COGNITION

NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR

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NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR

GE ROAD, RAIPUR - 492 010

MESSAGE FROM DIRECTOR'S DESK

It gives me immense pleasure to present the first issue of COGNITION - The Official Research Newsletter of NIT Raipur which showcases the commendable research carried out by the faculty members and students of the institute.

Research is an outcome of passion that emerges from dynamism and brilliance. Our faculty members and students are repository of vast knowledge and skillset. Consequently, during the last three years the research publications of NIT Raipur has increased from 350 indexed research papers in the year 2017 to 742 indexed research papers in the year 2020.

I strongly believe that the institute cannot progress in isolation and therefore we have signed 17 MoUs with several institutions and industries in the last three years for expanding its reach and establishing mutually beneficial partnerships. I would like to reassert that with all the relentless efforts and commitment, NIT Raipur will attain many more milestones in the years to come.

COGNITION highlights the diverse and multidisciplinary research work ensuing in NIT Raipur. It aims to recognize the significant research accomplishments of the faculty members and students of the institute to enhance innovation and to foster a motivational environment of interdisciplinary research and learning in our alma-mater. I ardently hope that our faculty members and students of NIT Raipur will continue to engage in more innovative endeavours and yield fruitful research output with the same enthusiasm.

I appreciate the editorial team members for their valuable time to keep up the spirit of this Research Newsletter in its true sense.

Stay Healthy and Stay Safe!

PROF. A. M. RAWANI
DIRECTOR
NATIONAL INSTITUTE OF TECHNOLOGY
RAIPUR

MESSAGE FROM DEAN (R & C)

At the very outset, I take this opportunity to congratulate the faculty members and students of NIT Raipur for notable contribution to the research in varied specializations.The institute is abuzz with ongoing research activities throughout the academic year. In this regard, the initiative of launching the official Research Newsletter- COGNITION is highly appreciable.

COGNITION is the remarkable compilation with abridged version of all essential events and significant research carried out by the faculty members and students. On this occasion, I may congratulate the editorial team of COGNITION for fabricating all the essential events related to the research and innovation in the systematic way.

I am happy to share that the inaugural issue of the research newsletter has covered all the significant events of academic research and innovation accomplishments i.e. technical articles and also showcases the abridged versions of the research papers, book chapters, books published, patents published/awarded, research projects undertaken, etc. by all the faculty members and students across different departments during the respective quarter.

I hope this endeavor may instill confidence and research motivation among all the faculty members and scholars of our institute.

All the best for the editorial team COGNITION for future endeavors.

Dr. Shubhrata Gupta
Dean (R&C)

Editorial Note: COGNITION

Warm Greetings to Everyone!

We, the editorial team, COGNITION: the official research newsletter of NIT Raipur, delighted to present the first edition with the prime concern to propagate recurrent ongoing research activities carried out by the faculty members and students of our institute. This inaugural issue primarily focuses on the significant events of academic research and innovation activities contributed in the previous time quarter.

The major objective of this quarterly research newsletter is to recognize the significant research work carried out by the faculty members and students, and to encourage an ambience of interdisciplinary research and learning in our institute.

The editorial team takes the opportunity to express profuse thanks and deep sense of gratitude to our honorable Director, Dr. A. M. Rawani, who inspired and supported in every step of shaping the newsletter and finally put before the research admirers. We may proudly assert that COGNITION is the brainchild of our Director Sir presenting in the lively form.

As we know, the academic research and innovation are key parameters for any technical institute that place in zenith point. The phenomenon of research has got a new dimension.

At this juncture, the researchers require constant motivation and encouragement. As it is the need of the hour, COGNITION may hopefully bring adequate source information related to the latest ongoing research activities which may create healthy research ambience in the institute.

In this inaugural issue of the research newsletter, it is attempted to cover with all the significant events of academic research and innovation activities i.e. technical articles and also showcases the condensed versions of the research papers, book chapters, books published, patents published/awarded, research projects undertaken, etc. contributed by the faculty members and students across various departments as per the available source information during the respective quarter time period.

Our sincere thanks goes to all the respected Deans, the Heads of all Departments, Faculty members, Researchers, Students, Administrative and Non-teaching staff for timely support and encouragement.

We, the editorial team, COGNITION may also request all the stakeholders for valuable feedback and suggestion which will help us to strengthen its quality publication and circulation at optimum level in forthcoming times.

Kindly send your valuable feedback at : cognition@nitrr.ac.in
Wish you all enjoy reading.

With regards

The Editorial Team: COGNITION

Dr. Ayush Khare
Associate Professor
Department of Physics

Dr. Sanjeev Das
Assistant Professor
Department of MME

Dr. Y Vijaya Babu
Assistant Professor
Department of HSS

Dr. A. K. Dash
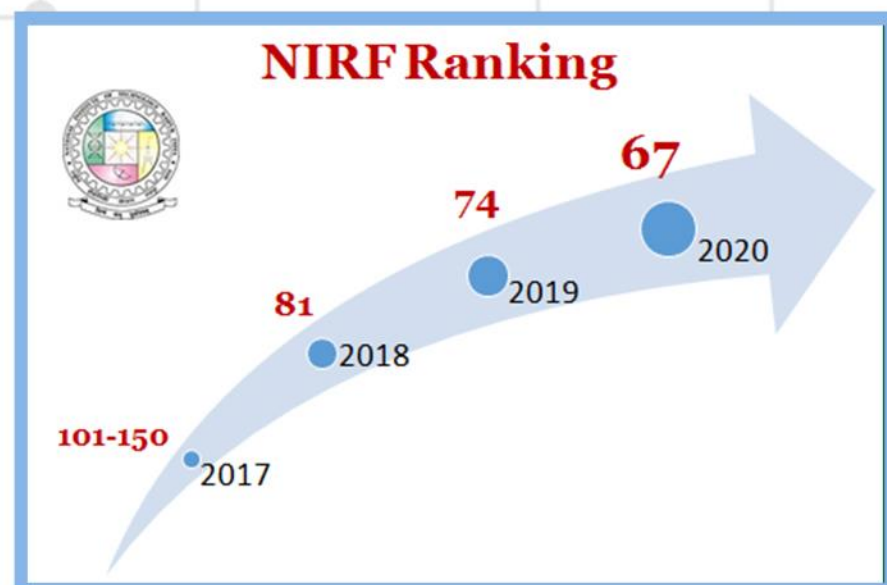Assistant Professor
Department of ME

Graphic Support by :

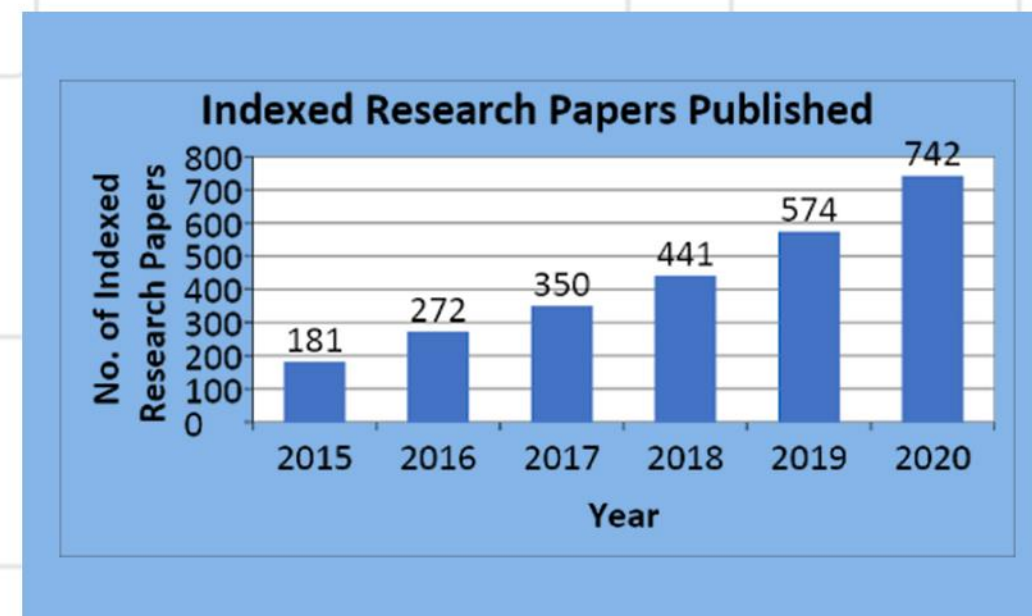Rajan Kumar Sharma | Neha D. Naralkar | Sourabh B. Chavan

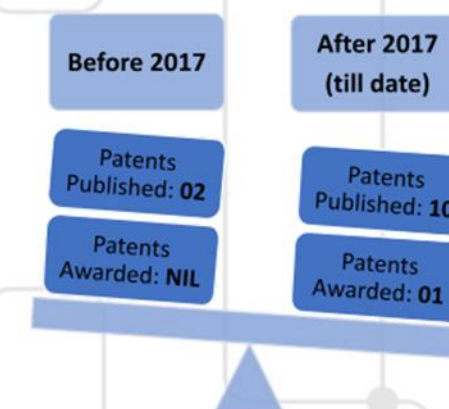# PROGRESS IN RESEARCH AND INNOVATION AT NIT RAIPUR

National Institute of Technology Raipur, an institute of national importance has proven it as a leader in the technical education in the central India. Since its inception in 2005, it has reached many milestones in various sectors of technical education that highlight its capabilities to model for other institutes in the region. In the last three years, the institute has been successful in improving its National Institutional Ranking Framework (NIRF) from 81 (2018) to 67 (2020).

Indexed Research Papers Published

NIRF Ranking

The following figure shows the reflection of high-quality research being carried out by the researchers at NIT Raipur, which is evident from the increasing numbers of awarded and published patents.

Before 2017	After 2017 (till date)
Patents Published: 02	Patents Published: 10
Patents Awarded: NIL	Patents Awarded: 01

With a diverse pool of expertise, substantial outcome has been observed in research in the thematic areas of Chemical Sciences, Healthcare, Civil and Structural Engineering, Materials Science and Metallurgy, Chemical Engineering, Mechanical and Manufacturing Technology, Waste Management Technologies, Renewable Energy and Environment, Power Electronics, Power System, Earthquake Engineering, Disaster Management, Information Technology and Telecommunication, Smart Grid Technology, Robotics, Basic and Applied Physics, Mathematics and Science. As far as publication of research papers in reputed journals is concerned, NIT Raipur has made a remarkable progress there as well.

Research and innovation are the two sides of same coin. NIT Raipur has secured a rank in Band 'A' (ranks between 11-25) among the Institutes of National Importance, Central Universities and Centrally Funded Technical Institutes in the Atal Ranking of Institutions on Innovation Achievements (ARIIA) 2020 by the Innovation Cell, Ministry of Education, Govt. of India announced on August 18, 2020. The productive research has resulted in form of many start-ups. The Institution Innovation Council (IIC) established at NIT Raipur received a 4-Star Performance rating on October 15, 2020 for the second consecutive year for undertaking the various activities prescribed by Ministry of Education's Innovation Cell (MIC) to promote Innovation and Start-up during the IIC calendar year 2019-20.

PATENT GRANTED TO NIT RAIPUR

TITLE: SYSTEM AND METHODS FOR TREATING COKING WASTEWATER

INVENTORS: PARMESH KUMAR CHAUDHARI AND RAJ KISHORE CHOUDHARY

DEPARTMENT: CHEMICAL ENGINEERING

MONTH & YEAR OF AWARD: NOVEMBER 2019

NATIONAL PATENT NO: 326392

Background of Invention

Coking industries produce wastewater which is known to be highly polluted effluent. The common practice to treat coking wastewater (CWW) is coagulation, which is further treated by a bioaerobic process to reduce cyanide and phenol using specific bacteria. Biological process has been reported by various authors to treat CWW. Other process like adsorption, vacuum distillation, coagulation and zero valent iron and ozonation have also been reported. Many times conventional method coagulation followed by biological treatment does not give the CWW dischargeable limit because stagnant operating condition needs to perform microorganisms. The electro coagulation (EC) has been found to be effective for treatment of various effluents. Thus, it has been taken for treatment of CWW and, show quite good results. Such a extent of pollution removal has not been seen in coagulation.

A primary treatment process to treat CWW, which is being applying in coking industries. EC followed by adsorption is able to bring the effluent near the dischargeable limit. In EC process, the best pH, current density (CD), electrode gap (EG) and electrolyte (NaCl) concentration were estimated by taking many runs. Similarly, many runs were taken to optimize pH, adsorbent dose and pollutants concentration in adsorption process.

Summary of the Invention

The present disclosure relates to a method for treating wastewater generated from coal coke industries by means of EC followed by adsorption. According to embodiments of the present disclosure, CWW stream can be treated first in an electrocoagulation reactor (ECR), and the resulting effluent from the EC can then be subjected to activated carbon adsorption to produce a reusable water stream. The method disclosed has minimized or eliminated inorganic, organic and other objectionable contaminants of CWW, and thus helped to recycle the treated water for cooling the hot coke of oven. After other treatment like membrane separation, it can be used for multiple uses.

Parmesh Kumar Chaudhari
Associate Professor
Chemical Engineering
Department

Raj Kishore Choudhary
Research Scholar
Chemical Engineering
Department

NIT RAIPUR IS ALL SET TO ESTABLISH THE FIRST TECHNOLOGY BUSINESS INCUBATOR OF THE STATE

Chhattisgarh's first Technology Business Incubator is going to be set up in the National Institute of Technology, Raipur. The Section-8 company of NIT Raipur, NIT Raipur Foundation for Innovation & Entrepreneurship is awarded with a grant-in-aid of Rs. 7 Crore 95 Lakhs by DST under the NIDHI-TBI SCHEME. This achievement came due to tremendous efforts to promote innovation and entrepreneurship ecosystem at NIT Raipur its Career Development Centre (CDC), which is a brainchild of Dr. A. M. Rawani, the visionary Director of NIT Raipur. This new technology incubation center aims to develop a flair of innovation and entrepreneurship in the youth of Chhattisgarh and the students of NIT Raipur.

The CDC under the guidance of our Director has been working very hard to support the student entrepreneurs right from the idea stage to grow up as successful startups. The students are awarded with financial support of seed grant, acceleration grant, travel support etc. in addition to active mentorship by various faculty members of NIT Raipur and training in business model from top notch experts from India and abroad. Since the inception of CDC in the year 2018, the Innovation & Entrepreneurship cells have been conducting a series of training programs, faculty development programs, student competitions, webinars, hackathon, E-summit, Startup Camps and many other activities as recommended by the Ministry of Education's Innovation Council. These efforts of NIT Raipur have been also recognized by Ministry of Education by awarding 4-star rating in ARIIA ranking in past 2 consecutive years. In addition to supporting students, the I & E Cell have also established a very strong mentor network consisting of faculties, alumni and industry personnel to guide the budding entrepreneurs at every stage.

Due to these initiatives and supportive eco system, NIT Raipur has emerged as strong innovation hub in the region, which set the foundation for creation of TBI at NIT Raipur.

The activities and working of the NIDHI-TBI at NIT Raipur will be guided as per the conditions laid down by the Department of Science and Technology. A well-qualified team including a CEO, Incubation Manager and other manpower will be inducted soon for the proper functioning of the center. Over a period of five years, the incubation center targets to promote 70 new ventures.

The alumni network of NIT Raipur has extended a very strong handholding support to promote innovation and entrepreneurship at NIT Raipur. Responding to the appeal of Dr. A. M. Rawani, the Alumni Association of GEC-NIT Raipur has dedicated second floor of the Golden Tower building with 5500 square feet built-up area to the Technology Business Incubator of NIT Raipur. In addition to these, a strong mentorship was also provided by alumni Dr. Anita Gupta (1987 batch of Mech. Engineering) whose constant guidance played a key role in getting the NIDHI-TBI grant approved from DST.

Director Dr. A. M. Rawani has extended his hearty congratulations to Team-CDC, all the Alumni and also to the students, faculty and entire NIT Raipur fraternity on this historical achievement and assured his continued support to strengthen such efforts in future as well.

BOOKS

AR. SHUBHAM JAISWAL DEPARTMENT OF ARCHITECTURE

About the book

When it comes to Buddhist Architecture, most of the literature on the topic revolves around the study of ancient Buddhist structures, such as rock-cut caves, chaityas, and viharas. While this is a necessary discourse in itself, it is in no way exhaustive. Over the ages, Buddhist architecture has adapted extensively to the evolving cultural and architectural landscape surrounding it, and this transformation has manifested itself differently in different social and physical contexts. However, in the present scenario, each of these examples of Buddhist architecture retains a characteristic style, reminiscent of its roots. This book is an effort to delve into such contexts and study the form and style of Buddhist structures worldwide. It takes into account regions that served as the seat of Buddhism, such as the Himalayan region (Bhutan), South Asia (Sri Lanka), Southeast Asia (Thailand), and East-Asia (Japan), and compares it to the birthplace of the religion, Bodhgaya - to present a holistic overview of the evolution. The book focuses on Contemporary Buddhist spaces via Architectural elements, Visual elements, Cultural elements, and Spatial planning. The book aims to act as a repository of information regarding these structures and act as a starting point for all those seeking to design and create modern Buddhist spaces.

DR. AWANISH KUMAR DEPARTMENT OF BIOTECHNOLOGY ENGG.

About the book

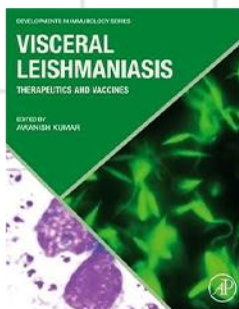Diabetes: Epidemiology, Pathophysiology and Clinical Management aims to be the one-stop diabetes book for researchers, scientists and clinicians. It details the epidemiology, causes, molecular mechanisms, molecular markers, available drugs, experimental drugs, treatment modalities, and dietary and lifestyle approaches related to diabetes. It focuses on various molecular aspects of diabetes, and its related co-morbidities. Apart from the drug-based treatment approach based on international guidelines, this book also describes various surgical treatments available for cases of uncontrolled symptomatic diabetes. It also lays emphasis on the future possibilities of different approaches for diabetes management.

**DR. AWANISH KUMAR
DEPARTMENT OF
BIOTECHNOLOGY ENGG.**

**DR. AMIT KESHAV AND DR. B MAJUMDAR
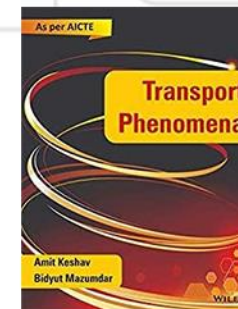DEPARTMENT OF CHEMICAL ENGG.**

About the book

Visceral Leishmaniasis: Therapeutics and Vaccines describes current therapeutics, natural anti-leishmanial molecules, anti-leishmanial screening, and explores vaccine candidates and amastigote-based vaccination strategies for Leishmania. The book provides a precise view on VL, Leishmania parasite culture, host immunity and immunomodulation, natural compounds effective against VL, animal models for VL, and methodologies available for anti-leishmanial drug screening procedures against VL, as well as vaccine and vaccination-related information on Leishmaniasis. Readers will find concrete information on past and current hurdles facing vaccine development for Leishmania, along with scientific opportunities and the potential impact of vaccines, including problems encountered.

About the book

Transport Phenomena is a subject of key importance and has its roots soiled in the basics of fluid flow, heat transfer, mass transfer, and numerical analysis. Its stems spread to the advanced subjects of modeling simulation and computational fluid dynamics. Developing a model for any physical process on the core areas of fluid mechanics, heat transfer, and mass transfer is necessary before the model is simulated for large-scale design. This book introduces various methods with examples to develop transport models.

MS. PRIYANSHI SHARMA
STUDENT OF B.TECH. III YEAR
DEPARTMENT OF COMPUTER SCIENCE AND ENGG.

About the book

This book "Problems with AI" discusses the Problems with AI in an insightful way and does not require the reader to have a strong hold on Machine Learning concepts.

This will give the readers a strong idea of issues with Machine Learning and link them with Machine Learning concepts so that readers can think independently.

DR. MONALISA BISWAL
DEPARTMENT OF ELECTRICAL ENGG.

About the book

A microgrid is a low voltage small-scale power grid (on distribution side) with distributed generation (DG), storage devices and controllable loads. Microgrids can operate independently called the islanded (autonomous) mode of operation or in conjunction with the main grid called the grid connected mode of operation. Microgrids offer several advantages and benefits including increased reliability, improved energy efficiency and resiliency, cost reduction, reduction in transmission losses, CO_2 emission reduction, and other environmental benefits. However, they also introduce several major challenges regarding the monitoring, operation, control, and protection which are also a subject of research. The book is organized into 11 chapters which covers diverse fields to satisfy engineers, researchers and personnel of power and control industry. The main topics which are covered in the book are Monitoring, Protection, Control and Operation of Microgrid. Introduction of this book deals with the basic concept of Microgrid and the different challenging issues which the Indian power sector is facing in the field of monitoring, control, planning and protection and their solutions.

TITLE OF BOOK: ABRASIVE WATER JET MACHINING OF ENGINEERING MATERIALS
PUBLISHER: SPRINGER
ISBN: 978-3-030-36001-6
MONTH/YEAR OF PUBLICATION: 2020
AUTHORS: JAGADISH AND KAPIL GUPTA
DEPARTMENT: MECHANICAL ENGG.
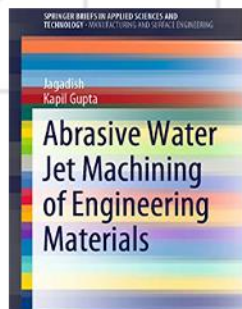
DR. JAGDISH
DEPARTMENT OF
MECHANICAL OF ENGG.

About the book

This book presents insights in green techniques used in conventional and advanced machining. It consists of various experimental case studies conducted by the authors on green machining of difficult-to-machine materials, polymer and ceramic materials. Effects of green techniques / processes on machining properties like material removal rate, surface quality, geometric accuracy, productivity, and environment while machining various materials are reported.

TITLE OF BOOK: E-REVOLUTION IN INDIAN HIGHER EDUCATION WITH COVID-19
PUBLISHER: SANKALP PUBLICATIONS
ISBN: 978-93-90636-14-3
MONTH/YEAR OF PUBLICATION: JANUARY 2021
AUTHORS: A M RAWANI AND AJIT KR. SINGH
DEPARTMENT: MECHANICAL ENGG.
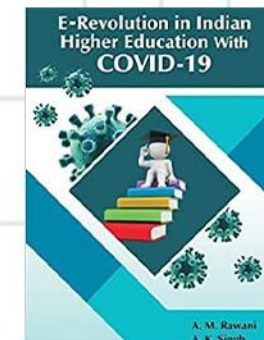
DR. A M RAWANI
DEPARTMENT OF MECHANICAL ENGG.

DR. AJIT KR. SINGH
TEMPORARY FACULTY
DEPARTMENT OF MECHANICAL ENGG.

About the book

Through this book, the authors have tried their best to shed light on the positive impact of COVID-19 pandemic outbreak by the e-revolution brought in the higher education sector of our country. The book addresses issues like challenges of higher education in COVID-19 pandemic, mental health of students due to closure of the institute, quality of online education, policy to govern online education, preparedness of educational institutes for new normal and strategies of educational institutions for new normal, among the various other issues addressed. The authors have also presented some suggestions in the book that will not only help in the re-establishment of higher education and higher education institutions post COVID-19 pandemic but will also help in implementation of the visionary Education 4.0 faster than expected.

BOOK CHAPTERS

TITLE OF BOOK CHAPTER : Evaluation of ASTER TIR Data-Based Lithological Indices in Parts of Madhya Pradesh and Chhattisgarh State, India.
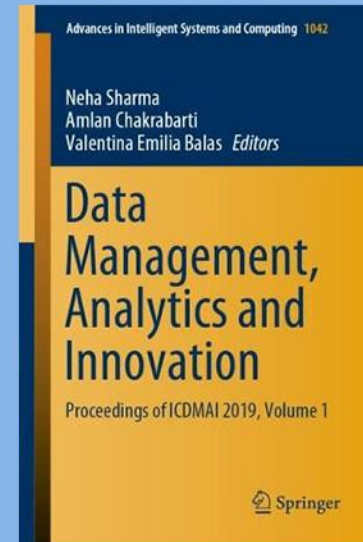**PUBLISHER:** Springer, Singapore
ISBN : 978-981-32-9949-8_12
MONTH/YEAR OF PUBLICATION: 2020
AUTHORS: Himanshu Govil, Subhanil Guha, Prabhat Diwan, Neetu Gill and Anindita Dey
DEPARTMENT : Applied Geology

Advances in Intelligent Systems and Computing 1042

Neha Sharma
Amlan Chakrabarti
Valentina Emilia Balas *Editors*

Data Management, Analytics and Innovation

Proceedings of ICDMAI 2019, Volume 1

Springer

TITLE BOOK CHAPTER : Analysing the Capability of NCI Technique in Change Detection using High-and Medium-Resolution Multispectral Data
PUBLISHER : Springer, Singapore
ISBN : 978-981-15-2097-6_10
MONTH/YEAR OF PUBLICATION : 2020
AUTHORS : Subhanil Guha, Himanshu Govil, Anindita Dey and Neetu Gill
DEPARTMENT : Applied Geology

Advances in Geographical and Environmental Sciences

Seema Sahdev
R. B. Singh
Manish Kumar *Editors*

Geoecology of Landscape Dynamics

IGU UGI

Springer

About the book chapter

The present study was performed in some parts of Madhya Pradesh and Chhattisgarh State, India to compare the different quartz indices, feldspar indices and mafic indices according to Ninomiya (2005) and Guha (2016) using thermal infrared (TIR) bands of ASTER data for detecting quartz, feldspar, and mafic minerals. Results showed that these indices are equally useful for delineating quartz, feldspar, or mafic minerals. Guha's mafic index (GMI) and Ninomiya's mafic index (NMI) presented almost the same result. Guha's quartz index (GQI) was more powerful than Ninomiya's quartz index (NQI) in identifying quartz content in alkali granites.

About the book chapter

In the present research work, NCI technique was applied for identifying the changed and unchanged pixels on various rectangular neighbourhood pixel windows in a small part of Dehradun city, India. Correlation image, slope image, and intercept image in the neighbourhood of a particular pixel for any two multi-temporal data sets provide significant information regarding changed pixels. The fundamental concept indicates a high correlation in the unchanged pixels and a low correlation in the changed pixels for same windows of two multi-date images. Results show that the NCI technique becomes more effective in higher resolution with small pixel window size.

TITLE OF BOOK CHAPTER : Analyzing Linear Relationships of LST with NDVI and MNDISI Using Various Resolution Levels of Landsat 8 OLI/TIRS Data
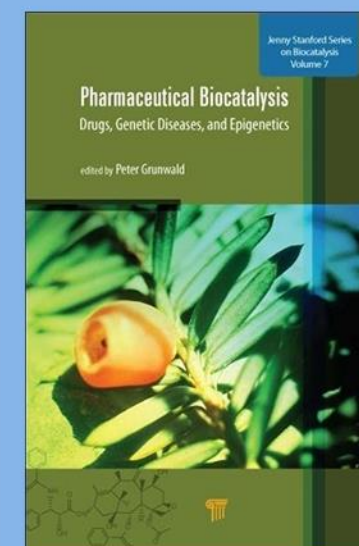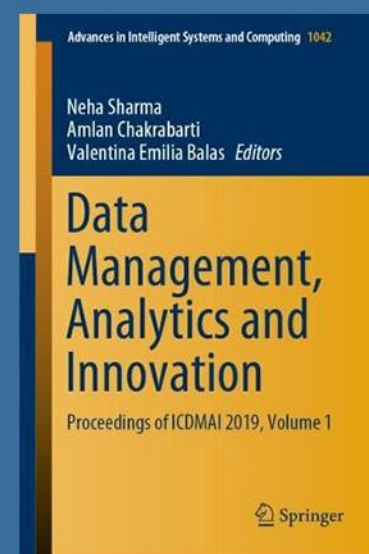**PUBLISHER:** Springer, Singapore
ISBN : 978-981-32-9949-8_13
MONTH/YEAR OF PUBLICATION: 2020
AUTHOR(S) : Himanshu Govil, Subhanil Guha, Prabhat Diwan, Neetu Gill and Anindita Dey
DEPARTMENT : Applied Geology

Advances in Intelligent Systems and Computing **1042**

Neha Sharma
Amlan Chakrabarti
Valentina Emilia Balas *Editors*

Data Management, Analytics and Innovation

Proceedings of ICDMAI 2019, Volume 1

Springer

TITLE OF BOOK CHAPTER : Successful screening of potent microorganisms producing L-asparaginase
PUBLISHER : Jenny Stanford Publisher, Singapore
ISBN : 9789814877145
MONTH/YEAR OF PUBLICATION : NOVEMBER 2020
AUTHORS : Awanish Kumar and Archana Vimal
DEPARTMENT : Biotechnology Engg.

Jenny Stanford Series on Biocatalysis Volume 7

Pharmaceutical Biocatalysis
Drugs, Genetic Diseases, and Epigenetics
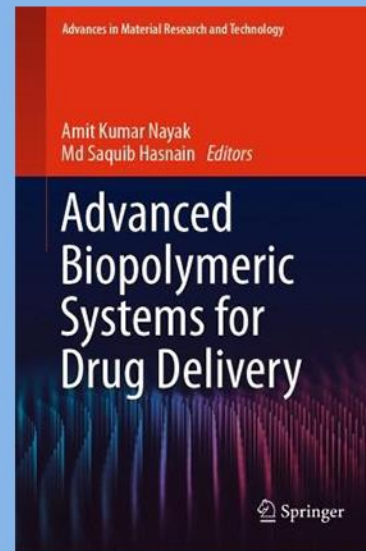
edited by Peter Grunwald

About the book chapter

The present study used the NDVI and the MNDISI to determine the linear relationship with LST under various spatial resolutions. Four multi-date Landsat OLI/TIRS images of parts of Chhattisgarh State of India were used from four different seasons. LST established moderate to strong negative correlations with NDVI and weak negative to moderate positive correlations with MNDISI. Generally, the coarser resolutions possess stronger correlation coefficient due to more homogeneity. The autumn image represents the strongest correlation at any resolution levels. The winter image shows the best predictability of LST distribution with the known NDVI and MNDISI values.

About the book chapter

Enzymes are the biological catalyst offering multiple utilities, including application in food and beverage, dairy, leather, textile, brewing, detergent, agriculture, and pharmaceutical industries. The pharmaceutical industry is one of the major consumers of enzymes and exploits it for various fundamental roles like in disease treatment, synthesis of any drug or biomolecule, creating diagnostic kits or biosensors. Baruch et al. investigated the role of L-asparaginase in curing a life-threatening disease necrotizing fasciitis commonly known as "flesh-eating disease." The in silico approach is a very promising way to screen out novel and promising source of L-asparaginase. This approach makes it feasible to check the potential of any microorganism to produce this enzyme and the probable enzyme-substrate affinity using computational tool. The substrate L-asparagine is activated in the presence of hydroxylamine hydrochloride in the enzyme reaction mixture. The amino acid L-asparagine is involved in many important physiological processes like seed germination, nitrogen storage, to overcome stress condition, as a transport compound, etc.

About the book chapter

Diabetes mellitus is common nowadays and its number is increasing day by day in all over the world. It is an endocrine or metabolic disorder which is characterized by high sugar levels in the blood due to insufficient levels or absolute deficiency of insulin in the body resulting in hyperglycemia as well as affecting other metabolic processes. Despite all the advancement in therapeutics, diabetes still remains a major cause of morbidity and mortality in the world. Few antidiabetic drugs along with insulin are available in the market for the treatment of diabetes, but the majority of them have massive side effects and are not satisfactory. The antidiabetic drug is either degraded by the enzymatic activities or by intestinal epithelial tight junctions which ultimately results in low bioavailability of the drug. Delivering insulin in the diabetic patients is currently invasive, i.e. painful.

Nanotechnology opened a door for non-invasive delivery of insulin in diabetic person and holds other advantages like targeted delivery and controlled release. Metallic nanoparticles were highly explored for drug delivery and have received much popularity because of their uniform size and sharp size distribution in nanometer dimension. But metallic nanoparticles are thermodynamically unstable, poor corrosion resistance, non-degrading, toxic, and biologically harmful/unsafe.

Recently, biopolymeric (polysaccharides/proteins) nanoparticles have revolutionized the world of drug delivery due to its high biocompatible, degradable, and safe nature.

Therefore, this chapter specifically describes current challenges in delivery of insulin, polysaccharide-based nanocarriers with insulin that can be used for targeted delivery of insulin with more bioavailability, non-toxicity, and effectivity along with its future prospects.

About the book chapter
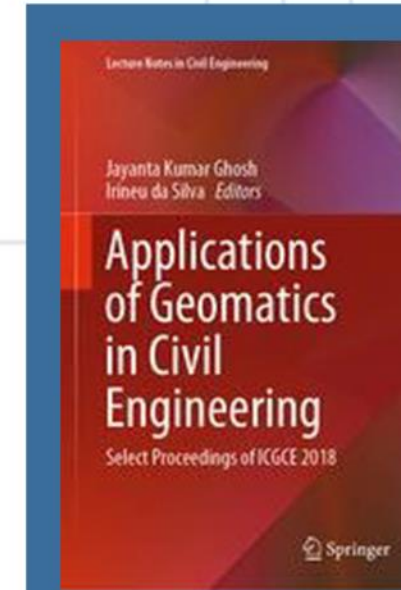
Intense rainfall in a shorter span of time causes a huge amount of erosion resulting in rapid deposition of sediment, consequently reducing the capacity of reservoir. Thus, it is necessary to estimate reservoir sedimentation and identify critical zones susceptible to erosion. With the help of RS and GIS technique, reservoir sedimentation and soil erosion have been assessed in Kodar river watershed. About 14.39% of the reservoir capacity has been lost due to sedimentation in the last 36 years when compared to the designed storage. Five number of sub-watershed are found to be critical and requires best management practices.

TITLE OF BOOK CHAPTER : Effect of Shear Span to Depth Ratio in Strut-And-Tie Model on Deep Beam Landsat 8 OLI/TIRS Data
PUBLISHER: Springer, Singapore
ISBN : 978-981-15-5643-2
MONTH/YEAR OF PUBLICATION: September 2020
AUTHORS: Renu Sahu, U. K. Dewangan Subhanil Guha, Prabhat Diwan, Neetu Gill and Anindita Dey
DEPARTMENT : Civil Engg.

TITLE OF BOOK CHAPTER : Enzymes as Green Biopolymeric Material in Environmental Remediation: A Greener Approach
PUBLISHER : Woodhead Publishing, Elsevier
ISBN : 978-0-12-820484-9
MONTH/YEAR OF PUBLICATION : JANUARY 2021
AUTHOR: Santosh Bahadur Singh
DEPARTMENT : Applied Chemistry

About the book chapter

In this paper, simply supported deep beam with different shear span to depth ratios are analyzed. The two different approaches are considered first as the elastic model of deep beam and Strut-and-Tie model. A study on strain behavior and flexural stress behavior with respect to shear span to depth ratio is considered. The load distribution in vertical tie mechanism and horizontal tie mechanism with respect to shear span to depth ratio is carried out and the graphs are plotted. Formulations of effectiveness factor in the Strut-and-Tie modeling are compared for different shear span to depth ratios on the deep beam. The FEM modeling of simply supported deep beam with different shear span to depth ratio is also computed using Finite Element Analysis Software "FEAST" in order to understand the stress flow path correctness. Based on all these parameters, some important conclusions are made.

About the book chapter

The level of environmental contamination is increasing as a result of the high rate of consumption of natural resources in usable goods to fulfill the endless desires of human beings. But after the end use of these goods, they come back to nature as pollutants. Enzymes are the most promising green bio-polymeric materials to transform and detoxify the environmental pollutants and also are able to restore the polluted environments. This chapter briefly describes the potential use of enzymes in environmental remediation as they have better capability to transform highly toxic pollutants into less toxic/innocuous end products.

About the book chapter

A novel evolutionary-based feature selection model for ACPs identification that will explore the relationships hidden across the various feature descriptors is explored in this chapter. In this model, the authors amalgamate the nine feature descriptors from the three groups of peptide feature descriptors including amino acid composition (three descriptors), grouped amino acid composition and composition/transition/distribution (three descriptors). The proposed model integrates these features to unfold the hidden association between the diverse features in peptide classification. However, the inclusion of irrelevant, redundant, and noisy attributes in the model building process phase can result in poor predictive performance and increased computation. Hence, evolutionary-based feature selection is utilized in the model that involves a combination of search and feature utility estimation by ReliefF score. Through extensive experiments on benchmark dataset, it is demonstrated that the proposed model achieves improved performance.

About the book chapter

Because of time and spatial variability of rainfall, a number of water storages have been constructed to tap the available water so that it can be utilized in accordance with requirement. In Sheonath River Basin out of the total agriculture zone of 22,702 km2 , only 11,9032 km is irrigated through networks of canal, which is only 52% of the total agriculture area. The basic objective of this study is to plan a suitable number of water storage sites for achieving maximum possible irrigation for the remaining 48% of the agriculture area which is not falling under the command area of the existing schemes.

About the book chapter

Since video includes both temporal and spatial features, it has become a fascinating classification problem. Each frame within a video holds important information called spatial information, as does the context of that frame relative to the frames before it in time called temporal information. The convolutional neural networks (CNN) model is a category of deep learning neural network model that can turn directly on the underdone inputs. This chapter implements a three-dimensional convolutional neural networks (CNN) model for video classification to analyse the classification accuracy gained using the 3D CNN model. The 3D convolutional networks are preferred for video classification since they inherently apply convolutions in the 3D space.
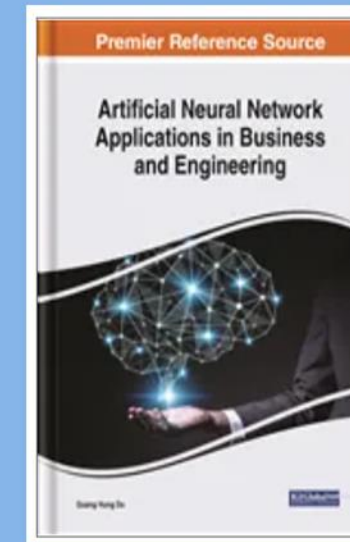
About the book chapter

In the current scenario, audio classification and recognition of a particular source of voice is a major challenge when several speakers are speaking at a time. The process of identifying each speaker in an audio segment is called speaker diarization. The major steps involved in speaker diarization are speech detection, speaker change, and speaker merges. Finding and suggesting the best filter is one of the most important task involved in every step of this process. In this chapter, a simple yet effective method using homorphism has been implemented to recommend the best filter for any audio classification task for this purpose.

TITLE OF BOOK CHAPTER : Modelling and Analysis of Active Biopotential Signals in Healthcare, Volume 2/Increasing the usability of the Devanagari script input based P300 speller
PUBLISHER: IOP
ISBN : 978-0-7503-3411-2
MONTH/YEAR OF PUBLICATION: DECEMBER 2020
AUTHORS: Ghanahshyam B Kshirsagar and Narendra D Londhe
DEPARTMENT : Electrical Engg.

TITLE OF BOOK CHAPTER: Language of Untold Vexation and Inscrutable Fear in the Dark Holds No Terror by Shashi Deshpande
PUBLISHER: Evincepub Publisher
ISBN: 978-93-90442-77-5-2020
MONTH/YEAR OF PUBLICATION : 2020
AUTHORS: Sandip Sarkar and Saikat Majumdar
DEPARTMENT: Humanities and Social Sciences

About the book chapter

The main purpose of this chapter is to increase the usability of Devanagari script input based P300 speller. For that purpose, we presented (i) a modified display paradigm called the zigzag RC paradigm, (ii) an overt attention-based spelling task and (iii) an efficient compact model for classification of the ERPs in a single trial. The experiments are performed on an ERP-EEG dataset of 64 DS characters collected from seven healthy subjects. The experimental evaluation includes the analysis of the classification performance, the error rate in the character detection and the ERP amplitudes, and the evaluation of workload.

About the book chapter

In the post-colonial era liberal thinking was brought into our country and that was developed and endorsed by Western education. The new novelists were credited with this novel where the threatened, manhandled and blasphemous embodiment of women are gradually blurred from the previous scenario, struggling against the male-dominated society which is utterly 'habitus' in complacency by "Promiscuous use of concubine and bride." In postcolonial fiction the image of a woman achieves a new matrix from both cultures. In this backdrop, where a woman is still progressing, evolving triumphantly from new issues, presenting a burgeoning qualities in different discourses and challenges, claiming the equality to men, there are still a kind of menace steeped in the soul of women for which she senses "A wife must always be a few feet behind her husband".

TITLE OF BOOK CHAPTER: Contextual Relevance of ICT-CALL Modules and Its Role in Promoting Employability Skills Among Engineering Students—A Study
PUBLISHER: Springer Nature, Singapore
ISBN: 978-981-13-9364-8
MONTH/YEAR OF PUBLICATION: 2020
AUTHOR: Yeddu Vijaya Babu
DEPARTMENT: Humanities and Social Sciences

TITLE OF BOOK CHAPTER : Algorithms for Intelligent Systems /Classification of ECG Heartbeat Using Deep Convolutional Neural Network
PUBLISHER: Springer, Singapore
ISBN: ISBN978-981-15-3688-5
MONTH/YEAR OF PUBLICATION : APRIL 2020
AUTHORS: Rekh Ram Janghel, Saroj Kumar Pandey and Kshitiz Varma
DEPARTMENT: Information Technology
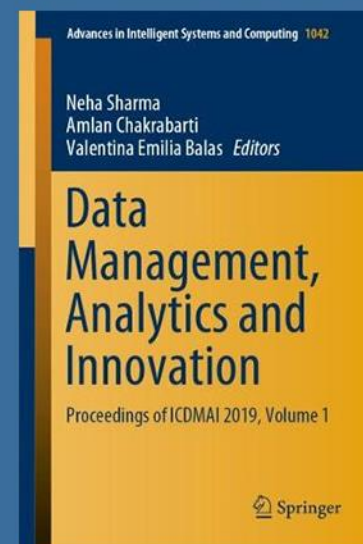
About the book chapter

This research paper deals with executing a task to examine contextual relevance of ICT-CALL modules in promoting employability skills among engineering students. This empirical study is based on ensuing perceptions of the learners in the context of imparting useful communication skills promoting employability skills through the ICT-CALL modules. This study probes mainly on how these skills enable individual interest in encouraging skills among the students based on the data collected from the students as a pilot study in one of the reputed national institutes of technologies in India. Theoretical groundwork for task has been demonstrated to the respondents. This task emphasizes mainly on the use of the learning modules and activities practiced in the language labs in promoting employability skills and to propose appropriate recommendations as well.

About the book chapter

The report of World Health Organization (WHO) specifies that the diagnosis and treatment of cardiovascular diseases are challenging tasks. To study the electrical conductivity of the heart, Electrocardiogram (ECG) which is an inexpensive diagnostic tool, is used. Classification is the most well-known topic for arrhythmia detection related to cardiovascular disease. Many algorithms have been evolved for the classification of heartbeat arrhythmia in the previous few decades using the CAD system. In this paper, we have developed a new deep CNN (11-layer) model for automatically classifying ECG heartbeats into five different groups according to the ANSI-AAMI standard (1998) without using feature extraction and selection techniques. The experiment is performed on publicly available Physionet MIT-BIH database and evaluated results are then compared with the existing works mentioned in the literature. To handle the problem of minority classes as well as the class imbalance problem, the database has been oversampled artificially using SMOTE technique. The augmented ECG database was employed for training the model while the testing was performed on the unseen dataset. On evaluation of the results from the experiment, we found that the proposed CNN model performed better in comparison to the experiments mentioned in other papers in terms of accuracy, sensitivity, and specificity, abstract environment.

TITLE OF BOOK CHAPTER : 3D Lung Segmentation Using Thresholding and Active Contour Method
PUBLISHER: Springer Singapore
ISBN : 978-981-15-1518-7
MONTH/YEAR OF PUBLICATION: 2020
AUTHORS : Satya Prakash Sahu, Bhawana Kamble and Rajesh Doriya
DEPARTMENT : Information Technology

TITLE OF BOOK CHAPTER : Fog Robotics : A New Perspective for Cloud-based Robots
PUBLISHER : CRC Press Taylor & Francis Group
ISBN : 9780367407155
MONTH/YEAR OF PUBLICATION : 2021
AUTHORS : Jaykumar Lachure and Rajesh Doriya
DEPARTMENT : Information Technology
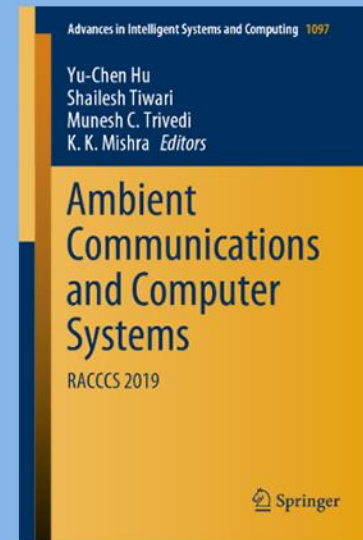
About the book chapter

Lung segmentation is the first step to identify any lung-related disease. It is an image processing-based process to obtain the boundary of the lung area fromthoracic on CT images. To challenge this scenario, advanced diagnosis methods are needed that requires CT scan images of patient. Radiologists need huge amountof time to detect if any person is having lung cancer or not. To help radiologists, several researchers had proposed many computer-aided diagnosis systems to detect lung-related disease at early stages. In the present work, lung segmentation is donein three dimensions. Image processing techniques are applied named thresholding,morphological operation and active contour to achieve this. At first, preprocessing is done to normalize the value and then Otsu thresholding to divide image into two regions. Morphological operation like erosion is applied to eliminate unwanted region. Active contour is applied at last to segment lung in 3D. Here, 15 subjects are taken from LIDC-IDRI. This method has achieved 0.967 Jaccard index and 0.983 Dice similarity coefficient when compared to ground truth. A 3D view of lung segmentation is also shown.

About the book chapter

Recent developments in Cloud Computing technology has enabled robotic systems to offload intensive computational tasks and large amount of data to the cloud infrastructure. Since, Cloud Computing is a centralized approach and it usually suffers from high latency delays which can be inappropriate for many real-time applications of IoT and robotics. In contrast, Fog Computing is decentralized approach which can act as an intermediator between cloud infrastructure and the end entity. Many robotics applications can also leverage the advantages of Fog Computing paradigm to have fast response, less energy consumption, low cost hardware, low latency, and minimal security concern. In this paper, we have presented the integration of Fog Computing with the robotics systems which has been termed as Fog Robotics. The integration has been demonstrated using use cases of Multi-Robot Systems, Self-Driving Cars and Weed Detection System.

TITLE OF BOOK CHAPTER : Recent Trends in Applied Mathematics/Effect of Variable Viscosity on Slow Rotation of a Porous Sphere in a Cavity

PUBLISHER: Springer, Singapore

ISBN : 978-981-15-9816-6

MONTH/YEAR OF PUBLICATION: 2021

AUTHOR: Madasu Krishna Prasad

DEPARTMENT : Mathematics

TITLE OF BOOK CHAPTER : Solid Lubricant Effect on the Microstructure and Hardness of the Functionally Graded Cemented Tungsten Carbide Heartbeat Using Deep Convolutional Neural Network

PUBLISHER : Springer

ISBN: PRINT ISSN 2195-4364 (ELECTRONIC)

MONTH/YEAR OF PUBLICATION : FEBRUARY 2020

AUTHORS : Rityuj Singh Parihar, Srinivasu Gangi Setti and Raj Kumar Sahu

DEPARTMENT : Mechanical Engg.

About the book chapter

This book presents select proceedings of the International Conference on Applied Mathematics in Science and Engineering (AMSE 2019). Various topics covered include computational fluid dynamics, applications of differential equations in engineering, numerical methods for ODEs and PDEs, mathematical modeling and analysis of biological systems, optimal control and controllability of differential equations, fractional calculus and its applications, nonlinear analysis, and functional analysis. This book will be of interest to researchers, academicians and students in the fields of applied sciences, mathematics and engineering.

About the book chapter

Functionally graded materials (FGMs) are special types of advanced composites with peculiar features and advantages. The controlled distribution of Cobalt (Co) and tungsten (W) compositions in cemented carbide form of gradient makes functionally graded material (FGCC) and results in customized material properties, which can be used as a cutting tool material. A gradient of solid lubricant can be added to FGCC for the improvement of the wear resistance of the cutting material. This chapter deals with the development of FGCC with and without solid lubricant and comparisons of their microstructure and hardness.

TITLE OF BOOK CHAPTER :
Hybrid Composite Perovskite Materials:
Design to Applications
PUBLISHER: Elsevier
ISBN : 978-0-12-820400-9
MONTH/YEAR OF PUBLICATION:
OCTOBER 2020
AUTHORS : Priyanka Roy, Numeshwar
Kumar Sinha and Ayush Khare
DEPARTMENT : Physics

About the book chapter

Hybrid Composite Perovskite Materials: Design to Applications discusses the manufacturing, design and characterization of organic-inorganic perovskite composite materials. The book goes beyond the basics of characterization and discusses physical properties, surface morphology and environmental stability. Users will find extensive examples of real-world products that are suitable for the needs of the market. Following a logical order, the book begins with mathematical background and then covers innovative approaches to physical modeling, analysis and design techniques. Numerous examples illustrate the proposed methods and results, making this book a sound resource on the modern research application of perovskite composites with real commercial value.

SPONSORED PROJECTS

01	TITLE OF RESEARCH PROJECT SANCTIONED	Ensuring optimal utilization of solar water pumps in rural Chhattisgarh
	SPONSORING AGENCY	Partnership 2020
	DURATION (FROM-TO)	January 2020 - November 2020
	AMOUNT SANCTIONED	USD 30595
	PI	Dr. Sachin Jain
	CO-PI (IF ANY)	Dr. Subhojit Ghosh and Dr. R. N. Patel

SUMMARY

This project is in collaboration with Prof. Jeremiah Johnson, Associate Professor, Department of Civil, Construction & Environmental Engineering North Carolina State University, USA and Sanjeev Jain, Chief Engineer CREDA (Chhattisgarh Renewable Energy Development Agency) for the improvement in the performance of solar water pumps in the rural Chhattisgarh. Project aims at the improvement of the solar water pumpsbased on the survey done. Survey will be carried out on the experiences of a small group of farmers who have been using the subsidized solar pumps.

02	**TITLE OF RESEARCH PROJECT SANCTIONED**	Modelling of the Environmental Sensor Data Recovery Problem
	SPONSORING AGENCY	SERB MATRIX
	DURATION (FROM-TO)	February 2020 - January 2023
	AMOUNT SANCTIONED	Rs. 6.6 Lacs
	PI	Dr. Govind P. Gupta, Department of Information Technology
	CO-PI (IF ANY)	NIL

SUMMARY

In a Wireless Sensor Network, the actual collection of the sensor data from different sensor nodes may suffer from data loss due to severe conditions of the sensor node and communication infrastructure such as malfunction of sensors, congestion in the communication network and interference during transmission of the sensor data etc. There are many applications of the Big Sensor Data system which is very sensitive to the missing sensor readings. Reconstruction of these missing sensor readings from the partially collected sensor readings at Big Sensor Data System is key research issue. The main objective of this research proposal is to fully utilize the deep features of the spatial and temporal correlation of the sensor data and periodic features of the sensor readings to enhance accuracy of the reconstruction for reconstructing the missing values.

03	**TITLE OF RESEARCH PROJECT SANCTIONED**	Development of Low-ppm Ammonia sensors using NiO/CeO2 heterostructured nanofibers
	SPONSORING AGENCY	DST-SERB, Govt. of India
	DURATION (FROM-TO)	April 2020 - March 2023
	AMOUNT SANCTIONED	Rs. 30.2 Lacs
	PI	Dr. Sudip Kumar Sinha, Department of Metallurgical and Materials Engg.
	CO-PI (IF ANY)	Dr. BijiP and Dr. Subhas Ganguly

SUMMARY

Precise and reliable detection of gaseous ammonia is of common interest due to its broad and diverse form range of roles in various environmental processes and industrial technologies. Therefore, considerable research efforts have been devoted to further improve the performances of these gas sensors. It is now known that 3D-hierarchical architectures can remarkably enhance the gas sensitivity owing to their favorable adsorption and desorption capacity to various toxic gases. Here, we intend to explore the synthesis and ammonia sensing application of NiO-CeO2 heterostructure p-n juntion composites as a novel low cost, reproducible, highly efficient, and productive alternative to the existing materials.

04	**TITLE OF RESEARCH PROJECT SANCTIONED**	Development of patient-specific vertebral disc joint implant with multi-components designing approach
	SPONSORING AGENCY	DST-Global innovation for technology Alliances
	DURATION (FROM-TO)	May 2020 - April 2023
	AMOUNT SANCTIONED	Rs. 30 Lacs
	PI	Dr. Arindam Bit, Department of Biomedical Engg.
	CO-PI (IF ANY)	NIL

SUMMARY

Low back pain is an occupational outcome in modern life-style. It occurs due to excessive demands of work, frequent lifting, vibration, and sitting posture of human trunk. It results in a progressive disorder of degradation ofintervertebral disk. The process Is painful and leads to severe osteoporosis in lumber regions of spinal cord. It is reported that it brings an burden to the economy due to its direct intervention to the outcome of professional activities. An annual report of patients with severe back-pain to the hospital is about 15% of all categories of patients, whereas, 30% of those reported patients are recommended for reconstructive surgery. Surprisingly, it is reported that more than 60% of the patients with above stated surgery are re-visiting hospital for surgical failures.There are many components of surgical failures, and improper disk management is a critical issue among them. In this proposal, a collaborative approach is made to address the critical issues of artificial intervertebral disk. Ateam is formed with Po-Liang Lai, orthopedic surgeon from Taiwan (having MOU with an orthopedic industry) withgood knowledge In the surgical management of degenerated intervertebral disk, and Arindam Bit, AssistantProfessor in Biomedical Engineering from India (having active interactions with Indian Orthopedic implantsmanufacturers) with proven knowledge in non-isotropic FEA modeling of bone and CFD modeling of FSI phenomena of soft tissues and porous tissues, and it the field of tissue engineering.

Both the team collectively proposed a section of innovation within the scope of the proposal which will results insuccessful management of degenerated intervertebral disk. A smart intervertebral disc with multi-component system is proposed which will be modeled with non-isotropicmaterial properties, and surface porosity. The geometry will be developed based on the three-dimensional reconstructed data obtained from CT scan images of the patients. It will make the designing to be customized.Additionally, fluid-structure-interaction phenomena is incorporated within the design to ensure the evaluation of diffusion phenomena of macromolecules through the porous surface of the developed disk to accommodate hydrostatic pressure during cyclic loading.The above developed model after being evaluated for cyclic loading condition, shall be fabricated in-house using dispenser module-based 3-D printing system. The composite material contain a mosaic model of bioink consisting of nano-HAP, chitosan, and non-mulberry silk fibroins to ensure desired surface topology, higher mechanical strength, and elasticity to the bioresorbable implant. In addition to the structural integrity of this type of implant, it will be doped with essential macromolecules such as genipin, growth factors, and cross-linking reagent for the augmented disks.Taiwanese group will obtain the human cadaver, and the CT scan will be taken to provide the source of optimizing geometric model of the intervertebral implant. The creep and dynamic loading test will be performed to analysis thebiomechanical properties for the meta-elastic finite element analysis and fluid-structure interaction modeling. The permeability and aggregate modulus can be calculated using a mathematical model of linear biphasic formula after the creep testing. The stiffness, phase angle, and elastic modulus will be investigated with varying frequency afterthe dynamic loading. After the developed intervertebral disc manufactured by Indian group, the complete assessment of mechanical properties of the prototypes will be performed according to the ASTM F2267 and ASTMF2077 guidelines in static and fatigue loading. The prototypes will be revised as a cycle process through the setests. Then, the in-vivo animal study will be conducted using a porcine cervical model.Taiwanese group will improve their abilities of analyzing the biomechanical properties of the cadaver specimen and performing in-vitro biomechanical experiment. The complete testing protocol including the assessment of mechanical strength and in-vivo animal experiment will also be built through this project.

05	TITLE OF RESEARCH PROJECT SANCTIONED	Fight Against the Corona-Virus Pandemic using Mathematical Modeling under Bioinformatics & Surveillance
	SPONSORING AGENCY	Chattisgarh Council Of Science & Technology Raipur (CCOST Raipur)
	DURATION (FROM-TO)	December 2020 - November 2021
	AMOUNT SANCTIONED	Rs. 1.25 Lacs
	PI	Dr. Arvind Kumar Sinha Department of Mathematics
	CO-PI (IF ANY)	Nil

SUMMARY

The first case of the COVID-19 pandemic in India was reported on January 30, 2020, originating from China. Slowly, the pandemic spread to various states and union territories, including the state of Chhattisgarh. Chhattisgarh was the first state to enforce strict actions against corona-virus prevention immediately after it reported the first case in Chhattisgarh on March 19, 2020, even before the Prime Minister of India announced a nationwide lockdown. The nationwide lockdown came into effect on March 25, 2020, but Chhattisgarh Government had restricted movement at malls, theatres, and other crowded areas before that. The strict restrictions imposed by the State Government, in the initial stages, kept COVID-19 under check. The project aims to study the fight against the corona-virus pandemic using mathematical modeling under Bioinformatics and Surveillance.

06	TITLE OF RESEARCH PROJECT SANCTIONED	Design of face recognition-based office entry and attendance system secured by blockchain based storage and audit trail.
	SPONSORING AGENCY	Chhattisgarh Council of Science and Technology (CCOST)
	DURATION (FROM-TO)	December 2020 - November 2021
	AMOUNT SANCTIONED	Rs. 2.2 Lacs
	PI	Dr. Rakesh Tripathi, Dept. of IT
	CO-PI (IF ANY)	Dr. Saikat Majumder, Dept. of ECE

SUMMARY

This project aims at designing and developing a contactless access control cum attendance system by using an IoT enabled facial recognition approach and leveraging blockchain based storage and audit trail for security of the database. The primary aim of the project is to mitigate the privacy and security risk in the current monitoring system by removing the hurdle of third-party dependency viz., authentication, verification, and storage. Thus, to address the issue of existing monitoring system, consortium blockchain based infrastructure is proposed, to provide better security and privacy in the system.

07	**TITLE OF RESEARCH PROJECT SANCTIONED**	Development of Breast Cancer Risk Assessment Women using Advance Artificial Intelligence Techniques: A Pilot Study
	SPONSORING AGENCY	ICMR
	DURATION (FROM-TO)	Feb 2021 - Feb 2024
	AMOUNT SANCTIONED	Rs. 6.45 Lacs
	PI	Dr. Bikesh Kumar Singh
	CO-PI (IF ANY)	Dr. Kesari Verma, Associate Professor, Computer Applications, NIT Raipur Dr. Narendra K Bodhey, Professor, Department of Radiodiagnosis, AIIMS Raipur

SUMMARY

Irrespective of the socio-economic and educational background there is increased incidence of breast cancer factors among Indian women due to low cancer literacy and awareness deficit ofbreast cancer risk. The project aims towarddeveloping an artificial intelligence (AI) based risk assessment system for early diagnosis of breastcancer using various risk factors related to patient's history, socio-economic status, anthropometricmeasures, clinical symptoms, dietary patterns and lifestyle factors. Routine blood pathology andfindings of radiology images such as Mammogram, ultrasound and magnetic resonance imaging(MRI) will also be taken into consideration if available.

08	**TITLE OF RESEARCH PROJECT SANCTIONED**	Hyperspectral Data Analysis
	SPONSORING AGENCY	Instruments Research & Development Establishment (DRDO)
	DURATION (FROM-TO)	January 2021 - December 2021
	AMOUNT SANCTIONED	Rs. 9.7 Lacs
	PI	Dr. Himanshu Govil
	CO-PI (IF ANY)	Nil

SUMMARY

This work will evaluate the Hyper spectral data for the different manmade and Natural features.

RESEARCH PAPERS PUBLISHED
(January - March 2021)

Title: "Evaluation of uranium containing ground water quality and non-carcinogenic risk assessment in inhabitant of Bijapur District of Chhattisgarh, Central India".
Authors: M. Singh, K. Tapadia, D. Jhariya and P. Sahu
Journal: Journal of Radio analytical and Nuclear Chemistry, Springer, 327, 939–947 (2021).
Web Link: https://doi.org/10.1007/s10967-020-07572-0

Title: "Detection of Wakashio oil spill off Mauritius using Sentinel-1 and 2 data: 1 capability of sensors, image transformation methods and mapping".
Authors: Sankaran Rajendrana, Ponnumony Vethamony, Fadhil N. Sadooni, Hamad Al-Saad Al Kuwari, Jassim A. Al-Khayat, Vashist O. Seegobin, Himanshu Govil and Sobhi Nasir
Journal: Environmental Pollution, Elsevier, 274, 1-11(2021).
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Authors: Sankaran Rajendran, Fadhil N. Sadooni, Hamad Al-Saad Al-Kuwari, Anisimov Oleg, Himanshu Govil, Sobhi Nasir and Ponnumony Vethamony
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Web Link: DOI: 10.1038/s41598-021-83260-7

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Authors: Subhanil Guha and Himanshu Govil,
Journal: Geocarto International, Taylor and Francis, (2021).
Web Link: https://doi.org/10.1080/10106049.2021.1886339

Title: "Relationship between land surface temperature and normalized difference water index on various land surfaces: A seasonal analysis".
Authors: Subhanil Guha and Himanshu Govil
Journal: International Journal of Engineering and Geosciences, Dergipark, 6 (3) 165-173 (2021).
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Authors: Preeti Chaturvedi, Parul Shukla, Balendu Shekher Giri, Pankaj Chowdhary, Ram Chandra, Pratima Gupta and Ashok Pandey
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Authors: Preeti Chaturvedi, Pankaj Chowdhary, Anuradha Singh, Deepshi Chaurasia, Ashok Pandey, Ram Chandra and Pratima Gupta
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Authors: Roshni Meghnani, Mohit Kumar, G. Pugazhenthi and Vasanth Dhakshinamoorthy
Journal: Separation and Purification Technology, Elsevier, 256, 117814 (2021).
Web Link: https://doi.org/10.1016/j.seppur.2020.117814

Title: "Molecular docking and ADMET analysis of synthetic statins for HMG-CoA Reductase inhibition activity".
Authors: Aditya L Toppo, Manisha Yadav, Swasti Dhagat, Seenivasan Ayothiraman and Jujjavarapu Satya Eswari
Journal: Indian Journal of Biochemistry and Biophysics, NISCAIR Online Periodicals Repository (NOPR), 58 (2), 127-134 (2021)
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Web Link: DOI: 10.1007/s11696-021-01565-3

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Authors: Abinash Pujahari and Dilip Singh Sisodia
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Journal: IET Power Electronics, IET, 13 (15), 3384-3395 (2021)
Web Link: DOI: 10.1049/iet-pel.2020.0158

Title: "Design of FOPID Controller for Higher Order Continuous Interval System Using Improved Approximation Ensuring Stability".
Authors: P. D. Dewangan, V. P. Singh and S. L. Sinha
Journal: SN Applied Science, Springer Nature3, 493 (2021)
Web Link: https://doi.org/10.1007/s42452-021-04492-w

Title: "MVFNet: A Multi-view Fusion Network for Pain Intensity Assessment in Unconstrained Environment Biomedical Signal Processing and Control".
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Authors: Ananya Rout and Sadhana Agrawal
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Authors: Luca Saba, Mohit Agarwal, Anubhav Patrick, Anudeep Puvvula, Suneet K. Gupta, Alessandro Carriero, John R. Laird, George D. Kitas, Amer M. Johri, Antonella Balestrieri, Zeno Falaschi, Alessio Paschè, Vijay Viswanathan, Ayman El-Baz, Iqbal Alam, Abhinav Jain, Subbaram Naidu, Ronald Oberleitner, Narendra N. Khanna, Arindam Bit, Mostafa Fatemi, Azra Alizad, and Jasjit S. Suri
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MEMORANDUM OF UNDERSTANDING
(January 2018-December 2020)

S. NO.	NAME OF THE ORGANIZATION	DATE OF MOU	PURPOSE OF MOU
1	VEDANTA LIMITED	25-JAN-2018	For mutual exchange of knowledge and capabilities through visits & activities, and for carrying out testing and consultancy projects.
2	UNIVERSITY OF WARWICK, UK	05-FEB-2018	For solving various challenges of science, engineering and technology by carrying out mutually beneficial collaborative research projects.
3	NATIONAL MINERAL DEVELOPMENT CORPORATION LIMITED (NMDC)	24-APR-2018	To carry out Feasibility studies on removal of contaminants from surface and ground water of Bailadila iron ore mine project and peripherals.
4	DEPARTMENT OF COMMERCE & INDUSTRY CHHATTISGARH	25-APR-2018	To provide boost to entrepreneurial talent and develop a startup eco-system through events, workshops and activities.
5	AIC@36INC	27-APR-2018	For promoting entrepreneurship through incubation to selected promising start-ups, and training & development programs and events.
6	INNOVATIOCURIS PRIVATE LIMITED, DELHI	05-MAY-2018	For promoting an integrated and collaborative strategic approach to product research, design, development, technology transfer
7	VALI-E-ASR UNIVERSITY IRAN	10-JAN-2019	For exchange of students, faculty members and research materials, and coordination in collaborative research projects.
8	NATIONAL ILAN UNIVERSITY TAIWAN	22-JAN-2019	For exchange of students, faculty members and research materials, and coordination in collaborative research projects.

| S. NO.	NAME OF THE ORGANIZATION	DATE OF MOU	PURPOSE OF MOU
9	NATIONAL INSTITUTE OF INDUSTRIAL ENGINEERING (NITIE) MUMBAI	05-FEB-2019	To promote interaction and collaboration between faculty, staff and students through visits and exchange programs, and to carry out joint academic and research programmes.
10	UNIVERSITY OF CALABRIA, ITALY	27-JUN-2019	For exchange of students, faculty members and research materials, and coordination in collaborative research projects.
11	VALI-E-ASR UNIVERSITY IRAN	10-JAN-2019	For exchange of students, faculty members and research materials, and coordination in collaborative research projects.
12	NATIONAL ILAN UNIVERSITY TAIWAN	22-JAN-2019	For exchange of students, faculty members and research materials, and coordination in collaborative research projects.
13	UNIVERSIDAD AUTÓNOMA DE CIUDAD JUÁREZ MEXICO	22-JAN-2019	For exchange of students, faculty members and research materials, and coordination in collaborative research projects.
14	DAMGHAN UNIVERSITY, IRAN	17-JAN-2020	For academic exchange and cooperation in conducting mutually beneficial collaborative research projects.
15	CHHATTISGARH COUNCIL OF SCIENCE & TECHNOLOGY (CGCOST)	04-SEP-2020	For addressal of Intellectual Property Rights to foster innovative research collaboration and consultancy
16	NATIONAL HIGHWAY AUTHORITY OF INDIA (NHAI)	01-NOV-2020	To enable the institute to voluntarily adopt nearby stretches of National Highways for using them as fields of study through paid internships for betterment of the highway infrastructure.
17	TAYLORMADE RENEWABLE LIMITED, GUJARAT	01-NOV-2020	To facilitate and promote research of waste water treatment technologies for effective wastewater treatment of domestic, groundwater and industrial effluents.
18	CENTRE FOR GANGA RIVER BASIN MANAGEMENT AND STUDIES, IIT KANPUR	04-DEC-2020	For development and execution of project proposals and activities to support implementation of Ganga River Basin Management Plan.
19	3D SRISHTI PRIVATE LIMITED, HYDERABAD	29-DEC-2020	For developing edible polymers, biodegradable materials, smart composite materials and exploring the usage of materials developed by 3D printing technologies

CONFERENCES ORGANIZED AND UPCOMING CONFERENCES

A two day 2nd National Conference on "Advanced Materials & Its Applications" was organised by Department of Physics, NIT Raipur during December 28 - 29, 2020.

The objective of the conference was to bring people from various fields of materials science at a common platform and to make researchers aware of the latest developments in the related fields.

The conference was inaugurated by Dr. S. Sanyal, Dean (Faculty Welfare), NIT Raipur. Dr. P. K. Dwivedi, Senior Scientist, Nanoscience and Nanofabrication Division, IIT Kanpur was the guest of honour for the inaugural session and delivered the keynote address of the conference.

Dr. Ayush Khare, Head, Dept. of Physics and the Chairman of the event introduced the participants about the conference. Dr. B. K. Sahoo and Dr. S. M. Saini acted as the Secretaries in the conference. Dr B. K. Sahoo proposed the vote of thanks by extending his heartfelt gratitude to all the resource persons, participating researchers, students and organizers. The first invited speech was delivered by Dr. B. R. Sankapal, VNIT Nagpur while Dr. S. P. Patel from GGU Bilaspur delivered the second invited speech.

The whole (online) conference was divided into 04 technical sessions. All the participants were provided with soft copy of Abstract Book. A total of 35 selected articles were published in the IOP Conference Series: Materials Science and Engineering (ISSN-1757-899X) (Scopus Indexed).
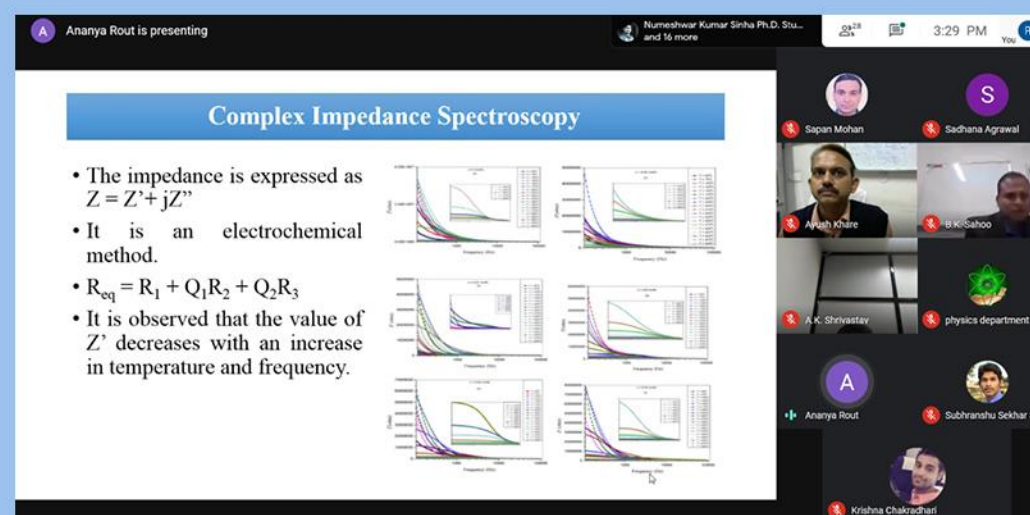
It was the second version of NCAMA. The first version of NCAMA was successfully organized during Dec. 21-22, 2019 where a total of 95 participants presented their research findings.

TITLE: INTERNATIONAL CONFERENCE ON MATERIALS AND TECHNOLOGIES

ORGANIZING DEPARTMENTS: DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING (MME), JOINTLY WITH DEPARTMENT OF MECHANICAL ENGINEERING (ME)

DURATION: JANUARY 9-10, 2021

Department of Metallurgical and Materials Engineering (DMME) and Department of Mechanical Engineering (ME), NIT Raipur jointly organized an International Conference on Material and Technologies (MaterialTECH 2021) on 9th and 10th Jan., 2021. The conference was inaugurated by the Chief Patron Dr. A. M. Rawani, Director, NIT Raipur. Dr. S. Gupta, Dean (R&C) was the patron of the conference and the conference was chaired by Dr. M. K. Tripathi, Assistant Professor, MME. The conference instilled a dialogue between industrial organizations and academic institutions for the transformation of adequate knowledge from academia-research to industry. The selected and peer-reviewed research articles have already been published in SCI-indexed proceedings 'Materials Today Proceeding'.
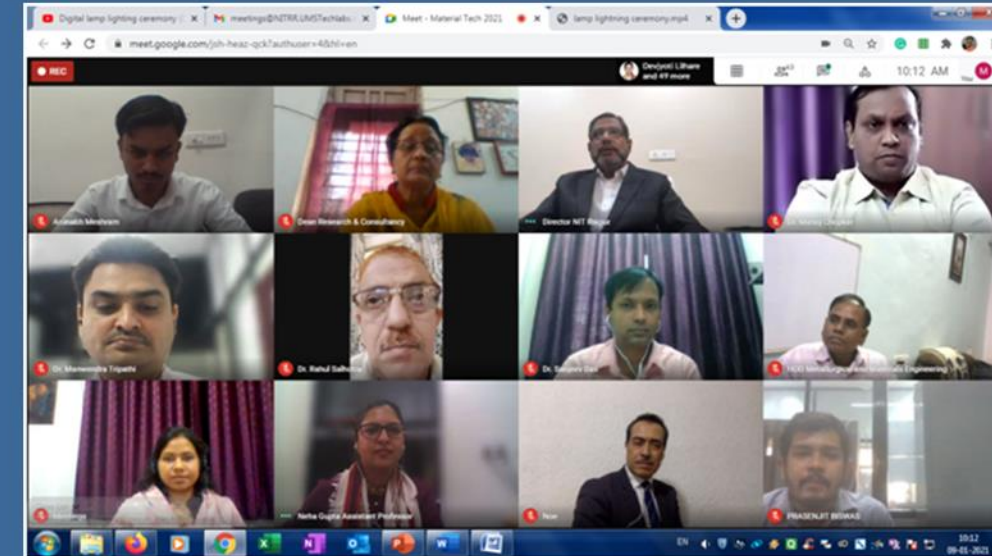
A total of 107 participants had registered out of which 7 were international participants from Japan, Brazil and Sri Lanka, etc.

FORTHCOMING CONFERENCE

TITLE: International Conference on Reaction Engineering (ICRE-2021)

Department of Chemical Engg. is going to organize two days International Conference on Reaction Engineering (ICRE-2021) during May 7-8, 2021. The ICRE-2021 brings together the collection of researchers who are at the forefront in the field of Reaction Engineering. The scientific program will include oral presentations of sub-disciplines, keynote sessions led by eminent scientists and poster sessions presented interactively by junior scientists and graduate students. It is the ultimate meeting place for all the experts worldwide for new inter disciplinary scientific collaborations and networking. There will be oral & poster presentation competition for UG / PG / M. Tech / Research Scholars / Faculty members related to various chemical and biological reactions. The expert talks by eminent scientists like Ajay K Dalai, Canada Research Chair of Bioenergy, Ranil Wickramasinghe, K K Pant, IIT Kanpur, Akshat Taksale, Monash University, Melbourne, V C Shrivastava, IIT Roorkee, etc. will be the highlights of the conference. The Chairman of this mega event is Dr. A K Poonia and Dr. P K Chaudhari, Dr. Amit Keshav and Dr. Dharm Pal are working as conference secretaries. The selected papers will be published in the International Journal of Chemical Reaction Engg. (IJCRE). The last date for abstract submission was April 10, 2021.

For more details, please join the link: icre.nitrr.ac.in
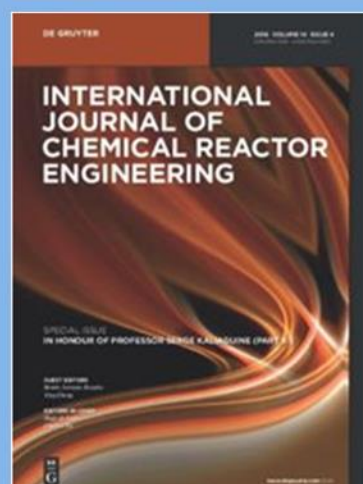
ARTICLES OF PRIME RELEVANCE

IMPACT OF DIGITAL FOOTPRINT ON OUR LIFE

SHOBHA LATA SINHA

DEPARTMENT OF MECHANICAL ENGG.

Introduction

In the modern era, we depend on the computer for our online and offline work. During online work, we usually leave our digital footprint on social media/environment. The digital footprint is anything that is about us or put out by us online. It includes social media such as Facebook, Twitter, or Instagram, our website, articles about us, or written material. It spans all time and does not just include what is found at the top of the page. It can be information that is both easy and hard to find. It is to be noted that our digital footprint is not just things we actively put online like photos or Facebook status updates. It is our information that is being scraped from more passive online activities as well.

Our digital footprint is data that is created through our activities and communication online. This can include more passive activities, such as if a website collects our IP address, and more active digital activities, such as sharing images on social media, birthday wishes, schedule of our outings, etc. We should keep in mind that anything we place online, whether text or images, can be available online forever, which may have an extreme positive or negative impact on our real life. Forever is a very long time, which means it is all the more important to keep on top of our digital footprint.

Our digital footprint is often used to obtain personal information about us, such as demographics, religion, private affairs, business, political positions, interests, etc. This information could be gathered using cookies, which are tiny files websites store on our computer after our first visit to track user activity. Cookies also allow us to hold items in a shopping cart, store preferences or login information, and make personalized suggestions based on our location or interests. Advertisers use our digital footprint to target us with customized advertisements e.g. if we look at a shirt online, we may later see advertisements for those shirts or similar items. Employers-both current and prospective also use our digital footprint. It is essential to care for our digital footprint if we are job hunting, as Googling is now a central part of the hiring process An online background check by recruiters is being carried out. It is a common practice these days. In worst-case scenarios, individuals could lose their job.

Ways to manage our digital footprint Fortunately, we have plenty of ways to be proactive in managing our digital footprint. The following are the tips for it:
Google ourselves: We may search for our name every few months, so we are conscious of the information others have access too.

Set up Google alerts: By setting up a Google alert for our name, the tool will then send us occasional alerts of every post that has our name on it.
Protect our data: We should not disclose our address, phone number, passwords or bank card numbers, etc. We should use our nickname instead of our real name.

Keeping login information safely: We should never share any of your usernames or passwords with anyone.

Think before we post: We should never put a temporary emotion on the permanent internet as anger is momentary, but online lasts forever. So, we should pause before we post. We need to think twice before we post.
Nix the pics: Any photo we post could be dug up someday. So, we need to limit our sharing of questionable image Advantages of a Digital Footprint When we do something wrong, our digital footprint can be detrimental, but it is not all doom and gloom. When we are doing right, a digital footprint can provide us with a great first impression. We are now aware that employers are following our trail so that we may take advantage of it. There are many ways to leverage our digital skills to get a job. Some tips are given below:

A robust online presence, or a digital footprint, can be a career asset in today's competitive job market.

Many employers are performing online searches-in addition to reviewing resumes and cover letters-in an attempt to learn about prospective hires, including their interests, industry involvement, and, more importantly, their ability to market themselves effectively.
Suppose hiring managers are impressed by the content they find, like thought-provoking commentary or links to industry articles. In that case, they may be more apt to reach out to individuals for an interview. On the other hand, a lack of activity can be a turn-off.
With the digital economy now driving much of the workforce, reinforcing our technical prowess with a solid digital presence can help job seekers.
Our digital footprint is now a reality of life. If we want to do anything significant globally, we need to understand how to craft our footprint and use it. This will help an individual to control the narrative through personal branding.
We must have a theme or style woven throughout our social media and website. This will make it easier for readers to tell what content is verifiably from us and what could have been put out by someone else about us.
Remedial Measures for Protecting our Reputation from Online Mistakes
There is no doubt how our behavior online can damage our real-life reputation. It can cost our jobs, strain relationships with friends and family members, and change the way people view us. Today, it is vital to view our online reputation as an extension of your real-life reputation.

Damaging one will hurt the other. We need to protect our online reputation to avoid devastating consequences. The tips are given below:
Think twice before you post: With any level of critical thinking or self-reflection, most individuals who have come under fire for their online content could have avoided their career-derailing mistakes.
Clean up your social media past: If you know you have skeletons in your social media closet, do not leave them there. You can use tools out there to delete vast volumes of old Facebook /Twitter posts in a single click. You can even set up a service to delete Tweets that are older than a specified age. Wiping out old content now reduces the risk of someone finding it and using it against you in the future.
Use your privacy settings: By setting privacy settings, we can be safe. With just a few clicks, you can shield most of your profile from anyone who is not already friends with you.
Be honest in writing thesis/reports / books: Nowadays copy-paste business is growing fast. If the thesis is made this way, it may harm you in the future as it is being dumped in repositories like Shodhganga or on various universities' websites. People are also referring to it. Any unfair practice may defame you.
Social media is not going anywhere, and it certainly has its benefits. For communication, connection, and staying informed, social media offers a good platform. We should be careful as online life and our real-life are the same. "DO NOT LEAVE YOUR FOOTPRINTS WHICH MAY HARM YOU IN FUTURE. THINK, ACT, AND POST ACCORDINGLY".

DETECTION OF MICROALGAE CELLS IN DRINKING WATER BY OPTICAL BIOSENSOR

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Introduction

Nanotechnology generally refers to a field of science and engineering dedicated to materials of sizes ranging from 1–100nm. The term 'nano' is extracted from the Greek word 'dwarf ', which means 'extremely small'. When used as a prefix, it means 10-9 or 0.000000001. A nanometer (nm) is one billionth of a meter. Nanoparticles are a unique group of materials with exceptional features and broad applications in various fields. In recent years, researchers have become increasingly interested in the synthesis of gold nanoparticles (AuNPs), because of their unique physical and chemical properties in wide areas like catalysis, biolabeling, nonlinear optical devices, and in the field of drug delivery. AuNPs have exceptional optical properties due to surface plasmon resonance (SPR) effects. It is an optical phenomenon occurring from the interaction between an electromagnetic wave and the conduction electrons in a metal. The SPR property of AuNPs makes them quite useful in the fields of bioimaging and biomedical therapeutics, and as bio-diagnostic tools. AuNPs are being widely used in a variety of biomedical applications because of their compatibility of synthesis and functionalization, less toxicity, and facility of detection. AuNPs can accumulate in the tumor cells and show optical scattering; thus, these nanoparticles can play an important role as a probe for the microscopy study of cancer cells. In addition, these nanoparticles can be used in chemotherapy and for the diagnosis of cancer. The AuNPs also provide an applicable and promising scaffold for drug and gene delivery. This method comprises the assembly of atoms (produced by the reduction of ions) into desired nanostructures. Top-down techniques, such as photolithography and electron beam lithography, involve the removal of matter from the bulk material to get the desired nanostructure. In this article, SPR property of AuNPs has been exploited by author in biological material detection. Currently, water pollution is one of the major environmental concerns in the present global scenario. Deterioration of the drinking water resources has a significant impact on human society, and consumption of polluted and hazardous water posed a serious threat to our health. Since there is a crucial requirement of conserving freshwater sources such as water reservoirs and ground waters; hence, water quality evaluation is essential. Several factors are accountable for the water quality deprivation, such as the existence of heavy metals, organic and inorganic contaminants, and pathogenic micro-organisms, as well as an excess of nutrients in the water pollution,causes health problems that block the sustainable advancement of the economy. Due to the easiness of culture and growth of green microalgae, they are generally found in the drinking water sources.

Hence, practical monitoring of such pollutants in drinking water needs rapid, simple, and low-cost screening devices. Although several sophisticated sensor devices such as GC, ICPMS, MS, etc., have been employed for the detection of water pollutants, however, they are not feasible for field application due to their bulky nature, expensive, complex operating process. Furthermore, these sensing devices are station at specific testing laboratories. On the other hand, enzyme-linked immune-absorbent assays gives faster result than the conventional culturing techniques, and generally takes three to four hours and also involves labeling reagents. Whereas Nucleic acid-based methods like polymerase chain reaction gives more accurate results and does not require culturing habits, however, it takes several hours and requires skilled persons. Hence, the development of simple, low-cost, high-sensitivity, and repaid sensing devices is highly in demand in the current scenario for monitoring of water contaminations. In this regard, the SPR sensor has been productively used for the detection of various types of biomolecules (such as DNA, proteins, peptides etc.,) and microalgae as label-free optical biosensors. SPR technique has ultra-high sensing capability, and it is used to detect analytes molecules at the surface of metals thin films or nanostructures. Due to its high sensitivity nature, SPR sensors have emanated as a practical sensing method in biological sensing applications. However, a conventional SPR sensor requires a prism-based light coupling mechanism for SPR excitation, and analytes need to be delivered However, a conventional SPR sensor requires a prism-based light coupling mechanism for SPR excitation, and analytes need to be delivered over the sensor surface through the flow cell, thereby limiting fast accessibility. In the case of metal nanoparticles, the excitation of surface plasmon is much simpler, and it does not require any light coupling mechanism, unlike the conventional SPR technique. Here, when the light having a wavelength much larger than the metal nanoparticles size is incident, it induced coherent oscillation of electrons in metals at resonant wavelength to generate SPR so-called Localized Surface Plasmon Resonance (LSPR). LSPR results in a high-intensity and strongly localized electromagnetic field that can be very sensitive to even minute changes in the adjacent dielectric medium on the metal nanoparticles surface that can be used to identify biomolecules. LSPR can be directly excited by the light, and such a sensing platform has been employed to detect target analytes without any labeling, enables real-time, precise, and rapid analysis. Besides, the LSPR sensing platform integrated with the capillary platform allows us to overcome the flow cell requirement and enables the rapid detection of analytes at low concentrations. So far, there has been no report on the detection of microalgae present in water using a plasmonic capillary-based LSPR sensing platform. Here, we present the detection of green microalgae (Chlorella sp. CB4) in water as a water pollutant at a very low concentration using our proposed plasmonic capillary-based LSPR sensor. The anticipated plasmonic sensing device consists of an embedded AuNPs in a glass capillary; a white light LED with the power supply; a CCD spectrometer, and a custom-made adapter; all the components were integrated into a single experimental platform. This enables the plasmonic capillary to simultaneous act as both flow-cell and sensing transducer. Besides, the plasmonic capillary sensor offers several advantages of easy handling, a smaller sample volume, fast ease of access, compact, lightweight, and portable thereby facilitating on-site field testing over the conventional SPR sensor design.

DEVELOPMENT OF BIOPOLYMER-BASED MUCOADHESIVE PATCH FOR EFFICIENT DRUG DELIVERY

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Introduction

Conventional administration of drug formulations (tablets, capsules, syrup, suspension, etc.) using the oral route and parenteral routes (intravenous, subcutaneous, intramuscular, intradermal, etc.) have their own benefits, limitations, and challenges. Though, the oral route is the most applied route of drug delivery, but the solid oral dosage forms are associated with the risk of choking and asphyxiation especially for pediatric, geriatric, dysphagic, and stroke patients. Even the patients who do not come under the above category are sceptical about chocking with these solid oral dosage forms. Syrups and suspensions might be associated with the inaccuracy of dosages due to measurement inaccuracy. Another challenge associated with the oral route is the first-pass metabolism of delivered drugs. Due to the first-pass metabolism, the dosage of drug administered orally is much more than that required concentration at the site of action. On the other hand, the most common drawback of the parenteral route (injection) is invasive i.e. the needle-associated pain. Secondary problems associated with the parenteral route are phlebitis and infiltration and it may also observe and occurred.

The injection may cause nerve injury and it is also frequently reported to be associated with intramuscular drug administration. Regular injectionsto the person for certain conditions in insulin-dependent diabetes are associated with other problems too. Therefore, alternative routes such as the mucosal route could be utilized for direct systemic drug delivery owing to their high vascularity. Mucoadhesive drug delivery systems are very much helpful for such delivery. Therefore, our research group is working on the development of a mucoadhesive patch fabricated using biopolymer (safe and biocompatible) for the efficient delivery of drug-like insulin. We feel that mucoadhesive drug delivery formulations can also be useful in the local delivery of drugs in certain conditions such as oral cancer where buccal delivery of anti-cancer drugs can be administered through buccal patches and tablets. Such formulations can be tuned for sustained delivery of drugs that would reduce the number of dosages, non-invasive, and prolong the therapeutic effect of the drug. A polymeric mucoadhesive patch can deliver drugs when attached to the buccal mucosa (inner side of the cheek). As mentioned above, oral and parenteral drug administration faces challenges that are commonly encountered. A limited number of buccal delivery formulations (patches and tablets) are available commercially abroad but not in the Indian market.

International research groups have used carboxymethyl cellulose as the mucoadhesive polymer. The novelty of our fabricated patch lies in the mucoadhesive polymer that has been reported for the first time for such an application in transmucosalbuccal drug delivery and related publications came in the international peer-reviewed journals. The fabricated product in my lab was a mucoadhesive polymeric buccal patch that can be used for systemic as well as local drug delivery. The buccal route is a completely non-invasive route for drug administration, and it is highly beneficial on various fronts. It can by-pass certain challenges faced by both oral and parenteral delivery systems. As we know that oral administration of drugs is associated with certain challenges such as first-pass metabolism and choking/asphyxiation. Drug molecules are metabolized by the hepatic first-pass effect. Due to this metabolism, a much higher amount of drug needs to be administered than that required at the site of action. Chocking/asphyxiation of tablets and capsules is another major problem for the patients, especially pediatric, geriatric, dysphagic, and stroke patients. Pain and injection site morbidity are major challenges with the parenteral drug administration. Though pain is the common aspect and always present, other injection-related problems are uncertain. On one hand problems, such as phlebitis is associated with intravenous administration, injection nerve injury is a common challenge with intramuscular drug delivery.

Keeping these challenges in mind, we advocated that the buccal route can be used for efficient delivery of drugs that face challenges upon oral and parenteral administration. The concept of using buccal mucosa is not new but is it least explored. Therefore, via utilizing this innovative concept, we have cast a patch of chitosan oligosaccharide (COS) as the base mucoadhesive biopolymer because of the application of COS in the mucoadhesivebuccal formulation has not been reported to date. This thin patch can be fabricated with compatible biopolymers and used to deliver a wide variety of small drug molecules and peptide drugs. As per the best of knowledge we have for the first time developed a mucoadhesivebuccal patch using COS as the mucoadhesive polymer and explored their role in the delivery of drug. There are even a few buccal patches and tablets that are commercially available but not in India. In view of the above result and discussion, the novelty of the work is the biopolymer COS has been used for the first time to formulate any mucoadhesive patch. We have also fabricated mucoadhesive buccal tablets and published interesting findings. We further went onanalyzing the min vitro as well asin vivo drug release patterns. The discussed work shall have a good impact on biotechnologists and pharma person both and may translate this knowledge to the pharmaceutical industry for the development of safe and effective drug delivery patch/tool.

THE FUTURE OF VEHICULAR ELECTRIFICATION IN INDIA

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Introduction

India possesses one of the highly mounting automobile markets in the world and perceived a yearly increase of 16% vehicle usage in the last past decade. The rapid increase results in increased air pollution in the nation. The transport sector contributes around 10% of the greenhouse gas (GHG) emissions, while the share of only road transport is approximately 88% of transport GHG emissions. As per a Global Carbon Project report, India stands fourth in the world in terms of carbon dioxide emission, which accounts for 7% of GHG emissions in 2017. It is the need of the hour to shift to the emission free sustainable transportation system. The paradigm shift of the transportation sector from the internal combustion engine (ICE) based vehicle towards electric vehicles (EVs) has been seen as a viable solution to provide emission-free transportation system. The National Electric Mobility Mission Plan (NEMMP) initiated in 2013 has developed a mission plan and blueprint for endorsing the Indian automobile sector with solutions for electric mobility. Further, NEMPP also drafts the incentives in four major areas related to the development of EVs, namely, EV manufacturing, demand encouragements, development of required charging infrastructure and lastly, the research and development related to all the above. In the recent years, there has been the development of e-vehicles (two and three wheelers). The two and three wheeler EVs available in the market are provided with a charger that enables to charge as simple as a mobile phone. However, the development of four-wheelers is limited, and the major reasons include the non-availability of charging stations and safety concerns, as shown in Fig.1. This article briefly discusses charging station infrastructure, present scenario and the future challenges in line with the Government of India's (GoI) vision 2030 for electric mobility.
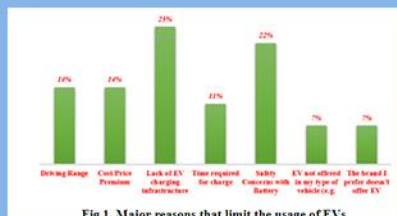

Fig.1. Major reasons that limit the usage of EVs

The GoI set a goal to achieve 100% EV mobilization in two, three and four-wheelers and more than 50% of the buses in India by 2030. However, the goals can be achieved only by facilitating proper charging infrastructure and encouraging investors to build new charging stations especially, the fast-charging stations for four-wheelers.

In case of charging station with multiple ports, each port is required to be isolated from other, and hence individual DC-DC converters are adopted for each port.

Based on the type of power supply, there are two types of charging AC charging and DC charging. The AC chargers are the onboard chargers usually preferred for less power ratings and more charging time whereas the DC charging is a off board chargers offers high power ratin with less charging time. Similarly, on the basis of therate of charging, the charging stations are classified as AC Level 1, AC Level 2 and DC fast charging (Level 3). As per the guidelines of charging stations for EVs issued by Ministry of Power, GoI, the public charging station should have minimum requirements of an exclusive transformer with all substation requirements, 33/11kV line cables associated, adequate space for entry and exit of vehicles, current and international standards such as CCS and CHAdeMO. To accommodate the increasing demand of 2- and 3-wheeler electric vehicles, which are the mainstream EVson the road at present, India adopted two types of charger standards, namely the Bharat EV Charger AC-001 and Bharat EV Charger DC-001.Both these types accommodate the requirements of 2- wheelers and 3-wheelers, i.e .low voltage rating with less than 100V being the battery voltage of the vehicle. Bharat Charger AC-001 is provided with the capability to charge threevehicles simultaneously and provide 230 V, 15 A, single-phase AC at the output end. The individual limited charge rate at each of the three connections is 3.3 kW. On the other hand, Bharat DC-001 gives an output of 15 kW with voltage between 72-200 V and 200 A being the maximum current. Following the guidelines and standards, only limited public charging stations are available in India. India started launching of public charging stations as a pilot project and are installed in various major cities like Delhi, Nagpur, Mumbai, Bangalore, Hyderabad, Jaipur, Kochi, and Visakhapatnam. Most of them are Bharat DC and AC charging stations while that in Mumbai and Delhi also have fast-charging stations. Besides these, most of the industries have setup their own charging station and are limited to their employees and customers only.

India's first public EVs charging plaza was setup by Energy Efficiency Services Limited (EESL) and inaugurated in July 2020 at Chelmsford Club, New Delhi. The plaza hosts 5 EV chargers of different specifications. Further, EESL has also set up the biggest public charging station program in Delhi with 60 power charging stations. United States Agency for International Development (USAID), through its Smart Power for Advancing Reliability and Connectivity (SPARC) program, supported EESL in the rollout. However, these are not sufficient and many more need to be built across various cities of the country to promote and increase the usage of EVs. The major issues/challenges associated with the development of charging stations includes: Issues related to voltage stability and harmonics due to EVs, as they are non-linear loads. This not only affects the voltage profile but also has a severe impact on the life of the equipment. Choosing an optimal location for the development of charging stations is the other major concern. The GoI has a plan to install a charging station for every 5 km on highways. However, it is difficult to choose a proper location in the city centres as it might result in voltage instability and also disturbs the regular power flow. Further, the uncontrolled charging, especially in peak hours, might lead to increased peak load demand and line losses along with transformer over loading and also increased system costs. This also might result in increased cost of operation and degradation of the lifetime of the components used. Moreover, in India EVs have not yet witnessed heavy penetrations and hence lacks experience on the probable influence on distribution networks.

Conversion of the energy from the AC grid to DC energy for battery results in the generation of harmonic currents. When these current harmonics and/or the grid impedance are too high, these current harmonics has a significant impact on the grid voltage.

Overcoming these issues and developing public charging stations is the major challenge for the Government to achieve the goals of the electric mobility by 2030.

QUANTUM BRAIN: AN EXPLORATION TOWARDS ARTIFICIAL SYNAPTIC DEVICES

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Introduction

Artificial intelligence (AI) is always intended to mimic human intelligence interfacing human brain with a virtual brain. This virtual brain is associated with neural network. Recently, a neuromorphic research team at MIT has launched a portable artificial synaptic chip incorporated with Artificial Intelligence devices to simplify its ramification. Our brain works by transmitting signals between neurons through synapses. These synapses also called for memory inhibition, decision making process, synaptic modulation etc. Any dramatic alteration in synaptic activities can slow down or cease the brain stimulations and eventually cause fatal hemisphere. Hence, a demand upraises for developing artificial synapses that can be incorporated with living neurons and fed to brain-computer interface.

What is a Quantum Brain? A quantum brain is colligated with quantum field hypothesis to justify the function of brain during its conscious period. However, it is hard to come up with the conscious mind as our brain floats with numerous non-arbitrary thoughts. Hence, quantum computers have the potentiality to work on all the events alike usual computer beyond any artificial intelligence. These computers use a two-terminal memristors and three-terminal transistor for artificial synapses stimulation inreal-time big data processing. The prime motive behind development of "Quantum Brain" is the so called Quantum Theory inter-relating fundamental physics into neuroscience. Therefore, a quantum brain is the integration of artificial neurons with quantum materials.

Configuration of Artificial Synaptic Device Neuroscience, Quantum theory and AI merge together to create the nucleotide of artificial synapses. These devices are hardware form of neural synapses associated with AI. These devices are reliable, computationally quicken and process computers to think like human brain. A CMOS circuit is accompanied with the artificial synaptic device to mimic the nerve cells responsible for memory creation, storage and deletion. It consists of two layered trans-metallic material tantalum penta-oxide (Ta_2O_{5-X}) and tantalum dioxide (TaO_{2-X}). It simulates synaptic activities under the increased or decreased resistance of tantalum oxide when came across the active neuro signals. It is much better than other current carrying devices where the current starts accumulating on one layer only.

These two layers of soft polymer are synthesized and separated by a trench of electrolyte to create a synaptic cleft of neurons in the brain. When the active neurons transmit the signal, it accumulates on the top of one electrode to create ions. These ions move around the trench and halt at the other electrode. These deposited ions modulate the conducting phase of neural transmission and simulate the memory artificially. Various materials such as Organometal Halide Perovskite (OHP) and Metal Halide Perovskite (MHP) have used for the fabrication of synaptic devices to emulate neural plasticity and promote the self-learning process. This ultra low-power device can be used for big data analysis, data security purpose, data computing, self-learning and brain-mimicking sensors. Scope of Quantum Brain in Artificial Synaptic Devices.

A quantum brain doesn't require any extra AI technique for the simulation of brain informatics with computer model. This quantum brain uses the signals of activated neural activities and directly embedded with the hardware format. It all starts with the similarities between brain and AI. And the state-of-art of computers in data handling is much better than a heterogeneous brain. However, when in brain-computer interfacing, the design of CPU/GPU, chips, memory shuttles at one place to mimic the brain's procedure of memorization, sorting and managing data. Therefore, quantum brain is justified to be termed as quantum cognition. Because of the emerging demand of big data management, the capacity of computers is much expanded to include more data centres. It comprises a pattern and interconnected to an atomic network to mimic the generous synaptic attributes in the brain. By applying a sort of voltage to the atom, it fires like a synaptic neuron. This firing behaviour can be considered as the quantum brain model used in AI.

Conclusions

The possibilities of configurable brain network either by fabrication the quantum material into artificial neurons or by inducing external stimuli can provide multiple opportunities. Artificial changes in neural state are strictly homogenous, though the fabricants are controllable by the transient state of quantum materials. Approximate prediction measurement of future events with minimum uncertainty makes quantum brain more deterministic. However, quantum materials with certain measurement fail to be deterministic.

When the whole world is now depending upon parallel computing, massive data storage and efficient plasticity; we have to make quantum materials flexible enough to fabricate on synaptic devices. Recently, memristors are considered as the modified fabrication materials for their high reliability, flexible resistivity and controlled ion doping.

In order to achieve the low-cost big data storing capacity, synaptic devices have to be integrated with three-dimensional neural network also. Building up an advanced level artificial synaptic device with less interference of AI technique is still far away from a saturated efficiency. Hence, standard hypothesis with feasible results should be scope for future valued quantum brain for the re-establishment of an artificial synaptic device.

AGRIBOT

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Introduction

Agribot with a slogan of "स्वस्मै स्वल्पं समाजाय सर्वस्वं" incorporates improvement of a framework which can screen temperature, stickiness, water guideline, level of Nitrogen, Phosphorus and Potassium (all developing plants need 17 fundamental components to develop their full hereditary potential. Of these 17 components, 14 are consumed by plants through soil, while the leftover three come from air and water. Nitrogen, Phosphorus, and Potassium or in short NPK, are the "Enormous 3" essential supplements in fertilizers.) dampness, alkalinity of soil. The proposed testing bot completely investigates farmland for our farmers. The point of this gadget is to make the live report of the substance/supplements in the soil. It assists with knowing different boundaries like stickiness, dampness, other large scale and miniature supplements present in the soil. The information gathered by sensors would be changed to a cloud stage. Also, authors will contrast the information given by sensors and the authentic information. What's more, present the proper subtleties in a page in only a couple of moments decreasing the month long continuous cycle. This project can diminish the issues in deciding the measure of supplements in soil with a less expensive expense with other innovation. It can likewise decrease the undesired utilization of composts to be added to the soil which can cause dead plants and lessen plant quality and amount. This can be resolved through the light assimilation of supplements by the optical transducer and created limit esteems for every supplement which choose the degree of supplements. Authors have planned a robotized Smart Agriculture framework which lessens the time and assets that is required while performing it physically. This framework utilizes the innovation of the Internet of Things. The framework likewise measures dampness of soil furthermore, level of water in fields. This framework functions admirably in the ideal conditions and further improvement can be made when the conditions are not ideal like legitimate brightening or lightening. The fundamental goal of the creators was to gather reasonable information of the agribusiness ranch that gives data on the climate design, crops by the joint approach of IOT and remote correspondence. In this undertaking, authors utilize diverse sorts of sensors like pH sensor, temperature sensor, and dampness sensor. In view of the continuous qualities, they are dissected and specific yield design is recommended which suits the dirt. This task's significant goal is to reestablish macronutrients present in the dirt by estimation of supplements present. The presence of supplements is acquired by utilizing sensors. Here utilize various sensors to gauge the continuous estimations of the supplements like Nitrogen (N), Phosphorous (P), Potassium (K)

and the information estimated is shipped off the cloud through Thing Speak. In this framework the continuous information is examined utilizing distinctive procedures and the information is shipped off the cloud which can be gotten to through portable applications. Authors determine the programmed water system. Soil dampness sensor is utilized to distinguish the dampness level present in the dirt, in view of the qualities acquired the field is inundate utilizing the valves. This additionally incorporates bug control utilizing ultrasonic sound producers to get bugs far from the homestead.

APPLICATION OF MACHINE LEARNING IN THE DETECTION OF NEURODEVELOPMENTAL DISORDERS

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Introduction

Neurodevelopmental Disorders (NDD) refers to a group of disorders that affects the development of the brain in children. NDD includes a range of brain abnormalities in learning, language, attention, visual, hearing, and motor functions. Attention Deficit Hyperactivity Disorder (ADHD) and Autism Spectrum Disorder (ASD) are the most common NDD in children but there are other NDD such as specific learning disability, intellectual disability and specific language impairment which are largely diagnosed in children at development stages. A recent survey by Dr. Narendra K Arora from INCLEN Trust International, New Delhi reported that the incidence of NDD in India is almost 1 in every 8 children and observed about one-fifth of children with NDD had two more other NDD conditions. With the growing threat among children, an early diagnosis of the condition and proper intervention would largely prevent the children from going through a rough and stressful childhood phase. Researchers have proposed many diagnosis methods for NDD detection using behavioral symptoms, brain signal processing, and imaging techniques. The assessment of behavioral symptoms is a traditional way for NDD diagnosis performed by trained psychologists through many developmental test batteries and physical examination. The brain imaging methods like Electroencephalography (EEG), Magnetic Resonance Imaging (MRI), Functional MRI (FMRI), and Magnetoencephalography have been used by researchers and have demonstrated significant differences in brain structural and functional data in children with NDD compared to children without NDD. Though many researchers have identified distinct changes in NDD children using neuroimaging methods, it is still in its experimental stage and not widely used for diagnosis in clinics.

With the recent advancement in computational methods and machine learning techniques there is a growing interest in automated disease identification/classification. Many researchers have explored the benefits of machine learning algorithms in classifying neurological diseases like epilepsy, Alzheimer's, and Parkinson's. Based on this, here the authors attempted to explore the possible benefits of machine learning techniques in NDD for efficient classification and diagnosis. The adaptation of machine learning techniques in NDD diagnosis will largely reduce the detection time which is large in traditional methods and thereby support the child as well as parents to start ministrations early. Among the various modalities, EEG and speech are becoming more popular due to their portability and low-cost design. Thus, some preliminary experiments were conducted using EEG and speech. A Specific language Impairment (SLI) is a kind of neurodevelopmental disorders which could disturb the speech production and language comprehension ability of a child. Thus, some preliminary experiments were conducted using voice data of SLI children and healthy group.

Linear predictive coding coefficients (LPCs) were extracted and two classifiers namely thenaïveBayes (NB) and support vector machine (SVM) were implemented to categorize the children in SLI and healthy groups. The best classification accuracy of 97.9% was secured by the NB classifier for the 5-fold cross-validation protocol. The study concluded that LPC parameters play a key role in SLI detection and could be used to detect other neurodevelopmental disorders via children's speech data. In the second experiment, authors investigated the dyslexic condition in Indian children using Rest EEG data. Dyslexia is a neurodevelopmental disorder associated with poor reading skills in children despite normal intelligence. Resting EEG of 15 Indian dyslexic children and 15 normal children were analyzed. Node strength at each electrode location for delta, theta, alpha, and the beta band was calculated and compared between groups. Results showed increased ($p<0.05$) delta, theta node strength in temporal, parietal, frontal, and occipital regions during rest in the dyslexic group. Also, the dyslexic group showed decreased ($p<0.05$) alpha, beta node strength at right temporal, prefrontal and left central brain areas. This study showed the efficiency of rest EEG parameters in the identification of significant brain regions and this could be used for efficient classification of the dyslexic condition in children. The preliminary results of this article give motivation for further investigation on the efficacy of machine learning techniquesfor NDD detection using a large dataset of EEG and speech.

BIOSENSOR: A DEVICE FOR RAPID ANALYSIS

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Introduction

Biosensor is an analytical device used to measure the concentration of an analyte. It consists of three components- bio element, transducer and output system. It is based on the principle of "Signal transduction". When analyte interacts with the element, some signals are produced which are detected by the transducer and converted into the electrochemical, optical or mechanical signals and further send to output system to obtain results in the readable form.

Biosensors developed in the laboratory are (a) Electrochemical biosensor (b) Paper based biosensor Biosensors are broadly classified into different categorize based on transducer and bio element used in them.

Piezoelectric Biosensors are also known as Acoustic Biosensors as they are based on the principle of "sound vibrations" i.e. acoustics. When a mechanical force is applied on a piezoelectric biosensor, they produce an electrical signal. The biological elements are attached to the surface of the piezoelectric biosensor. The piezoelectric biosensor, which is essentially a mass to frequency converter, converts the mechanical vibrations of the sensing molecules into proportional electrical signals.

Electrochemical biosensors are simple devices based on the measurements of electric current, ionic or conductance changes carried out by bio electrodes. Optical Biosensors, Optical Fibers play an important role in Optical Biosensors. The optical fibers allow detection through sensing elements based on the different properties of light like absorption, scattering and fluorescence. The reaction causes changes in either of the above-mentioned properties as a result of the change in the refractive index of the interacting surface. For example, if the biological elements are antibodies and are bound with a metal layer, the refractive index of the medium which comes in contact with this layer will be varied.One of the main advantages of using optical biosensors is their non-electrical nature. This allows them to analyse multiple elements on a single layer just by varying the wavelength of the light.

Potentiometric Biosensors In these biosensors, changes in ionic concentrations are determined by use of ion- selective electrodes. pH electrode is the most used ion-selective electrode, since many enzymatic reactions involve the release or absorption of hydrogen ions. The other important electrodes are ammonia-selective and CO_2 selective electrodes.

Thermometric Biosensors, Several biological reactions are associated with the production of heat and this forms the basis of thermometric biosensors. They are more commonly referred to as thermal biosensors or calorimetric biosensors.

Since their development in the early 1950's, biosensors have become very important in the fields of clinical, environmental and food monitoring. There are various advantages of biosensors over lab-based equipment like- small size, low cost, quick results and very easy to use.

Clinical Monitoring Electrochemical based Biosensors are commonly used in biochemical labs and clinics to monitor and measure glucose levels as well as lactic acid. Commercial Biosensor in the field of personal health care is becoming quite popular, especially, self-monitoring of blood glucose. The main advantage of this method is the analysis is performed in undiluted condition thus results are more accurate and blood samples contamination during course of analysis is prevented. Earlier self-monitoring devices were of one-time use applications i.e., test can be performed for a single time and the sensor must be disposed after that. But advances in this field allows, reusable sensors for improved patient care. Environmental Monitoring One of the major applications of biosensor is in the field of environmental pollution monitoring.

Especially, biosensors have substantial advantage in water pollution. There are numbering pollutants that are contaminating ground water like heavy metals, pesticides, fluoride, arsenic, phosphate, and microbes to mention some resulting intodegradation of portable water quality causing server health hazardous condition. Biosensors with sensing elements for nitrates and phosphates are becoming common for battling water pollutants. Such sensors can also be an important tool against monitoring of chemicals and hazardous biological specimens that can be used as a bio-weapons. Food Monitoring Fermentation is a large industrial operation used in dairy, beverage and other similar products. Large scale bacteria and cell culture must be maintained for this purpose. In order to minimize the cost of production and risk-free fermentation, it is essential to monitor these delicate yet expensive processes. Biosensors are designed to monitor and measure the generation of a fermented product. Commercial biosensors that can measure carbohydrates, acids, alcohol, etc. are already available in the market. Biosensors are used in food industry for food quality control for measurement of amino acids, carbohydrates, alcohols, gases, etc. Therefore, interdisciplinary efforts beyond the conventional specialties are required for the development of innovative biosensors for rapid and hassle-free analysis in different areas.

START-UP BY STUDENTS

With this goal in mind, Rajan and Gaurav did not just stop with a single product idea implementation. They expand their territory in other domains as well. Rajan Kumar Sharma did a thesis and project on monitoring traffic simulation using agent-based modeling, which enables dynamic objects such as vehicles to be modeled individually and have control over their behavior. They started executing projects based on Artificial Intelligence, Machine Learning, IoT, ABM (Agent Bsed Modelling), and Data Science. Result of the same, the company will soon launch an online platform having digital space for users where they can create their digital cards, Addressbook, Networks, and Identity. In upcoming versions they are going to provide one card-one solution by integrating AI based facial recognition considering home automation and smart transactions.

Rajan has also planned to come up soon with a digital platform to predict accurate cost expenses in construction and how to cut costs and better management of resources.

Apart from products being developed, the company also provide services in multiple domains that include Photography, Videography, Event Reporting and Planning , Interior Design, Digital Marketing, Web Design and Development, AR/VR Softwares, Comic Universe, Year Magazine, Mobile Games, Ads/Film Shoot, Animation and VFX, Agent Based Modeling.

WaterMark Studio consists of Graphics, Media and Technology in the cart, they have created a comic universe and building 124 comic characters which people can cross by soon in the global market.

All this is happening because of the great mentors, partners. The core team of the company is having Rajan Kumar Sharma and Gaurav Tarak. Great mentors are having confidence that WaterMark Studio, will have the future potential and can reach heights because of the wide region of domains covered under one roof.

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AR. VIVEK AGNIHOTRI
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Watermark Studio was founded by two Architecture Students from NIT Raipur, Rajan Kumar Sharma and Gaurav Tarak under the mentorship of Assistant Professors Vivek Agnihotri and Mayank Tenguria. Their mission for the startup was to merge technology in architecture and to make architects doing more than designing and supervising the construction of buildings. The company initiated its work with the idea of developing a product based on Augmented Reality, Virtual Reality, 3D modeling for visualization, simulation, and rendering graphics design to make architect's tasks easier and better. The product can create 3D models and execute those models with animation and visualization in the construction life cycle to make construction designs digital and provide a realistic view of the finished project. The product can visualize so much more about the project than a flat drawing could ever provide. Users can have a virtual walkthrough of the building's exterior and interior which is going to be built. The product enables the user to get a feel of how things will be laid out. Users can walk through the entry of their future home, reach the lobby, and even visualize guests having dinner in the dining area. Users can even visualize the texture of the tile that will be put up on a room's floor. Having an interest in graphics and software, Rajan Kumar Sharma is keen to implement his knowledge of the core field i.e. architecture and Information Technology to create products and services which can ease the work of people in their relevant domains.