## Chapter 4

**\$37.50**

Artificial Intelligence-Based Solutions for Cyber Security Problems (/chapter/artificial-intelligence-based-solutions-for-cyber-security-problems/266133) (pages 68-86)

Merve Yildirim

Due to its nature, cyber security is one of the fields that can benefit most from the techniques of artificial intelligence (AI). Under normal...

Sample PDF (/viewtitlesample.aspx?id=266133&ptid=244677&t=Artificial Intelligence-Based Solutions for Cyber Security Problems&isxn=9781799851011)



**Chapter 5****\$37.50**

Social Perspective of Suspicious Activity Detection in Facial Analysis: An ML-Based Approach for the Indian Perspective (/chapter/social-perspective-of-suspicious-activity-detection-in-facial-analysis/266134) (pages 87-107)

Rohit Rastogi, Priyanshi Garg

The world is witnessing an unprecedented growth of cyber-physical systems (CPS), which are foreseen to revolutionize our world via creating new...

Sample PDF (/viewtitlesample.aspx?id=266134&ptid=244677&t=Social Perspective of Suspicious Activity Detection in Facial Analysis: An ML-Based Approach for the Indian Perspective&isxn=9781799851011)

**Chapter 6****\$37.50**

Smart IDS and IPS for Cyber-Physical Systems (/chapter/smart-ids-and-ips-for-cyber-physical-systems/266136) (pages 109-136)

Sara A. Mahboub, Elmustafa Sayed Ali Ahmed, Rashid A. Saeed

One of the most important requirements is security and accessibility efforts which are represented as a critical issue that should be considered in...

Sample PDF (/viewtitlesample.aspx?id=266136&ptid=244677&t=Smart IDS and IPS for Cyber-Physical Systems&isxn=9781799851011)

**Chapter 7****\$37.50**

A Survey on Network Intrusion Detection Using Deep Generative Networks for Cyber-Physical Systems (/chapter/a-survey-on-network-intrusion-detection-using-deep-generative-networks-for-cyber-physical-systems/266137) (pages 137-159)

Srikanth Yadav M., Kalpana R.

In the present computing world, network intrusion detection systems are playing a vital part in detecting malicious activities, and enormous...

Sample PDF (/viewtitlesample.aspx?id=266137&ptid=244677&t=A Survey on Network Intrusion Detection Using Deep Generative Networks for Cyber-Physical Systems&isxn=9781799851011)

**Chapter 8****\$37.50**

Malicious URL Detection Using Machine Learning (/chapter/malicious-url-detection-using-machine-learning/266138) (pages 160-180)

Ferhat Ozgur Catak, Kevser Sahinbas, Volkan Dörtkardeş

Recently, with the increase in Internet usage, cybersecurity has been a significant challenge for computer systems. Different malicious URLs emit...

Sample PDF (/viewtitlesample.aspx?id=266138&ptid=244677&t=Malicious URL Detection Using Machine Learning&isxn=9781799851011)

**Chapter 9****\$37.50**

Video-Based Human Authentication System for Access Control (/chapter/video-based-human-authentication-system-for-access-control/266139) (pages 181-202)

Chintan M. Bhatt, Kevin R. Patel, Yashvi Nileshbhai Raythatha, Poojan S. Dharaiya, Chirag Jethva, Karan Mehul Kathiriya, Vidhya Piyushbhai Kothadia, Deep Kothadiya, Vaishali Mewada, Mayuri Jamanadas Popat

The issue of security is paramount in any organisation. Therefore, the authors intend to aid in the security of such organisations by bringing a...

Sample PDF (/viewtitlesample.aspx?id=266139&ptid=244677&t=Video-Based Human Authentication System for Access Control&isxn=9781799851011)


# Chapter 9

## Video-Based Human Authentication System for Access Control

**Chintan M. Bhatt**

*Charotar University of Science and Technology,  
India*

**Kevin R. Patel**

 <https://orcid.org/0000-0002-5662-8222>  
*Charotar University of Science and Technology,  
India*

**Yashvi Nileshbhai Raythatha**

*Charotar University of Science and Technology,  
India*

**Poojan S. Dharaiya**

*Charotar University of Science and Technology,  
India*

**Chirag Jethva**

*Charotar University of Science and Technology,  
India*

**Karan Mehul Kathiriya**

*Charotar University of Science and Technology,  
India*

**Vidhya Piyushbhai Kothadia**

*Charotar University of Science and Technology,  
India*

**Deep Kothadiya**

*Charotar University of Science and Technology,  
India*

**Vaishali Mewada**

*Charotar University of Science and Technology,  
India*

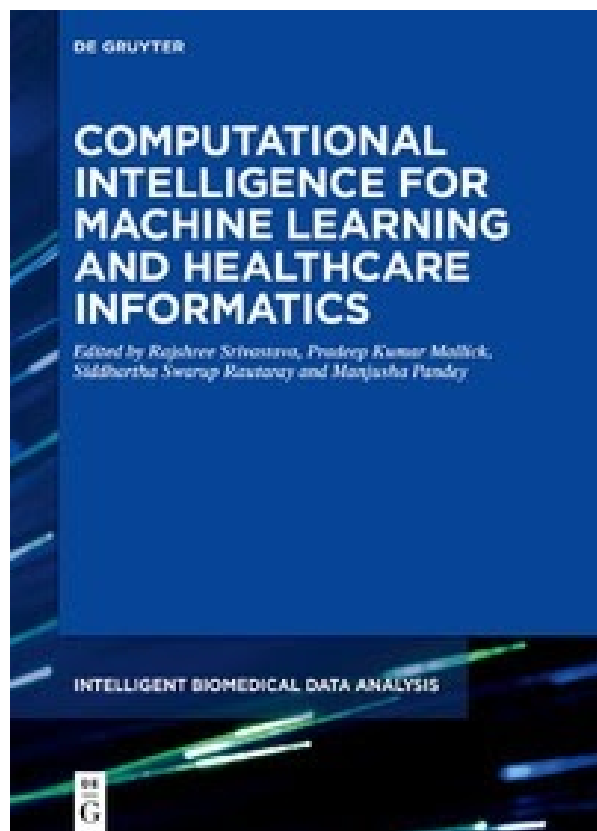
**Mayuri Jamanadas Popat**

*Charotar University of Science and Technology,  
India*

### ABSTRACT

*The issue of security is paramount in any organisation. Therefore, the authors intend to aid in the security of such organisations by bringing a video based human authentication system for access control which is a type of cyber physical system (CPS). CPS is an integration of computation and physical processes; here the computation is provided by face detection and recognition algorithm and physical process is the input human face. This system aims to provide a platform that allows any authorized person to enter*

DOI: 10.4018/978-1-7998-5101-1.ch009







# Contents

**Preface — VII**

**List of contributors — XIII**

María de Lourdes Sánchez, Adrián Will, Andrea Rodríguez,  
Luis O. González-Salcedo

- 1 A review of bone tissue engineering for the application of artificial intelligence in cellular adhesion prediction — 1**

Divya Gaba, Nitin Mittal

- 2 Implementation and classification of machine learning algorithms in healthcare informatics: approaches, challenges, and future scope — 21**

Sandeep Raj, Arvind Choubey

- 3 Cardiac arrhythmia recognition using Stockwell transform and ABC-optimized twin SVM — 35**

Shweta Sinha, Shweta Bansal

- 4 Computational intelligence approach to address the language barrier in healthcare — 53**

Yogesh Kumar, Manish Mahajan

- 5 Recent advancement of machine learning and deep learning in the field of healthcare system — 77**

Prabhsimar Kaur, Vishal Bharti, Srabanti Maji

- 6 Predicting psychological disorders using machine learning — 99**

Sweta Kumari, Sneha Kumari

- 7 Automatic analysis of cardiovascular diseases using EMD and support vector machines — 131**

J Naveenkumar, Dhanashri P. Joshi

- 8 Machine learning approach for exploring computational intelligence — 153**

Simrandeep Singh, Nitin Mittal, Harbinder Singh

- 9 Classification of various image fusion algorithms and their performance evaluation metrics — 179**

Dhrubasish Sarkar, Medha Gupta, Premananda Jana, Dipak K. Koley

**10 Recommender system in healthcare: an overview — 199**

Purva Ekatpure, Shivam

**11 Dense CNN approach for medical diagnosis — 217**

Dhaval Bhoi, Amit Thakkar

**12 Impact of sentiment analysis tools to improve patients' life in critical diseases — 239**

Diksha Thakur, Nitin Mittal, Simrandeep Singh, Rajshree Srivastava

**13 A fuzzy entropy-based multilevel image thresholding using neural network optimization algorithm — 253**

Daiyaan Ahmed Shaik, Vihal Mohanty, Ramani Selvanambi

**14 Machine learning in healthcare — 277**

Vanaja Ramaswamy, Saswati Mukherjee

**15 Computational health informatics using evolutionary-based feature selection — 309**

**Index — 329**



Dhaval Bhoi, Amit Thakkar

## 12 Impact of sentiment analysis tools to improve patients' life in critical diseases

**Abstract:** The development, approbation, and acceptance of various social media tools and applications have opened new doors of opportunity for gaining crucial insight from unstructured information. Sentiment analysis and opinion mining have become popular in modern years and can be applied in diversified application areas like healthcare informatics, sports, financial sector, politics, tourism, and consumer activities and behavior. In this regard, this chapter presents how sentiment analysis can help for betterment of people suffering from critical diseases. Healthcare-related unstructured tweets relating to being shared on Twitter is becoming crowd-pleasing source of information for healthcare research. Sentiment analysis is becoming metric measurement to find out feelings or opinion of patient suffering from severe diseases. Various tools and methodologies are used, from which color-coded Word Cloud can be formed based on sentiment. Exploring the methods used for sentiment analysis on healthcare research can allow us to get better insight and understanding of human feelings and their psychology and mindset. The study shows various types of tools used in each case and different media sources and examines its impact and improvement in diseases like obesity, diabetes, cardiovascular disease, hypertension, schizophrenia, Alzheimer's disease, and cancer using sentiment analysis and its impact on one's life. Sentiment analysis helps in designing strategies to improve patients understanding and behavior.

**Keywords:** Sentiment analysis, Healthcare informatics, Social media, Word Cloud

### 12.1 Introduction

Huge amount of textual data is collected by the healthcare industry. In year 2013, California-based health network collected medical records in electronic form with various images and annotations in data (W. Raghupathi and V. Raghupathi). Most of the information is stored as text records (Gupta and Lehal, 2010) in e-health records, hand-written observations form by physicians regarding patient's visits, social media, prescriptions, and letters. Further, "The majority of medical doctor

---

**Dhaval Bhoi, U & P U. Patel** Department of Computer Engineering, Chandubhai S. Patel Institute of Technology, Charotar University of Science and Technology, Gujarat, India

**Dr. Amit Thakkar, Smt. Kundanben Dinsha Patel** Department of Information Technology, Chandubhai S. Patel Institute of Technology, Charotar University of Science and Technology, Gujarat, India



# ICT FOR COMPETITIVE STRATEGIES

PROCEEDINGS OF 4TH INTERNATIONAL CONFERENCE  
ON INFORMATION AND COMMUNICATION TECHNOLOGY  
FOR COMPETITIVE STRATEGIES (ICTCS 2019),  
DECEMBER 13<sup>th</sup>-14<sup>th</sup>, 2019, UDAIPUR, INDIA

Edited by  
Durgesh Kumar Mishra, Nilanjan Dey,  
Bharat Singh Deora and Amit Joshi

# ICT for Competitive Strategies

**Proceedings of 4<sup>th</sup> International Conference on Information and Communication Technology for Competitive Strategies (ICTCS (2019)), December 13<sup>th</sup>–14<sup>th</sup>, 2019, Udaipur, India**

*Edited by*

Durgesh Kumar Mishra is Professor (CSE) and Director,  
*Sri Aurobindo Institute of Technology, Indore, Madhya Pradesh, India*

Nilanjan Dey is Assistant Professor,  
*Techno India College of Technology, India*

Bharat Singh Deora is Sr. Assistant Professor,  
*DCS & IT, JRN Rajasthan Vidyapeeth University, Udaipur, India*

Amit Joshi is Director,  
*Global Knowledge Research Foundation*



**CRC Press**

Taylor & Francis Group

Boca Raton London New York

---

CRC Press is an imprint of the  
Taylor & Francis Group, an **informa** business



First edition published 2020

by CRC Press

6000 Broken Sound Parkway NW, Suite 300, Boca Raton, FL 33487-2742

and by CRC Press

2 Park Square, Milton Park, Abingdon, Oxon, OX14 4RN

© 2020 Global Knowledge Research Foundation, Ahmedabad, India

CRC Press is an imprint of Taylor & Francis Group, LLC

Reasonable efforts have been made to publish reliable data and information, but the author and publisher cannot assume responsibility for the validity of all materials or the consequences of their use. The authors and publishers have attempted to trace the copyright holders of all material reproduced in this publication and apologize to copyright holders if permission to publish in this form has not been obtained. If any copyright material has not been acknowledged please write and let us know so we may rectify in any future reprint.

Except as permitted under U. S. Copyright Law, no part of this book may be reprinted, reproduced, transmitted, or utilized in any form by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying, microfilming, and recording, or in any information storage or retrieval system, without written permission from the publishers.

For permission to photocopy or use material electronically from this work, access [www.copyright.com](http://www.copyright.com) or contact the Copyright Clearance Center, Inc. (CCC), 222 Rosewood Drive, Danvers, MA 01923, 978-750-8400. For works that are not available on CCC please contact [mpkbookspermissions@tandf.co.uk](mailto:mpkbookspermissions@tandf.co.uk)

*Trademark notice:* Product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without intent to infringe.

*Library of Congress Cataloging-in-Publication Data*

A catalog record has been requested for this book

ISBN: 978-1-003-05209-8 (ebk)

Typeset in Times New Roman

Typeset by Ozone Publishing Services., Puducherry, India

# Table of Contents

<i>Lists of Figures</i>	<i>xiii</i>
<i>List of Tables</i>	<i>xxv</i>
<i>Preface</i>	<i>xxix</i>
<i>ICTCS 2019 Committee Members</i>	<i>xxxi</i>
<i>Technical Program Committee</i>	<i>xxxiii</i>
Internet of Things (IoT) – Enabler for Connecting World	1
<i>Ravi Shankar Jha and Priti Ranjan Sahoo</i>	
Hardware Based Data Compression Using Lempel-ZIV-WELCH Algorithm	9
<i>Onkar Choudhari, Marisha Chopade, Sourabh Chopde and Vaishali Ingle</i>	
Detection of Eye Diseases using Image Processing and Artificial Neural Networks	15
<i>K. Sujatha, V. Srividhya, V. Karthikeyan, L. Madheshwaran and N. P. G. Bhavani</i>	
A Hybrid Image Watermarking Methodology Based on BP-RBF Neural Network Model and Sift Transform Function	21
<i>Parmalik Kumar and Dr. A. K. Sharma</i>	
Applying Data Science Solutions in Healthcare Industry	35
<i>Vinay Kumar, Reema Thareja, Rashi Thareja and Priti R. Jain</i>	
Prediction of Weblogs for Improving the Performance in Web Usage Mining using Psosvm	43
<i>Pradip Suresh Mane, Dr. Ashok Kumar Jetawat and Dr. Pravin Nikumbh</i>	
Comparative Study of Machine Learning Algorithms on Sentiment Analysis of Product Reviews	53
<i>Ujwala Baruah, Ratnadeep Das, Amitabha Deb and Shah Alam Mazumder</i>	
Convolutional Neural Network-Based Pattern Recognition Technique for Diabetic Retinopathy Detection	61
<i>Rahul K Chaurasiya, Astha and Anmol Sarna</i>	
Gate Engineered Vertical Mosfet with Reduced Specific Resistance and Switching Delay	71
<i>Alok Naugarhiyaa, Sarita Singha, Payal Nautiyala, Shraddha Tiwaria, Akanksha Singha and Shrish Vermaa</i>	

Design and Development of Low-Cost Portable System for Detection of Eye Diseases	495
<i>Jaya Prasad, Reema Anne Roy, Monish Mohan Kora, Abin Sam, Chriso Christudhas and Pranali Choudhari</i>	
Learning Objects of Computer Science Discipline: An Analysis of E-PG Pathshala With Ugc-Net A Study for Future Sustainability with Emerging Topics	503
<i>Shweta Brahmabhatt, Sanjay Tiwari, Devarshi Mehta and Abhishek Kumar</i>	
Automated Person Authentication using Face, Iris and Ear Multimodal Biometric Fusion	511
<i>H. Purohit and P. Ajmera</i>	
Thought to Text Conversion using Deep Learning	519
<i>Swapnil Mane, Tiasha Nath, Shobin Thomas, Omkar Swami, Pranali Choudhari and Smita Chopde</i>	
Comparison of Regression Techniques for Predicting the Academic Performance of Students in Educational Data Mining	531
<i>Amit Thakkar, Jalpesh Vasa, Priya Nasit and Dhvani Raval</i>	
Feature Evaluation for Learning Underlying Data-Processing to Enhance Cloud Trust Through Rich Models	539
<i>Mahreen Saleem, M. R. Warsi and Saiful Islam</i>	
Fractional Delay Finite Impulse Response Ffilter Synthesis using Dierential Search Algorithm	545
<i>Atul Kumar Dwivedi</i>	
Analysis of PTS-MIMO-OFDM Signal for Goppa Coded Data	553
<i>Sharmila Sengupta and B. K. Lande</i>	
Intelligent Cryptography Approach on Identity Based Encryption (IBE) for Secured Distributed Ehr Data Storage in Cloud Computing	563
<i>Shikha, Paramjeet Singh and Dr. Rahul Malohtra</i>	
Encryption and Decryption Analysis of Non - Stationary Image using Canonical Transforms with Scrambling Technique	573
<i>Vivek Upadhyaya, Dr. Aditya Kumar Singh Pundir, Dr. Chhavi Saxena and Dr. Rahul Srivastava</i>	
Energy Efficient Strategies in Internet of Things: An Overview	585
<i>Namita Jain and Manju Mandot</i>	
Pricing Based Caching Strategy in Named Data Networking	593
<i>Ganesh Pakle, Ramchandra Manthalkar and Vaidya Madhav</i>	



# Comparison of regression techniques for predicting the academic performance of students in Educational Data Mining

Amit Thakkar, Jalpesh Vasa, Priya Nasit, Dhvani Raval

Smt. K. D. Patel Department of Information Technology, Chandubhai S. Patel Institute of Technology, CHARUSAT, Changa, Gujarat, INDIA

**ABSTRACT:** In the current educational system, predicting student performance will surely help the teacher to keep track of the progress of a student. These prediction systems support universities and students in improving a student's performance. This paper represents machine learning techniques for predicting student's performance. This paper aims to investigate those machine-learning methods fit to predict student performance from in-house E-Governance system data in the context of Educational Data Mining(EDM). We have used Polynomial Regression, Decision Tree and Random Forest Model for performance forecasting of graduates from various engineering streams. By predicting student's academic result priory can help both teacher and student to improve their teaching techniques and effectiveness of learning process, respectively.

**Keywords:** Machine Learning, Polynomial Regression, Decision Tree Regression, Random Forest Regression, Student performance, Educational Data Mining(EDM)

## 1. INTRODUCTION

In recent years, the availability of educational data has increased rapidly and these large amounts of data generated from this educational system need to be analyzed. Many universities have already started using the online Learning Management System (LMS) tools. These tools are capable of accessing and sharing data from all over the world, tracking student progress and providing rich educational content [1,10,12].

Educational institutions have used Educational Data Mining (EDM) to obtain an in-depth and thorough knowledge of their educational programs to strengthen their assessment, evaluation, planning and decision-making. EDM can help academic programs detect and uncover hidden trends in the results, which can be used to accurately forecast student performance.

We predict a student's academic performance using their scores only. Such systems are beneficial for student and faculty both to improve teaching technique and quality of education.

In section 2, related work is explained. Section 3 comprises of detailed methodology. In section 4 describes Experimental Setup and section 5 presents Experimental Result and Analysis. The last section is about the conclusion and future enhancement.

## 2. RELATED WORK

Recently, Due to the large volume of data in academic databases, forecasting student performance becomes more difficult. In [1] authors have provided an overview of the data mining techniques that have been used to predict students' performance and focus on how the prediction algorithm can be used to identify the most important attributes in a student's data. In [2] authors have used different data mining algorithm like Decision Tree, Naïve Bayes and Support Vector Machine for predicting student's performance. In [3], bilayered structure comprising of multiple base predictors and a cascade of ensemble predictors is developed for making predictions based on students' evolving performance states. In [4] authors have used data of undergraduate colleges in Kolkata. They used different feature selection algorithms to reduce the number of features.[11,12]

## **Computational Intelligence for Machine Learning and Healthcare Informatics**

# **Intelligent Biomedical Data Analysis (IBDA)**



Edited by  
Deepak Gupta, Nhu Gia Nguyen,  
Ashish Khanna, Siddhartha Bhattacharyya

## **Volume 1**



# **Computational Intelligence for Machine Learning and Healthcare Informatics**



Edited by

Rajshree Srivastava, Pradeep Kumar Mallick,  
Siddharth Swarup Rautaray and Manjusha Pandey

**DE GRUYTER**

**Editors**

Rajshree Srivastava  
DIT University  
Diversion Road  
Mussoorie, 248009 Uttarakhand, India  
rajshree.srivastava27@gmail.com

Siddharth Swarup Rautaray  
KIIT University  
KIIT Road  
Bhubaneswar, 751024 Odisha, India  
sr.rgpv@gmail.com

Pradeep Kumar Mallick  
KIIT University  
KIIT Road  
Bhubaneswar, 751024 Odisha, India  
pradeepmallick84@gmail.com

Manjusha Pandey  
KIIT University  
KIIT Road  
Bhubaneswar, 751024 Odisha, India  
manjushapandey82@gmail.com

ISBN 978-3-11-064782-2

e-ISBN (PDF) 978-3-11-064819-5

e-ISBN (EPUB) 978-3-11-064927-7

ISSN 2629-7140

**Library of Congress Control Number: 2020934485**

**Bibliographic information published by the Deutsche Nationalbibliothek**

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available on the Internet at <http://dnb.dnb.de>.

© 2020 Walter de Gruyter GmbH, Berlin/Boston

Cover image: [gettyimages/thinkstockphotos](https://www.gettyimages.com/detail/stock-photo/abalone-shell), Abalone Shell

Typesetting: Integra Software Services Pvt. Ltd.

Printing and binding: CPI books GmbH, Leck

[www.degruyter.com](http://www.degruyter.com)

---

Rajshree Srivastava would like to dedicate this book to her father Dr. R. L. Srivastava, mother Smt. Nandini Srivastava, and brother Sarvesh Lal Srivastava.

Pradeep Kumar Mallick would like to dedicate this book to his parents and students.

Siddharth Swarup Rautray would like to dedicate this book to his parents.

Manjusha Pandey would like to dedicate this book to her parents.





# Contents

**Preface — VII**

**List of contributors — XIII**

María de Lourdes Sánchez, Adrián Will, Andrea Rodríguez,  
Luis O. González-Salcedo

**1 A review of bone tissue engineering for the application of artificial intelligence in cellular adhesion prediction — 1**

Divya Gaba, Nitin Mittal

**2 Implementation and classification of machine learning algorithms in healthcare informatics: approaches, challenges, and future scope — 21**

Sandeep Raj, Arvind Choubey

**3 Cardiac arrhythmia recognition using Stockwell transform and ABC-optimized twin SVM — 35**

Shweta Sinha, Shweta Bansal

**4 Computational intelligence approach to address the language barrier in healthcare — 53**

Yogesh Kumar, Manish Mahajan

**5 Recent advancement of machine learning and deep learning in the field of healthcare system — 77**

Prabhsimar Kaur, Vishal Bharti, Srabanti Maji

**6 Predicting psychological disorders using machine learning — 99**

Sweta Kumari, Sneha Kumari

**7 Automatic analysis of cardiovascular diseases using EMD and support vector machines — 131**

J Naveenkumar, Dhanashri P. Joshi

**8 Machine learning approach for exploring computational intelligence — 153**

Simrandeep Singh, Nitin Mittal, Harbinder Singh

**9 Classification of various image fusion algorithms and their performance evaluation metrics — 179**

Dhrubasish Sarkar, Medha Gupta, Premananda Jana, Dipak K. Koley

**10 Recommender system in healthcare: an overview — 199**

Purva Ekatpure, Shivam

**11 Dense CNN approach for medical diagnosis — 217**

Dhaval Bhoi, Amit Thakkar

**12 Impact of sentiment analysis tools to improve patients' life in critical diseases — 239**

Diksha Thakur, Nitin Mittal, Simrandeep Singh, Rajshree Srivastava

**13 A fuzzy entropy-based multilevel image thresholding using neural network optimization algorithm — 253**

Daiyaan Ahmed Shaik, Vihal Mohanty, Ramani Selvanambi

**14 Machine learning in healthcare — 277**

Vanaja Ramaswamy, Saswati Mukherjee

**15 Computational health informatics using evolutionary-based feature selection — 309**

**Index — 329**

Dhaval Bhoi, Amit Thakkar

## 12 Impact of sentiment analysis tools to improve patients' life in critical diseases

**Abstract:** The development, approbation, and acceptance of various social media tools and applications have opened new doors of opportunity for gaining crucial insight from unstructured information. Sentiment analysis and opinion mining have become popular in modern years and can be applied in diversified application areas like healthcare informatics, sports, financial sector, politics, tourism, and consumer activities and behavior. In this regard, this chapter presents how sentiment analysis can help for betterment of people suffering from critical diseases. Healthcare-related unstructured tweets relating to being shared on Twitter is becoming crowd-pleasing source of information for healthcare research. Sentiment analysis is becoming metric measurement to find out feelings or opinion of patient suffering from severe diseases. Various tools and methodologies are used, from which color-coded Word Cloud can be formed based on sentiment. Exploring the methods used for sentiment analysis on healthcare research can allow us to get better insight and understanding of human feelings and their psychology and mindset. The study shows various types of tools used in each case and different media sources and examines its impact and improvement in diseases like obesity, diabetes, cardiovascular disease, hypertension, schizophrenia, Alzheimer's disease, and cancer using sentiment analysis and its impact on one's life. Sentiment analysis helps in designing strategies to improve patients understanding and behavior.

**Keywords:** Sentiment analysis, Healthcare informatics, Social media, Word Cloud

### 12.1 Introduction

Huge amount of textual data is collected by the healthcare industry. In year 2013, California-based health network collected medical records in electronic form with various images and annotations in data (W. Raghupathi and V. Raghupathi). Most of the information is stored as text records (Gupta and Lehal, 2010) in e-health records, hand-written observations form by physicians regarding patient's visits, social media, prescriptions, and letters. Further, "The majority of medical doctor

---

**Dhaval Bhoi**, U & P U. Patel Department of Computer Engineering, Chandubhai S. Patel Institute of Technology, Charotar University of Science and Technology, Gujarat, India

**Dr. Amit Thakkar**, Smt. Kundanben Dinsha Patel Department of Information Technology, Chandubhai S. Patel Institute of Technology, Charotar University of Science and Technology, Gujarat, India



Tomonobu Senjyu · Parikshit N. Mahalle ·  
Thinagaran Perumal · Amit Joshi  
Editors

# Information and Communication Technology for Intelligent Systems

Proceedings of ICTIS 2020, Volume 2

# Contents

<b>Internet of Things: Challenges, Security Issues and Solutions . . . . .</b>	<b>1</b>
Sweta Singh and Rakesh Kumar	
<b>Modeling and Performance Evaluation of Auction Model in Cloud Computing . . . . .</b>	<b>17</b>
Gagandeep Kaur	
<b>Framework for Resource Management in Cloud Computing . . . . .</b>	<b>25</b>
Gagandeep Kaur	
<b>Unique Stego Key Generation from Fingerprint Image in Image Steganography . . . . .</b>	<b>33</b>
A. Anuradha and Hardik B. Pandit	
<b>Self-powered IoT-Based Design for Multi-purpose Smart Poultry Farm . . . . .</b>	<b>43</b>
Tajim Md. Niamat Ullah Akhund, Shouvik Roy Snigdha, Md. Sumon Reza, Nishat Tasnim Newaz, Mohd. Saifuzzaman, and Masud Rana Rashel	
<b>Phrase-Based Statistical Machine Translation of Hindi Poetries into English . . . . .</b>	<b>53</b>
Rajesh Kumar Chakrawarti, Pratosh Bansal, and Jayshri Bansal	
<b>A Smart Education Model for Future Learning and Teaching Using IoT . . . . .</b>	<b>67</b>
Swati Jain and Dimple Chawla	
<b>Internet of Things (IoT)-Based Advanced Voting Machine System Enhanced Using Low-Cost IoT Embedded Device and Cloud Platform . . . . .</b>	<b>77</b>
Miral M. Desai, Jignesh J. Patoliya, and Hiren K. Mewada	

# Internet of Things (IoT)-Based Advanced Voting Machine System Enhanced Using Low-Cost IoT Embedded Device and Cloud Platform



Miral M. Desai, Jignesh J. Patoliya, and Hiren K. Mewada

**Abstract** The traditional voting system is basically of two major types. One is voting through ballot paper and another one is voting through electronic voting machine (EVM). Voting system through ballot paper requires so much resources as well as security. There will be maximum possibility of malfunctioning in case of ballot paper-based voting machine. Electronic voting machine-based voting system is better than ballot paper-based system, but it is not authenticated. This paper describes the design of smart and secure electronic voting machine based on the IoT platform. The suggested system is more efficient than both traditional systems, as both traditional systems are time consuming and also not authenticated. The proposed system functions into two specific phases. One is user authentication, and another is user voting. Authentication process can be done using fingerprint authentication. Fingerprint database of all the voters is stored in the system initially as prerequisites. If any person wants to vote to any party, the authentication of respective person is to be done by fingerprint matching process. Once the fingerprint matches successfully, the person can vote to any specific party. Data analysis can be done in form statistics of the percentage voting of individual party and is to be uploaded on the web server as well as Google spreadsheet. Due to the fingerprint authentication method, malfunctioning like fake voting and repeat vote can be avoided. As the system is based on the fingerprint authentication, in future it can be linked with the Aadhaar Card of the respective person.

---

M. M. Desai (✉) · H. K. Mewada

Department of EC Engineering, CSPIT, CHARUSAT, Changa, Gujarat, India  
e-mail: [miraldesai.ec@charusat.ac.in](mailto:miraldesai.ec@charusat.ac.in)

H. K. Mewada  
e-mail: [hmewada@pmu.edu.sa](mailto:hmewada@pmu.edu.sa)

J. J. Patoliya  
Electrical Engineering Department, Prince Mohammad Bin Fahd University, Al Khobar,  
Kingdom of Saudi Arabia  
e-mail: [jigneshpatoliya@charusat.ac.in](mailto:jigneshpatoliya@charusat.ac.in)



Shilpi Gupta  
Jignesh N. Sarvaiya (Eds.)

Communications in Computer and Information Science

1214

# Emerging Technology Trends in Electronics, Communication and Networking

Third International Conference, ET2ECN 2020  
Surat, India, February 7–8, 2020  
Revised Selected Papers



Springer



## Contents

### Electronics

QR Code Scanner Enabled Smart Car Parking System Using Raspberry Pi with Android App Access . . . . .	3
<i>Yesha Patel, Preksha Gandhi, Swapnil Shah, Shital Soman, and Arpan Desai</i>	
Smart Automated Energy Meter . . . . .	19
<i>R. Subhash, Venkatachalam Rajarajan Balaji, K. E. Sanjana, Nikhil Madhavan, and T. Siva</i>	
A High Efficiency Six Phase Voltage Doubler Cell Using 180 nm CMOS Process . . . . .	29
<i>K. Krishna Reddy and P. Sreehari Rao</i>	
Long Period Fiber Grating Sensors Design Optimization Using Jaya Algorithm . . . . .	37
<i>Monika Gambhir</i>	
Strategy for Designing Single Electron Transistors . . . . .	44
<i>Raj Shah, Rutu Parekh, and Rasika Dhavse</i>	
Experimental Study on Etching of Fiber Bragg Grating for Sensing Application . . . . .	58
<i>Chhaya Suratwala and Pranav Lapsiwala</i>	
Fabrication of Macro Porous Silicon Structures Using Pulsed Fiber Laser Technique for Capacitive Sensor Application . . . . .	68
<i>Shailesh M. Gheewala</i>	

### Communication

Target Tracking Using a Hybrid KF-PSO Tracking Model in WSN. . . . .	83
<i>Dhiren P. Bhagat and Himanshukumar Soni</i>	
New Modelisation of Silicon DWDM Demux, AND Gate for Wavelengths in C and L Bands . . . . .	99
<i>Mira Ganesh, Venkatachalam Rajarajan Balaji, R. Sri Nivedha, and D. Kavya</i>	



# QR Code Scanner Enabled Smart Car Parking System Using Raspberry Pi with Android App Access

Yesha Patel<sup>(✉)</sup>, Preksha Gandhi, Swapnil Shah, Shital Soman,  
and Arpan Desai

Charotar University of Science and Technology, Changa, India  
patelyesha2722@gmail.com

**Abstract.** A smart parking system using Raspberry Pi and android app access is proposed in this article. An automated smart parking system which provides the user to pre-book along with on the spot booking facility of parking spaces available around the area is implemented. The system also helps to store the user's information in database which enables for fast parking access thus reducing the traffic congestion. The hardware is realized using Raspberry Pi and IR sensor. In addition, the system is controlled through an app which is made using Kodular App Development tool, that helps the user to keep track of the updates about available parking spaces. The scalable and precise database can be created on firebase and host it on an application in real-time which is useful to store data in a json format (bucket format). The system is a perfect partner for people to book the parking spaces at their ease from remote locations without wasting time and avoiding traffic congestion.

**Keywords:** QR code scanning · Real-time database · Slot booking · Admin management

## 1 Introduction

Internet of things (IoT), a topic most discussed nowadays is a concept that connects billions of devices with the internet at any time and any place. The increasing traffic congestion has also led to increase in pollution. The number of vehicles is skyrocketing in India which causes imbalance in the ratio of vehicle and available parking spaces. In metropolitan areas, the traffic has also caused increase in anxiety level of drivers [1]. One of the most common problems today is less availability of parking spaces. Vehicles continue to outnumber existing parking spaces, thus clogging roads. Incidences of violence due to occupancy, deformed cars due to a space crunch, and overcharging for parking are some of the problems. The families are getting smaller but the total number of motor vehicles is exceeding the total number of heads per family which worsens the current parking scenario in the country. The situation is such that on any given working day approximately 40% of the roads in urban regions are taken up just for parking the cars. The problem has been further exacerbated by the fact that people from low-income groups are also able to own cars. Most cities propose

# **2020 International Conference on Inventive Computation Technologies (ICICT 2020)**

**Coimbatore, India  
26-28 February 2020**

**Pages 1-575**



**IEEE Catalog Number: CFP20F70-POD  
ISBN: 978-1-7281-4686-7**



120	Improved Ada Boost Classifier for Sports Scene Detection in Videos: from Data Extraction to Image Understanding <b>Yibo Yue, Yucheng Yang</b>	643
121	Intelligent Sensing System of Human Physiological Detection based on Biosensor and WSN <b>Jiaqi Kou</b>	647
122	Review of Machine Learning Algorithms for Health-care Management Medical Big Data Systems <b>Zou Xiang, Cao Jinghua, Wen Tao</b>	651
123	GWO based Task Allocation for Load Balancing in Containerized Cloud <b>Dimple Patel, Manoj Kumar Patra, Bibhudatta Sahoo</b>	655
124	Indoor Navigation with Deep Reinforcement Learning <b>Vijayalakshmi A Bakale, Yeshwanth Kumar V S, Vivekanand C Roodagi, Yashaswini N Kulkarni, Mahesh S Patil, Satyadhyhan Chickerur</b>	660
125	Heart Disease Prediction using Deep Neural Network <b>P. Ramprakash, R. Sarumathi, R. Mowriya, S. Nithyavishnupriya</b>	666
126	Particle Swarm Optimization based Classification Algorithm for Expert Prediction Systems <b>S. Punitha, M. Jeyakarthic</b>	671
127	A Novel Framework for Neural Machine Translation of Indian-English Languages <b>Tatwadarshi P. Nagarhalli, Vinod Vaze, N. K. Rana</b>	676
128	Robotic Helping Hand: A New Mechanism for Helping Disabled People <b>Mohammad Abu Sayed, Nusrat Jahan Prithee, Hasan U. Zaman</b>	683
129	Grey Wolf Aware Energy-saving and Load-balancing in Software Defined Networks Considering Real Time Traffic <b>Kuldeep Kurroliya, Sagarika Mohanty, Khushboo Kanodia, Bibhudatta Sahoo</b>	689
130	Singular Value Decomposition (SVD) based Image Tamper Detection Scheme <b>Sandeep Kaur, Alka Jindal</b>	695
131	Interleave-Division Multiple Access Systems with Invert Tree based Interleavers with Unequal Power Sharing Algorithm <b>Arpita Patel</b>	700
132	BlockChain to Prevent Fraudulent Activities: Buying and Selling Property Using BlockChain <b>Dipika Bhanushali, Akshara Koul, Sainiranjana Sharma, Bushra Shaikh</b>	705
133	Continuous Moving Object Clustering in Dynamic Road Network <b>John A, P. Mathiyalagan, Angelin Blessy</b>	710
134	Image Processing based Improved Face Recognition for Mobile Devices by using Scale-Invariant Feature Transform <b>Karthikeyan C, Bhukya Jabber, Deepak V, Vamsidhar E</b>	716
135	Image Processing based Methodology for Determination of Sperm Count and Vitality in Semen Sample <b>Riva Karia, Neha Agnihotri, Dhara Desai, Purva Badhe, Mrunal Rane</b>	723
136	Video Anomaly Detection using Inflated 3D Convolution Network <b>Dipali Koshti, Supriya Kamoji, Nehal Kalnad, Suyash Sreekumar, Shreya Bhujbal</b>	729



# Interleave-Division Multiple Access Systems with Invert Tree Based Interleavers with Unequal Power Sharing Algorithm

**Dr. Arpita Patel**

*Assistant professor, Department of E&C Engineering,  
Charotar University of Science and Technology, CHARUSAT, Changa, Gujarat, India*

## **Abstract:**

Power allocation is a major fear for practically coded Interleave division multiple access scheme. Various power allocation algorithms have been proposed for IDMA system. In this paper, the performance improvement of IDMA system using unequal power algorithm with comparison of various interleavers with coded and uncoded IDMA is presented. The simulation result shows that IDMA system gives better performance with invert tree based interleaver (ITBI) in comparison with other interleaver in terms of memory and complexity.

**Keywords:** unequal power, uncoded and coded IDMA, memory and complexity

## 1. INTRODUCTION:

Code-division multiple access (CDMA) and OFDM are currently an attractive candidate for 4G-LTE mobile communication and for future generation mobile communication. In CDMA, individual user message signal is extended by a spreading sequence at the sender and receiving end, the received signal is passed over de-spreader and matched filter which is matched to a spreading sequence [4]. If the spreading sequences are orthogonal to each other, there is no information loss from the matched filter. But this is the ideal case with all users synchronized and without intersymbol interference (ISI). However strict synchronization is difficult in uplink channel due to varying propagation delay. Also due to lower correlations amongst spreading codes for higher user count [10] it results in an increased MAI. Various multiuser detection has been proposed to suppress these two interferences, but their computational complexities restrict practical implementations [2-4]. Even though, after the advent of turbo codes [16-17], computational load can be much reduced with iterative multiuser detection [18], it is still a heavily burden to receiver in case of higher user count. The 3G standards have all set multiuser detection as

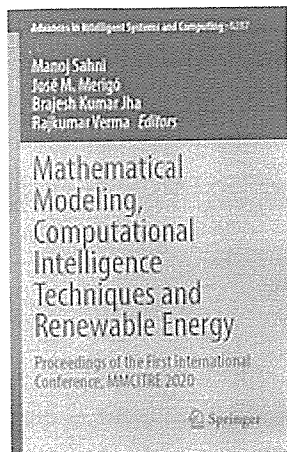
option. However, it is still challenging to develop efficient and effective low-cost multiuser detectors.

Although CDMA alleviate the Multiple Access Interference(MAI)with multi user detector (MUD)but its high computational cost restricts the higher user application in practical systems. Also throughput of CDMA system with single user detection and same power allocation is limited to interference. With the advent of multi user detection, this problem has been examined.Also,due to complexity of multi user detection the implementation of practically coded CDMA system is very serious concern. A new multiple access schemes called interleave division multiple access(IDMA) is a variant of CDMA examined newly. In IDMA each user has distinguish interleavers and thus they are integral part of it. An interleaver can be a part of channel coder to improve coding gain or can be used as a channel interleaver to reduce the effect of fading by scrambling burst error into random error. It uses chip by chip MUD for treating MAI with less computational cost.

With equal power allocation IDMA can perform very close to theoretical limit [12]. With Unequal power allocation the system performance can be improved, but to calculate the best power profile is a big matter for practical coded systems [7].

Various unequal power allocation methods have been investigated like linear programming and an interior-point method (IPM) [15][19] for power optimization for IDMA with AWGN channel. In [15] improved power optimization technique for IDMA over AWGN channels with lower complexity is proposed. In this paper IDMA is simulated with improved linear programming method discussed in [15] over various interleavers. Simulation results shows that,IDMA with unequal power distribution using invert tree based interleaver(ITBI)[10] provides similar results as random interleaver and other interleavers with least complexity and bandwidth requirement.

Engineering Computational Intelligence and Complexity  
Advances in Intelligent Systems and Computing



2021

# Mathematical Modeling, Computational Intelligence Techniques and Renewable Energy

Proceedings of the First International Conference, MMCITRE 2020

Editors: Sahni, M., Merigó, J.M., Jha, B.K., Verma, R. (Eds.)

Presents research works in the field of computational techniques

Discusses results of MMCITRE 2020 held in Gandhinagar, India, during 21–23 February 2020

Serves as a reference for researchers and practitioners in academia and industry

See more benefits

Buy this book

Book

81,89 €

Price for Spain (gross)

The eBook version of this title will be available soon

Due: May 29, 2021

ISBN 978-981-15-9953-8

Digitally watermarked, DRM-free

Included format:

PDF files can be used on all reading devices

Softcover

28,79 €

Price for Spain (gross)

Re-order Softcover

Due: May 29, 2021

ISBN 978-981-15-9952-1

Free shipping for individuals worldwide

Institutional customers should get in touch with their account manager

Please be advised Covid-19 shipping restrictions apply. Please review prior to ordering

The final prices may differ from the prices shown due to specifics of VAT rules

AQ Policy

About this book

About the authors

About this book

This book presents new knowledge and recent developments in all aspects of computational techniques, mathematical modeling, energy systems, applications of fuzzy sets and intelligent computing. The book is a collection of best selected research papers presented at the International Conference on "Mathematical Modeling, Computational Intelligence Techniques and Renewable Energy" organized by the Department of Mathematics, Pandit Deendayal Petroleum University, in association with Forum for Interdisciplinary Mathematics, Institution of Engineers (IEI) – Gujarat and Computer Society of India (CSI) – Ahmedabad. The book provides innovative works of researchers, academicians and students in the area of interdisciplinary mathematics, statistics, computational intelligence and renewable energy.

How all





1st International Conference on  
Mathematical Modeling,  
Computational Intelligence  
Techniques and Renewable Energy  
21 - 23 February, 2020

# SOUVENIR

Organized by:

Department of Mathematics  
School of Technology  
Pandit Deendayal Petroleum University

In Association with

Forum for Interdisciplinary Mathematics (FIM)  
Institution of Engineers (IEI)  
Computer Society of India (CSI)  
National Creativity Aptitude Test (NCAT)



**PDP**  
**PU**

**PANDIT  
DEENDAYAL  
PETROLEUM  
UNIVERSITY**



# Factors to consider: A review of smart grid implementation in India

Atmiya Patel<sup>1</sup>\*[0000-0002-8249-0765], Vipul N. Rajput<sup>1</sup> [0000-0001-6016-534X], Kartik S. Pandya<sup>2</sup>[0000-0002-0155-000X], and Dipayan Guha<sup>3</sup>[0000-0002-2603-6955]

<sup>1</sup> Dr. Jivraj Mehta Institute of Technology, Anand, India.

<sup>2</sup> Charotar University of Science and Technology, Changa, India.

<sup>3</sup> Motilal Nehru National Institute of Technology Allahabad, India.

Corresponding Author Email: atmiyapatel82@gmail.com

**Abstract.** The power sector of India is almost going to reach to its maturity owing to some significant recent improvements including reduction in power outages, stable frequency operations, improvement in voltage regulation, initiation of advanced metering installation and growing renewable resources. However, due to the centralize generation, the power grid of India is still suffering from high transmission and distribution losses, deficiency in fuel supply, electric theft, unbundling tariff structure, lacking of real-time control of grid and advanced infrastructure of the metering, lacking of concrete energy policies, etc. These challenges need to be addressed on an immediate basis by the effective deployment of the smart grid in India. This paper presents the scenario of these challenges for the Indian grid introduced during the journey of adapting the smart grid. First, the current scenario and key issues associated to the grid of India are explained. Subsequently, various aspects and policies for the implementation of smart grid are discussed. Finally, the enablers and barriers affecting the rapid evolving of smart grid in India are identified and discussed hypothetically. The motive of this paper is to provide a notable indicative assessment on the factors associated to smart grid of India which can be supportive to practitioners, researchers, and engineers involved in the smart grid deployment in India.

**Keywords:** Indian power grid, Smart grid, Enabler, Barrier

## 1 Introduction

A smart grid can be considered as modern electricity system which can proficiently assimilate the behavior and activities of all users associated to it – generators, clients and those that do both – so as to confirm economically effective, sustainable power network with small amount of losses and improved quality and security of supply and security [1]. The necessity of improving the consistency and efficacy of the power sector has been the origin of smart grid. Again, the depletion of fossil fuel and environment awareness increase the potential interest in renewable energy which is also one of the pioneers in the growth of the smart grid. As discussed in [2], smart meters which are



Axaykumar Mehta  
Abhishek Rawat  
Priyesh Chauhan *Editors*

# Advances in Electric Power and Energy Infrastructure

Proceedings of ICPCCI 2019



Springer

*Editors*

Axaykumar Mehta  
Department of Electrical Engineering  
IITRAM  
Ahmedabad, Gujarat, India

Abhishek Rawat  
Department of Electrical Engineering  
IITRAM  
Ahmedabad, Gujarat, India

Priyesh Chauhan  
Department of Electrical Engineering  
IITRAM  
Ahmedabad, Gujarat, India

ISSN 1876-1100                      ISSN 1876-1119 (electronic)  
Lecture Notes in Electrical Engineering  
ISBN 978-981-15-0205-7              ISBN 978-981-15-0206-4 (eBook)  
<https://doi.org/10.1007/978-981-15-0206-4>

© Springer Nature Singapore Pte Ltd. 2020

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.  
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

<b>Applied Computational Intelligence in Power Electronic Inverter to Mitigate Harmonics</b> . . . . .	115
<b>Margi Shah and Kartik S. Pandya</b>	
<b>Design and Analysis of DC Power Supply for Solid-State Power Amplifier</b> . . . . .	129
Rohit Agarwal, Rajesh Kumar, Gajendra Suthar and Hrushikesh Dalicha	
<b>Novel Current Source Multi-level Inverter for Efficient Electrical Arc Welding</b> . . . . .	139
Pankaj S. Sharma and Mulav P. Rathod	
<b>Design, Simulation and Development of Current Source Multilevel Inverter</b> . . . . .	153
Akashkumar Tarpada, Karan Chatrani and Mulav P. Rathod	
<b>Generalised Fault-Tolerant Structure for Multilevel Inverter</b> . . . . .	165
Shubham Gajbhiye, Pradyumn Chaturvedi, Sai Krishna Saketi and Pranav Mohod	
<b>A Comparative Study of Grid Synchronization Techniques SRF-PLL and DSRF-PLL Under Unbalanced Grid Voltage Condition</b> . . . . .	177
Atul Kunpara and Vithal N. Kamat	
<b>Investigation on Impact of Rooftop Solar System on LV Distribution Network</b> . . . . .	187
Dhaval Y. Raval and Saurabh N. Pandya	
<b>Review of the Impact of Vehicle-to-Grid Schemes on Electrical Power Systems</b> . . . . .	199
Praghmesh Bhatt, Chao Long and Mohammadsoaib Saiyad	
<b>Reviewing Surface Defects for the Performance Degradation in the Solar Devices</b> . . . . .	209
Kruti Pancholi, Mosam Pandya and Dhyey Raval	
<b>Identification of the Source of Power Quality Degradation Using Signature Extraction from Voltage Waveforms</b> . . . . .	219
Parth Vaghera, Dinesh Kumar, Nishant Kothari and Sayed Niamatullah	
<b>Study and Analysis of HTLS Conductors for Increasing the Thermal Loading of 220 kV Transmission Line</b> . . . . .	229
Akshit Kachhadiya, Chetan Sheth, Vinod Gupta and Krunal Darji	
<b>Energy Audit: A Case Study in a Rubberwood Processing Industry</b> . . . . .	239
Anith Krishnan, Saji Justus, Ajay Raj, Jestin Jaison, Nizy Susan Shaji, V. S. Unnimaya, Salini M. Venugopal and A. Sriram	

# Applied Computational Intelligence in Power Electronic Inverter to Mitigate Harmonics



Margi Shah and Kartik S. Pandya

**Abstract** This paper implies the application of artificial intelligence technique on cascade five-level H-bridge inverter with equal DC sources for objective of harmonic reduction. The multilevel modulation technique adopted is selective harmonic elimination. The approach is the development of optimal switching angles using particle swarm optimization technique with precise software and hardware validation. Harmonic analysis has been done at both optimized and unoptimized angles to corroborate the significance of AI method. The total harmonic distortion at optimized and unoptimized angles has corroborated that AI algorithms hold requisite dominance in one of the challenging issues of harmonic reduction.

**Keywords** Cascade multilevel inverter • Particle swarm optimization • Selective harmonic elimination

---

M. Shah · K. S. Pandya (✉)  
CHARUSAT University, Anand, GJ 388421, India  
e-mail: kartikpandya.ee@charusat.ac.in

M. Shah  
e-mail: margishah1234@gmail.com



Axaykumar Mehta  
Abhishek Rawat  
Priyesh Chauhan *Editors*

# Advances in Electric Power and Energy Infrastructure

Proceedings of ICPCCI 2019



Springer

*Editors*

Axaykumar Mehta  
Department of Electrical Engineering  
IITRAM  
Ahmedabad, Gujarat, India

Abhishek Rawat  
Department of Electrical Engineering  
IITRAM  
Ahmedabad, Gujarat, India

Priyesh Chauhan  
Department of Electrical Engineering  
IITRAM  
Ahmedabad, Gujarat, India

ISSN 1876-1100                      ISSN 1876-1119 (electronic)  
Lecture Notes in Electrical Engineering  
ISBN 978-981-15-0205-7              ISBN 978-981-15-0206-4 (eBook)  
<https://doi.org/10.1007/978-981-15-0206-4>

© Springer Nature Singapore Pte Ltd. 2020

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.  
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

# Contents

<b>A New Objective Function for Optimal Coordination of Directional Over-current Relays . . . . .</b>	<b>1</b>
Jay Shah, Nirmal Khristi, Vipul N. Rajput and Kartik S. Pandya	
<b>Symmetrical Fault—Swing Discrimination Using RMS Index-Based Superimposed Current Signals . . . . .</b>	<b>13</b>
K. R. Andanapalli and M. Biswal	
<b>Realization of Solid-State DC Circuit Breaker for HVDC System . . . . .</b>	<b>25</b>
Yogeshwari Prajapati and Mulav P. Rathod	
<b>A Review on Approaches Employed for Solving Directional Overcurrent Relays' Coordination Problem . . . . .</b>	<b>35</b>
Shanker D. Godwal, Kartik S. Pandya, Vipul N. Rajput and Santosh C. Vora	
<b>Reduction of Short-Circuit Level of EHV Substation . . . . .</b>	<b>53</b>
Jay Jogi, Chetan Sheth, Vinod Gupta and Krunal Darji	
<b>Recourse-based Stochastic Market Clearing Algorithm . . . . .</b>	<b>65</b>
Leena Heistrene, Poonam Mishra and Makarand Lokhande	
<b>Generator Ranking Based on Singular Value Decomposition for Voltage Stability Assessment. . . . .</b>	<b>75</b>
Shreya D. Bhanushali and Bhavik N. Suthar	
<b>Optimal Power Flow in Power Networks with TCSC Using Particle Swarm Optimization Technique . . . . .</b>	<b>91</b>
Patil Monal, Leena Heistrene and Vivek Pandya	
<b>Power Loss Minimization and Voltage Improvement with Small Size Distributed Generations in Radial Distribution System Using TOPSIS . . . . .</b>	<b>103</b>
Nivedita Naik and Shelly Vadhera	

# A Review on Approaches Employed for Solving Directional Overcurrent Relays' Coordination Problem



Shanker D. Godwal , **Kartik S. Pandya** , Vipul N. Rajput and Santosh C. Vora

**Abstract** The directional overcurrent relay (DOCR) coordination is considered as a highly constrained, nonlinear, and non-convex optimization problem. In order to find the optimum solution of these problems, many extensive efforts have been kept by the researchers. The optimum solution of directional overcurrent relay which coordination can be obtained by choosing proper time–current characteristic of DOCR, appropriate selection of objective function, and right selection of soft computing technique. This paper gives the insight into various approaches employed for DOCRs' coordination which are as optimization method-based approach, objective function-based approach, and standard and non-standard relay characteristic-based approaches presented in the past literature. Also, this paper discusses mathematical formulation for overcurrent relay coordination.

**Keywords** Relay coordination • Plug setting • Time multiplier setting • Plug setting multiplier • Relay characteristics

---

S. D. Godwal (✉)

Department of Electrical Engineering, CSPIT, CHARUSAT, Changa, Anand, Gujarat, India  
e-mail: shanker.godwal@nirmauni.ac.in

**K. S. Pandya**

Charotar University of Science and Technology, Changa, Anand, Gujarat 388421, India  
e-mail: kartikpandya.ee@charusat.ac.in

V. N. Rajput

Dr. Jivraj Mehta Institute of Technology, Anand, India  
e-mail: vipulrajput16986@gmail.com

S. C. Vora

Institute of Technology, Nirma University, Ahmedabad, India  
e-mail: santoshvora@yahoo.com

© Springer Nature Singapore Pte Ltd. 2020

A. Mehta et al. (eds.), *Advances in Electric Power and Energy Infrastructure*, Lecture Notes in Electrical Engineering 608,  
[https://doi.org/10.1007/978-981-15-0206-4\\_4](https://doi.org/10.1007/978-981-15-0206-4_4)



Axaykumar Mehta  
Abhishek Rawat  
Priyesh Chauhan *Editors*

# Advances in Electric Power and Energy Infrastructure

Proceedings of ICPCCI 2019



Springer

*Editors*

Axaykumar Mehta  
Department of Electrical Engineering  
IITRAM  
Ahmedabad, Gujarat, India

Abhishek Rawat  
Department of Electrical Engineering  
IITRAM  
Ahmedabad, Gujarat, India

Priyesh Chauhan  
Department of Electrical Engineering  
IITRAM  
Ahmedabad, Gujarat, India

ISSN 1876-1100                      ISSN 1876-1119 (electronic)  
Lecture Notes in Electrical Engineering  
ISBN 978-981-15-0205-7              ISBN 978-981-15-0206-4 (eBook)  
<https://doi.org/10.1007/978-981-15-0206-4>

© Springer Nature Singapore Pte Ltd. 2020

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.  
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

# Contents

<b>A New Objective Function for Optimal Coordination of Directional Over-current Relays . . . . .</b>	<b>1</b>
Jay Shah, Nirmal Khristi, Vipul N. Rajput and Kartik S. Pandya	
<b>Symmetrical Fault—Swing Discrimination Using RMS Index-Based Superimposed Current Signals . . . . .</b>	<b>13</b>
K. R. Andanapalli and M. Biswal	
<b>Realization of Solid-State DC Circuit Breaker for HVDC System . . . . .</b>	<b>25</b>
Yogeshwari Prajapati and Mulav P. Rathod	
<b>A Review on Approaches Employed for Solving Directional Overcurrent Relays' Coordination Problem . . . . .</b>	<b>35</b>
Shanker D. Godwal, Kartik S. Pandya, Vipul N. Rajput and Santosh C. Vora	
<b>Reduction of Short-Circuit Level of EHV Substation . . . . .</b>	<b>53</b>
Jay Jogi, Chetan Sheth, Vinod Gupta and Krunal Darji	
<b>Recourse-based Stochastic Market Clearing Algorithm . . . . .</b>	<b>65</b>
Leena Heistrene, Poonam Mishra and Makarand Lokhande	
<b>Generator Ranking Based on Singular Value Decomposition for Voltage Stability Assessment. . . . .</b>	<b>75</b>
Shreya D. Bhanushali and Bhavik N. Suthar	
<b>Optimal Power Flow in Power Networks with TCSC Using Particle Swarm Optimization Technique . . . . .</b>	<b>91</b>
Patil Monal, Leena Heistrene and Vivek Pandya	
<b>Power Loss Minimization and Voltage Improvement with Small Size Distributed Generations in Radial Distribution System Using TOPSIS . . . . .</b>	<b>103</b>
Nivedita Naik and Shelly Vadhera	

# A New Objective Function for Optimal Coordination of Directional Over-current Relays



Jay Shah, Nirmal Khristi, Vipul N. Rajput and **Kartik S. Pandya**

**Abstract** This paper presents a novel objective function to obtain the optimum relay settings of directional over-current relays (DOCRs). The proposed improved objective function (IOF) is developed to solve the problems of previously proposed OFs. The proposed research work modifies the previous OFs by introducing a new weighting factor and adding a new term, for fixing mis-coordination problem and minimizing the operating times of both primary and backup relays. The performance of the proposed IOF is evaluated by using 3- and 8-bus test systems. The simulation results reflect the superiority of IOF, compared to other variety of OFs presented in the literature.

**Keywords** Genetic algorithm · Objective function · Over-current relay · Power system protection · Relay setting · Relay coordination

## 1 Introduction

Because of cost-effectiveness, the DOCRs are generally applied for primary protection in distribution systems and as a backup protection of transmission systems [1]. In the coordination procedure of relays, the primary relays should be operating within specified time to signal circuit breaker to remove faulty part. On the other hand, backup relays should come in action only after the certain time interval for

---

J. Shah (✉) · V. N. Rajput  
Dr. Jivraj Mehta Institute of Technology, Anand, India  
e-mail: jayshah9512@gmail.com

V. N. Rajput  
e-mail: vipulrajput16986@gmail.com

N. Khristi  
Amul Dairy, Anand, India  
e-mail: nirmalkhristi@gmail.com

**K. S. Pandya**  
Charotar University of Science and Technology, Changa, India  
e-mail: kartikpandya.ee@charusat.ac.in



Axaykumar Mehta  
Abhishek Rawat  
Priyesh Chauhan *Editors*

# Advances in Electric Power and Energy Infrastructure

Proceedings of ICPCCI 2019



Springer

*Editors*

Axaykumar Mehta  
Department of Electrical Engineering  
IITRAM  
Ahmedabad, Gujarat, India

Abhishek Rawat  
Department of Electrical Engineering  
IITRAM  
Ahmedabad, Gujarat, India

Priyesh Chauhan  
Department of Electrical Engineering  
IITRAM  
Ahmedabad, Gujarat, India

ISSN 1876-1100                      ISSN 1876-1119 (electronic)  
Lecture Notes in Electrical Engineering  
ISBN 978-981-15-0205-7              ISBN 978-981-15-0206-4 (eBook)  
<https://doi.org/10.1007/978-981-15-0206-4>

© Springer Nature Singapore Pte Ltd. 2020

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.  
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

<b>Applied Computational Intelligence in Power Electronic Inverter to Mitigate Harmonics</b> . . . . .	115
Margi Shah and Kartik S. Pandya	
<b>Design and Analysis of DC Power Supply for Solid-State Power Amplifier</b> . . . . .	129
Rohit Agarwal, Rajesh Kumar, Gajendra Suthar and Hrushikesh Dalicha	
<b>Novel Current Source Multi-level Inverter for Efficient Electrical Arc Welding</b> . . . . .	139
Pankaj S. Sharma and Mulav P. Rathod	
<b>Design, Simulation and Development of Current Source Multilevel Inverter</b> . . . . .	153
Akashkumar Tarpada, Karan Chatrani and Mulav P. Rathod	
<b>Generalised Fault-Tolerant Structure for Multilevel Inverter</b> . . . . .	165
Shubham Gajbhiye, Pradyumn Chaturvedi, Sai Krishna Saketi and Pranav Mohod	
<b>A Comparative Study of Grid Synchronization Techniques SRF-PLL and DSRF-PLL Under Unbalanced Grid Voltage Condition</b> . . . . .	177
Atul Kunpara and Vithal N. Kamat	
<b>Investigation on Impact of Rooftop Solar System on LV Distribution Network</b> . . . . .	187
Dhaval Y. Raval and Saurabh N. Pandya	
<b>Review of the Impact of Vehicle-to-Grid Schemes on Electrical Power Systems</b> . . . . .	199
Praghmesh Bhatt, Chao Long and <b>Mahammadsoaib Saiyad</b>	
<b>Reviewing Surface Defects for the Performance Degradation in the Solar Devices</b> . . . . .	209
Kruti Pancholi, Mosam Pandya and Dhyey Raval	
<b>Identification of the Source of Power Quality Degradation Using Signature Extraction from Voltage Waveforms</b> . . . . .	219
Parth Vaghera, Dinesh Kumar, Nishant Kothari and Sayed Niamatullah	
<b>Study and Analysis of HTLS Conductors for Increasing the Thermal Loading of 220 kV Transmission Line</b> . . . . .	229
Akshit Kachhadiya, Chetan Sheth, Vinod Gupta and Krunal Darji	
<b>Energy Audit: A Case Study in a Rubberwood Processing Industry</b> . . . . .	239
Anith Krishnan, Saji Justus, Ajay Raj, Jestin Jaison, Nizy Susan Shaji, V. S. Unnimaya, Salini M. Venugopal and A. Sriram	

# Review of the Impact of Vehicle-to-Grid Schemes on Electrical Power Systems



Praghmesh Bhatt , Chao Long and **Mahammadsoaib Saiyad**

**Abstract** The vehicle-to-grid (V2G) describes plug-in electric vehicles (PEV), such as battery electric vehicles (BEV) and plug-in hybrid electric vehicles (PHEV), communicate with the power grid and sell demand response services by either returning electricity to the grid or by restricting their charging rate. Simultaneous charging of EV fleet can lead to an excessive loading, under-voltages and energy losses in distribution networks. On the other hand, the EVs in their idle mode has the ability to feed power back to grid which is useful for active power balancing, peak shaving, and stability enhancement. This paper reviews the V2G schemes to assess their impacts on the electrical power systems. The framework for coordinated operation of EVs with renewable energy sources in the various electricity markets was reviewed. The EVs' capability in energy loss minimization and provision of ancillary services such as frequency and voltage control was also investigated.

**Keywords** Ancillary service · Demand-side management · Electric vehicle · Optimal charging scheme · Vehicle-to-grid

## 1 Introduction

Electric vehicles (EVs) have been introduced into the market globally owing to the fact that EVs could significantly contribute towards the targets of the greenhouse gas emission reduction. The increasing share of EVs may have impact on power system performance, e.g. distribution network losses, peak power demand, voltage profiles, efficiency, reliability, and stability [1]. EVs are capable of delivering active and reactive power support, thus providing ancillary services for frequency regulation,

---

P. Bhatt (✉)

Pandit Deendayal Petroleum University, Gandhinagar, Gujarat 382007, India  
e-mail: praghmesh.bhatt@sot.pdpu.ac.in

C. Long

School of Engineering, Cardiff University, Cardiff CF24 3AA, UK

**M. Saiyad**

C S Patel Institute of Technology, CHARUSAT, Changa Gujarat 388421, India

© Springer Nature Singapore Pte Ltd. 2020

A. Mehta et al. (eds.), *Advances in Electric Power and Energy Infrastructure*, Lecture Notes in Electrical Engineering 608,  
[https://doi.org/10.1007/978-981-15-0206-4\\_17](https://doi.org/10.1007/978-981-15-0206-4_17)



# Palmprint based Pattern Recognition Using Fast ICA

Jayshri P. Patil

Assistant Professor  
Department of Computer Engineering,  
Gangamai Polytechnic,  
Dhule, India  
jayshripatil145@gmail.com

Chandrashekhar S. Pawar

Assistant Professor  
Department of Computer Science and Engineering,  
Devang Patel Institute of Advanced Technology and  
Research, CHARUSAT, Changa, Gujarat, India  
pawar.chandrashekhar88@gmail.com

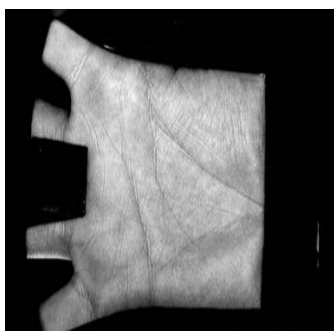
**Abstract**— The pattern of Palmprint has high dissimilarity because of its numerous determination features like ridges, principle lines, datum points, and wrinkles and so on. In this paper, a blend of Haar Wavelet, DCT and Fast ICA have been utilized to recognize the palmprint pattern using fast ICA. The images of Palm were initially decomposed by the Haar Wavelet and frequency band, independent of different image resolutions chosen for dimensionality decrease. Next on LL, band DCT was used. Lastly, Fast ICA used to discover the independent components of the DCT features. To find matching image, Euclidean Distance (ED) has been used. The procedure is validated on Polytechnic-University (Poly U) storage as well as the results show the efficiency and accuracy of the proposed method.

**Keywords**— *Independent Component Analysis (ICA), Palmprint, Discrete Cosine Transform (DCT), Haar Wavelet*

## I. INTRODUCTION

Palmprint is a biometric-based strategy of pattern recognition. This technique has numerous advantages, like stability, unique, collected, performance, and security, and so on. The palmprint recognition's error rate is the lowest in most biometric identification methods. The palmprint recognition has low cost, fast and high exactness features. Presently numerous research organizations at home and abroad invest a considerable measure of time and energy to do research of palm recognition. The palmprint pictures are taken from the poly U database to preprocess, as in Fig 1.

Fig. 1 Palmprint Image



In this manner, these pictures are taken to identify persons by utilizing Independent Component Analysis (ICA), it improve the accuracy of Palmprint recognition, having high dissimilarity because of its numerous determination features.

The paper is presented as layout of past efforts for palmprint recognition is described in section-II. The projected technique discussed in section-III. Section-IV gives the analysis and result. In the last section, V depicts the conclusion.

## II. THE TRADITIONAL PALMPRINT RECOGNITION

Palmprint recognition implemented online in [1], based on the 2D Gabor phase, which is used to excerpt various sorts. Then extricated features use for corresponding by applying Hamming Distance.

“K P Shashikala et al., [2] took the palmprint for recognition based on QPCA, DWT and DCT. DWT and DCT used to preprocess the image. QPCA is applied to take out the features and extracted features are matched by applying Euclidean Distance (ED)”.

S. M. Prasad et al., [3] used the palmprint for authentication. This method needs line and texture; both features to be extracted from the image of palmprint with the help of wavelet decomposition. Extracted features matched by product rule and sum rule.

Robust and competent point-based palmprint match based on Hough transform in [4]. Feature extracted from the principle line by applying the Hough transform. Gabor filter used to enhance the ridges.

The method used to recognize the palmprint is described in [5], which is based on minutiae. Minutiae features extracted by applying Gabor filter, which are matched by applying minutiae cylinder code.

The palmprint recognition technique based on the principle line described in [6]. In it PCA used for feature extraction and to match the features Euclidean Distance was applied.

“Hyperspectral palmprint image system is a method of correct feature band selection, implemented by Zhenhua Gout et al., [7]. This system extracted the features and selected best feature band using 2PCA”.

In [8], multispectral biometrics system used, in which “Palmprint images are sampled by using DWT and PCA used for features extraction. Features are matched by using Euclidean Distance (ED)”.

# Use of Machine Learning Services in Cloud



Chandrashekhar S. Pawar, Amit Ganatra, Amit Nayak, Dipak Ramoliya, and Rajesh Patel

**Abstract** Machine learning services are the comprehensive description of integrated and semiautomated web devices covering most facilities problems such as preprocessing information, design preparation, and design assessment, with the further forecast. REST APIs can bridge the outcomes of predictions with one's inner IT infrastructure. Like the original SaaS, IaaS, and PaaS cloud delivery models, ML and AI fields cover high-level services to provide infrastructure and platform, exposed as APIs. This article identifying the most used Cloud Technologies for Machine Learning as a Service (MLaaS): Google Cloud AI, Amazon, and Microsoft Azure.

**Keywords** Machine learning (ML) · Machine learning as a service (MLaaS) · Application program interface (API) · Artificial intelligence (AI) · Technology–organization–environment (TOE) framework · Information system (IS)

## 1 Introduction

The development of ML alternatives involves sophisticated, understanding, and costly assets because of this ML was mostly available to big firms that had such capacities. However, it was difficult to harness ML's authority for larger businesses or personal IT experts. One way to address the above-mentioned issues would be to have an ML as a service (MLaaS) capable of providing on-demand computing funds and an obviously specified API for ML procedure. Such a website would allow consumers to concentrate on the issue, and they are attempting to fix rather than the information of execution.

The algorithms of machine learning which are built on deep neural networks (NN) have been widely used in diverse fields. As the use of cloud services grows, MLaaS is accessible, and the training and deployment of these machine learning models are achieved on cloud providers' infrastructure [1].

---

C. S. Pawar (✉) · A. Ganatra · A. Nayak · D. Ramoliya · R. Patel

Faculty of Technology and Engineering (FTE), Devang Patel Institute of Advance Technology and Research-(DEPSTAR), Charotar University of Science and Technology (CHARUSAT), Changa, Gujarat, India

# Digital Learning: A New Perception to Learn Beyond the Classroom Boundary



Dweepna Garg, Radhika Patel, Rima Patel, Binal Kaka, Parth Goel, and Bhavika Patel

**Abstract** In the era of digital learning, when the mobile devices started gaining popularity, the Internet broke through the restriction on space and time and became a ubiquitous learning tool. The critical matters in the current information technology are the design of teaching activity in a way that is flexible which can be made interesting for the students. The challenge faced by most of the institutions is to provide online education to their students. This is because the institutions do not have the required set of digital capabilities. The lack of this digital strategy restricts few organizations to respond quickly to any customer query. It is preferred that in the competitive world, the institution should not only focus on digital learning but also try to bring about the innovative strategies with the help of which they can interact with the students. This would help in building an environment that is active, innovative, and challenging. Digital learning plays an important role in the skills landscape. This paper highlights the use of digital learning along with its impact on the society. The paper also showcases the existing systems that were used to impart the education and the limitations of it, which were then worked upon in the era of digital learning.

---

D. Garg (✉) · R. Patel · R. Patel · B. Kaka · P. Goel · B. Patel  
Devang Patel Institute of Advance Technology and Research (DEPSTAR), Charotar University of Science and Technology (CHARUSAT), Changa, Anand, Gujarat, India  
e-mail: [dweeps1989@gmail.com](mailto:dweeps1989@gmail.com)

R. Patel  
e-mail: [radhikapatel.it@charusat.ac.in](mailto:radhikapatel.it@charusat.ac.in)

R. Patel  
e-mail: [rimapatel.dcs@charusat.ac.in](mailto:rimapatel.dcs@charusat.ac.in)

B. Kaka  
e-mail: [binalkaka.dce@charusat.ac.in](mailto:binalkaka.dce@charusat.ac.in)

P. Goel  
e-mail: [parthgoel.ce@charusat.ac.in](mailto:parthgoel.ce@charusat.ac.in)

B. Patel  
e-mail: [bhavikapatel.dce@charusat.ac.in](mailto:bhavikapatel.dce@charusat.ac.in)

# IoT Based Self-Navigation Assistance for Visually Impaired



Nilesh Dubey, Gaurang Patel, Amit Nayak, and Amit Ganatra

**Abstract** One of the major challenges faced by visually challenged people is self-navigation in unknown environments. They often tend to get hurt by objects that they cannot feel using their hands or a walking cane, as certain objects are hard for a blind person to detect by just using tapping their walking cane. To avoid obstacles and navigate through a new environment, a smart belt for the visually impaired is performed in which he/she can continuously detect the obstacles around the user with its sensors that span the entire 360° of his/her field of view. Whenever an obstacle is in a nearby range, sufficiently enough to cause a hindrance, the device will give sensory cues to the user about the location of the obstacle and family members are also tracked them using GSM and GPRM system.

**Keywords** GSM · Obstacle detection · Visually impaired · HC-05 sensor system

---

N. Dubey (✉) · G. Patel

Department of Computer Science and Engineering, Devang Patel Institute of Advance Technology and Research, Faculty of Technology and Engineering (FTE), Charotar University of Science and Technology, Changa, India  
e-mail: [nileshdubey.ce@charusat.ac.in](mailto:nileshdubey.ce@charusat.ac.in)

G. Patel

e-mail: [gaurangpatel.dcs@charusat.ac.in](mailto:gaurangpatel.dcs@charusat.ac.in)

A. Nayak

Department of Information Technology, Devang Patel Institute of Advance Technology and Research, Faculty of Technology and Engineering (FTE), Charotar University of Science and Technology, Changa, India  
e-mail: [amitnayak.it@charusat.ac.in](mailto:amitnayak.it@charusat.ac.in)

A. Ganatra

Department of Computer Engineering, Charotar University of Science and Technology, Changa, India



# **A Survey on Collaboration Technologies and Systems of ICT Application in the Field of Education**

**Shivam Ribadiya**<sup>1</sup>[0000-0003-0833-0824] **Dweepna Garg**<sup>1</sup>[0000-0002-6376-8346] **Janardan Bharvad**<sup>1</sup>[0000-0003-2455-6962]

<sup>1</sup> Devang Patel Institute of Advance Technology and Research (DEPSTAR) , Charotar University of Science and Technology (CHARUSAT), 139, CHARUSAT Campus, Highway, Off, Nadiad - Petlad Rd, Changa, Gujarat 388421, India  
shivamribadiya@outlook.com  
dweeps1989@gmail.com  
janardanbharvad.dce@charusat.ac.in

## **Abstract.**

Information and Communication Technology (ICT), such as the global use of mobile phones and the Internet, has made an unparalleled contribution to the growing world economy. In education, the significance of information and communications technology (ICT) is recognized around the world. Numerous information and communication technology platforms in education are making the teaching and learning process productive, reliable, easier, pleasant, wider and more comprehensive. Efforts are being made to provide digital information technology resources in academic institutions globally. Institutions of higher education, including government and private-funded (state and central government), have made tremendous investments in enabling ICT institutions. The academic effectiveness of ICTs depends on different factors, like usage, intention, and structure of socioeconomic support. Both modern technology, equipment and facilities require routine repairs and updates that are not carried out due to a lack of skilled and committed staff, resulting in their obsolescence. In order to clarify the above observations and some of their consequences in a larger socio-economic sense, an institutional framework is used. This paper focuses on various ICT platforms and its application for teaching learning approach.

**Keywords:** ICT, WWW, RFID, AR, VR, MR, Social Media Networks.

## **1 Introduction to ICT Application**

Information and Communication Technology (ICT) is a wide term for information technology industry and society in global world. ICT enables all communication technologies including computer, information sharing, mobile phones, software, internet, wireless communication technology, video meeting, social media network applications, stores of information and user services like access, store and retrieval of digital information from one place to another place with help of wired or wireless medium. Information and Communication Technology (ICT) is a type of education

Tomonobu Senju  
Parikshit N. Mahalle  
Thinagaran Perumal  
Amit Joshi *Editors*



# Information and Communication Technology for Intelligent Systems

Proceedings of ICTIS 2020, Volume 1

# **Smart Innovation, Systems and Technologies**

Volume 195

## **Series Editors**

Robert J. Howlett, Bournemouth University and KES International,  
Shoreham-by-sea, UK

Lakhmi C. Jain, Faculty of Engineering and Information Technology,  
Centre for Artificial Intelligence, University of Technology Sydney,  
Sydney, NSW, Australia

The Smart Innovation, Systems and Technologies book series encompasses the topics of knowledge, intelligence, innovation and sustainability. The aim of the series is to make available a platform for the publication of books on all aspects of single and multi-disciplinary research on these themes in order to make the latest results available in a readily-accessible form. Volumes on interdisciplinary research combining two or more of these areas is particularly sought.

The series covers systems and paradigms that employ knowledge and intelligence in a broad sense. Its scope is systems having embedded knowledge and intelligence, which may be applied to the solution of world problems in industry, the environment and the community. It also focusses on the knowledge-transfer methodologies and innovation strategies employed to make this happen effectively. The combination of intelligent systems tools and a broad range of applications introduces a need for a synergy of disciplines from science, technology, business and the humanities. The series will include conference proceedings, edited collections, monographs, handbooks, reference books, and other relevant types of book in areas of science and technology where smart systems and technologies can offer innovative solutions.

High quality content is an essential feature for all book proposals accepted for the series. It is expected that editors of all accepted volumes will ensure that contributions are subjected to an appropriate level of reviewing process and adhere to KES quality principles.

**\*\* Indexing: The books of this series are submitted to ISI Proceedings, EI-Compendex, SCOPUS, Google Scholar and Springerlink \*\***

More information about this series at <http://www.springer.com/series/8767>



Tomonobu Senjyu · Parikshit N. Mahalle ·  
Thinagaran Perumal · Amit Joshi  
Editors

# Information and Communication Technology for Intelligent Systems

Proceedings of ICTIS 2020, Volume 1

 Springer

*Editors*

Tomonobu Senjyu  
Department of Electrical and Electronics  
Engineering  
University of the Ryukyus  
Nishihara, Japan

Thinagaran Perumal  
Universiti Putra Malaysia  
Serdang, Malaysia

Parikshit N. Mahalle  
Sinhgad Technical Education Society  
SKNCOE  
Pune, India

Amit Joshi  
Global Knowledge Research Foundation  
Ahmedabad, India

ISSN 2190-3018

ISSN 2190-3026 (electronic)

Smart Innovation, Systems and Technologies

ISBN 978-981-15-7077-3

ISBN 978-981-15-7078-0 (eBook)

<https://doi.org/10.1007/978-981-15-7078-0>

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd. 2021

This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd. The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

# Preface

This SIST volume contains the papers presented at the ICTIS 2020: Fourth International Conference on Information and Communication Technology for Intelligent Systems. The conference was held during May 15–16, 2020, organized on a digital platform ZOOM due to Pandemic COVID–19. The supporting partners were InterYIT IFIP and Knowledge Chamber of Commerce and Industry (KCCI).

This conference aimed at targeting state-of-the-art as well as emerging topics pertaining to ICT and effective strategies for its implementation in engineering and intelligent applications. The objective of this international conference is to provide opportunities for the researchers, academicians, industry persons, and students to interact and exchange ideas, experience, and expertise in the current trend and strategies for information and communication technologies. Besides this, participants will also be enlightened about the vast avenues and current and emerging technological developments in the field of ICT in this era and its applications will be thoroughly explored and discussed. The conference is anticipated to attract a large number of high-quality submissions and stimulate the cutting-edge research discussions among many academic pioneering researchers, scientists, industrial engineers, students from all around the world and provide a forum to researchers; propose new technologies, share their experiences, and discuss future solutions for design infrastructure for ICT; provide a common platform for academic pioneering researchers, scientists, engineers, and students to share their views and achievements; enrich technocrats and academicians by presenting their innovative and constructive ideas; and focus on innovative issues at the international level by bringing together the experts from different countries. Research submissions in various advanced technology areas were received, and after a rigorous peer-review process with the help of the program committee members and external reviewers, 76 papers were accepted with an acceptance rate of 0.19 for this volume.

The conference featured many distinguished personalities like Mike Hinchey—PhD University of Limerick, Ireland, President, International Federation of Information Processing; Bharat Patel—Honorary Secretary General, Knowledge Chamber of Commerce and Industry, India; Aninda Bose—Sr. Editor, Springer, India; Mufti Mahmud—PhD, Nottingham Trent University, UK; Suresh Chandra

Satapathy—PhD, Kalinga Institute of Industrial Technology, Bhubaneswar, India; Neeraj Gupta—PhD, School of Engineering and Computer Science, Oakland University, USA; Nilanjan Dey—PhD, Techno India College of Technology, Kolkata, India. We are indebted to all our organizing partners for their immense support to make this virtual conference successfully possible. A total of 23 sessions were organized as a part of ICTIS 2020 including 22 technical and 1 inaugural session. Approximately, 154 papers were presented in 22 technical sessions with high discussion insights. The total number of accepted submissions was 112 with a focal point on ICT and intelligent systems. Our sincere thanks to our Organizing Secretary, ICTIS 2020—Mihir Chauhan, Conference Secretary, ICTIS 2020—Aman Barot, and the entire team of Global Knowledge Research Foundation and Conference committee for their hard work and support for the entire shift of ICTIS 2020 from physical to digital modes in these new normal times.

Nishihara, Japan  
Pune, India  
Serdang, Malaysia  
Ahmedabad, India

Tomonobu Senjyu  
Parikshit N. Mahalle  
Thinagaran Perumal  
Amit Joshi



# Contents

<b>Modeling and Fuzzy Availability Analysis of Computer Networks: A Case Study</b> . . . . .	1
Ashish Kumar, Ombir Dahiya, and Monika Saini	
<b>Stochastic Modeling and Profit Evaluation of a Redundant System with Priority Subject to Weibull Densities for Failure and Repair</b> . . . . .	11
Monika Saini, Kuntal Devi, and Ashish Kumar	
<b>Convolutional Neural Networks: An Overview and Its Applications in Pattern Recognition</b> . . . . .	21
Aseem Patil and Milind Rane	
<b>SAMKL: Sample Adaptive Multiple Kernel Learning Framework for Lung Cancer Prediction</b> . . . . .	31
Ashima Singh, Arwinder Dhillon, and Jasmine Kaur Thind	
<b>Optimal Multiple Access Scheme for 5G and Beyond Communication Network</b> . . . . .	45
Nira and Aasheesh Shukla	
<b>Exergy and Energy Analyses of Half Effect–Vapor Compression Cascade Refrigeration System</b> . . . . .	55
Mihir H. Amin, Hetav M. Naik, Bidhin B. Patel, Prince K. Patel, and Snehal N. Patel	
<b>Effect of Servicescape and Nourishment Quality on Client’s Loyalty in Fine Dining Restaurants: A Statistical Investigation</b> . . . . .	77
Aravind Kumar Rai, Ashish Kumar, Pradeep Singh Chahar, and C. Anirvinna	
<b>Application of Data Mining for Analysis and Prediction of Crime</b> . . . . .	91
Vaibhavi Shinde, Yash Bhatt, Sanika Wawage, Vishal Kongre, and Rashmi Sonar	

<b>Analyze and Compare the Parameters of Microstrip Rectangular Patch Antenna Using Fr<sub>4</sub>, RT Duroid, and Taconic Substrate . . . . .</b>	<b>489</b>
Prakash Kuravatti	
<b>Performance Analysis of Hand-Crafted Features and CNN Toward Real-Time Crop Disease Identification . . . . .</b>	<b>497</b>
Vivek Tiwari, Aditi Agrahari, and Sriyuta Srivastava	
<b>Performance Analysis of GNSS Utility by Multi-constellation Over the Indian Region . . . . .</b>	<b>507</b>
Madhu Ramarakula and Goparaju V. R. Sai Suresh	
<b>Digital Learning: A New Perception to Learn Beyond the Classroom Boundary . . . . .</b>	<b>517</b>
Dweepna Garg, Radhika Patel, Rima Patel, Binal Kaka, Parth Goel, and Bhavika Patel	
<b>Performance Analysis of Channel Capacity of MIMO System Without CSI . . . . .</b>	<b>529</b>
Divya Singh and Aasheesh Shukla	
<b>Firmware Injection Detection on IoT Devices Using Deep Random Forest . . . . .</b>	<b>537</b>
E. Arul, A. Punidha, V. D. Ambeth Kumar, and E. Yuvarani	
<b>Adaptive Protection Scheme for Renewable Integrated Microgrid—A Case Study . . . . .</b>	<b>545</b>
S. G. Srivani, C. Suresha, K. N. S. V. Theertha, and D. Chandan	
<b>Relevant Feedback-Based User-Query Log Recommender System from Public Repository . . . . .</b>	<b>555</b>
V. Kakulapati, D. Vasumathi, and G. Suryanarayana	
<b>Intelligent Sentiments Information Systems Using Fuzzy Logic . . . . .</b>	<b>569</b>
Roop Ranjan and A. K. Daniel	
<b>Possibility Study of PV-STATCOM with CHB Multilevel Inverter: A Review . . . . .</b>	<b>579</b>
K. M. Nathgosavi and P. M. Joshi	
<b>Design and Development of Wireless Sensor for Variable Temperature and for Various Security Purposes . . . . .</b>	<b>591</b>
Prabhakar Singh and Minal Saxena	
<b>Analysis of Cloud Forensics Challenges and Solutions . . . . .</b>	<b>601</b>
Ashish Revar, Abhishek Anand, and Ishwarlal Rathod	
<b>Cohesion Measure for Restructuring . . . . .</b>	<b>609</b>
Sarika Bobde and Rashmi Phalnikar	

<b>Analysis of F-Shape Antenna with Different Dielectric Substrate and Thickness</b> . . . . .	615
Radhika Raina, Komal Jaiswal, Shekhar Yadav, Dheeraj Kumar, and Ram Suchit Yadav	
<b>Analyzing Forensic Anatomization of Windows Artefacts for Bot-Malware Detection</b> . . . . .	627
Vasundhra Gupta, Mohona Ghosh, and Niyati Baliyan	
<b>Low-Power Two-Stage OP-AMP in 16 nm</b> . . . . .	637
Gopal Agarwal and Vedvyas Dwivedi	
<b>Computation of Hopf Bifurcation Points in the Magnetic Levitation System</b> . . . . .	643
Sudarshan K. Valluru, Anshul Gupta, and Aditya Verma	
<b>Face Sketch-Image Recognition for Criminal Detection Using a GAN Architecture</b> . . . . .	651
Sunil Karamchandani and Ganesh Shukla	
<b>Studying Network Features in Systems Biology Using Machine Learning</b> . . . . .	661
Shubham Mittal and Yasha Hasija	
<b>Smart Predictive Healthcare Framework for Remote Patient Monitoring and Recommendation Using Deep Learning with Novel Cost Optimization</b> . . . . .	671
Anand Motwani, Piyush Kumar Shukla, and Mahesh Pawar	
<b>Enhanced Question Answering System with Trustworthy Answers</b> . . . .	683
C. Valliyammai, V. P. Siddharth Gupta, Puviarasi Gowrinathan, Kalli Poornima, and S. Yaswanth	
<b>Rumour Containment Using Monitor Placement and Truth Propagation</b> . . . . .	693
Amrah Maryam and Rashid Ali	
<b>Classification of Satellite Images</b> . . . . .	703
N. Manohar, M. A. Pranav, S. Aksha, and T. K. Mytravarun	
<b>Sign Language Recognizer Using HMMs</b> . . . . .	715
Venkata Sai Rishita Middi and Middi Appala Raju	
<b>Attendance Monitoring Using Computer Vision</b> . . . . .	725
Akanksha Krishna Singh, Mausami, and Smita Kulkarni	
<b>Heart Disease Prediction Using Ensemblers Learning</b> . . . . .	733
Meenu Bhatia and Dilip Motwani	

<b>Impact of Influencer Credibility and Content on the Influencer–Follower Relationships in India . . . . .</b>	<b>745</b>
Adithya Suresh, Akhilraj Rajan, and Deepak Gupta	
<b>Smart Employment System: An HR Recruiter . . . . .</b>	<b>753</b>
Kajal Jewani, Anupreet Bhuyar, Anisha Kaul, Chinmay Mahale, and Trupti Kamat	
<b>Alzheimer’s Disease Prediction Using Fastai . . . . .</b>	<b>765</b>
Chiramel Riya Francis, Unik Lokhande, Prabhjyot Kaur Bamrah, and Arlene D’costa	
<b>Author Index . . . . .</b>	<b>777</b>



# Digital Learning: A New Perception to Learn Beyond the Classroom Boundary



Dweepna Garg, Radhika Patel, Rima Patel, Binal Kaka, Parth Goel, and Bhavika Patel

**Abstract** In the era of digital learning, when the mobile devices started gaining popularity, the Internet broke through the restriction on space and time and became a ubiquitous learning tool. The critical matters in the current information technology are the design of teaching activity in a way that is flexible which can be made interesting for the students. The challenge faced by most of the institutions is to provide online education to their students. This is because the institutions do not have the required set of digital capabilities. The lack of this digital strategy restricts few organizations to respond quickly to any customer query. It is preferred that in the competitive world, the institution should not only focus on digital learning but also try to bring about the innovative strategies with the help of which they can interact with the students. This would help in building an environment that is active, innovative, and challenging. Digital learning plays an important role in the skills landscape. This paper highlights the use of digital learning along with its impact on the society. The paper also showcases the existing systems that were used to impart the education and the limitations of it, which were then worked upon in the era of digital learning.

---

D. Garg (✉) · R. Patel · R. Patel · B. Kaka · P. Goel · B. Patel  
Devang Patel Institute of Advance Technology and Research (DEPSTAR), Charotar University of Science and Technology (CHARUSAT), Changa, Anand, Gujarat, India  
e-mail: [dweeps1989@gmail.com](mailto:dweeps1989@gmail.com)

R. Patel  
e-mail: [radhikapatel.it@charusat.ac.in](mailto:radhikapatel.it@charusat.ac.in)

R. Patel  
e-mail: [rimapatel.dcs@charusat.ac.in](mailto:rimapatel.dcs@charusat.ac.in)

B. Kaka  
e-mail: [binalkaka.dce@charusat.ac.in](mailto:binalkaka.dce@charusat.ac.in)

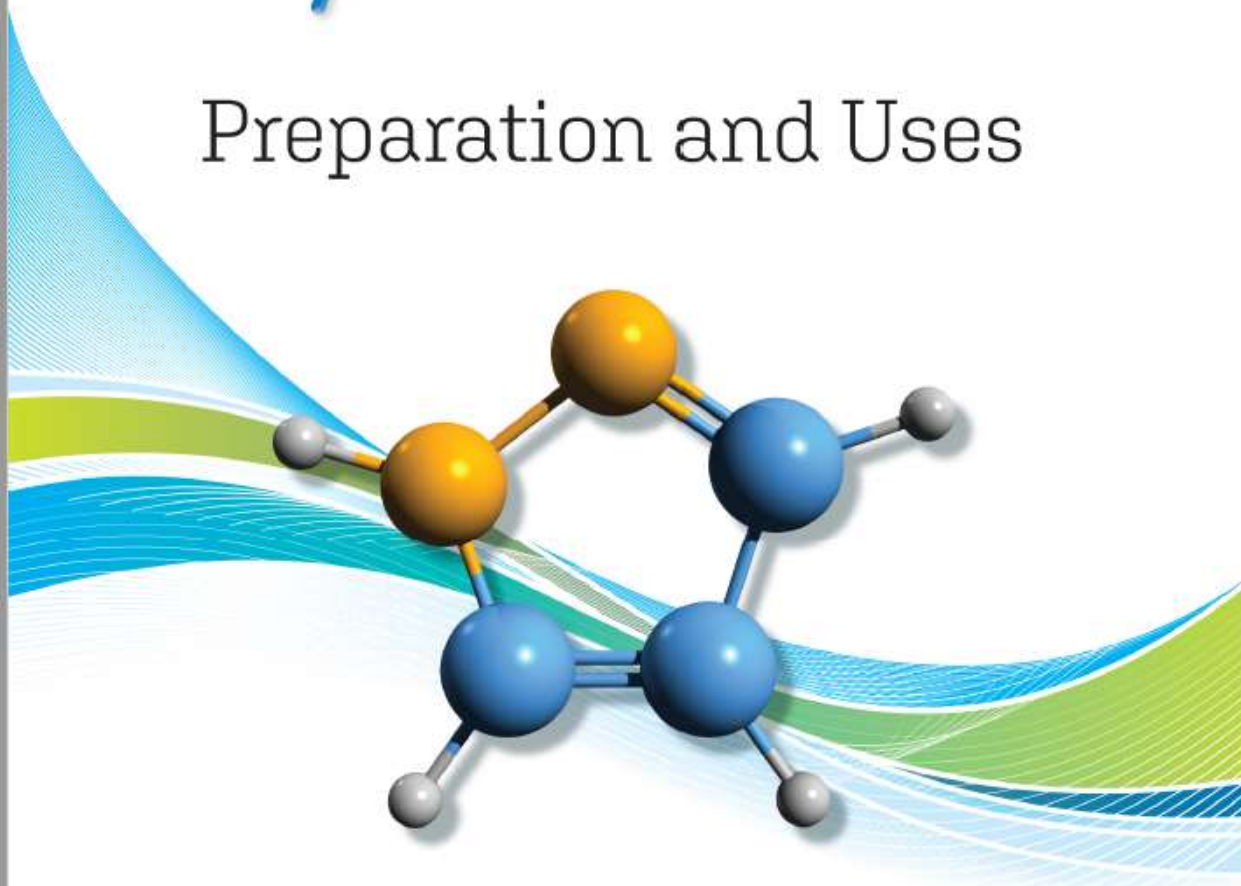
P. Goel  
e-mail: [parthgoel.ce@charusat.ac.in](mailto:parthgoel.ce@charusat.ac.in)

B. Patel  
e-mail: [bhavikapatel.dce@charusat.ac.in](mailto:bhavikapatel.dce@charusat.ac.in)

# **Faculty of Pharmacy**

# Pyrazole

Preparation and Uses



Dilipkumar Pal  
Editor

NOVA  
Complimentary Contributor Copy

## CONTENTS

<b>Preface</b>		<b>xi</b>
<b>Chapter 1</b>	Current Status of Pyrazolo Moiety in Drug Discovery (Synthetic vs. Natural) <i>Chandi Charan Kandar and Dilipkumar Pal</i>	<b>1</b>
<b>Chapter 2</b>	Synthesis and Therapeutic Applications of Pyrazole Scaffold <i>Roli Mishra and Satyendra Mishra</i>	<b>27</b>
<b>Chapter 3</b>	Pyrazole Based Ligands: Versatile Building Blocks <i>Preeti Oswal, Aayushi Arora, Gyandshwar Kumar Rao, Sushil Kumar, Arun Kumar and Ajai Kumar Singh</i>	<b>49</b>
<b>Chapter 4</b>	Pyrazole and Its Analogues as Potential Anti-Angiogenesis Agents <i>Dilipkumar Pal and Souvik Mukherjee</i>	<b>91</b>
<b>Chapter 5</b>	Green Chemistry Methods in Pyrazole Synthesis <i>Maja Molnar and Mario Komar</i>	<b>107</b>
<b>Chapter 6</b>	Pyrazoles as Antiviral Agents <i>Jeanne Fichez and Patricia Busca</i>	<b>145</b>
<b>Chapter 7</b>	Recent Research Advances in Aqueous Phase Synthesis of Pyrazoles <i>Venkata Durga Nageswar Yadavalli, Nelson L. C. Domingues, Ramesh Katla and Rakhi Katla</i>	<b>179</b>
<b>Chapter 8</b>	Pyrazole Moiety as a Source of Natural Products <i>Dilipkumar Pal, Souvik Mukherjee, Om Prakash Panda, Sitansu Sekhar Nanda and Dong Kee Yi</i>	<b>195</b>

Complimentary Contributor Copy



---

<b>Chapter 9</b>	Pyrazole and Its Derivatives, Preparation, SAR and Uses as Antioxidative Agent <i>Supriyo Saha and Dilipkumar Pal</i>	<b>211</b>
<b>Chapter 10</b>	Role of Pyrazole Ring in Neurological Drug Discovery <i>Supriyo Saha and Dilipkumar Pal</i>	<b>245</b>
<b>Chapter 11</b>	Pyrano[2,3-c]pyrazole Derivatives: Synthesis and Applications <i>Devendra Dewangan, Trimurti L. Lambat, Sami H. Mahmood and Subhash Banerjee</i>	<b>265</b>
<b>Chapter 12</b>	Pyrazole and Pyrazole Derivatives: A Versatile Platform in Anti-Convulsive Drug Discovery <i>Dilipkumar Pal, Sivadeep Mal and Souvik Mukherjee</i>	<b>301</b>
<b>Chapter 13</b>	Pyrazole Affixed Heterocycles: Synthesis and Their Herbicidal Activity <i>Shridevi Doddamani and Srikantamurthy Ningaiah</i>	<b>323</b>
<b>Chapter 14</b>	Development in Chemistry and Synthesis of Pyrazole Derivatives as Potential Anticancer Agents <i>Ashish D. Patel, Vinod Kumar Gurjar and Dilipkumar Pal</i>	<b>347</b>
<b>Chapter 15</b>	Recent Advances in Chemistry and Synthesis of Pyrazole Derivatives as Potential Promising Antimicrobial Agents <i>Vinod Kumar Gurjar, Dilipkumar Pal and Ashish D. Patel</i>	<b>377</b>
<b>Chapter 16</b>	Scaffold of Pyrazole Derivatives for Enzyme Inhibition <i>Neetu Sachan, Phool Chandra and Dilipkumar Pal</i>	<b>411</b>
<b>Chapter 17</b>	Role of Pyrazolo Ring in Plant System <i>Chandi Charan Kandar</i>	<b>447</b>
<b>Chapter 18</b>	Pyrazole and Its Derivatives: Preparation, SAR and Anthelmintic Activity <i>Arindam Maity</i>	<b>471</b>
<b>Chapter 19</b>	Pyrazole and Its Derivatives, Preparation, SAR and Anti-Inflammatory Activity <i>Kiran Gangarapu, Gouthami Thumma, Niveditha Nakka, Krishna Prasad Devarakonda, Dilipkumar Pal and Arivarasan Vishnu Kirthi</i>	<b>485</b>

## DEVELOPMENT IN CHEMISTRY AND SYNTHESIS OF PYRAZOLE DERIVATIVES AS POTENTIAL ANTICANCER AGENTS

*Ashish D. Patel<sup>1,\*</sup>, Vinod Kumar Gurjar<sup>2</sup> and Dilipkumar Pal<sup>3</sup>*

Ramanbhai Patel College of Pharmacy,  
Charotar University of Science and Technology, Changa, Gujarat, India  
School of Pharmacy, Parul University, Vadodara, Gujarat,  
India Department of Pharmaceutical Sciences, Guru Ghasidas Vishwavidyalaya  
(A Central University), Bilashpur, India

### ABSTRACT

Now a days, for management of various health issue, heterocyclic compounds play a vital role in the development of effective drugs. Pyrazole, the five-membered nitrogen-containing heterocycle is an important scaffold possessing amenable to extensive, promising biological activities. Due to potential applications of pyrazoles, many recent novel routes for synthesizing pyrazoles is developed for the treatment of disease. As a consequence, in this chapter covering advances in the synthesis and application of pyrazoles for treatment of cancer in the past decades. This advancements on pyrazole synthesis will draw a clear picture to the researchers' lobby for the development of active pyrazoles scaffold with improvement in current methodologies.

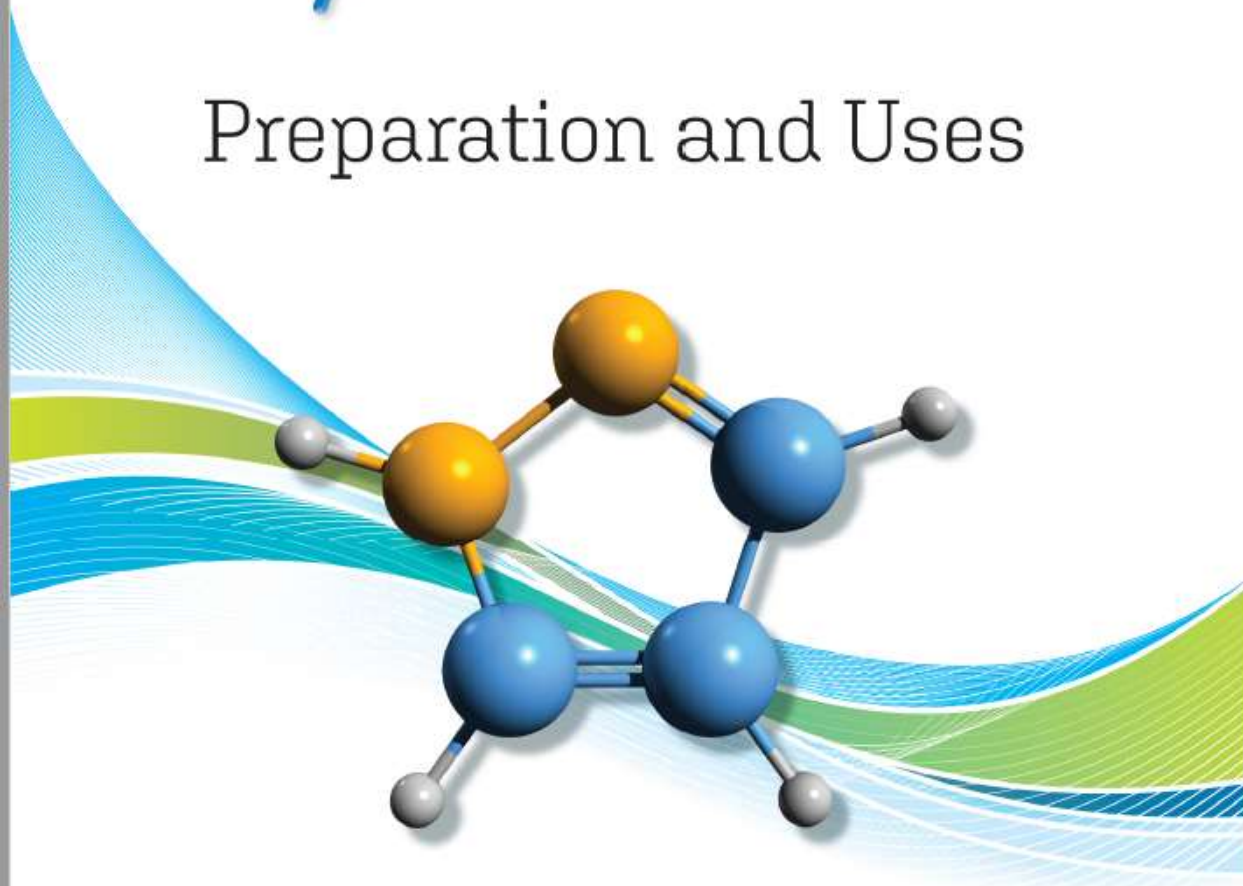
**Keywords:** pyrazole, heterocyclic compounds, synthesis, cancer

---

\* Corresponding Author's E-mail: [aashishpatel2388@gmail.com](mailto:aashishpatel2388@gmail.com)

# Pyrazole

Preparation and Uses



Dilipkumar Pal  
Editor

NOVA  
Complimentary Contributor Copy

## CONTENTS

<b>Preface</b>		<b>xi</b>
<b>Chapter 1</b>	Current Status of Pyrazolo Moiety in Drug Discovery (Synthetic vs. Natural) <i>Chandi Charan Kandar and Dilipkumar Pal</i>	<b>1</b>
<b>Chapter 2</b>	Synthesis and Therapeutic Applications of Pyrazole Scaffold <i>Roli Mishra and Satyendra Mishra</i>	<b>27</b>
<b>Chapter 3</b>	Pyrazole Based Ligands: Versatile Building Blocks <i>Preeti Oswal, Aayushi Arora, Gyandshwar Kumar Rao, Sushil Kumar, Arun Kumar and Ajai Kumar Singh</i>	<b>49</b>
<b>Chapter 4</b>	Pyrazole and Its Analogues as Potential Anti-Angiogenesis Agents <i>Dilipkumar Pal and Souvik Mukherjee</i>	<b>91</b>
<b>Chapter 5</b>	Green Chemistry Methods in Pyrazole Synthesis <i>Maja Molnar and Mario Komar</i>	<b>107</b>
<b>Chapter 6</b>	Pyrazoles as Antiviral Agents <i>Jeanne Fichez and Patricia Busca</i>	<b>145</b>
<b>Chapter 7</b>	Recent Research Advances in Aqueous Phase Synthesis of Pyrazoles <i>Venkata Durga Nageswar Yadavalli, Nelson L. C. Domingues, Ramesh Katla and Rakhi Katla</i>	<b>179</b>
<b>Chapter 8</b>	Pyrazole Moiety as a Source of Natural Products <i>Dilipkumar Pal, Souvik Mukherjee, Om Prakash Panda, Sitansu Sekhar Nanda and Dong Kee Yi</i>	<b>195</b>

Complimentary Contributor Copy



---

<b>Chapter 9</b>	Pyrazole and Its Derivatives, Preparation, SAR and Uses as Antioxidative Agent <i>Supriyo Saha and Dilipkumar Pal</i>	<b>211</b>
<b>Chapter 10</b>	Role of Pyrazole Ring in Neurological Drug Discovery <i>Supriyo Saha and Dilipkumar Pal</i>	<b>245</b>
<b>Chapter 11</b>	Pyrano[2,3-c]pyrazole Derivatives: Synthesis and Applications <i>Devendra Dewangan, Trimurti L. Lambat, Sami H. Mahmood and Subhash Banerjee</i>	<b>265</b>
<b>Chapter 12</b>	Pyrazole and Pyrazole Derivatives: A Versatile Platform in Anti-Convulsive Drug Discovery <i>Dilipkumar Pal, Sivadeep Mal and Souvik Mukherjee</i>	<b>301</b>
<b>Chapter 13</b>	Pyrazole Affixed Heterocycles: Synthesis and Their Herbicidal Activity <i>Shridevi Doddamani and Srikantamurthy Ningaiah</i>	<b>323</b>
<b>Chapter 14</b>	Development in Chemistry and Synthesis of Pyrazole Derivatives as Potential Anticancer Agents <i>Ashish D. Patel, Vinod Kumar Gurjar and Dilipkumar Pal</i>	<b>347</b>
<b>Chapter 15</b>	Recent Advances in Chemistry and Synthesis of Pyrazole Derivatives as Potential Promising Antimicrobial Agents <i>Vinod Kumar Gurjar, Dilipkumar Pal and Ashish D. Patel</i>	<b>377</b>
<b>Chapter 16</b>	Scaffold of Pyrazole Derivatives for Enzyme Inhibition <i>Neetu Sachan, Phool Chandra and Dilipkumar Pal</i>	<b>411</b>
<b>Chapter 17</b>	Role of Pyrazolo Ring in Plant System <i>Chandi Charan Kandar</i>	<b>447</b>
<b>Chapter 18</b>	Pyrazole and Its Derivatives: Preparation, SAR and Anthelmintic Activity <i>Arindam Maity</i>	<b>471</b>
<b>Chapter 19</b>	Pyrazole and Its Derivatives, Preparation, SAR and Anti-Inflammatory Activity <i>Kiran Gangarapu, Gouthami Thumma, Niveditha Nakka, Krishna Prasad Devarakonda, Dilipkumar Pal and Arivarasan Vishnu Kirthi</i>	<b>485</b>

## RECENT ADVANCES IN CHEMISTRY AND SYNTHESIS OF PYRAZOLE DERIVATIVES AS POTENTIAL PROMISING ANTIMICROBIAL AGENTS

*Vinod Kumar Gurjar<sup>1</sup>, Dilipkumar Pal<sup>2,\*</sup> and Ashish D. Patel<sup>3</sup>*

<sup>1</sup>School of Pharmacy, Parul University, P. O. Limda,  
Vadodara, Gujarat, India

<sup>2</sup>Department of of Pharmaceutical Sciences, Guru Ghasidas Vishwavidyalaya  
(A Central University), Bilaspur, Chhattisgarh, India

<sup>3</sup>Ramanbhai Patel College of Pharmacy,  
Charotar University of Science and Technology, Changa, Gujarat, India

### ABSTRACT

Pyrazoles and their variously substituted derivatives are important biological agents and a significant amount of research activity has been directed towards this class. The presence of this nucleus in therapeutic agents of diverse pharmacological categories such as celecoxib, a potent anti-inflammatory, the antipsychotic CDPPB, the anti-obesity drug rimonabant, difenamizole, an analgesic, betazole, an H<sub>2</sub>-receptor agonist and the antidepressant agent fezolamide have proved the pharmacological potential of the pyrazole moiety.

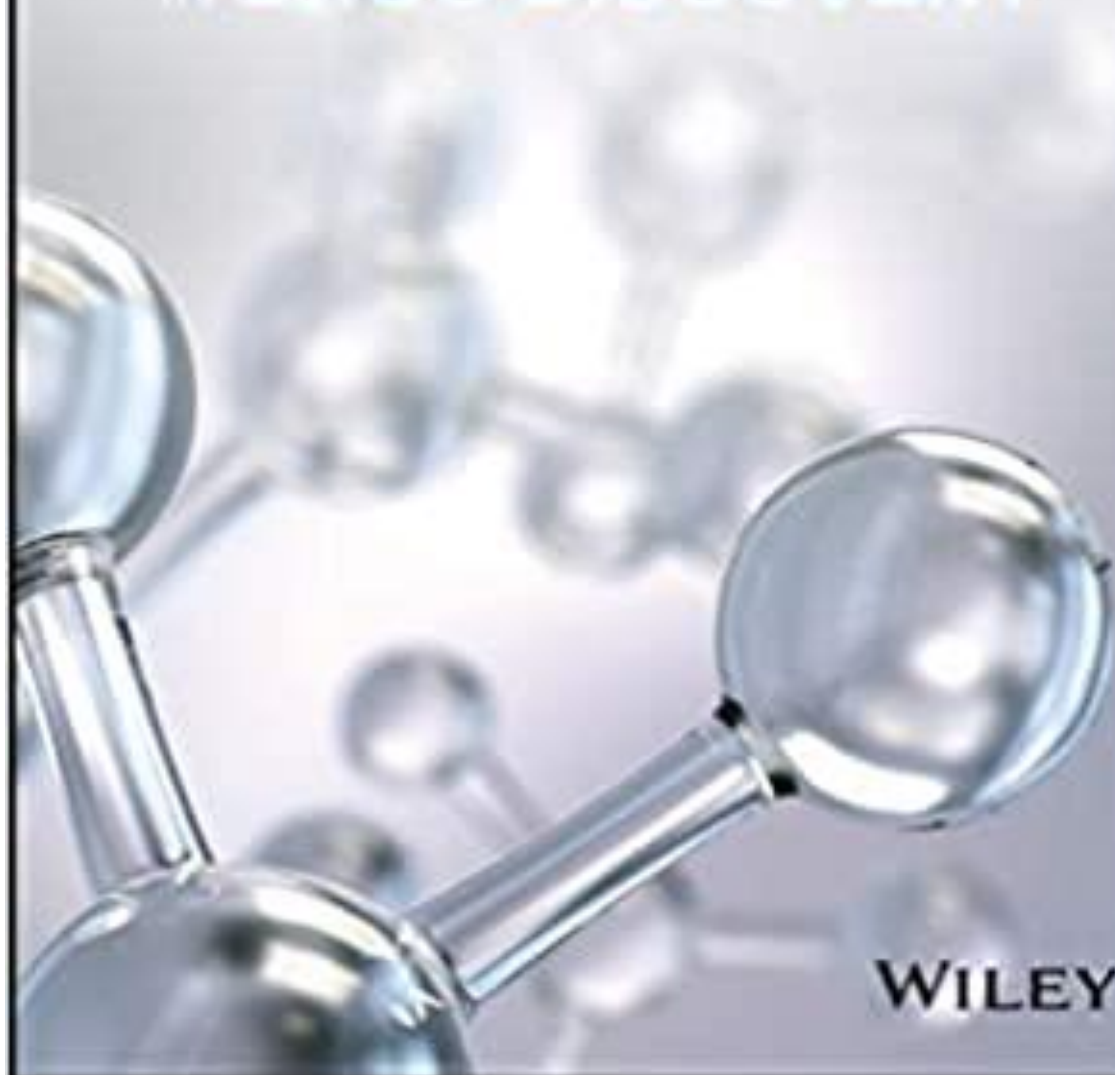
The treatment of bacterial infections remains a challenging therapeutic disaster because of emerging infectious diseases and the increasing number of multidrug-resistant microbial pathogens. Despite many antibiotics and chemotherapeutics available, the emergence of old and new antibiotic-resistant bacterial strains in the last decades lead to a

---

\* Corresponding Author's E-mail: drdilip2003@yahoo.co.in.

EDITED BY  
ANDREW G. MTEWA I CHUKWUEBUKA EGBUNA  
G. M. NARASIMHA RAO

POISONOUS PLANTS  
AND **PHYTOCHEMICALS**  
IN **DRUG DISCOVERY**



WILEY

1.7	Poisonous Plants as Biopesticides	9
1.8	Toxic Psychoactive Plants for Recreational and Religious Purposes	9
1.9	Poisonous Plants in Warfare and Bioterrorism	10
1.10	Poisonous Plants as Carcinogens and Teratogens	11
1.11	Conclusion	12
	References	12
<b>2</b>	<b>Classification of Phytotoxins and their Mechanisms of Action</b>	<b>19</b>
	<i>Andrew G. Mtewa, Chukwuebuka Egbuna, Kennedy J. Ngwira, Fanuel Lampiao, Umanq Shah, and Thokozani Kachulu Mtewa</i>	
2.1	Introduction	20
2.1.1	Endophytic Phytotoxins	20

## viii Contents

2.1.2	Secondary Metabolites	21
2.2	Possible Categorization	21
2.2.1	Biological Characteristics	21
2.2.2	Chemical Characteristics	22
2.3	Currently Available Classification Tools	24
2.4	Role of Phytotoxin Classification	25
2.4.1	Drug Discovery	25
2.4.2	Environmental Monitoring	25
2.4.3	Phytotoxins, Aquatic Life, and Water Quality	26
2.4.4	Air Contamination	26
2.4.5	Food Contamination	26
2.4.6	Security and Safety Services	27
2.4.7	Agricultural	27
2.5	Brief Mechanisms of Action	27
2.6	Conclusion	28
	References	28
<b>3</b>	<b>Poisonous Plants as Sources of Anticancer and Other Drugs</b>	<b>31</b>
	<i>Félicien Mushagalusa Kasali, Andrew G. Mtewa, and Gaétan Tabakam</i>	
3.1	Introduction	31
3.2	Poisonous Plants in the Treatment of Cancer and Other Diseases	32
3.3	Poisonous Plant-Based Anticancer Drugs that are on the Market	33
3.4	Poisonous Plant-Based Drugs Against Other Diseases that are on the Market	33
3.5	Conclusion	33
	References	75
<b>4</b>	<b>Drugs in Clinical Practice from Toxic Plants and Phytochemicals</b>	<b>79</b>
	<i>Tadele Mekurius Yodessa, Patrick Enay Ouwana, and</i>	



## 2

## Classification of Phytotoxins and their Mechanisms of Action

Andrew G. Mtewa<sup>1,2,3</sup>, Chukwuebuka Egbuna<sup>4,5</sup>, Kennedy J. Ngwira<sup>6</sup>,  
Fanuelp Lampiao<sup>7</sup>, Umang Shah<sup>8</sup>, and Thokozani Kachulu Mtewa<sup>9</sup>

<sup>1</sup> Division of Biological Chemistry and Drug Discovery, WCAIR, School of Life Sciences, University of Dundee, Dundee, UK

<sup>2</sup> Chemistry Section, Malawi Institute of Technology, Malawi University of Science and Technology, Limbe, Malawi

<sup>3</sup> Pharmbiotechnology and Traditional Medicine Center (PHARMBIOTRAC), Department of Pharmacology, School of Medicine, Mbarara University of Science and Technology, Mbarara, Uganda

<sup>4</sup> Department of Biochemistry, Faculty of Natural Sciences, Chukwuemeka Odumegwu Ojukwu University, Uli, Anambra State, Nigeria

<sup>5</sup> Nutritional Biochemistry and Toxicology Unit, World Bank Africa Centre of Excellence, Centre for Public Health and Toxicological Research (ACE-PUTOR), University of Port Harcourt, Port Harcourt, Rivers State, Nigeria

<sup>6</sup> Institute of Molecular Science, School of Chemistry, University of Witwatersrand, Johannesburg, South Africa

<sup>7</sup> Africa Centre of Excellency in Public Health and Herbal Medicine, College of Medicine, University of Malawi, Blantyre, Malawi

<sup>8</sup> Department of Pharmaceutical Chemistry, Ramanbhai Patel College of Pharmacy, Charotar University of Science and Technology, Changa, Gujarat, India

<sup>9</sup> Department of Water Resources, Ndata School of Climate and Earth Sciences, Malawi University of Science and Technology, Limbe, Malawi

### CONTENTS

- 2.1 Introduction, 20
  - 2.1.1 Endophytic Phytotoxins, 20
  - 2.1.2 Secondary Metabolites, 21
- 2.2 Possible Categorization, 21
  - 2.2.1 Biological Characteristics, 21
  - 2.2.2 Chemical Characteristics, 22
- 2.3 Currently Available Classification Tools, 24
- 2.4 Role of Phytotoxin Classification, 25
  - 2.4.1 Drug Discovery, 25
  - 2.4.2 Environmental Monitoring, 25
  - 2.4.3 Phytotoxins, Aquatic Life, and Water Quality, 26
  - 2.4.4 Air Contamination, 26
  - 2.4.5 Food Contamination, 26
  - 2.4.6 Security and Safety Services, 27
  - 2.4.7 Agricultural, 27
- 2.5 Brief Mechanisms of Action, 27
- 2.6 Conclusion, 28

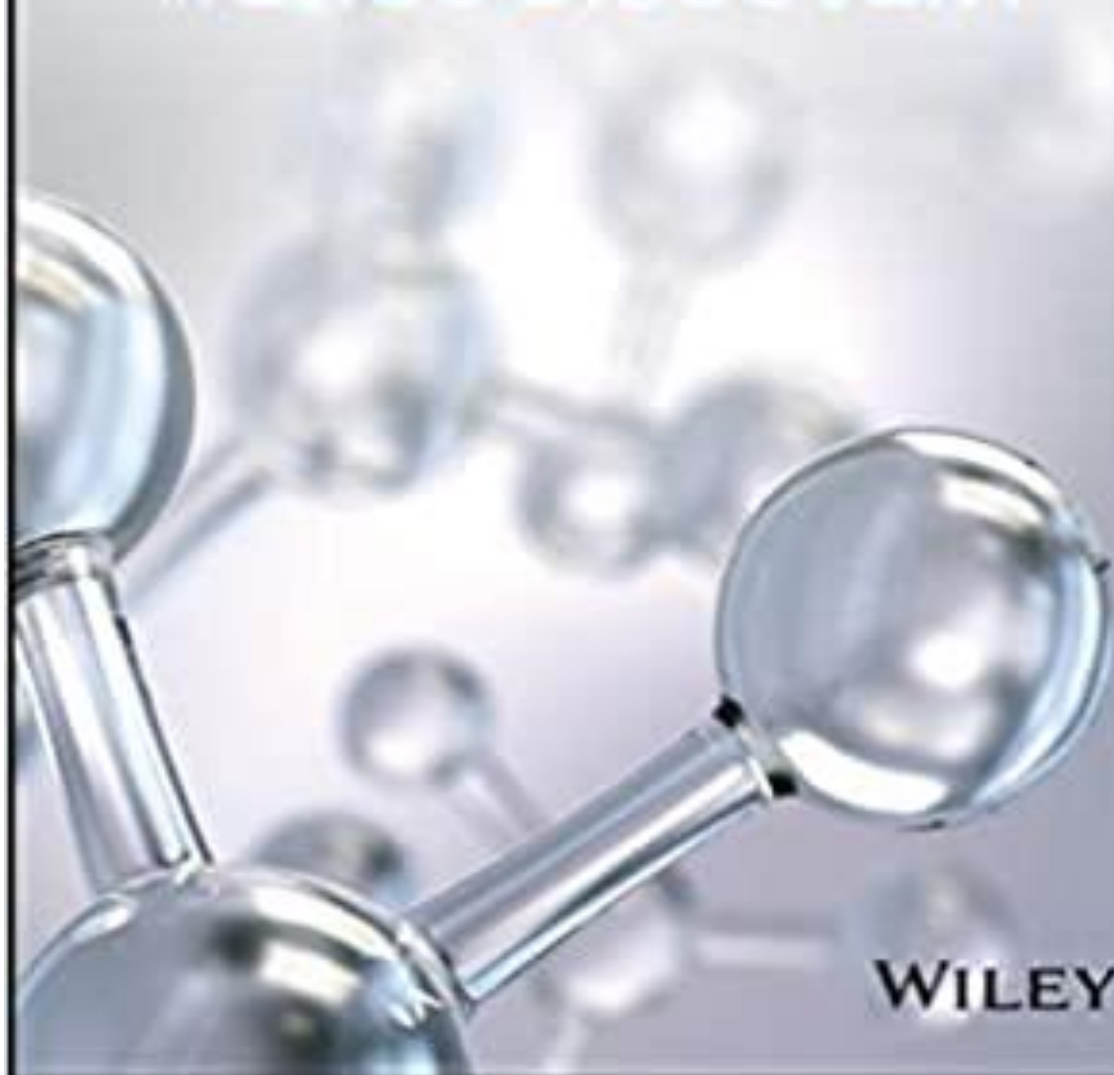
*Poisonous Plants and Phytochemicals in Drug Discovery*, First Edition.

Edited by Andrew G. Mtewa, Chukwuebuka Egbuna, and G.M. Narasimha Rao.

© 2021 John Wiley & Sons, Inc. Published 2021 by John Wiley & Sons, Inc.

EDITED BY  
ANDREW G. MTEWA I CHUKWUEBUKA EGBUNA  
G. M. NARASIMHA RAO

POISONOUS PLANTS  
AND **PHYTOCHEMICALS**  
IN **DRUG DISCOVERY**



WILEY

1.7	Poisonous Plants as Biopesticides	9
1.8	Toxic Psychoactive Plants for Recreational and Religious Purposes	9
1.9	Poisonous Plants in Warfare and Bioterrorism	10
1.10	Poisonous Plants as Carcinogens and Teratogens	11
1.11	Conclusion	12
	References	12
<b>2</b>	<b>Classification of Phytotoxins and their Mechanisms of Action</b>	<b>19</b>
	<i>Andrew G. Mtewa, Chukwuebuka Egbuna, Kennedy J. Ngwira, Fanuel Lampiao, Umanq Shah, and Thokozani Kachulu Mtewa</i>	
2.1	Introduction	20
2.1.1	Endophytic Phytotoxins	20

## viii Contents

2.1.2	Secondary Metabolites	21
2.2	Possible Categorization	21
2.2.1	Biological Characteristics	21
2.2.2	Chemical Characteristics	22
2.3	Currently Available Classification Tools	24
2.4	Role of Phytotoxin Classification	25
2.4.1	Drug Discovery	25
2.4.2	Environmental Monitoring	25
2.4.3	Phytotoxins, Aquatic Life, and Water Quality	26
2.4.4	Air Contamination	26
2.4.5	Food Contamination	26
2.4.6	Security and Safety Services	27
2.4.7	Agricultural	27
2.5	Brief Mechanisms of Action	27
2.6	Conclusion	28
	References	28
<b>3</b>	<b>Poisonous Plants as Sources of Anticancer and Other Drugs</b>	<b>31</b>
	<i>Félicien Mushagalusa Kasali, Andrew G. Mtewa, and Gaétan Tabakam</i>	
3.1	Introduction	31
3.2	Poisonous Plants in the Treatment of Cancer and Other Diseases	32
3.3	Poisonous Plant-Based Anticancer Drugs that are on the Market	33
3.4	Poisonous Plant-Based Drugs Against Other Diseases that are on the Market	33
3.5	Conclusion	33
	References	75
<b>4</b>	<b>Drugs in Clinical Practice from Toxic Plants and Phytochemicals</b>	<b>79</b>
	<i>Tadele Mekurius Yodessa, Patrick Enay Ouwana, and</i>	

## 11

## Secondary Metabolites and Toxins of Microbial Origin for the Treatment of Diseases

*Dharmandra Baria<sup>1</sup>, Umang Shah<sup>2</sup>, Chukwuebuka Egbuna<sup>3,4</sup>, and Andrew G. Mtewa<sup>5,6,7</sup>*

<sup>1</sup>Department of Pharmaceutical Chemistry, A.R. College of Pharmacy, Gujarat, India

<sup>2</sup>Department of Pharmaceutical Chemistry, Ramanbhai Patel College of Pharmacy, Charotar University of Science and Technology, Changa, Gujarat, India

<sup>3</sup>Department of Biochemistry, Faculty of Natural Sciences, Chukwuemeka Odumegwu Ojukwu University, Uli, Anambra State, Nigeria

<sup>4</sup>Nutritional Biochemistry and Toxicology Unit, World Bank Africa Centre of Excellence, Centre for Public Health and Toxicological Research (ACE-PUTOR), University of Port-Harcourt, Port-Harcourt, Rivers State, Nigeria

<sup>5</sup>Division of Biological Chemistry and Drug Discovery, WCAIR, School of Life Sciences, University of Dundee, Dundee, UK

<sup>6</sup>Chemistry Section, Malawi Institute of Technology, Malawi University of Science and Technology, Limbe, Malawi

<sup>7</sup>Pharmbiotechnology and Traditional Medicine Center (PHARMBIOTRAC), Department of Pharmacology, School of Medicine, Mbarara University of Science and Technology, Mbarara, Uganda

### CONTENTS

- 11.1 Introduction, 226
- 11.2 Antimicrobial Agents from Microbial Sources, 227
- 11.3 Antifungal Agents from Microbial Sources, 229
- 11.4 Anticancer Agents from Microbial Sources, 230
- 11.5 Hypocholesterolemic Agents from Microbial Sources, 235
- 11.6 Immunosuppressants from Microbial Sources, 237
- 11.7 Enzyme Inhibitors from Microbial Sources, 239
- 11.8 Antiparasitic Agents from Microbial Sources, 240
- 11.9 Recent Advances in Drug Discovery from Microbial Sources, 241

*Poisonous Plants and Phytochemicals in Drug Discovery*, First Edition.

Edited by Andrew G. Mtewa, Chukwuebuka Egbuna, and G.M. Narasimha Rao.

© 2021 John Wiley & Sons, Inc. Published 2021 by John Wiley & Sons, Inc.



# **Faculty of Computer Science and Applications**



[Advanced Computing Technologies and Applications](#) pp 107-116 | [Cite as](#)

# Intelligent System to Diagnose LBP Using Genetic Algorithm and Support Vector Machine

Authors

[Authors and affiliations](#)

Mittal Bhatt , Vishal Dahiya

Conference paper

First Online: 07 May 2020

275

Downloads

Part of the [Algorithms for Intelligent Systems](#) book series (AIS)

<b>8</b>	<b>Improvement of Lightweight Integrity Verification Algorithm Using TDHA</b> .....	<b>75</b>
	Anushka Gangwal, Dhyey Mehta, Soham Khedekar and Aruna Gawde	
<b>9</b>	<b>Catchment Area Detection and Optimization</b> .....	<b>85</b>
	Richard Joseph, Sanket Gokhale, Akash Hasamnis, Grishma Gurbani and Rishil Kirtikar	
<b>10</b>	<b>Automation in Healthcare Using IoT and Cryptographic Encryption Against DOS and MIM Attacks</b> .....	<b>97</b>
	Prajakta Kamble and Aruna Gawade	
<b>11</b>	<b>Intelligent System to Diagnose LBP Using Genetic Algorithm and Support Vector Machine</b> .....	<b>107</b>
	Mittal Bhatt and Vishal Dahiya	
<b>12</b>	<b>Area Analysis for Dengue Prediction</b> .....	<b>117</b>
	Aniket Milind Banginwar, Shreyas Nanaware, Kalpita Bhagat and Deepshikha Chaturvedi	
<b>13</b>	<b>Crowdsourcing for Urban Laborers and Time Optimization</b> ....	<b>127</b>
	Nihit Natu, Ayush Gupta, Viraj Mahadik and Amiya Kumar Tripathy	
<b>14</b>	<b>Implementation of Residual Network (ResNet) for Devanagari Handwritten Character Recognition</b> .....	<b>137</b>
	Mandar Mhapsekar, Prathamesh Mhapsekar, Aniket Mhatre and Vinaya Sawant	
<b>15</b>	<b>An Efficient E-Commerce Design by Implementing a Novel Data Mapper for Polyglot Persistence</b> .....	<b>149</b>
	Kishan Trivedi, Sambhav Shah and Kriti Srivastava	
<b>16</b>	<b>Improving Extreme Learning Machine Algorithm Through Optimization Technique</b> .....	<b>157</b>
	Nilesh Rathod and Sunil B. Wankhade	
<b>17</b>	<b>Intrusion Detection System Against Malign Packets—A Comparative Study Between Autoencoder and Ensemble Model</b> .....	<b>165</b>
	Adit Sadiwala, Kishan Rathore, Yash Shah, Harsh Shah and Kriti Srivastava	
<b>18</b>	<b>Chest Pathology Detection Using Medical Imaging</b> .....	<b>177</b>
	Devansh Shah, Purav Nisar and Pankaj Sonawane	
<b>19</b>	<b>Disorder Detection in Tomato Plant Using Deep Learning</b> .....	<b>187</b>
	Saiqa Khan and Meera Narvekar	

# Chapter 11

## Intelligent System to Diagnose LBP Using Genetic Algorithm and Support Vector Machine



Mittal Bhatt and Vishal Dahiya

### 1 Introduction

The field of medical science always an important application area for the implementation of newly evolves technology related to field of reasoning and learning [1–5]. Diagnosing for diseases is an art as it is differing verities of parameters from person to person. To carry out the procedure of diagnosis of diseases, medical practitioner has to identify relationship between reasons and responses and is hardly one to one. Designing intelligent system in domain of medical science for diagnosis will increase capability of system.

#### 1.1 Medical Background

As shown in Fig. 1, human body spine is comprised of 33 vertebrae and its structure is like numbers of bones arranged in stack. As it is depicted in Fig. 1, lower lumbar spine is made up of five vertebrae named as L1–L5. The disks between vertebrae are fibrocartilage pads of cylindrical shapes that lie between the vertebral bodies, responsible for giving flexibility and stability to spine.

Aging is unavoidable parameter of human life; during this period, structure of spine undergoes several changes which affect its functionality. In recent studies, it has been observed that heredity and effects of genetic influences play key role in degeneration of disk [6, 7].

---

M. Bhatt (✉)

CHARUSAT University, Changa, Anand, India  
e-mail: [bhattmittal2008@gmail.com](mailto:bhattmittal2008@gmail.com)

V. Dahiya

Indus University, Ahmedabad, India



Amit Joshi  
Mahdi Khosravy  
Neeraj Gupta *Editors*

# Machine Learning for Predictive Analysis

Proceedings of ICTIS 2020

<b>Classroom to Industry: A Pathway of a Student to Be an Engineer</b> .....	473
K. Rajeshwari, S. Preetha, and H. M. Anitha	
<b>ML Suite: An Auto Machine Learning Tool</b> .....	483
Nilesh M. Patil, Tanmay P. Rane, and Anmol A. Panjwani	
<b>Survey and Gap Analysis on Event Prediction of English Unstructured Texts</b> .....	491
Krishnanjan Bhattacharjee, S. ShivaKarthik, Swati Mehta, Ajai Kumar, Rushikesh Kothawade, Paritosh Katre, Piyush Dharkar, Neil Pillai, and Devika Verma	
<b>Human Action Detection Using Deep Learning Techniques</b> .....	503
Vedantham Ramachandran, Peddireddy Janaki Rani, and Kalavathi Alla	
<b>Deep Learning Methods and Applications for Precision Agriculture</b> .....	515
Nilay Ganatra and Atul Patel	
<b>Object Detection with Convolutional Neural Networks</b> .....	529
Sanskriti Patel and Atul Patel	
<b>Autonomous Vehicle Simulation Using Deep Reinforcement Learning</b> .....	541
Rishikesh Kadam, Vishakha Vidhani, Bhavika Valecha, Anushree Bane, and Nupur Giri	
<b>Bitcoin Price Prediction Using Time Series Analysis and Machine Learning Techniques</b> .....	551
Aman Gupta and Himanshu Nain	
<b>The Detection of Diabetic Retinopathy in Human Eyes Using Convolution Neural Network (CNN)</b> .....	561
Saloni Dhuru and Avinash Shrivastava	
<b>Breast Cancer Classification Using Machine Learning Algorithms</b> .....	571
Simran Sharma and Sachin Deshpande	
<b>A Strategic Approach to Enrich Brand Through Artificial Intelligence</b> .....	579
Pranav Desai	
<b>Real Estate Price's Forecasting Through Predictive Modelling</b> .....	589
Nitin Sharma, Yojna Arora, Priyanka Makkar, Vikas Sharma, and Hardik Gupta	
<b>Bitcoin Cost Prediction Using Neural Networks</b> .....	599
Nitin Sharma, Yojna Arora, and Priyanka Makkar	

# Object Detection with Convolutional Neural Networks



Sanskruti Patel and Atul Patel

**Abstract** During the last years, a noticeable growth is observed in the field of computer vision research. In computer vision, object detection is a task of classifying and localizing the objects in order to detect the same. The widely used object detection applications are human–computer interaction, video surveillance, satellite imagery, transport system, and activity recognition. In the wider family of deep learning architectures, convolutional neural network (CNN) made up with set of neural network layers is used for visual imagery. Deep CNN architectures exhibit impressive results for detection of objects in digital image. This paper represents a comprehensive review of the recent development in object detection using convolutional neural networks. It explains the types of object detection models, benchmark datasets available, and research work carried out of applying object detection models for various applications.

**Keywords** CNN · Single-stage object detection · Two-stage object detection

## 1 Introduction

During the last years, a noticeable growth is observed in the field of computer vision research. Employing machine learning methods provides robust solution to solve computer vision tasks. In computer vision, object detection deals with detecting instances of objects from a particular class in a digital image or video [1]. It is a task of classifying and localizing the objects in order to detect the same. It determines the location where the object is presented in the image and scales one or more objects [2].

---

S. Patel (✉) · A. Patel

Faculty of Computer Science and Applications, Charotar University of Science and Technology,  
Changa, India

e-mail: [sanskrutipatel.mca@charusat.ac.in](mailto:sanskrutipatel.mca@charusat.ac.in)

A. Patel

e-mail: [atulpatel.mca@charusat.ac.in](mailto:atulpatel.mca@charusat.ac.in)

Amit Joshi  
Mahdi Khosravy  
Neeraj Gupta *Editors*

# Machine Learning for Predictive Analysis

Proceedings of ICTIS 2020

<b>Classroom to Industry: A Pathway of a Student to Be an Engineer</b> .....	473
K. Rajeshwari, S. Preetha, and H. M. Anitha	
<b>ML Suite: An Auto Machine Learning Tool</b> .....	483
Nilesh M. Patil, Tanmay P. Rane, and Anmol A. Panjwani	
<b>Survey and Gap Analysis on Event Prediction of English Unstructured Texts</b> .....	491
Krishnanjan Bhattacharjee, S. ShivaKarthik, Swati Mehta, Ajai Kumar, Rushikesh Kothawade, Paritosh Katre, Piyush Dharkar, Neil Pillai, and Devika Verma	
<b>Human Action Detection Using Deep Learning Techniques</b> .....	503
Vedantham Ramachandran, Peddireddy Janaki Rani, and Kalavathi Alla	
<b>Deep Learning Methods and Applications for Precision Agriculture</b> .....	515
Nilay Ganatra and Atul Patel	
<b>Object Detection with Convolutional Neural Networks</b> .....	529
Sanskriti Patel and Atul Patel	
<b>Autonomous Vehicle Simulation Using Deep Reinforcement Learning</b> .....	541
Rishikesh Kadam, Vishakha Vidhani, Bhavika Valecha, Anushree Bane, and Nupur Giri	
<b>Bitcoin Price Prediction Using Time Series Analysis and Machine Learning Techniques</b> .....	551
Aman Gupta and Himanshu Nain	
<b>The Detection of Diabetic Retinopathy in Human Eyes Using Convolution Neural Network (CNN)</b> .....	561
Saloni Dhuru and Avinash Shrivastava	
<b>Breast Cancer Classification Using Machine Learning Algorithms</b> .....	571
Simran Sharma and Sachin Deshpande	
<b>A Strategic Approach to Enrich Brand Through Artificial Intelligence</b> .....	579
Pranav Desai	
<b>Real Estate Price's Forecasting Through Predictive Modelling</b> .....	589
Nitin Sharma, Yojna Arora, Priyanka Makkar, Vikas Sharma, and Hardik Gupta	
<b>Bitcoin Cost Prediction Using Neural Networks</b> .....	599
Nitin Sharma, Yojna Arora, and Priyanka Makkar	



# Deep Learning Methods and Applications for Precision Agriculture



Nilay Ganatra and Atul Patel

**Abstract** Agriculture is the primary source of basic needs like food, raw material and fuel, which are considered as the basic building blocks for the economic growth of any nation. Agriculture products threatened by various factors including decline in pollinators, various diseases in crops, improper irrigation, technology, scarcity of water and many others. Deep learning has emerged as a promising technique that can be used for data intensive applications and computer vision tasks. It has a great potential and like other domains, it can also apply to agriculture domain. In this paper, a comprehensive review of research dedicated to applications of deep learning for precision agriculture is presented along with real time applications, tools and available datasets. The findings exhibit the high potential of applying deep learning techniques for precision agriculture.

**Keywords** Deep learning • Convolutional neural network • Precision agriculture

## 1 Introduction

The research shows that approximately 65% living beings are directly or indirectly depends on the agricultural products. This sector faces various changes to accomplish the needs of growing population which has almost doubled in last 50 years. Increased population and climate changes are considered as the detrimental factors for agriculture to fulfill its necessity. Moreover, the agriculture products threatened by various factors including decline in pollinators, various diseases in crops, improper irrigation, technology, scarcity of water and many others. Pre-emptive measures against

---

N. Ganatra (✉) • A. Patel

Faculty of Computer Science and Applications, Charotar University of Science & Technology, Changa, India

e-mail: [nilayganatra.mca@charusat.ac.in](mailto:nilayganatra.mca@charusat.ac.in)

A. Patel

e-mail: [atulpatel.mca@charusat.ac.in](mailto:atulpatel.mca@charusat.ac.in)

Kanubhai K. Patel  
Deepak Garg  
Atul Patel  
Pawan Lingras (Eds.)

Communications in Computer and Information Science 1374

# Soft Computing and its Engineering Applications

Second International Conference, icSoftComp 2020  
Changa, Anand, India, December 11–12, 2020  
Proceedings

# Contents

## Theory and Methods

On the Performance Analysis of Efficient Path-Planning Algorithms for Fire-Fighting Robots. . . . .	3
<i>Sreesruthi Ramasubramanian and Senthil Arumugam Muthukumaraswamy</i>	
Automatic Image Colorization Using GANs . . . . .	15
<i>Rashi Dhir, Meghna Ashok, Shilpa Gite, and Ketan Kotecha</i>	
Gujarati Task Oriented Dialogue Slot Tagging Using Deep Neural Network Models . . . . .	27
<i>Rachana Parikh and Hiren Joshi</i>	
Energy Efficient Aspects of Federated Learning – Mechanisms and Opportunities . . . . .	38
<i>Shajulin Benedict</i>	
Classification of UrbanSound8k: A Study Using Convolutional Neural Network and Multiple Data Augmentation Techniques. . . . .	52
<i>Aamer Abdul Rahman and J. Angel Arul Jothi</i>	
Quantile Regression Support Vector Machine (QRSVM) Model for Time Series Data Analysis . . . . .	65
<i>Dharmendra Patel</i>	
Selection of Characteristics by Hybrid Method: RFE, Ridge, Lasso, and Bayesian for the Power Forecast for a Photovoltaic System . . . . .	75
<i>Jose Cruz, Wilson Mamani, Christian Romero, and Ferdinand Pineda</i>	
Parameter Optimization of Reaching Law Based Sliding Mode Control by Computational Intelligence Techniques . . . . .	88
<i>Vishal Mehra and Dipesh Shah</i>	
Efficiency of Parallelization Using GPU in Discrete Dynamic Models Construction Process . . . . .	101
<i>Iryna Strubytska and Pavlo Strubyskyi</i>	
On the Performance Analyses of a Modified Force Field Algorithm for Obstacle Avoidance in Swarm Robotics . . . . .	111
<i>Girish Balasubramanian, Senthil Arumugam Muthukumaraswamy, and Xianwen Kong</i>	



# Quantile Regression Support Vector Machine (QRSVM) Model for Time Series Data Analysis

Dharmendra Patel<sup>(✉)</sup> 

Smt. Chandaben Mohanbhai Patel Institute of Computer Applications,  
CHARUSAT, Changa, Gujarat, India  
dharmendrapatel.mca@charusat.ac.in

**Abstract.** Analysis of time series information is very interesting as it can be used to understand the past and to forecast the future. Mainly, the data models of the time series are based on the normal least square regression (LSR). For handle the outliers, the least square regression is not efficient. Data from the time series contains outliers in a notable quantity that may affect the results of the prediction. The proposed solution will use statistical techniques of quantile regression that robustly gives insights based on different dimensions as well as treats outliers. The advantage of quantile regression is to discover more useful predictive relationships in situations where there is a poor relationship between independent variables. The paper described the statistics of QRSVM model. The paper dealt experiments based on time series data and proved that QRSVM model is superior than LSR model in insights generations and for outlier handling.

**Keywords:** Least square regression · Quantile regression · Support vector machine · Time series analysis · Quantile regression support vector machine model

## 1 Introduction

Time series data is very vital for many applications such as economics, medicine, education, social sciences, epidemiology, weather forecasting, physical sciences etc. to derive meaningful insights at different points in time. Conventional statistics methods have several limitations to deal with time series data so specialized methods known as time series analysis requires predominantly in such cases. The simplest and most popular method is linear least square method. Least square method gives the trend line to best fit to a time series data. It exhibits several advantages:

- It is very simple method to understand and derive the prediction
- It is to be applicable for all most all applications
- It gives maximum likelihood solutions if correlate with Markov Conditions.

However, it suffers from several critical limitations:

- Sensitive towards outliers.
- Data needs to be normally distributed for better results.
- It exhibits tendency of outfit data.

Kanubhai K. Patel  
Deepak Garg  
Atul Patel  
Pawan Lingras (Eds.)

Communications in Computer and Information Science 1374

# Soft Computing and its Engineering Applications


Second International Conference, icSoftComp 2020  
Changa, Anand, India, December 11–12, 2020  
Proceedings



Rethinking the Limits of Optimization Economic Order Quantity (EOQ) Using Self Generating Training Model by Adaptive-Neuro Fuzzy Inference System. . . . .	123
<i>A. Stanley Raj, H. Mary Henrietta, K. Kalaiarasi, and M. Sumathi</i>	
Hybrid POS Tagger for Gujarati Text . . . . .	134
<i>Chetana Tailor and Bankim Patel</i>	
Optimization of ICT Street Infrastructure in Smart Cities . . . . .	145
<i>Gayatri Doctor, Shamik Joshi, and Axay Gandhi</i>	
Transfer Learning-Based Image Tagging Using Word Embedding Technique for Image Retrieval Applications . . . . .	157
<i>M. Poonkodi, J. Arunnehru, and K. S. Anand</i>	
Comparison of Deep Learning Models for Cancer Metastases Detection: An Experimental Study . . . . .	169
<i>Vijaya Gajanan Buddhavarapu and J. Angel Arul Jothi</i>	
A Lightweight Hybrid Majority Vote Classifier Using Top-k Dataset. . . . .	182
<i>Moses L. Gadebe and Okuthe P. Kogeda</i>	
<b>Systems and Applications</b>	
Twitter Emotion Analysis for Brand Comparison Using Naive Bayes Classifier . . . . .	199
<i>Siva Shanmugam and Isha Padmanaban</i>	
A Smart Card Based Lightweight Multi Server Encryption Scheme. . . . .	212
<i>Pranav Vyas</i>	
Firmware Attack Detection on Gadgets Using Ridge Regression (FAD-RR) . . . . .	224
<i>E. Arul and A. Punidha</i>	
Automatic Text Extraction from Digital Brochures: Achieving Competitiveness for Mauritius Supermarkets. . . . .	234
<i>Yasser Chuttur, Yusuf Fauzel, and Sandy Ramasawmy</i>	
Improved Predictive System for Soil Test Fertility Performance Using Fuzzy Rule Approach . . . . .	249
<i>O. T. Arogundade, C. Atasie, Sanjay Misra, A. B. Sakpere, O. O. Abayomi-Alli, and K. A. Adesemowo</i>	
Artificial Intelligence Applications to Tackle COVID-19 . . . . .	264
<i>Devansh Shah and Santosh Kumar Bharti</i>	



# A Smart Card Based Lightweight Multi Server Encryption Scheme

Pranav Vyas<sup>(✉)</sup> 

Smt. Chandaben Mohanbhai Patel Institute of Computer Applications,  
Charotar University of Science and Technology, Changa, India  
[Pranavvyas.mca@charusat.ac.in](mailto:Pranavvyas.mca@charusat.ac.in)

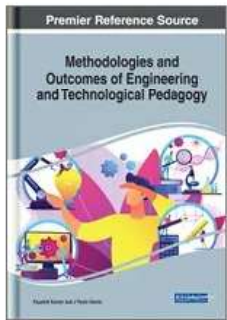
**Abstract.** Due to advancements in connectivity and networking, the Internet has become integral part of our lives. Today, the Internet is used in all spheres of life from health and medicine to finances, education and entertainment. In order to get services from various Internet based platforms users need to prove their identity. A single smart card can be used to prove identity of users to avail services offered by various platforms. This benefit is also a vulnerability of the system. We propose a smart token based scheme for mutual authentication between the user and the service provider. We apply modified Diffie-Hellman protocol to keep the proposed solution lightweight for use over variety of devices.

**Keywords:** Multi server encryption · Smart card · Smart token

## 1 Introduction

These days the world is increasingly becoming app oriented. The apps are used for different purposes, starting from purchasing groceries and electronics to financial transactions to health and fitness. While using these apps, users share large amount of personal information that is sensitive in nature. The users receive many services over the internet in response of payment. Currently in India one of the preferred modes of payment for online transactions is by debit card. The usage of debit card for payment serves multiple purposes: 1) from the perspective of issuing authority it is also easier as giving a single card to customer reduces cost of production 2) it keeps your actual account number hidden 3) a single card can be used on multiple platforms for payment towards variety of services 4) since it is just a single card, managing its information is much easier for the user.

A debit card is associated with a single pin. This feature of a single pin makes it very suitable to use for multiple services. A user can use the debit card to pay towards a number of services provided by various platforms on the internet. However, if a user wishes to subscribe to new service, he/she must register with the new platform and provide identity details to the new platform. A debit card can effectively be used in instances such as online grocery shopping, reservation or ticket booking and payment for variety of utilities. A malicious user can keep a close watch on the activities of the user and gather information that can be used to reveal debit card details or such similar confidential information. This can result in misuse of cards or even identity theft. This scenario highlights a major drawback of using a single set of information (debit card details) on multiple platforms. This issue can be addressed with remote authentication.



## Education in the Era of Industry 4.0: Qualifications, Challenges, and Opportunities

Dharmendra Trikamlal Patel (Charotar University of Science and Technology, India)

Source Title: Methodologies and Outcomes of Engineering and Technological Pedagogy

Copyright: © 2020 | Pages: 24

DOI: 10.4018/978-1-7998-2245-5.ch007

OnDemand PDF  
Download: **\$37.50**

Available

[Current Special Offers](#)

### Abstract

Industry 4.0 has changed the thinking of industry owners in terms of technological usage. With the help of modern digital technology, industry can fulfill the requirements of customers easily and compete strongly against their competitors. In order to achieve good quality of products at an affordable price, industry needs skilled people who are aware of autonomous and intelligent components. To prepare skilled people compatible with Industry 4.0, education plays a very important role. The chapter starts with which kind of qualifications are needed to fit in the smart factory era. In next section, the chapter deals with challenges that emerge in education in order to implement skills suitable for Industry 4.0. Lastly, the chapter describes opportunities for the education sector as far as the smart factory is concerned.

## Chapter 6

Modern Pedagogy Tools in Engineering Education .....78

*J. Srinivas, National Institute of Technology, Rourkela, India*

Engineering pedagogical techniques have received wide attention in recent times. Various fields of engineering have acquainted with progressive teaching methods and training techniques. The concept of pedagogy now has different dimensions. Along with modern challenges in industries, the teaching approaches have been modified in several respects. Earlier teacher training programs are to be upgraded with modern pedagogical concepts. This chapter brings out an introduction and a few application courses following the pedagogical engineering approaches. The concepts of technological pedagogical content knowledge and constructive pedagogy are summarized.

### Section 2

#### Education in the Industry 4.0 Era

## Chapter 7

Education in the Era of Industry 4.0: Qualifications, Challenges, and

Opportunities .....88

*Dharmendra Trikamlal Patel, Charotar University of Science and  
Technology, India*

Industry 4.0 has changed the thinking of industry owners in terms of technological usage. With the help of modern digital technology, industry can fulfill the requirements of customers easily and compete strongly against their competitors. In order to achieve good quality of products at an affordable price, industry needs skilled people who are aware of autonomous and intelligent components. To prepare skilled people compatible with Industry 4.0, education plays a very important role. The chapter starts with which kind of qualifications are needed to fit in the smart factory era. In next section, the chapter deals with challenges that emerge in education in order to implement skills suitable for Industry 4.0. Lastly, the chapter describes opportunities for the education sector as far as the smart factory is concerned.

## Chapter 8

Digital Technology Integration in Different Educational Fields: Design,

Architecture, Tourism, and Business Engineering .....112

*Hridayjit Kalita, Birla Institute of Technology, Mesra, India  
Kaushik Kumar, Birla Institute of Technology, Mesra, India*

The perception of learning and teaching in the educational universities have been affected by digital technology. With the industrial concern over sustainability of resources and efficiency in operation in a digital environment, the need arises to implement digital technologies in the educational setting so that digital competence

# Chapter 7

## Education in the Era of Industry 4.0: Qualifications, Challenges, and Opportunities

**Dharmendra Trikamlal Patel**

 <https://orcid.org/0000-0002-4769-1289>

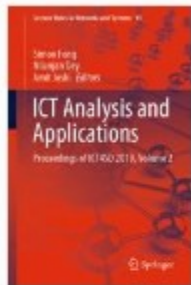
*Charotar University of Science and Technology, India*

### ABSTRACT

*Industry 4.0 has changed the thinking of industry owners in terms of technological usage. With the help of modern digital technology, industry can fulfill the requirements of customers easily and compete strongly against their competitors. In order to achieve good quality of products at an affordable price, industry needs skilled people who are aware of autonomous and intelligent components. To prepare skilled people compatible with Industry 4.0, education plays a very important role. The chapter starts with which kind of qualifications are needed to fit in the smart factory era. In next section, the chapter deals with challenges that emerge in education in order to implement skills suitable for Industry 4.0. Lastly, the chapter describes opportunities for the education sector as far as the smart factory is concerned.*

DOI: 10.4018/978-1-7998-2245-5.ch007






[ICT Analysis and Applications](#) pp 47-54 | [Cite as](#)

# Learner Performance and Preference Meter for Better Career Guidance and Holistic Growth

Authors

[Authors and affiliations](#)

Nilay M. Vaidya , Kanubhai K. Patel

Conference paper

First Online: 04 February 2020

263

Downloads

Part of the [Lecture Notes in Networks and Systems](#) book series (LNNS, volume 93)

# **Lecture Notes in Networks and Systems**

Volume 93

## **Series Editor**

Janusz Kacprzyk, Systems Research Institute, Polish Academy of Sciences,  
Warsaw, Poland

## **Advisory Editors**

Fernando Gomide, Department of Computer Engineering and Automation—DCA,  
School of Electrical and Computer Engineering—FEEC, University of Campinas—  
UNICAMP, São Paulo, Brazil

Okyay Kaynak, Department of Electrical and Electronic Engineering,  
Bogazici University, Istanbul, Turkey

Derong Liu, Department of Electrical and Computer Engineering,  
University of Illinois at Chicago, Chicago, USA; Institute of Automation, Chinese  
Academy of Sciences, Beijing, China

Witold Pedrycz, Department of Electrical and Computer Engineering,  
University of Alberta, Alberta, Canada; Systems Research Institute, Polish  
Academy of Sciences, Warsaw, Poland

Marios M. Polycarpou, Department of Electrical and Computer Engineering,  
KIOS Research Center for Intelligent Systems and Networks, University of Cyprus,  
Nicosia, Cyprus

Imre J. Rudas, Óbuda University, Budapest, Hungary

Jun Wang, Department of Computer Science, City University of Hong Kong,  
Kowloon, Hong Kong

The series “Lecture Notes in Networks and Systems” publishes the latest developments in Networks and Systems—quickly, informally and with high quality. Original research reported in proceedings and post-proceedings represents the core of LNNS.

Volumes published in LNNS embrace all aspects and subfields of, as well as new challenges in, Networks and Systems.

The series contains proceedings and edited volumes in systems and networks, spanning the areas of Cyber-Physical Systems, Autonomous Systems, Sensor Networks, Control Systems, Energy Systems, Automotive Systems, Biological Systems, Vehicular Networking and Connected Vehicles, Aerospace Systems, Automation, Manufacturing, Smart Grids, Nonlinear Systems, Power Systems, Robotics, Social Systems, Economic Systems and other. Of particular value to both the contributors and the readership are the short publication timeframe and the world-wide distribution and exposure which enable both a wide and rapid dissemination of research output.

The series covers the theory, applications, and perspectives on the state of the art and future developments relevant to systems and networks, decision making, control, complex processes and related areas, as embedded in the fields of interdisciplinary and applied sciences, engineering, computer science, physics, economics, social, and life sciences, as well as the paradigms and methodologies behind them.

**\*\* Indexing: The books of this series are submitted to ISI Proceedings, SCOPUS, Google Scholar and Springerlink \*\***

More information about this series at <http://www.springer.com/series/15179>

Simon Fong · Nilanjan Dey ·  
Amit Joshi  
Editors

# ICT Analysis and Applications

Proceedings of ICT4SD 2019, Volume 2

*Editors*

Simon Fong  
University of Macau  
Macau, China

Nilanjan Dey  
Techno India College of Engineering  
Kolkata, India

Amit Joshi  
Ahmedabad, India

ISSN 2367-3370

ISSN 2367-3389 (electronic)

Lecture Notes in Networks and Systems

ISBN 978-981-15-0629-1

ISBN 978-981-15-0630-7 (eBook)

<https://doi.org/10.1007/978-981-15-0630-7>

© Springer Nature Singapore Pte Ltd. 2020

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd. The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore



# Organization

## Organizing Chairs

Mr. Bharat Patel, Chairman, CEDB

Mr. Peter Kent, Chief Executive Officer (CEO), UKEL, UK

## Organizing Co-chair

Mr. Nakul Sharedalal, Advisor, G R Foundation, India

## Organizing Secretary

Amit Joshi, SITG Ahmedabad and Global Knowledge Research Foundation

## Members

Dr. Vijay Singh Rathore, Department of CSE, JECRC, Jaipur, India

Mr. Aman Barot, G R Foundation, India

Dr. Mahipal Singh Deora, BN University, Udaipur, India

Dr. Nisheeth Joshi, Banasthali University, Rajasthan, India

Mr. Nilesh Vaghela, Electromech Corporation, Ahmedabad, India

Mr. Vinod Thummar, SITG, Gujarat, India

Dr. Chirag Thaker, L. D. College of Engineering, Gujarat, India

Prof. S. Rama Rao, Professor, Goa University, Goa, India

Dr. Nitika Vats Doohan, Indore, India

Dr. Parikshit Mahalle, Sinhgad Group, Pune, India  
Dr. Priyanks Sharma, RSU, Ahmedabad  
Dr. Nitika Vats Doohan, Indore  
Dr. Mukesh Sharma, SFSU, Jaipur  
Dr. Manuj Joshi, SGI, Udaipur, India  
Dr. Bharat Singh Deora, JRNRV University, Udaipur  
Mr. Ricky, P Tunes, Goa University, India  
Prof. L. C. Bishnoi, GPC, Kota, India  
Dr. Vikarant Bhateja, Lucknow, India  
Dr. Satyen Parikh, Dean, Ganpat University, Ahmedabad, India  
Dr. Puspendra Singh, JKL, Jaipur, India  
Dr. Aditya Patel, Ahmedabad University, Gujarat, India  
Mr. Ajay Choudhary, IIT Roorkee, India

## **Technical Program Committee**

Prof. Milan Tuba, Singidunum University, Serbia  
Dr. Durgesh Kumar Mishra, Chairman, Div IV, CSI

## **Technical Program Committee Co-chairs**

Dr. Mahesh Bunde, Dean Research, Poornima University, Jaipur  
Dr. Nilanjay Dey, Techno India College of Engineering, Kolkata, India

## **Advisory Committee**

Shri Nitin Kunkolienker, President, MAIT  
Prof. S. Rama Rao, Professor, Goa University, Goa  
Mr. P. N. Jain, Add. Sec., R&D, Government of Gujarat, India  
Prof. J. Andrew Clark, Computer Science University of York, UK  
Mr. Vivek Ogra, President, GESIA  
Prof. Mustafizur Rahman, Endeavour Research Fellow, Australia  
Dr. Kalpdram Passi, Laurentian University, ON, Canada  
Mr. Chandrashekhar Sahasrabudhe, ACM India  
Dr. Pawan Lingras, Saint Mary University, Canada  
Dr. S. C. Satapathy, Professor in CSE, AP, India  
Mr. Niko Phillips, Active Learning, UK, India  
Dr. Bhagyesh Soneji, Chairperson, Assocham Western Region  
Dr. Dharm Singh, NUST, Windhoek, Namibia

Dr. Vinay Chandna, Principal, JECRC, Jaipur, India  
Prof. H. R. Vishwakarma, VIT, Vellore, India  
Prof. Siddesh K. Pai, National Institute of Construction Management and Research,  
Goa, India

## Members

Dr. Amit Kaul, UK  
Prof. Babita Gupta, College of Business California State University, California, USA  
Prof. Ting-Peng Liang, National Chengchi University, Taipei, Taiwan  
Prof. Anand Paul, The School of Computer Science and Engineering, South Korea  
Prof. Rachid Saadane, Casablanca, Morocco  
Prof. Brent Waters, University of Texas, Austin, Texas, USA  
Prof. Philip Yang, Price water house Coopers, Beijing, China  
Prof. H. R. Vishwakarma, VIT, Vellore, India  
Prof. Martin Everett, University of Manchester, England  
Dr. Rajeev Vaghmare, Principal, SITG, Ahmedabad, India  
Prof. XiuYing Tian, Instrument Lab, Yangtze Delta Region Institute of Tsinghua  
University, Jiading, China  
Prof. Gengshen Zhong, Jinan, Shandong, China  
Prof. Mustafizur Rahman, Endeavour Research Fellow, Australia  
Prof. Ernest Chulantha Kulasekera, University of Moratuwa, Sri Lanka  
Prof. Subhadip Basu, Visiting Scientist, The University of Iowa, Iowa City, USA  
Dr. Ashish Rastogi, Higher College of Technology, Muscat, Oman  
Prof. Ahmad Al-Khasawneh, The Hashemite University, Jordan  
Dr. Basant Tiwari, Professor Ethiopia University, Ethiopia  
Prof. Jean Michel Bruel, Departement Informatique IUT de Blagnac, Blagnac,  
France  
Dr. Ramesh Thakur, DAVV, Indore, India  
Prof. Shuiqing Huang, Department of Information Management, Nanjing  
Agricultural University, Nanjing, China  
Prof. Sami Mnasri, IRIT Laboratory Toulouse, France  
Dr. Krishnamachar Prasad, Department of Electrical and Electronic Engineering,  
Auckland, New Zealand  
Prof. Foufou Sebt, Dijon Cedex, France  
Dr. Haibo Tian, School of Information Science and Technology, Guangzhou,  
Guangdong  
Mr. Vinod Thummar, SITG, Gujarat, India  
Prof. Sunarto Kampus UNY, Yogyakarta, Indonesia  
Prof. Feng Jiang, Harbin Institute of Technology, China  
Prof. Feng Tian, Virginia Polytechnic Institute and State University, USA  
Dr. Savita Gandhi, Gujarat University, Ahmedabad, India

Prof. Abdul Rajak A. R., Department of Electronics and Communication Engineering Birla Institute of Technology and Sciences, Abu Dhabi  
Prof. Hoang Pham, Rutgers University, Piscataway, NJ, USA  
Prof. Shashidhar Ram Joshi, Institute of Engineering, Pulchowk, Nepal  
Prof. Abrar A. Qureshi, Ph.D., University of Virginia, USA  
Dr. Aynur Unal, Stanford University, USA  
Dr. Manju Mandot, JRN RVU, Udaipur, India  
Dr. Rajveer Shekawat, Manipal University, India  
Prof. Ngai-Man Cheung, Assistant Professor, University of Technology and Design, Singapore  
Prof. J. Andrew Clark, Computer Science University of York, UK  
Prof. Yun-Bae Kim, Sungkyunkwan University, South Korea  
Prof. Lorne Olfman, Claremont, California, USA  
Prof. Louis M. Rose, Department of Computer Science, University of York  
Nedia Smairi, CNAM Laboratory, France  
Dr. Vishal Gaur, Government Engineering College, Bikaner, India  
Dr. Aditya Patel, Ahmedabad University, Gujarat, India  
Mr. Ajay Choudhary, IIT Roorkee, India  
Prof. Prasun Sinha, Ohio State University Columbus, Columbus, OH, USA  
Dr. Devesh Shrivastava, Manipal University, Jaipur, India  
Prof. Xiaoyi Yu, National Laboratory of Pattern Recognition, Institute of Automation, Chinese Academy of Sciences, Beijing, China  
Prof. R. S. Rao, New Delhi, India

# Preface

The Fourth International Conference on ICT for Sustainable Development (ICT4SD 2019) targets theory, development, applications, experiences and evaluation of interaction sciences with fellow students, researchers and practitioners.

The conference may concern any topic within its scope. Workshops may be related to any topics within the scope of the conference. The conference is devoted to increase the understanding role of technology issues and how engineering has day by day evolved to prepare human-friendly technology. The conference will provide a platform for bringing forth significant research and literature across the field of ICT for Sustainable Development and provide an overview of the technologies awaiting unveiling. This interaction will be the focal point for leading experts to share their insights, provide guidance and address participant's questions and concerns.

The conference was held during 5–6 July 2019, at Hotel Vivanta By Taj, Panaji, Goa, India, and organized by Global Knowledge Research Foundation and supported by The Institution of Engineers (India), Supporting Partner InterYIT, International Federation for Information Processing, State Chamber Partner Goa Chamber of Commerce & Industry, and National Chamber Partner Knowledge Chamber of Commerce & Industry.

Research submissions in various advanced technology areas were received, and after a rigorous peer review with the help of program committee members and 56 external reviewers for 519 papers from 8 different countries including Algeria, USA, United Arab Emirates, Serbia, Qatar, Mauritius, Egypt, Saudi Arabia, Ethiopia and Oman, 113 were accepted with an acceptance ratio of 0.11.

Technology is the driving force of progress in this era of globalization. Information and Communication Technology (ICT) has become a functional requirement for the socio-economic growth and sustained development of any country. The influence of Information Communication Technology (ICT) in shaping the process of globalization, particularly in productivity, commercial and financial spheres, is widely recognized. The ICT sector is undergoing a revolution that has momentous implications for the current and future social and economic situation of all the countries in the world. ICT plays a pivotal role in empowering



people for self-efficacy and how it can facilitate this mission to reach out to grassroots level. Finally, it is concluded that ICT is a significant contributor to the success of the ongoing initiative of Startup India.

In order to recognize and reward the extraordinary performance and achievements by ICT and allied sectors & promote universities, researchers and students through their research work adapting new scientific technologies and innovations, the two-day conference had presentations from the researchers, scientists, academia and students on the research works carried out by them in different sectors.

ICT4SD Summit is a flagship event of G R Foundation. This is the fourth edition. The summit was inaugurated by Dr. Pramod Sawant, Chief Minister of Goa, along with other eminent dignitaries including Shri Manguirsh Pai Raikar, Chairperson, Assocham's National Council for MSME; Shri. Prajyot Mainkar, Chairman, IT Committee of Goa Chamber of Commerce and Industry; Mike Hinchey, President, IFIP and Chair, IEEE, UK and Ireland; Milan Tuba, Vice Rector for International Relations, Singidunum University, Serbia; and Shri Amit Joshi, Director, G R Foundation.

Dr. Pramod Sawant shared his views and aim on creating a world-class IT Infrastructure and connectivity for e-governance in the state of Goa. Government is committed to create adequate infrastructure for the industry promotion of e-governance, e-education and streamlining of IT in Goa. He further stated that the infrastructure development and capacity building for promotion of IT is one of the main focus areas.

Shri Manguirsh Pai Raikar, Chairperson, Assocham's National Council for MSME, said that this summit is to provide a common platform and bringing forth significant industries, researches and literatures across the field of ICT for Sustainable Development and provide an overview of the technologies awaiting unveiling along with recognizing and rewarding the extraordinary performance as well achievements by ICT and allied industries, communally.

Shri Prajyot Mainkar, Chairman, IT Committee of Goa Chamber of Commerce and Industry, highlighted and encouraged the entrepreneurship and said that GCCI will continue to support such programmes for larger public benefits with great degree of excellence.

The international dignitaries including Mike Hinchey, President, IFIP and Chair, IEEE, UK and Ireland and Milan Tuba, Vice Rector for International Relations, Singidunum University, Serbia, also highlighted the issues and opportunities in the information processing and education sector.

Macau, China  
Kolkata, India  
Ahmedabad, India

Simon Fong  
Nilanjan Dey  
Amit Joshi

# Contents

<b>The Analytical CRM OLAP Analysis Tools and Data Mining . . . . .</b>	<b>1</b>
Sanjay Agal and Pooja Devija	
<b>An Ensemble Framework for Flow-Based Application Layer DDoS Attack Detection Using Data Mining Techniques . . . . .</b>	<b>9</b>
K. Munivara Prasad, V. Samba Siva, J. Nagamuneiah and Siddaiah Nelaballi	
<b>EM Design of Low RCS Proximity Coupled Patch Array . . . . .</b>	<b>21</b>
Avinash Singh, Deepa K. Sasidharan and Hema Singh	
<b>A Double-Weighted Parametric Model for Academic Software Project Effort Estimation . . . . .</b>	<b>31</b>
Jatinderkumar R. Saini and Vikas S. Chomal	
<b>Learner Performance and Preference Meter for Better Career Guidance and Holistic Growth . . . . .</b>	<b>47</b>
Nilay M. Vaidya and Kanubhai K. Patel	
<b>Grading of Tuberculosis Bacilli Using Computer Vision Assisted Detection Method for ZN-Stained Images of Bright Field Microscopy . . . . .</b>	<b>55</b>
Vishakha Yadav and G. Thippeswamy	
<b>Modeling the Dynamics of Carbon Dioxide Over an Educational Institute . . . . .</b>	<b>65</b>
Srikumar Sastry, Arnav Saha and Ranendu Ghosh	
<b>Orthogonalizing Weights in Capsule Network Architecture . . . . .</b>	<b>77</b>
Shubhranil Kundu and B. Gagana	
<b>Smart Billing Using Content-Based Recommender Systems Based on Fingerprint . . . . .</b>	<b>85</b>
Darshita Mittal, Sanyukta Shandilya, Dhruv Khirwar and Archana Bhise	

# About the Editors

**Simon Fong** graduated from La Trobe University, Australia, with a 1st Class Honors B.Eng. Computer Systems degree and a Ph.D. Computer Science degree in 1993 and 1998, respectively. Simon is now working as an Associate Professor at the Computer and Information Science Department of the University of Macau, China. He is also one of the founding members of the Data Analytics and Collaborative Computing Research Group at the Faculty of Science and Technology. Prior to his academic career, Simon held various managerial and technical positions, such as systems engineer, IT consultant, and e-commerce director in Australia and Asia. Dr. Fong has published over 300 international conference and peer-reviewed journal papers, mostly in the areas of data mining and optimization algorithms.

**Nilanjan Dey** was born in Kolkata, India, in 1984. He received his B.Tech. degree in Information Technology from West Bengal University of Technology in 2005, M.Tech. in Information Technology in 2011 from the same University, and Ph.D. in digital image processing in 2015 from Jadavpur University, India. In 2011, he was appointed as an Assistant Professor in the Department of Information Technology at JIS College of Engineering, Kalyani, India, followed by Bengal College of Engineering and Technology, Durgapur, India, in 2014. He is now employed as an Assistant Professor in the Department of Information Technology, Techno India College of Technology, India. He is a visiting fellow of the University of Reading, UK. His research topics are signal processing, machine learning, and information security. Dr. Dey is an Associate Editor of IEEE ACCESS and is currently the Editor-in-Chief of the International Journal of Ambient Computing and Intelligence. He is the Series Co-Editor of Advances in Ubiquitous Sensing Applications for Healthcare (AUSAH), Elsevier, and Springer Tracts in Nature-Inspired Computing (STNIC).

**Amit Joshi** is a young entrepreneur and researcher who holds an M.Tech. in Computer Science and Engineering and is currently pursuing research in the areas of Cloud Computing and Cryptography. He has six years of academic and industrial

experience at prestigious organizations in Udaipur and Ahmedabad. Currently, he is working as an Assistant Professor in the Department of Information Technology, Sabar Institute in Gujarat. He is an active member of the ACM, CSI, AMIE, IACSIT-Singapore, IDES, ACEEE, NPA, and many other professional societies. He also holds the post of Honorary Secretary of the CSI Udaipur Chapter and Secretary of the ACM Udaipur Chapter. He has presented and published more than 30 papers in national and international journals/conferences of the IEEE and ACM. He has edited three books, on Advances in Open Source Mobile Technologies, ICT for Integrated Rural Development, and ICT for Competitive Strategies. He has also organized more than 15 national and international conferences and workshops, including the International Conference ICTCS 2014 at Udaipur through the ACM-ICPS. In recognition of his contributions, he received the Appreciation Award from the Institution of Engineers (India) in 2014, and an award from the SIG-WNs Computer Society of India in 2012.

# Learner Performance and Preference Meter for Better Career Guidance and Holistic Growth



Nilay M. Vaidya and Kanubhai K. Patel

**Abstract** One of the biggest challenges for higher educational institutes is to increase the placement ratio. Another challenge is to increase the holistic development of the students. Looking at the global requirement, the companies require people not only excellent in the domain knowledge but required excellent in the soft skill too. Finding and predicting the performance factor of the student may help in improving the system and also give an indication to improve pedagogy being offered to students. Many tutoring systems and continuous evaluation patterns adopted by many institutes help in improving the performance of a student. As the trend changes toward holistic development of the students, focus is also upon the soft skills measurement factor. This encouraged us to have a model that helps predicting the holistic performance of a student based on the continuous evaluation as well as performance indicator of a student in other activities too. A gray-based decision-making theory helps assessing the required parameters that find the continuous performance measurement of a learner for each aspect. The multi-attribute situation decision-making theory helps in improving the criticality of the information system by recognizing the sensitivity of the criteria.

**Keywords** Employability · Grey decision-making · Multi-attribute situation decision-making · Tutoring system

## 1 Introduction and Related Work

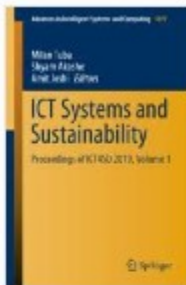
With the revolution in the global market and the rapid development in Information Technology (IT) around, many companies started demanding the candidates with the good technical skill as well as soft skills. Soft skill development becomes one of the important components in good institutes nowadays. Institutes have started applying the different modules to build the soft skill measure among students. But

---

N. M. Vaidya (✉) · K. K. Patel  
Charotar University of Science and Technology, Changa, Gujarat, India  
e-mail: [vaidyanilay@gmail.com](mailto:vaidyanilay@gmail.com)

K. K. Patel  
e-mail: [kkpatel7@gmail.com](mailto:kkpatel7@gmail.com)





[ICT Systems and Sustainability](#) pp 83-89 | [Cite as](#)

# Enhancing Programming Competence Through Knowledge-Based Intelligent Learning System

Authors

[Authors and affiliations](#)

Kanubhai K. Patel , Nilay Vaidya

Conference paper

First Online: 29 February 2020

165

Downloads

# Advances in Intelligent Systems and Computing

Volume 1077

## Series Editor

Janusz Kacprzyk, Systems Research Institute, Polish Academy of Sciences,  
Warsaw, Poland

## Advisory Editors

Nikhil R. Pal, Indian Statistical Institute, Kolkata, India

Rafael Bello Perez, Faculty of Mathematics, Physics and Computing,  
Universidad Central de Las Villas, Santa Clara, Cuba

Emilio S. Corchado, University of Salamanca, Salamanca, Spain

Hani Hagras, School of Computer Science and Electronic Engineering,  
University of Essex, Colchester, UK

László T. Kóczy, Department of Automation, Széchenyi István University,  
Gyor, Hungary


Vladik Kreinovich, Department of Computer Science, University of Texas  
at El Paso, El Paso, TX, USA

Chin-Teng Lin, Department of Electrical Engineering, National Chiao  
Tung University, Hsinchu, Taiwan

Jie Lu, Faculty of Engineering and Information Technology,  
University of Technology Sydney, Sydney, NSW, Australia

Patricia Melin, Graduate Program of Computer Science, Tijuana Institute  
of Technology, Tijuana, Mexico

Nadia Nedjah, Department of Electronics Engineering, University of Rio de Janeiro,  
Rio de Janeiro, Brazil

Ngoc Thanh Nguyen , Faculty of Computer Science and Management,  
Wrocław University of Technology, Wrocław, Poland

Jun Wang, Department of Mechanical and Automation Engineering,  
The Chinese University of Hong Kong, Shatin, Hong Kong

The series “Advances in Intelligent Systems and Computing” contains publications on theory, applications, and design methods of Intelligent Systems and Intelligent Computing. Virtually all disciplines such as engineering, natural sciences, computer and information science, ICT, economics, business, e-commerce, environment, healthcare, life science are covered. The list of topics spans all the areas of modern intelligent systems and computing such as: computational intelligence, soft computing including neural networks, fuzzy systems, evolutionary computing and the fusion of these paradigms, social intelligence, ambient intelligence, computational neuroscience, artificial life, virtual worlds and society, cognitive science and systems, Perception and Vision, DNA and immune based systems, self-organizing and adaptive systems, e-Learning and teaching, human-centered and human-centric computing, recommender systems, intelligent control, robotics and mechatronics including human-machine teaming, knowledge-based paradigms, learning paradigms, machine ethics, intelligent data analysis, knowledge management, intelligent agents, intelligent decision making and support, intelligent network security, trust management, interactive entertainment, Web intelligence and multimedia.

The publications within “Advances in Intelligent Systems and Computing” are primarily proceedings of important conferences, symposia and congresses. They cover significant recent developments in the field, both of a foundational and applicable character. An important characteristic feature of the series is the short publication time and world-wide distribution. This permits a rapid and broad dissemination of research results.

**\*\* Indexing: The books of this series are submitted to ISI Proceedings, EI-Compendex, DBLP, SCOPUS, Google Scholar and Springerlink \*\***

More information about this series at <http://www.springer.com/series/11156>

Milan Tuba · Shyam Akashe ·  
Amit Joshi  
Editors

# ICT Systems and Sustainability

Proceedings of ICT4SD 2019, Volume 1

*Editors*

Milan Tuba  
Belgrade, Serbia

Shyam Akashe  
ITM University  
Gwalior, India

Amit Joshi  
Global Knowledge Research Foundation  
Ahmedabad, India

ISSN 2194-5357

ISSN 2194-5365 (electronic)

Advances in Intelligent Systems and Computing

ISBN 978-981-15-0935-3

ISBN 978-981-15-0936-0 (eBook)

<https://doi.org/10.1007/978-981-15-0936-0>

© Springer Nature Singapore Pte Ltd. 2020

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd. The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore



people for self-efficacy and how it can facilitate this mission to reach out to grassroots level. Finally, it is concluded that ICT is a significant contributor to the success of the ongoing initiative of Startup India.

In order to recognize and reward the extraordinary performance and achievements by ICT and allied sectors & promote universities, researchers and students through their research work adapting new scientific technologies and innovations, the two-day conference had presentations from the researchers, scientists, academia and students on the research works carried out by them in different sectors.

ICT4SD Summit is a flagship event of GR Foundation. This is the fourth edition. The summit was inaugurated by Dr. Pramod Sawant, Chief Minister of Goa, along with other eminent dignitaries including Shri Mangursh Pai Raikar, Chairperson, Assocham's National Council for MSME; Shri. Prajyot Mainkar, Chairman, IT Committee of Goa Chamber of Commerce and Industry; Mike Hinchey, President, IFIP and Chair, IEEE, UK and Ireland; Milan Tuba, Vice Rector for International Relations, Singidunum University, Serbia; and Shri Amit Joshi, Director, GR Foundation.

Dr. Pramod Sawant shared his views and aim on creating a world-class IT infrastructure and connectivity for e-governance in the state of Goa. Government is committed to create adequate infrastructure for the industry promotion of e-governance, e-education and streamlining of IT in Goa. He further stated that the infrastructure development and capacity building for promotion of IT is one of the main focus areas.

Shri Mangursh Pai Raikar, Chairperson, Assocham's National Council for MSME, said that this summit is to provide a common platform and bringing forth significant industries, researches and literatures across the field of ICT for Sustainable Development and provide an overview of the technologies awaiting unveiling along with recognizing and rewarding the extraordinary performance as well achievements by ICT and allied industries, communally.

Shri Prajyot Mainkar, Chairman, IT Committee of Goa Chamber of Commerce and Industry, highlighted and encouraged the entrepreneurship and said that GCCI will continue to support such programmes for larger public benefits with great degree of excellence.

The international dignitaries including Mike Hinchey, President, IFIP and Chair, IEEE, UK and Ireland and Milan Tuba, Vice Rector for International Relations, Singidunum University, Serbia, also highlighted the issues and opportunities in the information processing and education sector.

Belgrade, Serbia  
Gwalior, India  
Ahmedabad, India

Milan Tuba  
Shyam Akashe  
Amit Joshi

# Contents

<b>Managing Multimedia Big Data: Security and Privacy Perspective . . . .</b>	<b>1</b>
Gayatri Kapil, Zaiba Ishrat, Rajeev Kumar, Alka Agrawal and Raees Ahmad Khan	
<b>Nature-Inspired Metaheuristics in Cloud: A Review . . . . .</b>	<b>13</b>
Preeti Abrol, Savita Guupta and Sukhwinder Singh	
<b>An Analytical Approach to Document Clustering Techniques . . . . .</b>	<b>35</b>
Vikas Choubey and Sanjay Kumar Dubey	
<b>Sentiment Analysis of Amazon Mobile Reviews . . . . .</b>	<b>43</b>
Meenakshi, Arkav Banerjee, Nishi Intwala and Vidya Sawant	
<b>Domain-Based Ranking of Software Test—Effort Estimation Techniques for Academic Projects . . . . .</b>	<b>53</b>
Jatinderkumar R. Saini and Vikas S. Chomal	
<b>Life Cycle Costing Model for Equipment for Indian Naval Shipbuilding Programme . . . . .</b>	<b>71</b>
Alok Bhagwat and Pradnya C. Chitrao	
<b>Enhancing Programming Competence Through Knowledge-Based Intelligent Learning System . . . . .</b>	<b>83</b>
Kanubhai K. Patel and Nilay Vaidya	
<b>Digidhan Dashboard—Monitoring and Analysis of Digital Payments . . . . .</b>	<b>91</b>
Deepak Chandra Misra, Inder Pal Singh Sethi, Om Pradyumana Gupta, Misha Kapoor and Ritesh Kumar Dwivedi	
<b>Pneumonia Identification Using Chest X-Ray Images with Deep Learning . . . . .</b>	<b>105</b>
Nishit Pareshbhai Nakrani, Jay Malnika, Satyam Bajaj, Harihar Prajapati and Vivaksha Jariwala	

# Enhancing Programming Competence Through Knowledge-Based Intelligent Learning System



Kanubhai K. Patel and Nilay Vaidya

**Abstract** Computer programming competence is essential for computer science students. For them, it is challenging to understand computer programming courses easily. It eventually causes a lack of interest in the programming courses. It also impacts on employability of the students. Currently, around 20–30% fresh graduates are only employable and get placed. To overcome the problem, the authors have proposed a framework of Knowledge-based Intelligent Learning System (KILS) which enhance the programming competence of the students and thereby increase their employability. An experiment was conducted on undergraduate and postgraduate computer science students to evaluate the significance of the proposed solution to the problem. The results show that the proposed solution not only enhances their programming competence which ultimately increasing their employability but also improves the students' involvement and attitudes towards programming.

**Keywords** Knowledge-based learning system · Student learning · Computer programming competence · Student involvement

## 1 Introduction

A good number of students are taking admission in undergraduate level (such as BCA and B.Sc.(IT)) and postgraduate level (such as MCA and M.Sc.(IT)) computer science programmes. Programming competence is the desired knowledge and skills of students in computer programming-based courses or programmes. For these students, it becomes difficult to understand computer programming courses easily in initial years as it involves the comprehension of theoretical background, practical usage of semantics and syntactic coding and algorithmic skills [1]. It eventually

---

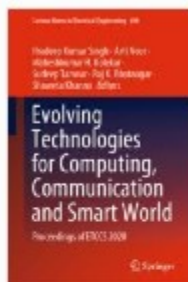
K. K. Patel (✉) · N. Vaidya

Charotar University of Science and Technology, Changa 388421, Gujarat, India

e-mail: [kkpatel7@gmail.com](mailto:kkpatel7@gmail.com)

N. Vaidya

e-mail: [vaidyanilay@gmail.com](mailto:vaidyanilay@gmail.com)



[Evolving Technologies for Computing, Communication and Smart World](#) pp 69-81 | [Cite as](#)

# Unsupervised Learning-Based Sentiment Analysis with Reviewer's Emotion

Authors

[Authors and affiliations](#)

Harsh Jigneshkumar Patel, Jai Prakash Verma , **Atul Patel**

Conference paper

First Online: 26 November 2020

68

Downloads

Part of the [Lecture Notes in Electrical Engineering](#) book series (LNEE, volume 694)

# Contents

<b>Toward Response-Type Identification for the Real Time . . . . .</b>	<b>1</b>
Chaman Verma, Veronika Stoffová, Zoltán Illés, and Mandeep Singh	
<b>Automatic Leaf Species Recognition Using Deep Neural Network . . . . .</b>	<b>13</b>
Deepak Kumar and Chaman Verma	
<b>Injecting Power Attacks with Voltage Glitching and Generation of Clock Attacks for Testing Fault Injection Attacks . . . . .</b>	<b>23</b>
Shaminder Kaur, Balwinder Singh, Harsimranjit Kaur, and Lipika Gupta	
<b>Traffic Jam Minimization and Accident Avoidance System Using IoT . . . . .</b>	<b>39</b>
Mohsin Khan and Bhavna Arora	
<b>Software Reusability Estimation Using Machine Learning Techniques—A Systematic Literature Review . . . . .</b>	<b>53</b>
Deepika and Om Prakash Sangwan	
<b>Unsupervised Learning-Based Sentiment Analysis with Reviewer's Emotion . . . . .</b>	<b>69</b>
Harsh Jigneshkumar Patel, Jai Prakash Verma, and Atul Patel	
<b>Event-Triggered Share Price Prediction . . . . .</b>	<b>83</b>
Jay Pareshkumar Patel, Nikunj Dilipkumar Gondha, Jai Prakash Verma, and Zdzislaw Polkowski	
<b>A Review: Efficient Transportation—Future Aspects of IoV . . . . .</b>	<b>97</b>
Ajay Dureja and Suman Sangwan	
<b>Compact High Gain 28 GHz Concentric Circular Director Low-Cost Antenna for 5G Millimeter-Wave Communication . . . . .</b>	<b>109</b>
Raqeebur Rehman and Javaid A. Sheikh	



# Unsupervised Learning-Based Sentiment Analysis with Reviewer's Emotion



Harsh Jigneshkumar Patel, Jai Prakash Verma , and Atul Patel

**Abstract** The sentiment analysis performed using the general methodologies, i.e., lexicon and neural networks based mainly on the content written by the user. They all are mainly content-centric methodologies. The aspect of the user's mindset and sentiment for writing the reviews is never considered and the emotions of the writer. In this paper, we are proposing the consideration of these aspects and their impact. They are accommodated on the basis of the sentiment score of the review written by the user. The intensity of the words used to describe the product or an issue matters significantly in the classification of the product features. Unsupervised learning methods were used to calculate more precise sentence-level sentiments with the help of contextual dependencies. They are more suitable for the aspect-based sentiment analysis as they are found to be more adaptable to different contexts and domains with the change in information rather than changing the entire model structure. The clustering algorithms are used for segregating the different types of groups related to viral sharing of ads. Various factors can be analysed to decide whether the ad is shared by a user or not.

**Keywords** Sentiment analysis · Text summarisation · Unsupervised learning · Machine learning · Text mining

---

H. Jigneshkumar Patel · J. Prakash Verma (✉)  
Institute of Technology, Nirma University, Ahmedabad, Gujarat, India  
e-mail: [jaiprakash.verma@nirmauni.ac.in](mailto:jaiprakash.verma@nirmauni.ac.in)

H. Jigneshkumar Patel  
e-mail: [17bit028@nirmauni.ac.in](mailto:17bit028@nirmauni.ac.in)

A. Patel  
CMPICA, Charusat University, Changa, Gujarat, India  
e-mail: [atulpatel.mca@charusat.ac.in](mailto:atulpatel.mca@charusat.ac.in)

# **Faculty of Sciences**

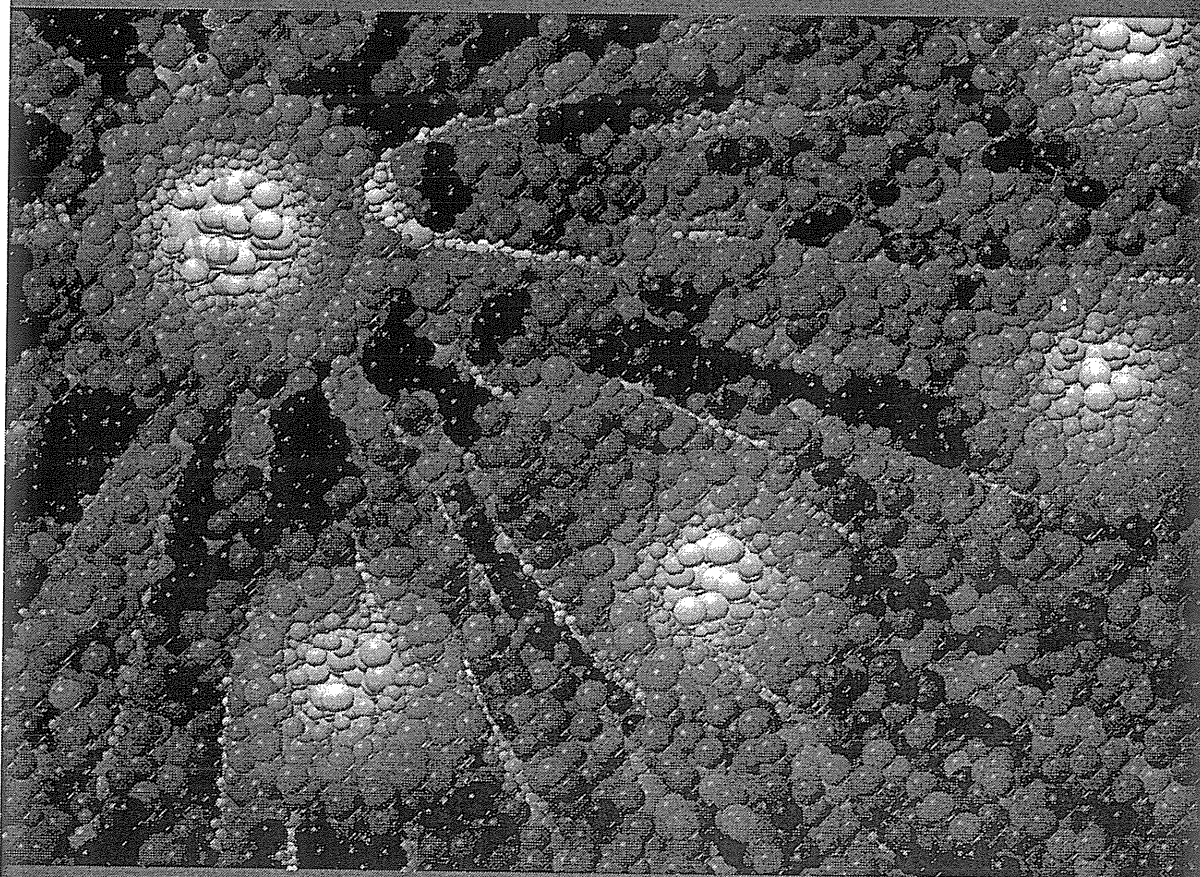
2019-90  
①

①

# Nanomaterials-Based Composites for Energy Applications

Emerging Technology and Trends

Editor Keka Talukdar



**AAP** | APPLE  
ACADEMIC  
PRESS

**CRC** Press  
Taylor & Francis Group

Apple Academic Press Inc.  
4164 Lakeshore Road  
Burlington ON L7L 1A4  
Canada

Apple Academic Press Inc.  
1265 Goldenrod Circle NE  
Palm Bay, Florida 32905  
USA

© 2020 by Apple Academic Press, Inc.

No claim to original U.S. Government works

International Standard Book Number-13: 978-1-77188-806-6 (Hardcover)

International Standard Book Number-13: 978-0-42926-505-1 (eBook)

All rights reserved. No part of this work may be reprinted or reproduced or utilized in any form or by any electronic, mechanical or other means, now known or hereafter invented, including photocopying and recording, or in any information storage or retrieval system, without permission in writing from the publisher or its distributor, except in the case of brief excerpts or quotations for use in reviews or critical articles.

This book contains information obtained from authentic and highly regarded sources. Reprinted material is quoted with permission and sources are indicated. Copyright for individual articles remains with the authors as indicated. A wide variety of references are listed. Reasonable efforts have been made to publish reliable data and information, but the authors, editors, and the publisher cannot assume responsibility for the validity of all materials or the consequences of their use. The authors, editors, and the publisher have attempted to trace the copyright holders of all material reproduced in this publication and apologize to copyright holders if permission to publish in this form has not been obtained. If any copyright material has not been acknowledged, please write and let us know so we may rectify in any future reprint.

**Trademark Notice:** Registered trademark of products or corporate names are used only for explanation and identification without intent to infringe.

---

#### Library and Archives Canada Cataloguing in Publication

---

Title: Nanomaterials-based composites for energy applications : emerging technology and trends / edited by Keka Talukdar.

Names: Talukdar, Keka, 1975- editor.

Description: Includes bibliographical references and index.

Identifiers: Canadiana (print) 2019020222X | Canadiana (ebook) 20190202262 |  
ISBN 9781771888066 (hardcover) | ISBN 9780429265051 (ebook)

Subjects: LCSH: Nanostructured materials. | LCSH: Nanocomposites (Materials) |  
LCSH: Renewable energy sources—Technological innovations.

Classification: LCC TA418.9.N35 N36 2020 | DDC 620.1/15—dc23

---

---

CIP data on file with US Library of Congress

---

Apple Academic Press also publishes its books in a variety of electronic formats. Some content that appears in print may not be available in electronic format. For information about Apple Academic Press products, visit our website at [www.appleacademicpress.com](http://www.appleacademicpress.com) and the CRC Press website at [www.crcpress.com](http://www.crcpress.com)

For Non-Commercial Use



# Contents

<i>Contributors</i> .....	<i>ix</i>
<i>Abbreviations</i> .....	<i>xi</i>
<i>Foreword</i> .....	<i>xvii</i>
<i>Preface</i> .....	<i>xix</i>
<b>PART I: Preparation and Properties of Nanocomposites for Energy Applications</b> .....	<b>1</b>
<b>1. Preparation and Properties of Nanocomposites for Energy Applications</b> .....	<b>3</b>
Idowu David Ibrahim, Chewe Kambole, Azunna Agwo Eze, Adeyemi Oluwaseun Adeboje, Emmanuel Rotimi Sadiku, Williams Kehinde Kupolati, Tamba Jamiru, Babatunji Wunmi Olagbenro, and Oludaisi Adekomaya	
<b>2. Recent Progress in Nanocrystalline Oxide Thin Films</b> .....	<b>43</b>
Pallabi Gogoi, D. Pamu, and L. Robindro Singh	
<b>3. Application of Magnetic Fluid in the Energy Sector</b> .....	<b>65</b>
Kinnari Parekh and R. V. Upadhyay	
<b>4. Nanostructured Materials and Composites for Renewable Energy</b> .....	<b>91</b>
Idowu David Ibrahim, Chewe Kambole, Azunna Agwo Eze, Adeyemi Oluwaseun Adeboje, Emmanuel Rotimi Sadiku, Williams Kehinde Kupolati, Tamba Jamiru, Babatunji Wunmi Olagbenro, and Oludaisi Adekomaya	
<b>5. Simulation and Modeling of Nanotechnology Aircraft Energy System Using MATLAB</b> .....	<b>121</b>
Indradeep Kumar	
<b>6. Promising Nanomaterials and Their Applications in Energy Technology</b> .....	<b>145</b>
Tathagat Waghmare	

For Non-Commercial Use



## CHAPTER 3

---

# Application of Magnetic Fluid in the Energy Sector

KINNARI PAREKH<sup>1</sup> and R. V. UPADHYAY<sup>1,2</sup>

<sup>1</sup>*Dr. K. C. Patel R&D Center, Charotar University of Science and Technology, Changa – 388421, Anand District, Gujarat, India, E-mail: kinnariparekh.rnd@charusat.ac.in*

<sup>2</sup>*P D Patel Institute of Applied Sciences, Charotar University of Science and Technology, Changa – 388421, Anand District, Gujarat, India*

---

### ABSTRACT

In the present chapter, the review of energy applications of magnetic fluid is presented. Few studies mentioning the use of magnetic fluid for voltage generator, energy harvester and energy storage is reviewed; however, the study is yet at the preliminary level and needs focused research with the novel design and synthesis of special magnetic fluid for the purpose. The use of magnetic fluid for energy transfer devices, especially for heat transfer using convection pipe study and automatic cooling devices (ACD) shows potential. A special type of magnetic fluid, known as temperature-sensitive magnetic fluid (TSMF) can be used to achieve enhanced heat transfer. Results published in the literature are reviewed and presented in this article. However, the work is still, to the author's knowledge, is the tip of an iceberg. The motive to write this article is to explore the potential benefits of magnetic fluid in the energy sector as well as to spread awareness in the field of heat transfer.

### 3.1 INTRODUCTION

The energy sector is highly influenced by the need of magnetic materials as they play a vital role in improving the functioning of devices especially

# Contents

---

<i>Contributors</i> .....	<i>ix</i>
<i>Abbreviations</i> .....	<i>xi</i>
<i>Foreword</i> .....	<i>xvii</i>
<i>Preface</i> .....	<i>xix</i>

## **PART I: Preparation and Properties of Nanocomposites for Energy Applications ..... 1**

<b>1. Preparation and Properties of Nanocomposites for Energy Applications.....</b>	<b>3</b>
Idowu David Ibrahim, Chewe Kambole, Azunna Agwo Eze, Adeyemi Oluwaseun Adeboje, Emmanuel Rotimi Sadiku, Williams Kehinde Kupolati, Tamba Jamiru, Babatunji Wunmi Olagbenro, and Oludaisi Adekomaya	
<b>2. Recent Progress in Nanocrystalline Oxide Thin Films .....</b>	<b>43</b>
Pallabi Gogoi, D. Pamu, and L. Robindro Singh	
<b>3. Application of Magnetic Fluid in the Energy Sector .....</b>	<b>65</b>
Kinnari Parekh and R. V. Upadhyay	
<b>4. Nanostructured Materials and Composites for Renewable Energy.....</b>	<b>91</b>
Idowu David Ibrahim, Chewe Kambole, Azunna Agwo Eze, Adeyemi Oluwaseun Adeboje, Emmanuel Rotimi Sadiku, Williams Kehinde Kupolati, Tamba Jamiru, Babatunji Wunmi Olagbenro, and Oludaisi Adekomaya	
<b>5. Simulation and Modeling of Nanotechnology Aircraft Energy System Using MATLAB.....</b>	<b>121</b>
Indradeep Kumar	
<b>6. Promising Nanomaterials and Their Applications in Energy Technology .....</b>	<b>145</b>
Tathagat Waghmare	

For Non-Commercial Use

Maulin P. Shah *Editor*

# Microbial Bioremediation & Biodegradation

 Springer

*Editor*

Maulin P. Shah  
Environmental Microbiology Lab  
Bharuch, Gujarat, India

ISBN 978-981-15-1811-9      ISBN 978-981-15-1812-6 (eBook)  
<https://doi.org/10.1007/978-981-15-1812-6>

© Springer Nature Singapore Pte Ltd. 2020

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.  
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

---

## Contents

<b>1</b>	<b>Bioremediation Approaches for Treatment of Pulp and Paper Industry Wastewater: Recent Advances and Challenges . . . . .</b>	<b>1</b>
	Vineet Kumar, Indu Shekhar Thakur, and Maulin P. Shah	
<b>2</b>	<b>Microbial Remediation of Heavy Metals . . . . .</b>	<b>49</b>
	Lakhan Kumar and Navneeta Bharadvaja	
<b>3</b>	<b>Dyes: Effect on the Environment and Biosphere and Their Remediation Constraints . . . . .</b>	<b>73</b>
	Kunal Jain, Chirayu Desai, Onkar Tiwari, and Datta Madamwar	
<b>4</b>	<b>Microbial Bioremediation and Biodegradation of Hydrocarbons, Heavy Metals, and Radioactive Wastes in Solids and Wastewaters . . . . .</b>	<b>95</b>
	Rahul Kumar and Subir Kundu	
<b>5</b>	<b>Advancement of Omics: Prospects for Bioremediation of Contaminated Soils . . . . .</b>	<b>113</b>
	Kriti Gupta, Rimi Biswas, and Angana Sarkar	
<b>6</b>	<b>Microbial Biotransformation of Hexavalent Chromium [Cr(VI)] in Tannery Wastewater . . . . .</b>	<b>143</b>
	Arukula Deepa and Brijesh Kumar Mishra	
<b>7</b>	<b>Bioremediation: A Low-Cost and Clean-Green Technology for Environmental Management . . . . .</b>	<b>153</b>
	Daniela Landa-Acuña, Richard Andi Solórzano Acosta, Edwin Hualpa Cutipa, Celia Vargas de la Cruz, and Bernabe Luis Alaya	
<b>8</b>	<b>Microbial Degradation of Pharmaceuticals and Personal Care Products from Wastewater . . . . .</b>	<b>173</b>
	Sudeeptha Girijan and Mathava Kumar	





## Dyes: Effect on the Environment and Biosphere and Their Remediation Constraints

3

Kunal Jain, Chirayu Desai, Onkar Tiwari, and Datta Madamwar

### Abstract

The early excitement of industrialization during the twentieth century and unprecedented population rise have now compelled us to think about developing environmental remediation strategies on a priority basis to save the basic essential components of life. Understanding the impact of dyes and dye intermediates which have been the major component of industrial pollutants in the environment is the prime need, to reclaim the pristine environment. Physical and chemical environmental cleanup technologies developed for dye and textile effluents are proven to be expensive and energy consuming, often generate toxic by-products, and more importantly are faced with limited success in a narrower scope. Consequently, the need for an alternate approach has led to the development of self-sustainable, greener biological methods (i.e., bioremediation). It offers a great advantage of astonishing catabolic diversity of the innate microbial population inhabiting the polluted environment. Factors like geological aspects, climate, soil and water characteristics, waste and disposal facilities, etc. play a vital role in the success of different technologies (including bioremediation). Besides chemical structure, degree of recalcitrance, toxicity, and bioavailability of dye molecules are considered significant parameters for their treatments. In this review, an attempt has been made to understand the complexities and constraints of existing technologies and few optimistic scenarios to improve and develop new methodologies for treatment of industrial effluents from dye and textile industries.

K. Jain · D. Madamwar (✉)

Environmental Genomics and Proteomics Lab, UGC-Centre of Advanced Study, Post Graduate Department of Biosciences, Sardar Patel University, Satellite Campus, Anand, Gujarat, India

C. Desai


PD Patel Institute of Applied Science, Charotar Institute of Science and Technology, Changa, Gujarat, India

O. Tiwari

Department of Biotechnology, Ministry of Science & Technology, New Delhi, India

© Springer Nature Singapore Pte Ltd. 2020

M. P. Shah (ed.), *Microbial Bioremediation & Biodegradation*,  
[https://doi.org/10.1007/978-981-15-1812-6\\_3](https://doi.org/10.1007/978-981-15-1812-6_3)



# Emerging Technologies in **Environmental Bioremediation**

Edited by  
Maulin P. Shah  
Susana Rodriguez-Couto  
S. Sevinç Şengör



Elsevier

Radarweg 29, PO Box 211, 1000 AE Amsterdam, Netherlands  
The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, United Kingdom  
50 Hampshire Street, 5th Floor, Cambridge, MA 02139, United States

Copyright © 2020 Elsevier Inc. All rights reserved.

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system, without permission in writing from the publisher. Details on how to seek permission, further information about the Publisher's permissions policies and our arrangements with organizations such as the Copyright Clearance Center and the Copyright Licensing Agency, can be found at our website: [www.elsevier.com/permissions](http://www.elsevier.com/permissions).

This book and the individual contributions contained in it are protected under copyright by the Publisher (other than as may be noted herein).

#### Notices

Knowledge and best practice in this field are constantly changing. As new research and experience broaden our understanding, changes in research methods, professional practices, or medical treatment may become necessary.

Practitioners and researchers must always rely on their own experience and knowledge in evaluating and using any information, methods, compounds, or experiments described herein. In using such information or methods they should be mindful of their own safety and the safety of others, including parties for whom they have a professional responsibility.

To the fullest extent of the law, neither the Publisher nor the authors, contributors, or editors, assume any liability for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions, or ideas contained in the material herein.

#### British Library Cataloguing-in-Publication Data

A catalogue record for this book is available from the British Library

#### Library of Congress Cataloging-in-Publication Data

A catalog record for this book is available from the Library of Congress

ISBN: 978-0-12-819860-5

For Information on all Elsevier publications  
visit our website at <https://www.elsevier.com/books-and-journals>

*Publisher:* Susan Dennis

*Acquisition Editor:* Kostas Marinakis

*Editorial Project Manager:* Vincent Gabrielle

*Production Project Manager:* Omer Mukthar

*Cover Designer:*

Typeset by MPS Limited, Chennai, India



4.3.7	Laccase mediator system .....	101
4.3.8	Immobilization of laccase .....	104
4.4	Application of laccases for bioremediation of environmental pollutants .....	106
4.4.1	Degradation of xenobiotic compounds .....	107
4.4.2	Decolorization of synthetic dyes .....	110
4.4.3	Treatment of industrial effluent .....	113
4.4.4	Potential applications in pulp and paper industry .....	113
4.4.5	Applications of laccases to develop ecofriendly processes .....	114
4.5	Limitations and future prospects .....	115
	References .....	116

### **Chapter 5: Emerging bioremediation technologies for the treatment of wastewater containing synthetic organic compounds .....131**

*Kunal Jain, Jenny Johnson, Neelam Devpura, Rohit Rathour, Chirayu Desai, Onkar Tiwari and Datta Madamwar*

5.1	Introduction .....	131
5.2	Electrobioremediation .....	134
5.3	Bioelectrochemical systems/technology .....	135
5.4	Phytotechnology (phytoremediation) .....	138
5.4.1	Phytoreactors and constructed wetlands .....	138
5.4.2	Plant–microbe phytoremediation .....	139
5.4.3	Plant enzymes and metabolites .....	140
5.4.4	Hydroponic systems .....	141
5.4.5	Plant tissue culturing .....	141
5.5	Electron beam irradiation .....	142
5.6	Conclusion: unresolved challenges and future perspectives .....	144
	Acknowledgments .....	146
	References .....	146

### **Chapter 6: Bacterial quorum sensing in environmental biotechnology: a new approach for the detection and remediation of emerging pollutants .....151**

*Debapriya Sarkar, Kasturi Poddar, Nishchay Verma, Sayantani Biswas and Angana Sarkar*

6.1	Introduction .....	151
6.2	Mechanisms of bacterial quorum sensing .....	152
6.2.1	Two-component system in Gram-positive bacteria .....	153
6.2.2	Acyl homoserine lactone in Gram-negative bacteria .....	153
6.3	Quorum sensing in environmental biotechnology .....	154



# *Emerging bioremediation technologies for the treatment of wastewater containing synthetic organic compounds*

Kunal Jain<sup>1</sup>, Jenny Johnson<sup>1</sup>, Neelam Devpura<sup>1</sup>, Rohit Rathour<sup>2</sup>, Chirayu Desai<sup>2</sup>, Onkar Tiwari<sup>3</sup> and Datta Madamwar<sup>1</sup>

<sup>1</sup>*Environmental Genomics and Proteomics Lab, UGC-Centre of Advanced Study, Post Graduate Department of Biosciences, Sardar Patel University, Satellite Campus, Bakrol, India,* <sup>2</sup>PD Patel Institute of Applied Science, Charotar Institute of Science and Technology, Changa, India,

<sup>3</sup>*Department of Biotechnology, Ministry of Science & Technology, New Delhi, India*

## **5.1 Introduction**

Ever since the evolution of human beings, tools and machinery have coevolved with them. The coevolution of human life and technology development has provided much required technical edge for their survival and sustenance during their early life on the Earth. Initial inventions, which might have been accidental discoveries, paved the way for modern industrial revolutions. With the rise in human populations the need for technologically driven life also increased proportionately and we did not realize when our environment started to lose its pristine nature. The modern industrial revolution marked a significant point in human history, since when the ease of human life on Earth has exponentially increased. The change also brought changes in the biosphere, for which humans were not prepared and had not anticipated where it would rapidly create situations where the basic entity of life is in danger.

Human activities have damaged and polluted the natural terrestrial, aerial, and aquatic ecosystems at the same pace and with same intensity. In recent years environmental pollution has become a priority problem globally. It has changed drastically and been compounded with the daily transformations in the habits, lifestyles, and ever-rising living standards of humans. The major impact on the pristine environment was made by synthetic organic compounds (SOCs). The SOCs are often an intimation of natural organic compounds, that historically were derived from naturally occurring materials (petroleum, natural gas or coal). From the latter part of the 20th century natural organic compounds

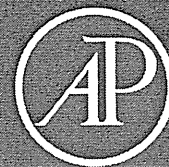


# Plant Small RNA

*Biogenesis, Regulation and Application*



Edited by  
Praveen Guleria  
Vineet Kumar



# Plant Small RNA

## Biogenesis, Regulation and Application

Edited by

**Praveen Guleria**  
DAV University, India

**Vineet Kumar**  
Lovely Professional University, India



**ACADEMIC PRESS**  
An imprint of Elsevier

# Contents

Contributors .....	xix
--------------------	-----

## SECTION 1 Basics

<b>CHAPTER 1</b>	<b>Introduction to plant small RNAs .....</b>	<b>3</b>
	Yu Yu, Xiaowei Mo, Beixin Mo	
	Introduction.....	3
	Discovery history of small RNAs .....	3
	Diversity of small RNAs .....	4
	miRNAs.....	5
	siRNAs .....	14
	phasiRNAs .....	17
	Movement of small RNAs.....	20
	Future perspectives.....	22
	Acknowledgment .....	22
	References.....	22
	Further reading .....	35
<b>CHAPTER 2</b>	<b>Diversity and types of small RNA .....</b>	<b>37</b>
	Lionel Morgado	
	Small regulatory RNAs: Historical milestones .....	37
	Classifying endogenous small RNA in plants.....	39
	Hairpin sRNA and microRNA .....	40
	Natural antisense transcript siRNA .....	40
	Secondary and trans-acting siRNA .....	41
	Heterochromatic siRNA.....	42
	References .....	43
<b>CHAPTER 3</b>	<b>Biogenesis of small RNA: Molecular pathways and regulatory mechanisms .....</b>	<b>49</b>
	Lionel Morgado	
	DNA-dependent RNA polymerase.....	49
	RNA-dependent RNA polymerase.....	50
	Dicer.....	50
	Argonaute proteins in plants .....	50
	AGO1 .....	52
	AGO10 .....	52
	AGO5 .....	52



siRNA-mediated abiotic stress tolerance in plants.....	525
MicroRNA-mediated abiotic stress tolerance in plants .....	528
Conclusion .....	532
References.....	534

## SECTION 4 Future scope

### CHAPTER 24 Challenges of small RNA technology ..... 545

Ravi K. Singh, Annangarachari Krishnamachari,  
Murali Sharaff

Small RNAs in plants: An expanding world .....	545
RNA interference: Basis of small RNA technology .....	547
Small RNA technology: Enormous potential.....	548
Disease resistance .....	548
Metabolic engineering.....	549
Abiotic stress.....	550
Male sterility .....	550
Small RNA technology: Its challenges and pitfalls .....	551
Off-target effects .....	551
Stability of transgene .....	552
Persistence of double-stranded RNAs (dsRNAs).....	553
Food risk assessment of genetically modified (GM) plants .....	554
Biosafety evaluation of genetically modified (GM) plants .....	554
Future prospects.....	555
Bioinformatics approaches to achieve better gene silencing .....	556
Spray-induced gene silencing .....	557
CRISPR/Cas9: A platform for editing plant genomes .....	558
Conclusions.....	559
References.....	559

### CHAPTER 25 Future scope of small RNA technology in crop science..... 567

Christina Mohr, Hieu Xuan Cao, Klaus Humbeck

Introduction.....	567
Overview of diverse small RNA pathways in plants.....	568
Perspectives on small RNA sequencing and trafficking .....	569
Developments and challenges of sRNA-mediated gene silencing for crop improvement .....	571

# Challenges of small RNA technology

# 24

Ravi K. Singh<sup>a,\*</sup>, Annangarachari Krishnamachari<sup>b</sup>, Murali Sharaff<sup>c</sup>

<sup>a</sup>*Department of Plant Biology, Uppsala BioCenter, Linnean Center for Plant Biology, Swedish University of Agricultural Sciences, Uppsala, Sweden*

<sup>b</sup>*School of Computational and Integrative Sciences, Jawaharlal Nehru University, New Delhi, India*

<sup>c</sup>*Department of Biological Sciences, P.D. Patel Institute of Applied Sciences, Charotar University of Science and Technology, Changa, India*

<sup>\*</sup>*Current address: Bioinformatics and Genomics Laboratory, University Department of Botany, Magadh University, Bodh Gaya, India*

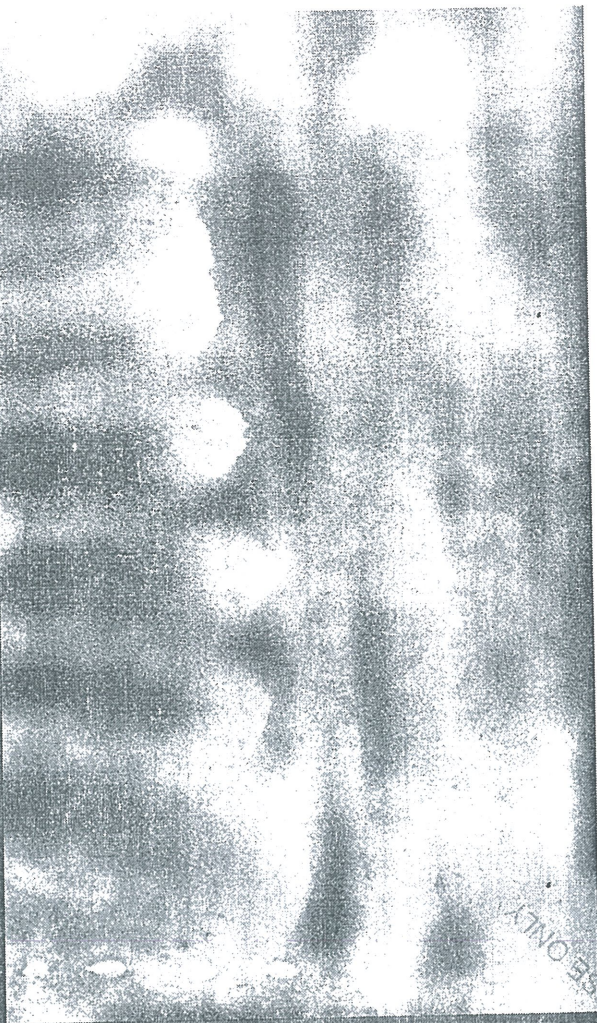
## Small RNAs in plants: An expanding world

Small RNAs are the ubiquitous components of cellular transcriptomes. Most of these small RNAs are non-coding, regulatory RNAs that range from ~17 to 33 nucleotides in length in eukaryotes [1, 2]. Non-coding small RNAs play essential roles in complex biological processes across the tree of life. These non-coding small RNAs have emerged as critical regulators of important genomic functions, such as transcription, translation, chromatin structure modifications, etc. [3, 4]. Here, small RNAs act to guide the effector protein, Argonaute (AGO), to target gene sequence, such as mRNA, via base-pairing interactions [5].

Plant genomes encode a plethora of small RNAs. The diversity in small RNAs and its abundance varies among plant species [3, 6]. High-throughput sequencing technologies further enabled the expansion and diversity in small RNAs population, with the discovery of novel small RNA species in various cells and tissues at different stages of development, and in response to various stress conditions [2, 7]. Based on their mode of biogenesis, plant small RNAs are broadly classified into microRNAs (miRNAs) and small interfering RNAs (siRNAs) [1, 8]. miRNAs are synthesized from their respective genes, whereas siRNAs may come from different sources such as aberrant transcripts, trans-acting silencing genes, overlapping genes, or heterochromatin, and are therefore further classified into different types such as trans-acting siRNAs (ta-siRNAs), natural antisense RNAs (nat-siRNAs), and heterochromatic siRNAs (hc-siRNAs), respectively. The miRNAs are transcribed as a primary transcript (pri-miRNA) in an RNA pol-II-dependent manner in the nucleus.



This book focus upon AFM working principle, its different modes (i.e., contact, non-contact and tapping modes), analysis of some AFM result and few applications also. this book also underline the features of AFM as high versatile and useful morphological tool to scan a large variety of surfaces, with a planar resolution ranging from nano-meter scale down to atomic scale. We hope this book may helpful to researcher and student to understand the basic concept of AFM as well as performing with it for different kind of samples.

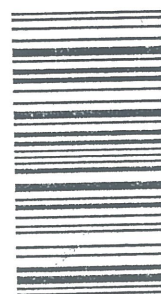


Dr. Vanarajsinh Solanki  
Dr. Abhay Dasadiya  
Dr. Pramita Mishra

Dr. Vanaraj Solanki had earned his master(M.Sc) in physics (2008) from S. P. University, VVNagar, and Ph.D from Institute of Physics, Bhubaneswar, India. He has also worked at Materials Research Centre, Indian Institute of Science, Bangalore, during his postdoc. Presently, Dr. Solanki is working as a Research Scientist at, KRADLE, CHARUSAT, Changa.



# Atomic Force Microscopy Fundamentals and Applications



978-620-0-24724-7



**LAP LAMBERT**  
Academic Publishing

3.4.6. (157)  
19-20



Dr. Vanarajsinh Solanki  
Dr. Abhay Dasadiya  
Dr. Pramita Mishra

# Atomic Force Microscopy Fundamentals and Applications

FOR AUTHOR USE ONLY

LAP LAMBERT Academic Publishing

**Imprint**

Any brand names and product names mentioned in this book are subject to trademark, brand or patent protection and are trademarks or registered trademarks of their respective holders. The use of brand names, product names, common names, trade names, product descriptions etc. even without a particular marking in this work is in no way to be construed to mean that such names may be regarded as unrestricted in respect of trademark and brand protection legislation and could thus be used by anyone.

Cover image: [www.ingimage.com](http://www.ingimage.com)

**Publisher:**

LAP LAMBERT Academic Publishing

is a trademark of

International Book Market Service Ltd., member of OmniScriptum Publishing Group

17 Meldrum Street, Beau Bassin 71504, Mauritius

Printed at: see last page

ISBN: 978-620-0-24724-7

Copyright © Dr. Vanarajsinh Solanki, Dr. Abhay Dasadiya, Dr. Pramita Mishra  
Copyright © 2019 International Book Market Service Ltd., member of  
OmniScriptum Publishing Group

FOR AUTHOR USE ONLY

## Table of Contents

1. Introduction .....	3
2.AFM Working .....	7
3. Non-Contact Mode AFM .....	13
4.Contact Mode AFM .....	17
5.Tapping Mode AFM .....	21
6. AFM analysis and applications .....	25
References .....	45
Abbreviations .....	51

FOR AUTHOR USE ONLY

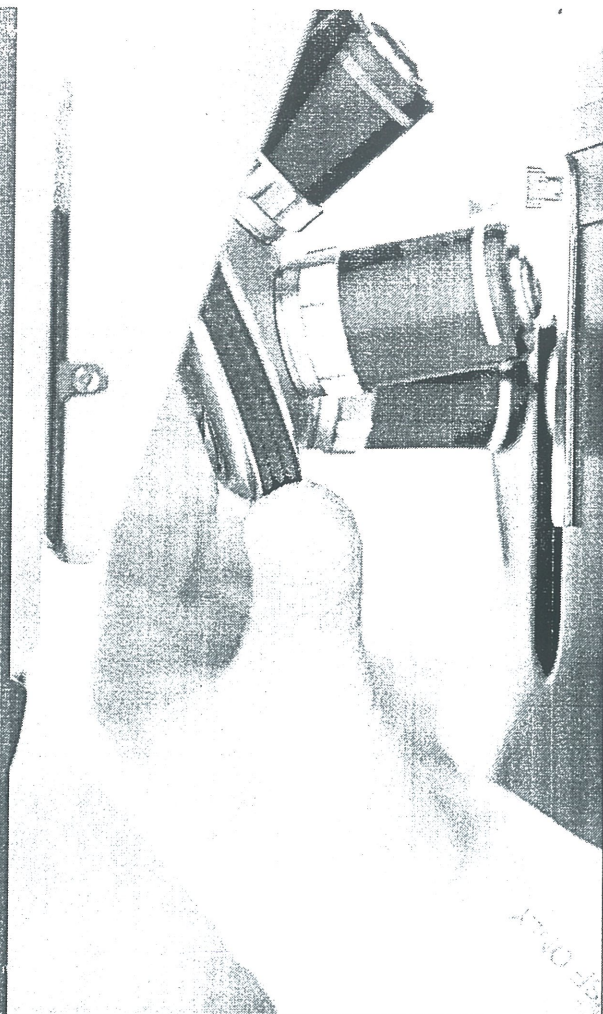
## 1. INTRODUCTION

In recent years, nanostructured materials have gained immense attention of the researchers as they exhibit a variety of fascinating and useful properties with many technological implications [1-4]. With frontier research in many areas getting guided by nano-dimensional science and technology, their fundamental understanding and application regimes demand the immense attention that this field is receiving. For nano-scale (~1-100 nm) objects the larger active surface area and modified properties, which differ significantly from their bulk, control many aspects of their behaviour [1, 2]. Consequently, their characterization roots gain high significance [1-6], in addition to their. The goal is to provide good control on understanding the nanostructures structurally, morphologically, electronically etc. Amongst different analyzing tools, Atomic Force Microscope (AFM), type of scanning probe microscope (SPM), is a powerful technique to investigate the materials morphologically at nanometer scale [5].

Microscopy is the most important and widely used instrument for morphological characterization in different fields that includes material science, bio-logical research etc. [5-6]. An Optical microscope, based on the transmission of light supported by different glasses and lenses based system, has been greatly used for the investigations of morphological properties at micrometer scale. In the last century, the great effort of various researchers and engineers have promoted to the development of scanning and transmission electron microscopy (SEM and TEM) which are based on interaction mechanisms of electrons with the matter. These systems are capable to resolve the nanostructure, thus provide the further morpho-structural details at sub-micrometric and nanometric scale [7].



This book focus on different material characterization tools focusing on morphology/topology and structural properties of the materials. In the chapter related to morphological characterization tools the book mainly discussed Transmission Electron Microscope (TEM), Scanning Electron Microscope (SEM), and Atomic Force Microscope (AFM) whereas structural characterization chapter includes the details of X-ray Diffractometer (XRD), Neutron diffraction, Raman Microscope, Selected Area Electron Diffraction (SAED). Here, we have tried our best to explain each detail of the experimental techniques which will be very helpful to new learners.



Dr. Vanaraj Solanki had earned his masters in physics (2008) from S. P. University, VVNagar, and Ph.D from Institute of Physics, Bhubaneswar, India. He has also worked at Materials Research Centre, Indian Institute of Science, Bangalore, during his postdoc. Presently, Dr. Solanki is working as a research Scientist at, KRADLE, CHARUSAT, Changa.

Dr. Vanarajsinh Solanki  
Dr. Abhay Dasadia  
Dr. Pramita Mishra

# Experimental Techniques for Material Characterization- Part-1



978-620-0-25440-5



LAP LAMBERT  
Academic Publishing

3. 4. 6 (2)  
(19-20)



**Imprint**

Any brand names and product names mentioned in this book are subject to trademark, brand or patent protection and are trademarks or registered trademarks of their respective holders. The use of brand names, product names, common names, trade names, product descriptions etc. even without a particular marking in this work is in no way to be construed to mean that such names may be regarded as unrestricted in respect of trademark and brand protection legislation and could thus be used by anyone.

Cover image: [www.ingimage.com](http://www.ingimage.com)

**Publisher:**

LAP LAMBERT Academic Publishing

is a trademark of

International Book Market Service Ltd., member of OmniScriptum Publishing Group

17 Meldrum Street, Beau Bassin 71504, Mauritius

Printed at: see last page

ISBN: 978-620-0-25440-5

Copyright © Dr. Vanarajsinh Solanki, Dr. Abhay Dasadia, Dr. Pramita Mishra  
Copyright © 2019 International Book Market Service Ltd., member of  
OmniScriptum Publishing Group

FOR AUTHOR USE ONLY

## Table of Contents

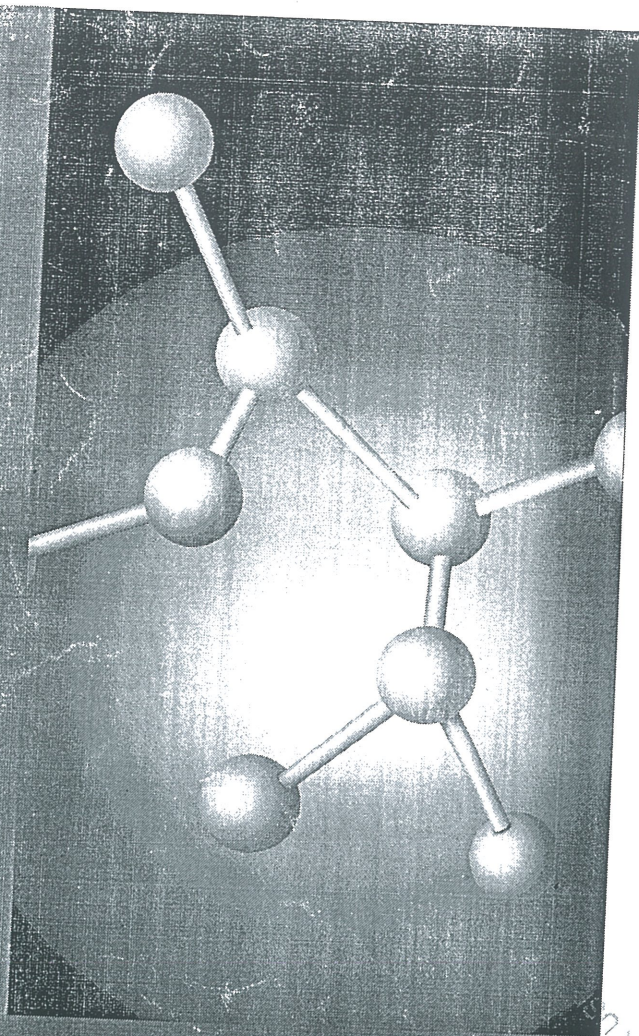
1. Introduction .....	3
2. Morphological Characterization, Tools.....	8
3. Structural Characterization Tools Morphology .....	28
References .....	44
Abbreviations .....	48

FOR AUTHOR USE ONLY



4.4.8

The X-ray diffraction is a useful tool for research work and different types of analysis like powder analysis, texture analysis, stress analysis, single crystal analysis, high-resolution analysis. All of these studies are under nondestructive testing. This book emphasizes on structure determination techniques of transition metal chalcogenides using x-rays diffraction. Work presented in book mainly describes the use of Powder X-ray Diffraction (PXRD) and single crystal diffraction calculations for the determination of crystal structure for transition metal chalcogenides.



Abhay Dasadia  
Vanaraj Solanki  
Brinda Nariya

# Structure Determination of Transition Metal Chalcogenides

FOR AUTHOR USE

Dr. Abhay Dasadia did M.Sc. (Solid State Physics) in 2008, M.Phil in 2009 an Ph.D (Crystal Growth) in 2013 from Department Of Physics, S.P.University, Vallabh Vidyanagar, Gujarat, India. Presently, he is Assistant Professor of Physics at A.D.Patel.Institute of Technology, New Vallabh Vidyanagar, Gujarat, India.



978-620-0-26714-6

LAP  
**LAMBERT**  
Academic Publishing

3.6.6  
(19-21)  
17



LAP LAMBERT Academic Publishing

FOR AUTHOR USE ONLY

# Structure Determination of Transition Metal Chalcogenides

Abhay Dasadia  
Vanaraj Solanki  
Brinda Nariya



#### Imprint

Any brand names and product names mentioned in this book are subject to trademark, brand or patent protection and are trademarks or registered trademarks of their respective holders. The use of brand names, product names, common names, trade names, product descriptions etc. even without a particular marking in this work is in no way to be construed to mean that such names may be regarded as unrestricted in respect of trademark and brand protection legislation and could thus be used by anyone.

Cover image: [www.ingimage.com](http://www.ingimage.com)

Publisher:

LAP LAMBERT Academic Publishing

is a trademark of

International Book Market Service Ltd., member of OmniScriptum Publishing Group

17 Meldrum Street, Beau Bassin 71504, Mauritius

Printed at: see last page

ISBN: 978-620-0-26714-6

Zugl. / Approved by: Vallabh Vidyanagar, Sardar Patel University, 2009

Copyright © Abhay Dasadia, Vanaraj Solanki, Brinda Nariya

Copyright © 2019 International Book Market Service Ltd., member of OmniScriptum Publishing Group

FOR AUTHOR USE ONLY

## CONTENTS

	Page no.
ACKNOWLEDGEMENTS	1
PREFACE	3
<b>CHAPTER 1</b>	
<b>INFORMATION ABOUT TRANSITION METAL CHALCOGENIDE</b>	7
1.1 INTRODUCTION	8
1.2 ELEMENTAL INFORMATION	9
1.3 APPLICATION OF TRANSITION METAL TRICHALCOGENIDES	12
1.4 OCCURRENCE AND SYNTHESIS	13
1.5 EXISTING INFORMATION ABOUT TRANSITION METAL CHALCOGENIDE CRYSTALS	14
1.6 USES	17
REFERENCES	19
<b>CHAPTER 2</b>	
<b>GROWTH OF TRANSITION METAL CHALCOGENIDE</b>	23
2.1 HISTORICAL INTRODUCTION OF CRYSTAL GROWTH	24
2.2 DIFFERENT METHODS OF CRYSTAL GROWTH	25
2.3 VAPOUR TRANSPORT TECHNIQUE	25
2.3.1 Chemical vapour transport (CVT) technique	26
2.3.2 Direct vapour transport (DVT) technique	29
2.4 CRYSTAL GROWTH	30
2.4.1 Growth furnace	30
2.4.2 Ampoule	31
2.4.3 Crystal growth by chemical vapour transport technique	32
2.5 CONCLUSION	33
REFERENCES	34
<b>CHAPTER 3</b>	
<b>X-RAY DIFFRACTION STUDY OF TRANSITION METAL CHALCOGENIDES</b>	36
3.1 INTRODUCTION	37
3.2 Principle of X-Ray generation	37
3.2.1 Instrumentation	38

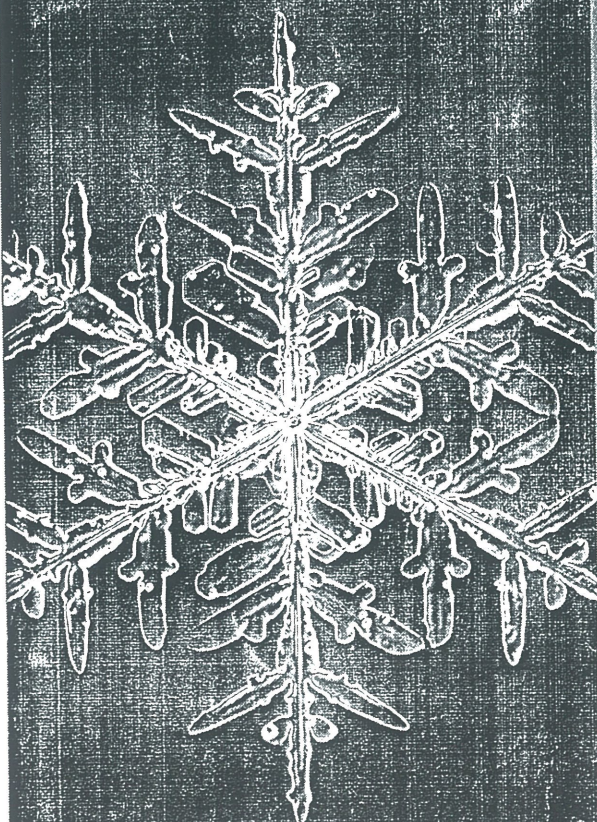
3.3 X-RAY POWDER DIFFRACTION	39
3.3.1 Experimental	39
3.3.2 X-ray diffractogram	41
3.3.3 Particle size determination	43
3.4 SINGLE X-RAY DIFFRACTION	44
3.4.1 Details of X-ray data collection and refinement of ZrSTe	45
3.4.2 Structure description and discussion of ZrSTe	49
3.5 CONCLUSION	51
REFERENCES	52

FOR AUTHOR USE ONLY



The book gives the in depth understanding of crystal growth of transition metal trichalcogenide crystals by vapor transport method. Book also summarize the analytical techniques for the determination of some structural, optical and electrical properties of crystals. It also gives brief concept of high pressure study on electrical resistivity measurements of the transition metal trichalcogenide crystals.

Crystal growth and Characterizations



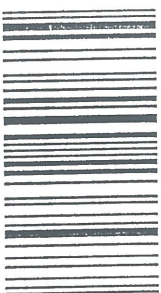
Abhay Dasadia  
Vanraj Solanki

# Growth and characterizations of transition metal trichalcogenides

Crystal growth by vapor transport and some analytical techniques for transition metal chalcogenides



Dr. Abhay Dasadia did M.Sc. (Solid State Physics) in 2008, M.Phil in 2009 an Ph.D (Crystal Growth) in 2013 from Department Of Physics, S.P. University, Vallabh Vidyanagar, Gujarat, India. Presently, he is Assistant Professor of Physics at A.D.Patel Institute of Technology, New Vallabh Vidyanagar, Gujarat, India.



978-620-0-23747-7

Dasadia, Solanki

LAP  
LAMBERT  
Academic Publishing

119-20

34.6 (122)



Abhay Dasadia  
Vanraj Solanki

# **Growth and characterizations of transition metal trichalcogenides**

**Crystal growth by vapor transport and some  
analytical techniques for transition metal  
chalcogenides**

FOR AUTHOR USE ONLY

**LAP LAMBERT Academic Publishing**



### **Imprint**

Any brand names and product names mentioned in this book are subject to trademark, brand or patent protection and are trademarks or registered trademarks of their respective holders. The use of brand names, product names, common names, trade names, product descriptions etc. even without a particular marking in this work is in no way to be construed to mean that such names may be regarded as unrestricted in respect of trademark and brand protection legislation and could thus be used by anyone.

Cover image: [www.ingimage.com](http://www.ingimage.com)

### **Publisher:**

LAP LAMBERT Academic Publishing

is a trademark of

International Book Market Service Ltd., member of OmniScriptum Publishing Group

17 Meldrum Street, Beau Bassin 71504, Mauritius

Printed at: see last page

ISBN: 978-620-0-23747-7

Copyright © Abhay Dasadia, Vanraj Solanki

Copyright © 2019 International Book Market Service Ltd., member of OmniScriptum Publishing Group

FOR AUTHOR USE ONLY

# CONTENTS

	Page no.
ACKNOWLEDGEMENTS	1
PREFACE	3
<b>CHAPTER 1</b>	
<b>INFORMATION ABOUT TRANSITION METAL TRICHALCOGENIDE SINGLE CRYSTALS</b>	<b>7</b>
1.1 INTRODUCTION	8
1.2 ELEMENTAL INFORMATION	9
1.2.1 Zirconium (Zr)	10
1.2.2 Selenium (Se)	11
1.2.3 Sulphur (S)	12
1.3 APPLICATION OF TRANSITION METAL TRICHALCOGENIDES	13
1.4 OCCURRENCE AND SYNTHESIS	14
1.5 EXISTING INFORMATION ABOUT $ZrX_3$ (X=S, Se) CRYSTALS	15
1.5.1 Structural properties	15
1.6 PHYSICAL PROPERTIES	17
REFERENCES	19
<b>CHAPTER 2</b>	
<b>VAPOR TRANSPORT GROWTH OF TRANSITION METAL TRICHALCOGENIDE SINGLE CRSTALS</b>	<b>23</b>
2.1 INTRODUCTION	24
2.2 DIFFERENT METHODS OF CRYSTAL GROWTH	25
2.2.1 Solution growth technique	25
2.2.2 Flux growth technique	25
2.2.3 Melt growth	25
2.2.4 Vapour transport technique	26
2.2.4.1 Direct vapour transport (DVT) technique	27
2.2.4.2 Chemical vapor transport (CVT) technique	27
2.3 EXPERIMENTAL SET UP	29
2.3.1 Dual zone horizontal furnace	29
2.3.2 Cleaning of ampoule	31
2.3.3 Sealing of ampoule	31
2.4 GROWTH OF $ZrX_3$ (X=S, Se) SINGLE CRYSTALS	32
2.4.1 Charge preparation	32
2.4.2 Crystal growth	32
2.5 CONCLUSION	34
REFERENCES	35

<b>CHAPTER 3</b>	
<b>POWDER X-RAY DIFFRACTION OF TRANSITION METAL TRICALCOGENIDE CRYSTALS</b>	<b>37</b>
3.1 INTRODUCTION	38
3.2 ENERGY DISPERSIVE ANALYSIS OF X-RAYS (EDAX)	38
3.2.1 Experimental	38
3.2.2 EDAX of $ZrX_3$ (X=S, Se) single crystals	40
3.3 X-RAY POWDER DIFFRACTION (XRD)	42
3.3.1 Experimental	42
3.3.2 X-ray diffractogram	44
3.3.3 Particle size determination	46
3.4 MICROSTRUCTURAL ANALYSIS	48
3.4.1 Experimental	48
3.4.2 Surface microstructure	51
3.5 CONCLUSION	53
REFERENCES	55
<b>CHAPTER 4</b>	
<b>HIGH PRESSURE STUDY SINGLE TRANSITION METAL TRICALCOGENIDE CRYSTALS</b>	<b>56</b>
4.1 INTRODUCTION	57
4.2 METHOD FOR GENERATING STATIC PRESSURE	59
4.2.1 Piston cylinder devices	59
4.2.2 Hydraulic press	60
4.3 RESISTANCE MEASUREMENT USING BRIDGMAN ANVIL CELL	65
4.4 RESULTS AND DISCUSSION	66
4.5 CONCLUSION	67
REFERENCES	68
<b>CHAPTER 5</b>	
<b>TEMPERATURE DEPENDENT TRANSPORT PROPERTIES MEASUREMENTS</b>	<b>69</b>
5.1 INTRODUCTION	70
5.2 RESISTIVITY MEASUREMENTS	70
5.2.1 Resistivity measurements along chain axis	71
5.3 MEASUREMENTS OF HALL PARAMETERS	74
5.3.1 Van der Pauw technique	74
5.4 THERMOELECTRIC POWER MEASUREMENTS	76
5.4.1 Hot probe method	77
5.5 CONCLUSION	83
REFERENCES	84

## 1.1 INTRODUCTION

Among the many semiconducting material investigated for photovoltaic solar-cell applications, e.g. Si, CdS, CdTe, CuInSe<sub>2</sub>, [1-2] and GaInP/GaAs/Ge for tandem cells, [3] transition-metal dichalcogenide TMDC materials have attracted a remarkable degree of attention due to their comprehensive potential properties. They are cheap and abundant, available in both n- and p-type forms, have energy-band gaps well suited to solar energy conversion, a high absorption coefficient in the visible range, the tendency to grow a thin films, and they are nontoxic materials. These superior properties qualify them as potential candidates for photovoltaic applications. Zirconium dichalcogenides showed the possibility to be used in solid state solar cell technology and devices; they also exhibit some interesting switching and memory effects [4]. For the reported chalcogenides, almost all main group metals cooperate with the element of group 16 (S, Se, Te) and alkali, alkaline-earth metals or rare-earth elements to form multinary chalcogenides [5].

The compounds of these materials have the common formula MX<sub>2</sub> where M is a transition metal of groups IVb, Vb, VIb and X is one of the chalcogens S, Se or Te. The most striking feature of these compounds is that they crystallize in quasi-two-dimensional structure consisting of a sheet of metal atoms sandwiched between two sheets of chalcogens forming X-M-X layers with strong mixed covalent ionic intra-layer bonding while the inter-layer bonding is one of the relatively weak van der Waals type. This two-dimensional bonding behavior is responsible for the marked anisotropy in a number of their physical properties. Several studies on the structure [6] optical [7-8] and electronic properties [9-11] have been performed for these layer-type structure compounds.

Extending this project to the ternary systems, we have grown needles of new ternary transition metal chalcogenides phase of ZrSTe. To the best of our knowledge, no structural report is available on ZrSTe single crystal. Here we are reporting single crystal X-ray diffraction data of ZrSTe. Structure shows twisted two dimensional zigzag chain of Zr-Te parallel to c-axis. Earlier author has already reported growth and electrical properties of ZrSTe [12].

The trichalcogenides of the group IV-B transition metals form an interesting class of isostructural chain compounds, which crystallize with the ZrX<sub>3</sub> type structure [13-14]. The comparatively low symmetry and their large number of crystallographically different atoms contained in the primitive cell, lead to 21 k=0, non degenerate, optical phonons transforming as the irreducible representations of the C<sub>2h</sub><sup>2</sup> point group. These long wave length vibrational states of the binary compounds and their ternary derivatives have been extensively investigated by means of Raman and infrared spectroscopic method [15-18]. Different models [19] for representation of the inter atomic forces have been proposed on account of the experimental data and to estimate the degree of inter chain coupling in these compounds. Transition-metal trichalcogenides of the ZrS<sub>3</sub>

## **Chapter-1**

---

### **Information about Transition Metal**

### **Chalcogenide crystals**

FOR AUTHOR USE ONLY



<b>CHAPTER 6</b>	<b>86</b>
<b>UV-Vis-NIR SPECTROSCOPY OF TRANSITION METAL TRICHALCOGENIDES</b>	
6.1 INTRODUCTION	87
6.2 OPTICAL ANALYSIS	87
6.2.1 Fundamental absorption	89
6.2.2 Direct and indirect transitions	89
6.2.2.1 Direct transition	89
6.2.2.2 Indirect transition	91
6.3 OPTICAL BAND GAP DETERMINATION	92
6.4 EXPERIMENTAL	93
6.4.1 UV-VIS-NIR spectrophotometer	94
6.5 RESULTS AND DISCUSSION	96
6.6 CONCLUSION	99
REFERENCES	100

FOR AUTHOR USE ONLY

## **Chapter-1**

---

### **Information about transition metal trichalcogenide Single crystals**

FOR AUTHOR USE ONLY

## 1.1 INTRODUCTION

The most striking feature of these compounds is their structure, that can be classified into three type, depending on the number of different  $\text{MX}_3$  chains present in the unit cells. Recently, the transition metal trichalcogenides of group IVB, VB and VIB have received much more attention because of the considerable diversity in their physical properties [1].

The electronic structure of these compounds is of considerable interest both from the experimental and theoretical points of view. They possess a pseudo one-dimensional structure, where there is an infinite chain of trigonal prismatic ( $\text{MX}_6$ ) units, extending parallel to the b-axis and share upper and lower faces. The chains with strong ionic covalent (or metallic) bonding are separated by a relatively large distance and bonding among such chains is weak. Thus a and c planes perpendicular to the chain axis in  $\text{MX}_3$  crystals are more compressive than others. In addition, the chain type structure, in  $\text{MX}_3$  results in the formation of intercalation compounds. These compounds also exhibit superconductivity and charge density wave phenomena. Transition metal trichalcogenides,  $\text{MX}_3$ , (M is a transition metal of group IVB, VB and VIB where X is a chalcogen) constitute structurally and chemically well defined family of compounds. These trichalcogenides are thin fibrous ribbons and offer several interesting phenomena originating from their strong anisotropy.

The chemical bonding processes in transition metal trichalcogenides are of interest because, as opposed to the dichalcogenides, they may involve either single chalcogen atoms or paired-chalcogen legends. Layered transition metal dichalcogenides have been studied in past years [1-2] but few data are available for transition metal trichalcogenides. This is due to the difficulty of growing large size and good quality crystals of the  $\text{MX}_3$  compounds.

The comparatively low symmetry and their large number of crystallographically different atoms contained in the primitive cell, lead to 21  $k=0$ ,

# VACUUM TECHNOLOGY FUNDAMENTALS FOR BEGINNERS



This book mainly focusing on basic of vacuum technology. We have discussed preliminary definitions that are useful for students to understand the basic of vacuum. In addition, book describing the detailed working of few selective vacuum pumps and gauges which are commonly used in most of the scientific instruments. First chapter of the book is mainly about definitions used in the subject whereas second chapter is about process to create vacuum, details of different pumps and their working. Third chapter of the book focus on ways of measuring order of vacuum with the help of different vacuum gauges. Finally, we have summarize the book in last chapter. We believe this basic book will be helpful to those students who are in their initial stage of vacuum learning.

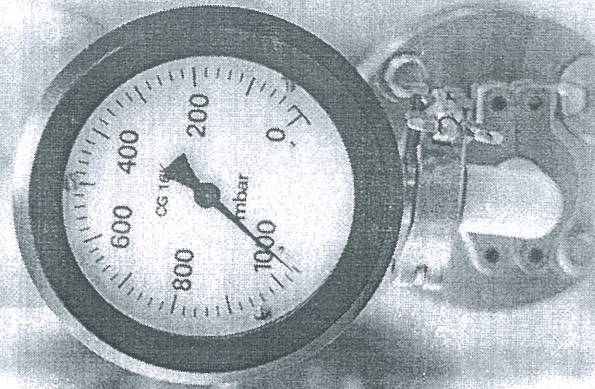
VACUUM TECHNOLOGY FUNDAMENTALS FOR BEGINNERS

VANARAJ SOLANKI, PRAMITA MISHRA, RUCHITA PATEL



EDUCATION  
PUBLISHING  
www.education.in

# VACUUM TECHNOLOGY FUNDAMENTALS FOR BEGINNERS



VANARAJ SOLANKI  
PRAMITA MISHRA, RUCHITA PATEL

3-4-6  
(19-20)  
(19)  
(20)

## **EDUCREATION PUBLISHING**

RZ 94, Sector - 6, Dwarka, New Delhi - 110075  
Shubham Vihar, Mangla, Bilaspur, Chhattisgarh - 495001

**Website:** [www.educreation.in](http://www.educreation.in)

---

© Copyright, 2019, Author

All rights reserved. No part of this book may be reproduced, stored in a retrieval system, or transmitted, in any form by any means, electronic, mechanical, magnetic, optical, chemical, manual, photocopying, recording or otherwise, without the prior written consent of its writer.

**ISBN:** 978-93-5373-146-5

**Price:** Rs.75.00

The opinions/ contents expressed in this book are solely of the author and do not represent the opinions/ standings/ thoughts of Educreation.

Printed in India



## Table of Contents

1. Introduction .....	5
2. Vacuum pumps .....	11
3. Vacuum gauges .....	29
4. Summery .....	41
References .....	42
Abbreviations .....	43

## 1. INTRODUCTION

### What is Vacuum or Ultra high vacuum?

The vacuum means "absence of matter" or "an empty area or space". In other words, space that is essentially empty of matter, such that its gaseous pressure is much less than atmospheric pressure. The word vacuum comes from the Latin term for empty," but in reality, no volume of space can ever be perfectly empty. A perfect vacuum with a gaseous pressure of absolute zero is a philosophical concept that is never observed in practice. Physicists often discuss ideal test results that would occur in a perfect vacuum, which they simply call "vacuum" or "free space" in this context, and use the term partial vacuum to refer to real vacuum.

The quality of a vacuum refers to how closely it approaches a perfect vacuum. The residual gas pressure is the primary indicator of quality, and is most commonly measured in units called torr.

Ultra high vacuum (UHV) is the vacuum regime characterized by the pressures lower than about  $10^{-9}$  mbar( $10^{-9}$  torr). UHV requires the use of special materials in creating the vacuum system, extreme cleanliness to maintain the vacuum system, and baking of the entire system to remove water and other trace gases that adsorb on the surfaces of the chamber. At these low pressures (LP) the mean free path (MFP) of a gas molecule is approximately 40 km, so gas molecules will collide with the chamber walls many times before colliding with each other. Almost all interactions therefore take place on various surfaces in the chamber.

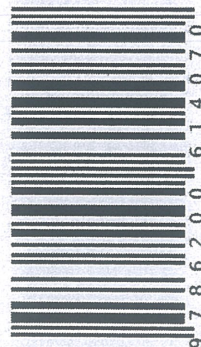
Remedial Mathematics  
in

B. Pharm.

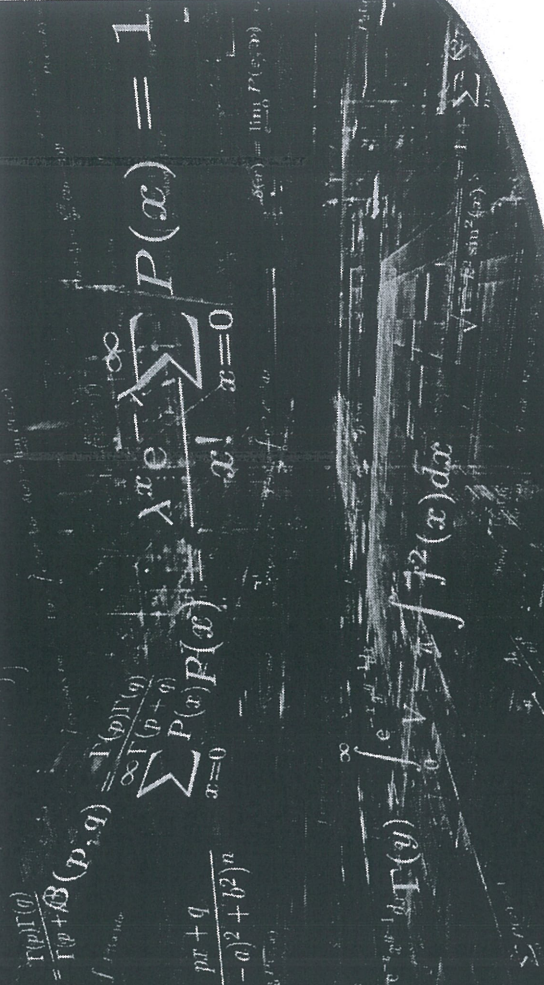
This book gives detail information on some aspects of Remedial Mathematics. The fundamental concepts: Logarithm, Function, Limit, Continuity, Matrices, Determinant, Differentiation, Analytical Geometry, Integration, differential equation, and Laplace transform, that will be beneficial for undergraduate students in Pharmacy. Moreover, this book builds a bridge for Pharmacy students to understand the basics of every mathematical concept. Also, this book will be helpful to researchers in Pharmacy.



Dr. Jimit R. Patel is working as an assistant professor at P. D. Patel Institute of Applied Sciences, Charotar University of Science and Technology since 2017. He has six-year teaching and ten years of research experience. His specialization is in applied mathematics. He published 35 research papers in reputed national and international Journals.



Jimitkumar R. Patel  
Remedial Mathematics  
in  
B. Pharm.





4	Trivedi Kinjal, Upadhyay V Ramesh	NA	Influence of multi- components in a magnetic fluid on tribological properties	Proceedin g tribology society of India	NA	Inter- National	42898	NA	PDPIAS	Tribology society of India
5	C. K. Sumesh, Sanni Kapatel and Arti Chaudhari		An approach for scalable production of Silver (Ag) decorated WS2	AIP						
6	P. C. Vinodkumar, Tanvi Bhavsar, Manan Shah		Spectroscopy and decay properties of $s$ -s mesons using Martin -like confinement potential	Proceedin gs of the DAE-BRNS Symp. on Nucl. Phys.	62nd DAE- BRNS SYMPOSIU M ON NUCLEAR PHYSICS	National	43093	81837208 1-X	PDPIAS	DAE-BRNS
7	Tanvi Bhavsar, Manan Shah, P. C. Vinodkumar		A relativistic quark model for T2cs	Proceedin gs of the DAE-BRNS	BRNS SYMPOSIU M ON	National	43093	81837208 1-X	PDPIAS	DAE-BRNS
8	Manan Shah, Tanvi Bhavsar, P. C. Vinodkumar		S-wave spectroscopy and Hyperfine splitting of Bc meson	Proceedin gs of the DAE-BRNS Symp. on	BRNS SYMPOSIU M ON NUCLEAR	National	43093	81837208 1-X	PDPIAS	DAE-BRNS
9	Tanvi Bhavsar, Manan Shah, P. C. Vinodkumar		Pseudoscalar Charmonia Masses And Its Digamma Decay Width With QCD Correction	AIP	INTERNATI ONAL CONFEREN CE ON CONDENSE D MATTER AND	INTERNAT IONAL	May-18	978-0- 7354-1648- 2	PDPIAS	AIP



Remedial Mathematics  
Bachelor of Pharmacy (Semester - I)

Index

**Chapter 1**

Partial Fraction.....	6
Logarithms	
Functions	
Limits and continuity	

**Chapter 2**

Matrices and Determinant.....	27
-------------------------------	----

**Chapter 3**

Differentiation.....	43
----------------------	----

**Chapter 4**

Analytical Geometry.....	55
--------------------------	----

**Chapter 5**

Differential Equation And Laplace Transform.....	67
--	----



2017-18  
3-4-6

### 3.4.6 Number of books and chapters in edited volumes published per teacher during the last five years (15)

3.4.6.1: Total number of books and chapters in edited volumes / books published, and papers in national/international conference-proceedings year wise during the last five year

Sl. No.	Name of the teacher	Title of the book/chapter published	Title of the paper	Name of the conference	National / International	Year of publication	number of the proceedings	Institute at the time of	Name of the publisher
1	Rekha C. Akhani, Arti T. Patel, Manisha J. Patel, Samir R. Dedania and Darshan H. Patel		Column chromatography free purification of recombinant $\alpha$ -amylase from <i>Bacillus licheniformis</i> by tagging with hydrophobic Elastin Like Polypeptide	Proceedings of National Academy of Science of India Section B					
2	Krunal B. Kachhia, Praveen Agarwal and Jyotindra C. Prajapati	<del>M. Chao X., Agarwal P., Area I. (eds)</del> Advances in Real and Complex Analysis with Applications. Trends in	Certain Image Formulae and Fractional Kinetic Equations Involving Extended Hypergeometric Functions		International	42992	978-981-10-4336-9	PDPIAS	Birkhäuser, Singapore
3	Jain K, Desai C, Madamwar D	Metal-Microbe Interactions and Bioremediation, CRC Press, Taylor & Francis	Bacterial interactions with chromium and strategies for remediation of hexavalent chromium pollution	NA	International	4-7-2017	9.78E+12	PDPIAS	Taylor & Francis Group



## 1

# PARTIAL FRACTION, LOGARITHMS, FUNCTIONS, LIMITS AND CONTINUITY

In, this chapter, we will discuss four fundamental concepts of calculus [1,2], namely: Partial Fraction, Logarithms, Functions and Limits, and Continuity.

## Partial Fraction

We are familiar with the method of Least common multiple (LCM) of denominators of the Fraction to combine the number of fractions into a single. In this section, we will see the converse process from it i.e., separate fractions. The partial Fraction is a converse process that is splitting up of a given fraction into some simpler fractions.

## Polynomial:

An algebraic expression of the form  $f(x) = a_0 + a_1x + a_2x^2 + \dots + a_nx^n$  is called a polynomial in  $x$  with  $a_n \neq 0$ ,  $a_1, a_2, \dots, a_n$  are real numbers and  $x$  is an unknown variable. The highest power of  $x$  in the algebraic expression that exists is called the degree of the polynomial.

Ex: 1.  $f(x) = x^4 + 2x^3 + 3x^2 + 4x + 5$  is a polynomial with degree 4 and  $a_0 = 5, a_1 = 4, a_2 = 3, a_3 = 2, a_4 = 1$

2.  $f(x) = 2x^3 + x + 1$  is a polynomial of degree 3 with  $a_0 = 1, a_1 = 1, a_2 = 0$  and  $a_3 = 2$

## Rational Fraction:

The quotient  $\frac{P(x)}{Q(x)}$  of two polynomials  $P(x)$  and  $Q(x) \neq 0$  is called a rational fraction.

e.g., Consider  $P(x) = x^2 + 1$  and  $Q(x) = x^3 + 2x^2 + 3x + 1$  so  $\frac{P(x)}{Q(x)} = \frac{x^2+1}{x^3+2x^2+3x+1}$

## Proper and Improper Fractions:

- The rational Fraction  $\frac{P(x)}{Q(x)}$  is a proper fraction, if the degree of the numerator  $P(x)$  is less than the degree of the denominator  $Q(x)$ .
- The rational Fraction  $\frac{P(x)}{Q(x)}$  is an improper fraction, if the degree of the numerator  $P(x)$  is greater than or equal to the degree of the denominator  $Q(x)$ .

Ex: 1.  $\frac{P(x)}{Q(x)} = \frac{x+1}{x^2+1}$  (Proper)

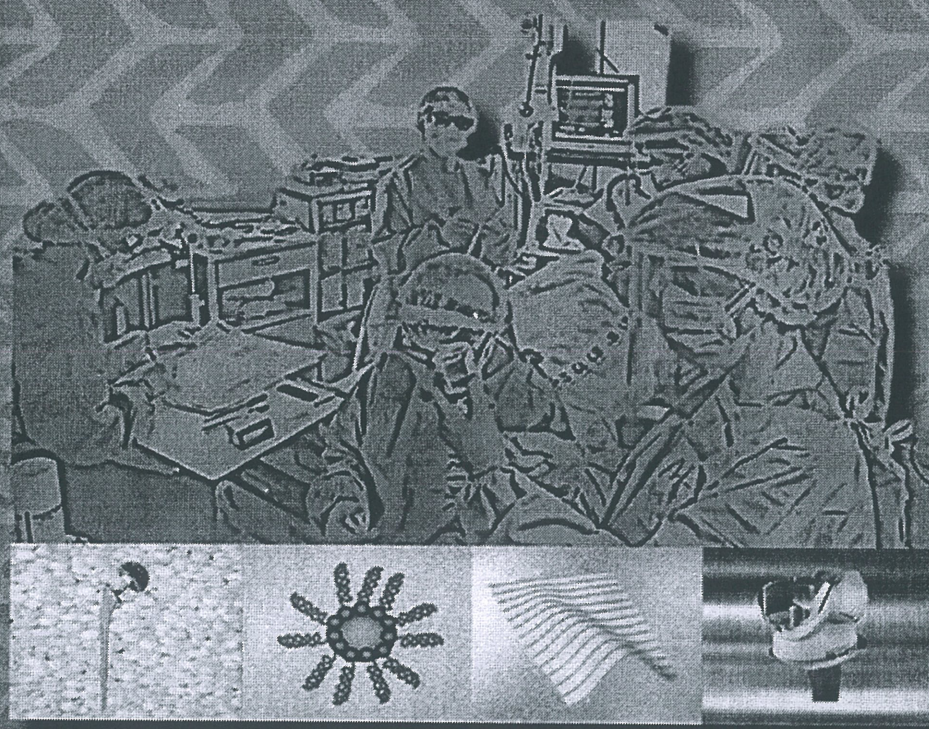
2.  $\frac{P(x)}{Q(x)} = \frac{x^2+1}{x^2+1}$  (Improper)

13	Mitesh Patel, Vaibhav Patel, Tapas Chaudhuri	Book: Preparation and Characterization of PBS/Polymer Nanocomposites		PDPIAS	Lambert Academic publishing	International	2019	ISBN: 978- 620-0- 21841-4	PDPIAS	Lambert Academic publishing
14	Mitesh Patel, Sanjay Panjabi, Vaibhav Patel	Book: Instrumentation Technique used for Nanomaterial Characterization		PDPIAS	Educreation Publishing	International	2019	ISBN: 978- 620-0- 21841-4	PDPIAS	Lambert Academic publishing
15	Mitesh Patel	Book: Preparation and Characterization of Inorganic Polymer Blend Nanocomposites		PDPIAS	Springer Nature Singapore Pte Ltd.	National	2019	ISBN: 978- 93-5373- 156-4	PDPIAS	Educreation Publishing
16	Kunal Jain, Chirayu Desai, Onkar Tiware and Datta Madanwar	Chapter in the Book: Microbial Bioremediation & Biodegradation	the Environment and Biosphere and Their Remediation Constraints (doi:https://doi. org/10.1007/97	PDPIAS	Elsevier	International	#####	978-981- 15-1812-6	PDPIAS	Springer Nature Singapore Pte Ltd.



# Nanohybrids

Future Materials for  
Biomedical Applications



*Gaurav Sharma*  
*Alberto García-Peñas*

MIRIF



### 3.4.6 Number of books and chapters in edited volumes published per teacher during the last five years (15)

3.4.6.1: Total number of books and chapters in edited volumes / books published, and papers in national/international conference-proceedings year wise during the last five year

Sl. No.	Name of the teacher	Title of the book/chapters published	Title of the paper	Title of the proceedings of the conference	Name of the conference	National / International	Year of publication	number of the proceeding	Institute at the time of publication	Name of the publisher
1	Patel K, Goswami D, Dhandhukai P and Thakker JN	Book Chapter in Book : Microbes in action " Industrial Microbiology"	Microbial Carotenoids: Properties, Physicochemical factors for fermentation, Biosynthesis and Applications (Chapter 7)	NA	NA	International	9-1-2016	978-1-63484-520-5	PDPIAS	Nova Science, USA
2	Goswami D, Dhandhukai P and Thakker JN	Book chapter in a Book: Bacilli and Agrobiotechnology	Book chapter entitled Expanding the Horizons for the Use of Paenibacillus Species as PGPR for Sustainable Agriculture	NA	NA	International	#####	978-3-319-44409-3	PDPIAS	Springer
3	Tanvi Bhavsar, Manan Shah, P. C. Vinodkumar	NA	Status of Zc (4050), Y(4140) and Y(4360) states as mixed P wave states of charmonium	Proceedings of the DAE-BRNS Symp. on Nucl. Phys.	61st DAE-BRNS SYMPOSIUM ON NUCLEAR PHYSICS	National	12-9-2016	818372079-X	PDPIAS	DAE-BRNS
4	P. C. Vinodkumar, Manan Shah, Tanvi Bhavsar, Bhavin Patel	NA	Mass spectra of Charmonia using Martin-like potential in a Relativistic Dirac formalism	Proceedings of the DAE-BRNS Symp. on Nucl. Phys.	61st DAE-BRNS SYMPOSIUM ON NUCLEAR PHYSICS	National	42626	818372079-X	PDPIAS	DAE-BRNS

2016-17  
3.4.6



# Table of Contents

## *Preface*

### **Hybrid Magneto-Plasmonic Nanoparticles in Biomedicine: Fundamentals, Synthesis and Applications**

J.G. Ovejero, P. Herrasti ..... 1

### **Biomaterials for Cell Regeneration**

A. Saravanan, P. Senthil Kumar, R.V. Hemavathy, S. Jeevanantham ..... 55

### **Biosensors Based on Graphene**

Shalini Muniandy, Chin Wei Lai, Thiruchelvi Pulingam, Bey Fen Leo ..... 69

### **Hybrid Materials based on Silica Nanostructures for Biomedical Scaffolds (Bone Regeneration) and Drug Delivery**

Mojdeh Rahnama Ghahfarokhi, Jhaleh Amirian ..... 103

### **Nanohybrids for Wound Healing Application**

A. Saravanan, P. Senthil Kumar, R. Jayasree, S. Jeevanantham ..... 121

### **Bioresorbable Metals for Cardiovascular and Fracture Repair Implants**

S.C. Cifuentes, V. San-Miguel, Y. Wang, A. García-Peñas ..... 134

### **Application of Biopolymeric Electrospun Nanofibers in Biological Science**

Mehdihasan I. Shekh, Jhaleh Amirian, Gisyah Abdi, Diji M. Patel, Bing Du ..... 156

### **Development of Hybrid Materials Based on Polymers for Biomedical Applications: A Short Introduction**

A. García-Peñas, S.C. Cifuentes, Y. Wang, V. San-Miguel ..... 202

### **Role of Liposomes Composite as Drug Transport Mechanism**

P. Senthil Kumar, P.R. Yaashikaa ..... 230

### **Gelatin Based Hydrogels for Tissue Engineering and Drug Delivery Applications**

Jhaleh Amirian, Gisyah Abdi, Mehdihasan I. Shekh, Ehsan Amel Zendehdel, Bing Du, Florian J. Stadler ..... 244

## *Keyword Index*

## *About the Editors*



9	Bhoomika Pandya, ,Manan Shah, P. C. Vinodkumar		Charmonia within an instanton potential		DAE International Symposium on Nuclear Physics	<a href="https://www.s&lt;br/&gt;copus.com/so&lt;br/&gt;urceid/12489">https://www.s copus.com/so urceid/12489</a>				PDPIAS	
10	Tanvi Bhavsar, Manan Shah, P. C. Vinodkumar		A relativistic approach for triply heavy avour baryon		DAE International Symposium on Nuclear Physics					PDPIAS	
11	Manan Shah, Tanvi Bhavsar, P. C. Vinodkumar		Doubly heavy baryon in the relativistic quark model		DAE International Symposium on Nuclear Physics	<a href="https://www.s&lt;br/&gt;copus.com/so&lt;br/&gt;urceid/17800">https://www.s copus.com/so urceid/17800</a>				PDPIAS	
12	Anamika Jha and Sanjay Jha		Isolation and Characterization of Rhizosphere- Competent Indigenous Phosphate- Solubilizing Bacteria for Biofertilizer Applications	International journal of plant biotechnolog y	Women in Science & Technology: Creating Sustainable Career”	<a href="https://www.s&lt;br/&gt;copus.com/so&lt;br/&gt;urceid/28526">https://www.s copus.com/so urceid/28526</a>	2018	2456-0162		PDPIAS	journals Pub



## Chapter 7

# Application of Biopolymeric Electrospun Nanofibers in Biological Science

Mehdihasan I. Shekh<sup>1,2\*</sup>, Jhaleh Amirian<sup>1,2</sup>, Gisy Abd<sup>3</sup>, Dijit M. Patel<sup>4</sup>, Bing Du<sup>1</sup>

<sup>1</sup>College of Materials Science and Engineering, Shenzhen Key Laboratory of Polymer Science and Technology, Guangdong Research Center for Interfacial Engineering of Functional Materials, Nanshan District Key Lab for Biopolymers and Safety Evaluation, Shenzhen University, Shenzhen 518055, PR China

<sup>2</sup>Key Laboratory of Optoelectronic Devices and Systems of Ministry of Education and Guangdong Province, College of Optoelectronic Engineering, Shenzhen University, Shenzhen 518060, PR China

<sup>3</sup>Center of new technologies, University of Warsaw, ul. Banacha 2c, 02-097 Warsaw, Poland

<sup>4</sup>Department of Advanced Organic Chemistry, P. D. Patel Institute of Applied Sciences, Charotar University of Science and Technology, Changa 388421, Gujarat, India

mehdi.shekh3@yahoo.com\*

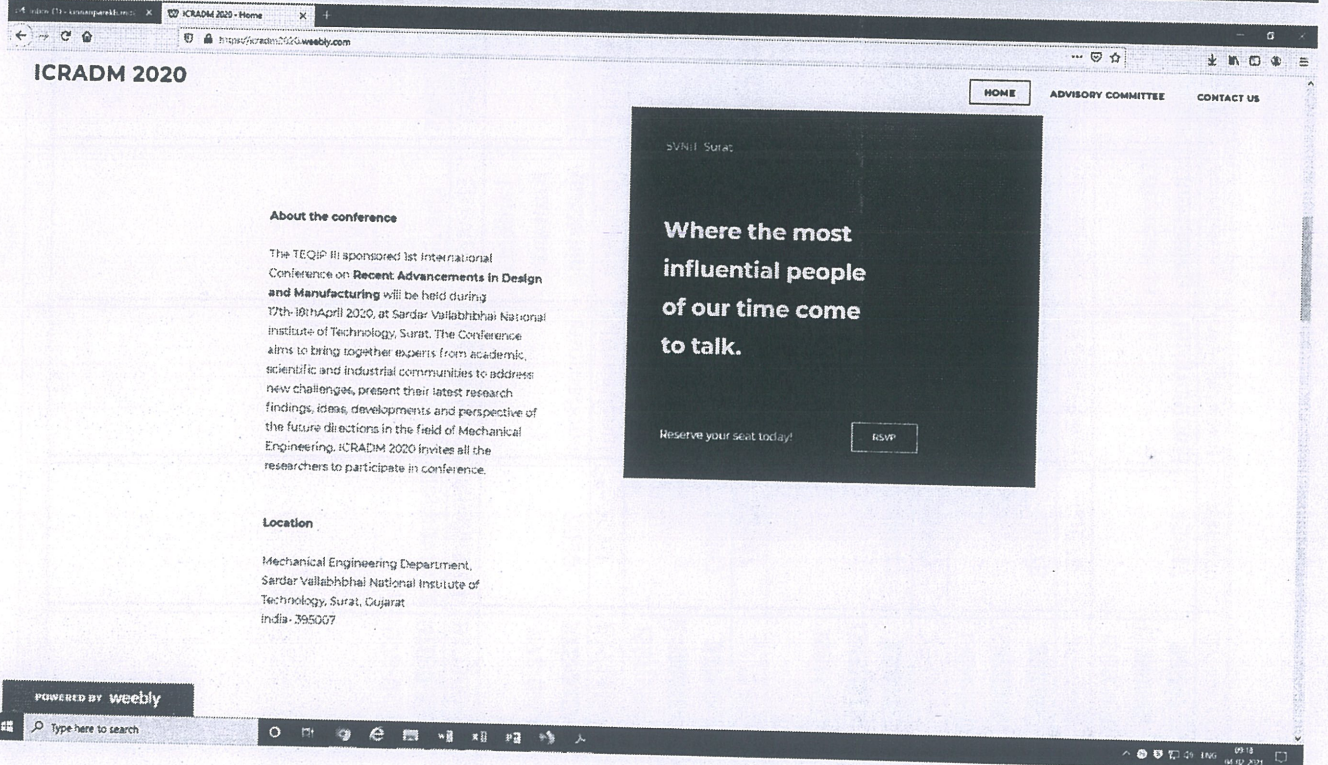
### Abstract

Biopolymers are those class of macromolecules which are found in nature or extracted from the living organisms. Various structures and properties of the biopolymers-based materials are well researched till to date. These mainly includes hydrogels, bio glasses, bio inks, biocomposites, fibers and others. These biopolymers-based structures have some limitations. However, Biopolymers have some common advantages (i.e., non-toxicity, easy availability, monodispersity, degradability, and better solubility etc.) and disadvantages (i.e., poor thermal and chemical stabilities, brittleness etc.). To overcome these disadvantages, it is necessary to tailor these polymers by few emerging techniques like “Electrospinning”. Electrospinning is one of the easiest techniques to prepare nanofibers from polymeric solutions by applying high voltage. Obtained nano/micro structural polymeric fibers have good properties like high surface area, porosity and low weights etc. The materials having high surface area and porosity can easily interact with cells and tissues, are better mobile vehicles for drugs, as well as possess good filtration and adsorption abilities. Thus, these one-dimensional structures of the biopolymers are very useful in various fields of biomedical especially water sanitation/desalination, tissue engineering, drug delivery and scaffolds. Various biopolymers like chitosan, chitin,



24

12





17	Kunallain, Jennyjohnson, Neelem Devpura, Rohit Rathour, Chirayu Desai, Onkar Tiwari, Datta Madamwar	Chapter in the Book: Emerging Technologies in Environmental Bioremediation	bioremediation technologies for the treatment of wastewater containing synthetic organic compounds (DOI:https://doi .org/10.1016/B 978-0-12-	PDPIAS	Elsevier	International	#####	978-0-12- 819860-5	PDPIAS	Elsevier
18	Ravi K Singh, Krishnamachari A, Murali Sharaff	Plant Small RNA:Biogenesis, Regulation and Application	Challenges of small RNA technology	KRADLE	Lambert Academic publishing	International	2020	978-0-12- 817112-7	PDPIAS	Elsevier
19	Vanaraj Solanki, Abhay dasadia and Pranita Mishra,	Book: Atomic force microscopy fundamentals and applications		KRADLE	Lambert Academic publishing	International	43647	ISBN: 978- 620-0- 24724-7	KRADLE	Lambert Academic publishing
20	Vanaraj Solanki, Abhay dasadia and Pranita Mishra,	Experimental Techniques for Material Characterization- part-1		KRADLE	Lambert Academic publishing	International	43647	ISBN:978- 620-0- 25440-5	KRADLE	Lambert Academic publishing
21	Abhay dasadia, Vanaraj Solanki and Brinda Nariya	Structural Determination of Transition Metal Chalcogenides		KRADLE	Lambert Academic publishing	International	43678	ISBN:978- 620-0- 26714-6	KRADLE	Lambert Academic publishing
22	Abhay dasadia, and Vanaraj Solanki	Growth and Characterizations of Transition Metal Trichalcogenides		KRADLE	Educreation Publishing	International	43647	ISBN:978- 620-0- 23747-7	KRADLE	Lambert Academic publishing



# Shear Mode Damper Testing Using Flake Shape Based Magnetorheological Fluids

D. M. Patel<sup>1\*</sup>, D. V. Bhatt<sup>2</sup> and R. V. Upadhyay<sup>3</sup>

<sup>1</sup> C S Patel Institute of Technology, Department of Mechanical Engineering, Charotar University of Science and Technology, CHARUSAT-Campus, Changa-388421, India.

<sup>2</sup> Department of Mechanical Engineering, S.V.N.I.T., Surat-395007, Gujarat, India.

<sup>3</sup> P D Patel Institute of Applied Science, Charotar University of Science and Technology, CHARUSAT-Campus, Changa-388421, India

\*E-Mail: dipalpatel.me@charusat.ac.in, TP: +91-9428900884

**Abstract:** Use of anisotropic iron particles in the synthesis of magnetorheological (MR) fluid having a high yield stress is a challenge as it increases the viscosity of the fluid in off-state. In this clause, a novel flake shaped iron powder based MR fluid with high yield stress is synthesized and used in shear mode MR damper (SMMD). MR damper design is optimized using fluid properties and Bingham model. Damping performance of newly synthesized MR fluid damper is at par with the available friction based damper used in front loaded washing machine. The unique feature of this design is minimal volume of the fluid (1.5 ml) required to achieve damping force of 50N. Performance of the damper is also evaluated with different volume fraction particles based MR fluid. MR damper performance is also evaluated for stroke length and frequency of excitation in this work. Effect of settling of particle on damper performance is discussed in this work. It shows that the flakes shaped-based MR fluid show better stability against gravity. The smaller quantity of present flake shaped-based MR fluid will reduce the cost of shear mode damper.

**Keywords:** Magnetorheological Fluid; Flake shaped particle;

## 1. Introduction

By using passive damper between structure and delicate equipment, it is possible to take in either shock (high damping) or vibration (low damping) during normal operation. Therefore, research was concentrated on developing active dampers for vibration isolation [1]. Semi-active damper utilizing Magnetorheological (MR) fluids also can be used for this requirement. The MR fluids are colloidal dispersions of micro-sized multi-domain magnetic particles that go through a striking alteration in their rheological, magnetic and mechanical properties when a magnetic field is used [2,3]. MR effects (rheological properties) in the MR fluid has found numerous applications like MR shock absorbers [4], MR mounts [5], clutches, brakes [5,6], recoil system [7-9] etc.

In all these applications, the maximum effect is limited by the saturation magnetization of the dispersed magnetic particles. The performance of MR fluid in applications is judged by three parameters called figure of merits [10]. These are; (i)  $F_1 = \tau^2/\eta$ , where  $\tau$  is yield stress and  $\eta$  is the viscosity of MR fluid at zero magnetic field, maximizing this figure of merit, helps in minimizing the device size and electrical power consumption.

(ii)  $F_2 = \tau^2/\eta\rho$ , here  $\rho$  is the density of MR fluid. This is an important term, when one deals with weight-sensitive applications and (iii)  $F_3 = \tau/BH$ , here  $B$  and  $H$  are magnetic flux density and intensity of the fluid. Minimization of this figure of merit will help to reduce current requirement, and it is usually required for high bandwidth applications. Then all these virtues are to be optimized for the MR fluid properties. While the suitability of an MR fluid for a particular use depends on factors such as stability, durability and temperature range, therefore, it becomes very significant to design new MR fluids, which can enhance the MR effect.

In earlier research, much attention has been focused on the use of spherical carbonyl iron particles as a dispersion material because of its high saturation magnetization value. More frequently than not, good MR fluids should be stable against settling and should have high magnetic strength. The major focus on MR fluid research has been to enhance the MR effect, to improve stability against sedimentation and re-dispersability of MR fluids [10-19]. In summation, many efforts have been reported by adding nanoparticles and viscoelastic media to improve stability and re-dispersion. According to recent research, MR fluid based on micro- and nano-fibres have shown better



23	Vanaraj Solanki, Pranita Mishra, and Ruchita Patel	Vacuum Technology, Fundamentals for beginners		PDPIAS	Nova Science Publisher USA	National	43678	ISBN 978- 93-5373- 146-5	KRADLE	Educreation Publishing
24	Dweipayan Goswami, Janki N Thakker and Pinakin Dhandhukia	Book Microbial Catalysts	Urease producing microbes to aid Bio- calcification: An Interdisciplinary	PDPIAS	Nova Science Publisher	International	2019	9781- 53616-089- 5	PDPIAS	Nova Science Publisher USA
25	Dweipayan Goswami, Pinakin Dhandhukia and Janki N Thakker	Book Microbial Catalysts	Microbial Enzymes: The Types and Roles in the Bio- Control of Fungal Phytopathogens	PDPIAS	STM	International	2019	978-1- 53616- 0888-8	PDPIAS	Nova Science Publisher
26	Sheeba Menon Janki N Thakker	Research and Reviews: A Journal of Biotechnology	Allelopathic Effect of Amaranthus Viridis.L Fresh Leaves on Chickpea Seeds Under in Vivo Condition	PDPIAS		National	2019	2231-3826	PDPIAS	STM

# **Faculty of Medical Sciences**

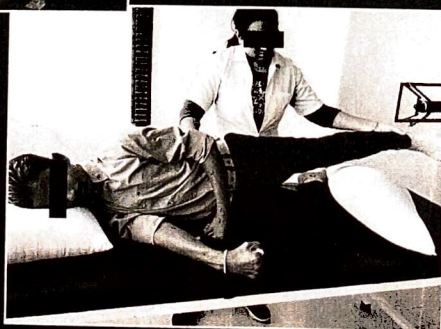




# Principles and Practice of Physical Rehabilitation



**Neeta J Vyas**  
**Megha S Sheth**  
**Srishti S Sharma**  
**Priyasingh B Rangey**



## Highlights

- Comprehensive
- Richly illustrated
- Case scenarios
- Easy to remember boxes
- Clinical pearls
- Review questions





ples and Practice of Physical Rehabilitation

- Exercise/Physical Activity and Primary Cancer Prevention 770
- Medical and Clinical Considerations 771
- Common Cancers and their Treatment 771
- Cancer Recurrence Warning Signs 775
- Side Effects of Cancer or Cancer Therapy 775
- Cancer Rehabilitation 778
- Precautions or Contraindications to Exercise for Patients with Cancer 782
- Program Implementation 783

Burns

Harita Pultsya Vyas

- Epidemiology 797
- Risk Factors 797
- Skin Anatomy 797
- Etiology 799
- Classification 799
- Pathological Changes 802
- Clinical Features 803
- Complications 803
- Burn Wound Healing 804
- Management of Burns 804
- Follow-up Care 810

Organ Transplant

Jaini Patel, Bijal Dodia, Aashish Contractor

- Indications 815
- Contraindications 815
- Eligibility and Candidacy 816
- Pretransplant Period 816
- Transplant Surgery Types 816
- Transplant Surgery 817
- Transplant Surgery Outcomes 818
- Immunosuppressive Agents 818
- Rehabilitation 818

Diabetes Mellitus

Dhruv Dave

- Etiology of Diabetes Mellitus 835
- Pathophysiology of Diabetes Mellitus 836
- Risk Factors for Development of Diabetes Mellitus 837
- Clinical Classification of Diabetes Mellitus 837
- Signs and Symptoms of Diabetes Mellitus 837
- Diagnosis of Diabetes Mellitus 838
- Treatment Modality in Type 2 Diabetes Mellitus 838
- Management of Type 2 Diabetes Mellitus 838
- Complications of Diabetes Mellitus 839
- Glycemic Control in Diabetes 840

- Physiotherapy Evaluation 841
- Role of Exercises in Diabetes Mellitus 842
- Management of Diabetic Foot 845
- Management of Diabetic Neuropathy 846
- Management of Musculoskeletal Complications 846
- Prevention Guidelines 846
- Psychosocial Burden of Diabetes Mellitus 847

41. Obesity

850

Anjali Bhise

- Classification 851
- Prevalence 851
- Causes 852
- Physiological Changes 852
- Complications 854
- Measurement 854
- Management 859

42. Pregnancy

867

Payal Gahlot

- Trimesters 868
- Complications of Pregnancy 869
- Postural Changes Associated with Pregnancy 869
- Benefits of Exercising During Pregnancy 870
- Assessment 872
- Exercises During Pregnancy 872
- Labor 881
- Postnatal Period 885
- Cesarean Section 890

43. Psychosocial Issues in Rehabilitation

894

Srishti S Sharma, Priyasingh Rangey, Neeta J Vyas, Megha S Sheth

- Epidemiology 894
- Psychosocial Adaptation 895
- Personality and Coping Styles 895
- Depression and Anxiety 897
- Anxiety 898
- Acute Stress Disorder and Post-traumatic Stress Disorder 899
- Psychosocial Wellness 900
- Substance Abuse, Agitation and Violence, and Hypersexuality 900

44. Disorders of Speech

903

Srishti S Sharma, Neeta J Vyas, Megha S Sheth, Priyasingh Rangey

- Production of Speech 903
- Epidemiology 904

# 40

## CHAPTER

# Diabetes Mellitus

Dhruv Dave

## LEARNING OBJECTIVES

After reading this chapter, the readers should be able to:

- ♦ Explain the pathophysiology, signs, and symptoms of diabetes mellitus
- ♦ Understand the diagnosis
- ♦ Learn the treatment and complications of diabetes mellitus
- ♦ State various guidelines for framing exercise planning and prescription
- ♦ Plan and execute various forms of therapeutic modalities for diabetes mellitus.

## CHAPTER OUTLINE

- |   |   |   |
|---|---|---|
| • Etiology of diabetes mellitus                     | – Third-line therapy  | – Other forms of exercises in type 2 diabetes mellitus  |
| • Pathophysiology of diabetes mellitus              | – Fourth-line therapy                                       | – Impact of physical exercise on blood pressure among diabetic patients                               |
| • Risk factors for development of diabetes mellitus | • Complications of diabetes mellitus                        | – Impact of physical exercise on waist circumference and basal metabolic rate among diabetic patients |
| • Clinical classification of diabetes mellitus      | • Glycemic control in diabetes                              |   |
| • Signs and symptoms of diabetes mellitus           | – Targets for glycemic control                              |   |
| • Diagnosis of diabetes mellitus                    | – Factors affecting glycemic control                        |   |
| • Treatment modality in type 2 diabetes mellitus    | • Physiotherapy evaluation                                  | • Management of diabetic foot   |
| – Classification of antidiabetic drugs              | – Measurement of adiposity                                  | • Management of diabetic neuropathy   |
| • Management of type 2 diabetes mellitus            | • Role of exercises in diabetes mellitus                    | • Management of musculoskeletal complications   |
| – First-line therapy                                | – Impact of aerobic exercise on type 2 diabetes mellitus    | • Prevention guidelines   |
| – Second-line therapy                               | – Effect of resistance exercise in type 2 diabetes mellitus | • Psychosocial burden of diabetes mellitus  |
|   | – Exercise prescription in type 2 diabetes mellitus         |   |

## INTRODUCTION

Diabetes mellitus is a group of metabolic diseases in which primarily hyperglycemia occurs due to defects in insulin secretion, insulin action, or both. Chronic hyperglycemia in diabetes is associated with long-term damage, dysfunction, and failure of vital organs, especially eyes, kidneys, nerves, heart, and blood vessels. The global burden of this disease is magnifying day by day, and it is one of the four major types of noncommunicable diseases (cardiovascular disease, diabetes, cancer, and chronic respiratory diseases). If not managed, it can lead to some

serious complications by damaging the major organs of the body. Early detection and management along with prevention is the key to reduce its impact.

**Box 40.1** shows a brief history of origin of diabetes mellitus.

## ETIOLOGY OF DIABETES MELLITUS

Type 1 diabetes is caused by autoimmune destruction of the  $\beta$  cells of the pancreas. This process occurs in genetically susceptible people and is (presumably) triggered by an environmental factor. When the majority (approximately

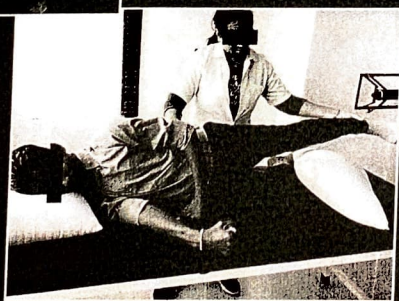




# Principles and Practice of Physical Rehabilitation



**Neeta J Vyas**  
**Megha S Sheth**  
**Srishti S Sharma**  
**Priyasingh B Rangey**



## Highlights

- Comprehensive
- Richly illustrated
- Case scenarios
- Easy to remember boxes
- Clinical pearls
- Review questions







## LEARNING OBJECTIVES

After reading this chapter, the readers should be able to:

- Define the stroke and describe the risk factors of stroke
- Understand the types of stroke and pathophysiology of stroke and stroke syndromes
- Gain knowledge on how one can prevent stroke and diagnose stroke
- Understand the medical management of stroke
- Understand the mechanisms of recovery, including neuroplasticity, that drive stroke recovery, as well as the impact of physiotherapy interventions on these underlying mechanisms
- Identify key principles of treatment in stroke rehabilitation
- Design and deliver effective physiotherapy treatment strategies for improving patient-preferred outcomes following stroke

## CHAPTER OUTLINE

- |                                  |  |   |
|----------------------------------|--|---|
| • Burden of illness              | • Diagnosis of stroke and investigations | – Rehabilitation of walking   |
| • Risk factors for stroke        | • Management of stroke                   | – Rehabilitation of upper limb functions                                |
| • Types of stroke                | – Medical management of stroke           | – Prevention and management of poststroke shoulder pain and subluxation |
| – Stroke subtypes                | – Surgical management of stroke          | • Instructions for patient/caregiver                                    |
| • Pathophysiology                | – Assessment and examination             | • Recovery and outcomes   |
| • Stroke syndromes               | • Rehabilitation                         |   |
| – Anterior circulation diseases  | – Recovery of functions following stroke |   |
| – Posterior circulation diseases | – Task-oriented exercises                |   |
| • Sequelae of stroke             | – Rehabilitation of sit-to-stand         |   |
| • Stroke prevention              |  |   |

## INTRODUCTION

## Definition

The World Health Organization defined stroke as: “rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than of vascular origin.” This definition excludes transient ischemic attack (TIA), which is defined to last less than 24 hours, and patients with stroke symptoms caused by subdural hemorrhage, tumors, poisoning, or trauma. However, the classic definition has been under criticism due to its primary focus on clinical symptom and its duration.

Recently, the Stroke Council of the American Heart Association (AHA)/American Stroke Association published an updated definition of stroke for the 21st century and recommended that term “stroke” should be broadly used to include all of the following:

- Central nervous system (CNS) infarction
- Ischemic stroke
- Silent CNS infarction
- Stroke caused by intracerebral hemorrhage
- Stroke caused by subarachnoid hemorrhage
- Stroke caused by cerebral venous thrombosis
- Stroke, not otherwise specified.

The updated definition of stroke incorporates clinical and tissue criteria. Definition of each type of stroke is illustrated in **Table 26.1**.