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5th Global Conference on

ADVANCED NANOTECHNOLOGY AND NANOMATERIALS

October-27, 28 2025 | Prague, Czech Republic

Theme:

Nanotechnology for a Sustainable and Smart Future:

Innovations Transforming Medicine, Energy, and Industry

Sub-theme:

- Nanomedicine and Biotechnology: Revolutionizing Healthcare
- Beyond Graphene: The Next Generation of 2D Materials
- Self-Healing and Smart Nanomaterials for Future Technologies
- Frontiers in Nanoscience: Integrating Quantum, AI, and Emerging Nanotechnologies
- Sustainable Nanomaterials: Advanced Solutions for Industry and Environment
- Nanoelectronics and Quantum Technologies: Enabling the Next Digital Revolution
- Nanotechnology for Clean Energy and Sustainable Power Solutions
- Environmental Nanotechnology: Innovations for Water, Air, and Soil Remediation
- Nanotechnology in Food, Agriculture, and Smart Packaging
- Nanotechnology in Wearable and Flexible Electronics
- Nanorobotics and Intelligent Nanosystem

NANO INTELLECTS 2025

https://nanointellects.peersalleyconferences.com/

2 DAYS WITH MORE THAN 45 SESSIONS, KEYNOTES & ORAL PRESENTATIONS

12+ INNOVATIVE FEATURED SPEAKERS

20+ HOURS OF NETWORKING EVENTS

60+ INTERNATIONAL SPEAKERS

125+ EDUCATIONAL SESSIONS

WHO SHOULD ATTEND?

- Nanotechnology Professionals
- Materials Engineers
- Materials Scientists
- Physicists and Chemists
- Metallurgists
- Geotechnical Engineers
- Biomedical Engineers
- Academicians and Students
- Policy Makers
- Clinical Investigators
- Industries
- Entrepreneurs
- Materials Science Colleges
- Materials Companies
- Nanotechnology Companies
- Training Institutes
- Associations
- Chemical Companies
- Experts and Researchers
- Materials Science
- Nanotechnology

PRESENTATION FORUM

KEYNOTE FORUM / MINI-PLENARY SESSIONS

Presentations under Keynote Forum or Mini-Plenary Sessions includes abstracts with remarkable research value selected by the program committee. These significant speeches are delivered by globally recognized honorable speakers and it is open to all registrants.

DISTINGUISHED SPEAKERS FORUM (ORAL ABSTRACT SESSIONS)

In this forum, speakers and experts of the research field gets an opportunity to showcase their noble research work that involves comprehensive research findings. These formal oral presentations include a wide range of talks covering basic research to advanced research findings in accordance to the theme and scientific sessions of the conference.

STUDENT FORUM

POSTER SESSION

This session is particularly introduced to encourage more number of student participation at international conferences, however it is not restricted only to students since it is also available for the participants with language barrier. There are specific guidelines to be followed to prepare the poster. Poster topic should be selected only from relevant scientific sessions with in-depth technical details.

YOUNG INVESTIGATORS FORUM

An exclusive opportunity for students and young investigators to present their research work through a formal oral presentation. Young Investigators Forum provides a global platform for young researchers and scholars to showcase their valuable contribution to the scientific world and to get acknowledged by the global scientific community of experts. It is an excellent opportunity to recognize young scientific assets with promising research ideas. These oral presentations are of shorter time duration with 10-15 minutes of informative and precise presentations in relevant scientific sessions.

EDUCATIONAL WORKSHOPS/RESEARCH WORKSHOPS/ CORPORATE WORKSHOPS/MINI- SYMPOSIA

With an aim of transferring knowledge among the participants, workshops are introduced as a part of international conferences. These interactive and occasionally practical sessions gives an opportunity for participants to engage in detail discussion. Workshops are mostly scheduled for 60 to 90-minutes. It may range from learning about a specific topic relevant to international education, products and research which sometimes involves practical demonstration. It helps in enhancing skills, knowledge and understanding of the research field in depth through interactive discussions.

HIGHLIGHTS OF THE DAY SESSIONS

"Highlights of the Day Sessions" is introduced to discuss and focus a ray upon previous day ORAL ABSTRACT presentations by experts to summarise the key findings. It helps in getting better insights into the various dimensions of the topic.

MEET THE PROFESSOR @ NETWORKING SESSIONS

This session involves open discussion between the experts and session attendees, it gives enough time for getting answers to specific questions and doubts. It is an opportunity for attendees to increase their professional networking, sometimes also leads to an excellent collaboration opportunity.

EDUCATIONAL SESSIONS/ TRAINING PROGRAMS

Educational Sessions or training programs are specifically designed for a better understanding of the latest findings and technologies. These are generally 45-minute sessions that gives an exposure to the multidisciplinary field, that provides in-depth learning experiences and address educational needs.

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COMBO B (Registration + 3 Night Accommodation)
Delegate Registration

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Speaker Registration
COMBO A (Registration + 2 Night Accommodation)
COMBO B (Registration + 3 Night Accommodation)
Delegate Registration

TYPES OF STUDENT REGISTRATIONS
Registration
YIF
COMBO A (Registration + 2 Night Accommodation)
COMBO B (Registration + 3 Night Accommodation)
Posters

TYPES OF ADDITIONAL REGISTRATIONS
Accompanying Person
E-Poster
Virtual Presentation
Workshops
Start-Ups

TIME TO CONNECT

WITH YOUR PEERS

CONCURRENT EDUCATIONAL SESSIONS

MONDAY - OCTOBER-27, 2025

- Nanoscience and Technology
- Novel Drug Delivery

- Nano Polymers, Nanotubes and Nano Porous Materials
- Nano Physics
- Nano Weapons

GROUP PHOTO | COFFEE BREAK

- Nano-Surgery
- Functional Nano Materials
- Graphene and Fullerenes

- Properties of Nanomaterials
- Materials Science and Engineering
- Nano Structures

LUNCH BREAK

- Nano Chemistry
- Molecular Nanotechnology
- Nanotechnology in Cancer Treatment

- Advancing Cellulose-based Nanotechnology
- Nano Mechanics
- Forensic Nanotechnology

COFFEE BREAK

- Nanotechnology and Energy
- Nanostructures and Nanofilms

- Nano Medicine
- 3D Printing
- Carbon Nanotubes

CONCURRENT EDUCATIONAL SESSIONS

TUESDAY - OCTOBER-28, 2025

- Fuel Cells
- Lipid Nanotechnology
- Nano Biotechnology

- Nano Pharmaceuticals
- Nano Polymers
- Nanotechnology in Tissue Engineering

GROUP PHOTO | COFFEE BREAK

- Nanotechnology in Urology
- Robotics
- Nanotoxicology

- Nanotribology
- Nano Products
- Commercialization of Nanotechnology

LUNCH BREAK

- Artificial Intelligence
- Nanobots

- Nanosensors
- Nanodentistry
- Self-healing materials

COFFEE BREAK

- Nanotechnology Materials Science
- Nanotechnology in Military Applications

- Fight Against Climate Change
- Nano and Big Data
- Nanographene
- Nano-systems

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>>FEATURED TALKS <<

SUBMIT YOUR ABSTRACT NOW

Speaker Slots Filling Quickly

Title: Transitioning from MLOps to LLMOps: Navigating the Unique Challenges of Large Language Models

Speaker Name: Saurabh A. Pahune

Affiliation: Cardinal Health, USA

Abstract:

Large Language Models (LLMs), such as the GPT series, LLaMA, and BERT, possess incredible capabilities in human-like text generation and understanding across diverse domains, which have revolutionized artificial intelligence applications. However, their operational complexity necessitates a specialized framework known as LLMOps (Large Language Model Operations), which refers to the practices and tools used to manage lifecycle processes, including model fine-tuning, deployment, and LLMs monitoring. LLMOps is a subcategory of the broader concept of MLOps (Machine Learning Operations), which is the practice of automating and managing the lifecycle of ML models. LLM landscapes are currently composed of platforms (e.g., Vertex AI) to manage end-to-end deployment solutions and frameworks (e.g., LangChain) to customize LLMs integration and application development. This paper attempts to understand the key differences between LLMOps and MLOps, highlighting their unique challenges, infrastructure requirements, and methodologies. The paper explores the distinction between traditional ML workflows and those required for LLMs to emphasize security concerns, scalability, and ethical considerations. Fundamental platforms, tools, and emerging trends in LLMOps are evaluated to offer actionable information for practitioners. Finally, the paper presents future potential trends for LLMOps by focusing on its critical role in optimizing LLMs for production use in fields such as healthcare, finance, and cybersecurity.

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Speaker Slots Filling Quickly

Title: Dynamic drugs: Dynamic antiviral drug MolVirx

Speaker Name: Boris Farber

Affiliation: TRIZ Biopharma Innovations LLC, USA

Abstract:

Pandemics driven by RNA viruses, such as influenza and coronaviruses, expose a critical gap: the lack of adaptable, broad-spectrum antivirals. Traditional drugs, which are rigidly designed to target a single viral enzyme, often falter as viruses mutate, rendering them ineffective. This contradiction—static drugs versus dynamic viral targets—has long hindered progress. At TRIZ Biopharma, we tackled this challenge head-on, leveraging TRIZ principles to pioneer MolVirx, a dynamic antiviral drug that redefines therapeutic possibilities.

MolVirx, a novel ensemble of carboxylated cyanocobalamin derivatives, targets RNA-dependent RNA polymerase (RdRp) and viral RNA aptamers with unprecedented adaptability. Unlike conventional cyanocobalamin, which showed negligible in vivo efficacy despite high doses, MolVirx enhances binding affinity through combinatorial carboxylation. Molecular modeling revealed that its eight derivatives form supramolecular structures, integrating into multiple regions of the RdRp-RNA complex. This multi-target approach disrupts viral replication at various stages, eliminating resistance risks—a breakthrough resolving the tension between specificity and universality. Initial in vitro studies are striking: MolVirx achieves efficacy against coronaviruses at doses 100 times lower (4-10 μM/mL) than cyanocobalamin (900-1200 μM/mL).

Our journey overcame another contradiction: balancing broad-spectrum action with safety. By enabling self-organization, MolVirx adapts to diverse viral mechanisms without impacting healthy cells, paving the way for a universal antiviral strategy. This presentation will unveil how MolVirx's dynamic design addresses the urgent need for effective, resistance-proof therapies, offering a glimpse into the future of antiviral innovation. Join us to explore a solution poised to transform global health.

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Speaker Slots Filling Quickly

Title: Transportation of Radioactivity in the Marine World

Speaker Name: Amala David

Affiliation: Stony Brook Uniersity, USA

Abstract:

Naturally occurring radioisotopes are omnipresent in the Earth's crust, permeating soil, rocks, and aquatic systems, and establishing a fundamental baseline of radiation within marine environments. In addition to these natural sources, anthropogenic activities have introduced artificial radionuclides, further complicating the radiological landscape of the oceans. Marine organisms are continuously exposed to this complex mixture of natural and artificial radioactivity through multiple pathways, including direct absorption from seawater and trophic transfer via contaminated food sources. Of particular interest are radionuclides such as uranium-238, thorium-232, potassium-40, polonium-210, and lead-210, which are readily assimilated by marine biota and may pose significant ecological and health risks. This presentation delves into the intricate processes governing the transport and fate of radioisotopes in the marine environment, with a special emphasis on their interactions with sediments, rocks, and colloidal particles at the nano- and microscale. By integrating recent advances in nanotechnology and nanomaterials science, we explore how the physicochemical properties of radionuclide-bearing particles influence their mobility, bioavailability, and ultimate impact on marine ecosystems. Furthermore, we examine the synergistic effects of ionizing radiation from both natural and artificial sources, highlighting emerging insights into the mechanisms of uptake, accumulation, and potential toxicity in marine organisms.

Our findings underscore the critical importance of interdisciplinary approaches—combining geochemistry, marine biology, and nanoscience—to unravel the complexities of radionuclide transport. This work not only advances our fundamental understanding of marine radioecology but also informs risk assessment and the development of innovative remediation strategies for safeguarding ocean health in an era of increasing environmental challenges.

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Speaker Slots Filling Quickly

Title: Balancing East-African wetland conservation with human needs: Managing uncertainties in environmental policy design

Speaker Name: Julius Kenneth Ningu

Affiliation: University of Bonn, Germany

Abstract:

Abstract should give clear indication of the objectives, scope, results, methods used, and conclusion of your work. One figure and one table can be included in your results and discussions. Stakeholders and actor coalitions in wetland management generate and apply a great variety of meanings, values, and interests when interacting with wetlands which are hardly predictable. Wetland policy-making is faced with uncertainties which need to be managed in finding solutions to this problem. Based on experiences of a collaborative wetland research in East-Africa the research objective was to develop a wetland policy process framework which will promote social deliberation and reconciliations of plural wetland values to reduce uncertainties. The scope involved the rapidly developing societies in East-Africa which impose increasing pressures on wetlands due to rising food demand and degradation of upland soils. This scope was applied because balancing wetland conservation with human needs for food and energy is becoming an increasing contentious issue. The result of our research was a new cognitive-driven information design method that has been developed to assist wetland policy-analysts in achieving these aims and also to overcome limitations of prescriptive decision-making. The methodology employed included collection and use of information and communication technologies to analyse, integrate and visualise complex socio-ecological wetland information. In conclusion, the outcome of this research can be applied at all stages of wetland policy process including agenda setting, identification of plural wetland values, establishment of decision-scenarios, social deliberations during policy formulation, governmental decision-making, policy implementation and evaluation. A three-stage implementation process is recommended.

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Title: Analytical Model Prediction Versus Experimental Characterization of Performance of Nanofluids of Different Concentrations in Hydronic Air Coil

Speaker Name: Debendra Kumar Das

Affiliation: University of Alaska Fairbanks, USA

Abstract:

The performance of a hydronic heating coil using two nanofluids; aluminum oxide and copper oxide nanoparticles dispersed in 60% ethylene glycol (EG) and 40% water, by mass (60% EG) were modeled analytically in 2009 to evaluate and compare their performance with the conventional heat transfer fluid, 60% EG. The modeling was performed for particle volumetric concentrations of 1,2,3 and 4%. The predictions from this analytical model revealed that a 16.6% increase in coil heating capacity can be achieved with the 4% Al_2O_3/60% EG nanofluid and a 7.4 % increase with the 2% CuO/60% EG nanofluid compared with heating capacity with the conventional base fluid. For the pumping power comparison, the model predicted that for 4% Al_2O_3/60% EG nanofluid, with heating coil capacities ranging from 10 kW to 16 kW, the liquid pumping power to overcome the frictional pressure drop on the tube side of the coil averaged 16.8% less than that required for the coil with the base fluid at equal heating output. For the 2% CuO/60% EG nanofluid, pumping power averaged 11.0% less than the base fluid for the same range of heating capacities. Therefore, the model prediction showed that the heat transfer performance of the Al_2O_3 & CuO nanofluids is superior to that of their corresponding base fluid in hydronic heating coil applications. To ascertain this theoretical prediction, experiments were performed in two stages over several years on a practical hydronic heating coil commonly used in residences in cold regions like Alaska using Al_2O_3/60% EG nanofluids of 1, 2 and 3% nanoparticle volumetric concentrations. The experimental results were summarized in two publications in 2018 and 2024 concluding that nanofluids did not perform well as expected. The performance of 1% nanofluid was generally equal to that of the base fluid under identical inlet conditions. However, the higher concentration nanofluids exhibited heat rates up to 14.6% lower than the 60% EG. This performance degradation was found to be the inability to maintain nanofluids dispersion stability, particle agglomeration, and subsequent decline in the thermophysical properties of nanofluids over time.

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Title: Nano-plasmonic Strategies in Cancer Theragnostic: Unlocking Molecular Signatures with SERS

Speaker Name: Jyothi B. Nair

Affiliation: Leibniz Institute of Photonic Technology, Germany

Abstract:

This work aims to develop and validate Surface-Enhanced Raman Spectroscopy (SERS) platforms for both diagnostic and therapeutic applications in cancer, with a focus on specific cancer types. The objectives are to (1) design nanoparticle-based probes for theragnostic applications, (2) track the intracellular effects of the chemotherapy drugs and tracking the cellular events (3) assess the therapeutic efficacy of targeted drug loaded nano particles within a novel drug delivery system by utilizing SERS imaging and fingerprinting.

The study scope covers the synthesis of plasmonic nanoparticles, *in vitro* cellular models, and 3D spheroidal models to evaluate both drug delivery and molecular interactions. SERS was employed to amplify weak Raman signals, allowing for the detection of molecular fingerprints at the single-cell and single-molecule levels. Our methods include nanoparticle synthesis and functionalization, cell culture and drug treatment protocols, and advanced SERS imaging techniques.

Key results, indicate that PTX internalization disrupts microtubule integrity, and the hollow gold nanoparticle-based drug delivery system demonstrates significant therapeutic effects, as evidenced by distinct SERS spectra. These findings confirm that our SERS-based approach provides a sensitive and specific platform for monitoring intracellular drug effects and therapeutic outcomes.

In conclusion, our study validates the potential of SERS-based technologies for clinical applications, offering a versatile platform for early cancer diagnosis and treatment monitoring, particularly for challenging subtypes. Ongoing work involves the detection of exosome biomarkers for early and precise TNBC diagnosis, paving the way for improved patient outcomes.

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Title: Energy Optimal Speed Profiles for a Differential Drive Mobile Robot with Payload

Speaker Name: Mauricio Fernando Jaramillo Morales

Affiliation: Universidad Autonoma de Manizales, Colombia

Abstract:

Mobile robots are being increasingly used in various environments, including households, hospitals, agriculture, and industry. In these settings, robots often need to cover long distances, sometimes carrying heavy payloads, which results in high energy consumption. To address this, the paper presents a set of novel optimal speed profiles for two-wheel differential drive robots. These profiles are derived using Hamiltonian formalism, leading to closed-form speed profiles for both straight and rotational motions. The derivation utilizes a power model that explicitly accounts for robot and motor dynamics, as well as external payloads.

The energy consumption of a commercial two-wheel differential drive robot was experimentally evaluated using various trapezoidal and proposed optimal speed profiles (fig1). The results demonstrated significant energy savings with the new profiles. Notably, the savings were positively correlated with the payload—i.e., the heavier the robot or the load it carries, the greater the benefit from optimization. This feature makes the optimization method easily adaptable to logistics solutions in warehouses with mobile robots.

Relative energy savings were observed to be more significant along shorter path segments. This is because, as the path length increases, the relative contributions of the start and end segments (where accelerations occur) to the total energy consumption decrease. Nevertheless, the savings remained substantial for path segments up to at least 8 meters. For rotational trajectories, energy savings were also considerable, particularly when compared with the default trapezoidal speed profile.

The proposed optimal speed profiles, which incorporate all relevant motor and robot parameters, facilitate easy adaptation to different differential drive platforms with minimal effort. Additionally, the paper presents an analysis of how trajectory times and maximum speeds vary with changing payloads.

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Title: New approaches for the treatment of multiple sclerosis using biocompatible nanoparticles

Speaker Name: Giovanna Rassu

Affiliation: University of Sassari, Italy

Abstract:

Multiple sclerosis (MS) is an immune-mediated disease of the central nervous system (CNS) characterized by demyelination and axonal degeneration. Current treatments primarily focus on disease-modifying therapies, but strategies targeting remyelination and repair are emerging as the next frontier in MS management. Recently, a novel approach has been explored using plant-derived exosomes as delivery systems for Clemastine (CLM), a histamine receptor H1 antagonist with demonstrated potential in modulating inflammatory responses and promoting remyelination. Exosomes, naturally occurring extracellular vesicles, offer a promising platform for MS treatment due to their ability to cross the blood-brain barrier (BBB) and deliver therapeutic cargo directly to the CNS. Additionally, the potential for nose-to-brain transport via intranasal administration presents an exciting avenue for targeted delivery. Lemon-derived exosomes have been extracted, loaded with CLM and characterized; their efficacy has been studied in vitro. Furthermore, in the presentation will discuss other alternative strategies for MS treatment, based on biocompatible nanoparticles.

This work has been developed within the framework of the project e.INS- Ecosystem of Innovation for Next Generation Sardinia (cod. ECS 00000038) funded by the Italian Ministry for Research and Education (MUR) under the National Recovery and Resilience Plan (NRRP) - MISSION 4 COMPONENT 2, "From research to business" INVESTMENT 1.5, "Creation and strengthening of Ecosystems of innovation" and construction of "Territorial R&D Leaders", CUP J83C21000320007.

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Speaker Slots Filling Quickly

Title: Functionalized porous silica nanoparticles: green synthetic approaches and adsorption applications for wastewater remediation

Speaker Name: Fabiana Tescione

Affiliation: Institute of Polymers, Italy

Abstract:

Although several treatment technologies have been applied for the removal of contaminants from wastewater, adsorption is a well-known, best performing, environmentally friendly and low-cost method of equilibrium separation. In this field, integrating nanotechnology into pollution recovery systems represents a significant step toward achieving this important objective [1]. Silica nanoparticles (SiO_2-NPs) are highly promising for treating inorganic contaminants due to their unique properties, such as high surface area and high adsorption capacity. Furthermore, SiO_2-NPs can be easily synthesized and appropriately functionalized by sol-gel synthesis to extend their applicability from inorganic to organic contaminants, such as dyes [2-3].

This work illustrates sustainable approaches for the design and development of porous and functionalized SiO_2-NPs that can be used to assist in the remediation of wastewater by adsorbing pollutants from various sources.

The adsorption performance was investigated by using SiO_2-NPs as absorbents for copper (II) ions from an aqueous solution. The effects of the initial Cu^{2+} concentration and the pH values on the adsorption capability were also investigated. The largest adsorption (i.e., ~50 wt% of the initial Cu^{2+} amount) was obtained with the more porous nanoplatforms.

Moreover, adsorption efficiency was investigated regarding methylene blue, 4-nitrophenol, and heavy metal ions in the urban wastewater. The results demonstrated how the final adsorption efficiency of SiO_2-NPs is significantly influenced by particles architectures. The SiO_2-NPs, stable in pH value around neutral conditions, can be easily produced and their use would well comply with a green strategy to reduce wastewater pollution.

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Title: An Exploration of the Discontinuous-Continuous Fusion in Yuunohui'tlapoa for Keyboard

Speaker Name: Julio Estrada

Affiliation: National Autonomous University of Mexico, Mexico

Abstract:

This work arises from compositional and theoretical research on music scales through *d1-theory,* and on the continuum; it resorts to a terminology useful for composers, interpreters, or musicologists without mathematical training, as the author himself. The musical topic of the continuum emerged in the 20th century, introducing ideas like rhythm as frequency, micro intervals, timbre, noise, glissandi, and spatialization. A unified study to comprehend the musical continuum as a global field needs to focus on a blend of components of rhythm (pulse, attack, micro durations) and sound (pitch, dynamics, color). This idea is understood as a *macro timbre*. When these components in a continuous macro timbre are intended to be asynchronous, the audible result is an amalgam of disruptions, interferences or crossings that are perceived as an elastic musical matter. By combining sequential pitch with continuous transitions of chords density, harmonic content, dynamics, and speed of pulse, such as *yuunohui'tlapoa* for a keyboard, asynchrony produces a discontinuous-continuous macro timbre. The synthesis of this last is perceived as internal collisions of rhythm, melody, and harmony within a *melo-harmonic* texture or as a macro-timbre texture. The substantial differences between discontinuity and continuity in terms of calculation, memory, perception, or imagination, prompted the need for a distinct compositional approach to allow the notation of its constant spatial-temporal evolution, this being fulfilled by chronographic recording of rhythm and sound.

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Speaker Slots Filling Quickly

Title: Assessing the earthquake performance of existing buildings in New Zealand

Speaker Name: Lusa Tuleasca

Affiliation: UNITEC Institute of Technology, New Zealand

Abstract:

Following the 2011 Canterbury earthquakes, evaluating the structural integrity of existing buildings has emerged as a key priority for structural engineers in New Zealand. To standardize these evaluations, the New Zealand Society for Earthquake Engineering, the Structural Engineering Society, the New Zealand Geotechnical Society, in collaboration with the Ministry of Business, Innovation and Employment, and the Earthquake Commission, have collectively produced a publication titled *"The Seismic Assessment of Existing Buildings, Technical Guidelines for Engineering Assessments" (ASEB).*

This document sets out the requirements for structural engineers to follow when evaluating the earthquake performance for existing buildings. A two-stage evaluation process is recommended: (1) Initial Seismic Assessment (ISA), *"which enable a broad indication of the seismic rating of a building",* and (2) Detailed Seismic Assessment (DSA), *"which provide a more comprehensive assessment of the likely seismic rating of a building"*. Both stages express seismic performance as a rating in percentage form.

The ASEB guidelines aim to help all parties involved in a building's "life" address the challenges of understanding, managing, and reducing seismic risk for occupants of existing buildings. These guidelines allow engineers to evaluate the seismic behaviour of existing buildings and their components in a consistent manner and report the results to building owners and managing organizations. They apply to all types of existing buildings, regardless of age or construction material, but exclude structures such as bridges, towers, masts, and retaining walls. The focus is on buildings undergoing seismic retrofit, alteration, or change of use.
The primary objective of the authors is to illustrate how seismic assessment practices in New Zealand have evolved since the Canterbury earthquakes, within the framework of these new technical guidelines, and to provide two examples of buildings where these guidelines were applied.

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Speaker Slots Filling Quickly

Title: Forward and inverse design of nanophotonic devices

Speaker Name: Jun-long Kou

Affiliation: Nanjing University, China

Abstract:

Artificially designed photonic devices have broad application prospects in various modern optical fields. Traditional design usually relies on known physical models, with structural optimization done via numerical simulation. As the structure depends heavily on prior models, traditional optimization has limited freedom. In recent years, due to the growing demand for high - performance photonic devices, inverse design methods with higher design freedom have developed rapidly.

Inverse design breaks the limitations of traditional methods, enabling efficient parameter optimization in the full parameter space, thus being more likely to yield device structures with extreme performance. This report sums up common inverse design methods for photonic devices and presents specific applications of inverse design in different photonic fields. As computer science advances, inverse design shows unparalleled potential and is expected to enable higher - freedom optical field control in various optical fields.

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Title: Nanorobots and the Endothelial Glycocalyx: A Novel Approach to Cardiovascular Health

Speaker Name: Antea Krsek

Affiliation: University of Rijeka, Croatia

Abstract:

The endothelial glycocalyx is a carbohydrate-protein coat covering the endothelial cell interior, crucial for vascular permeability regulation, mechanotransduction, and blood component interaction with the vessel wall. Vascular homeostasis and cardiovascular health depend on glycocalyx integrity. Glycocalyx degradation has been linked to cardiovascular diseases like atherosclerosis and hypertension because it blunted vascular permeability regulation and inflammation. Current studies have recognized oxidative stress and metabolic derangements as pathogenic mechanisms of glycocalyx degradation. Nanorobots are being developed to interact with the glycocalyx for targeted drug delivery, monitoring changes in the composition of the glycocalyx, and supporting regeneration therapies. They can be functionalized with molecules such as hyaluronic acid or heparin for targeting glycocalyx receptors, providing increased therapeutic specificity. Nanorobots can also assist in regenerating the glycocalyx using drugs that induce glycosaminoglycan production, thereby restoring endothelial function and preventing vascular injury. Nanorobots also possess magnetic or electrostatic guidance systems that enable them to move very precisely to selected vascular sites and enhance their ability to deliver medication. Some recent advances include nanorobots with artificial surface glycocalyx that improve circulation time and biocompatibility and research on nanoparticle motion compared to glycocalyx maturity. The capacity of nanorobots to survey, repair, and restore the glycocalyx could revolutionize therapeutic ways for cardiovascular illnesses. Despite these advancements, some issues remain, including the limited half-life of the glycocalyx in some cardiovascular illnesses and the issue of managing nanorobots non-invasively. Current studies are addressing these issues, offering potential novelties for nanomedicine for cardiovascular disease.

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Title: Metallic and Non-Metallic Plasmonic Nanostructures for LSPR Sensors

Speaker Name: Samar Ghopry

Affiliation: Jazan University, Saudi Arabia

Abstract:

Localized surface plasmonic resonance (LSPR) provides a unique scheme for light management and has been demonstrated across a large variety of metallic nanostructures. More recently, non-metallic nanostructures of two-dimensional atomic materials and heterostructures have emerged as a promising, low-cost alternative in order to generate strong LSPR. In this paper, a review of the recent progress made on non-metallic LSPR nanostructures will be provided in comparison with their metallic counterparts. A few applications in optoelectronics and sensors will be highlighted. In addition, the remaining challenges and future perspectives will be discussed.

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Title: Suboptimal Tours for Robots in AI Applications

Speaker Name: Nodari Vakhania

Affiliation: Autonomous University of the State of Morelos, Mexico

Abstract:

Traveling Salesman Problem (TSP) aims to find the shortest tour visiting each city from a given set once and returning to the first visited city. Many real-life problems require solving such a task.

Displacement of objects or people from their current location satisfying the above stated restrictions is a typical task in practice, for example, in the management of containers in a customs port, products in a warehouse, the delivery of products within a given region, an automated transport system, etc. Robotic systems that include unmanned vehicles are currently used due to their efficiency in carrying out their work. A tour, constructed by an algorithm that solves different versions of TSP in real time is required for each autonomous vehicle included in a mission; such are drones or robots that have the capacity to move the objects or people. From individual tours obtained for each robot an overall solution, that avoids conflicts between the tours of each robot are constructed dynamically. In this talk we will concern some recent solution methods for traveling salesman problems and their use in these kinds of applications.

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Title: From Nature to Nanotechnology: The Promise of Green Nanoparticles in Cancer Therapy

Speaker Name: Kanu Priya

Affiliation: Sharda University, India

Abstract:

Green nanoparticles have emerged as a promising frontier in health sector particularly in the treatment of deadly diseases like cancer. The advantage of safe therapeutics via green nanoparticles over conventional treatments, making it more substantial for the future role. Green nanoparticles are usually made from the bioactive compounds, derived from natural sources of plants, algae and fungi. As compare to conventional synthetic nanoparticles which involves toxic and harsh chemicals, green nanoparticles made up of natural resources and possess less toxicity to human body. These nanoparticles possess inherent biocompatibility, biodegradability, and multifunctionality, making them ideal candidates for targeted drug delivery and imaging in oncology. Nanoparticles contain medicinal plants exhibit promising anticancer properties by selectively targeting cancer cells while sparing healthy ones. Additionally, their antioxidant activity helps mitigate oxidative stress, potentially aiding in cancer prevention and treatment. Researchers have harnessed green nanoparticles to selectively target cancer cells, sidestepping issues like systemic toxicity and drug resistance seen in traditional chemotherapy. Utilizing materials from diverse natural sources facilitates sustainable and eco-friendly nanoparticle synthesis for cancer therapy. This abstract explores how green nanoparticles can improve cancer treatment, leading to personalized medicine and better patient outcomes in oncology. However, the challenges in production, standardization, and regulatory approval is essential for fully realizing their clinical potential. With continued research and development, green nanoparticles could pave the way for safer, more effective cancer therapies in the near future.

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Title: Efficient Antimicrobial Polymer Nanocomposite Coatings for Hospital Walls

Speaker Name: Richa Tomar

Affiliation: Sharda University, India

Abstract:

In healthcare institutions, nosocomial infections are a major problem, typically arising from the persistence of dangerous germs on regularly touched surfaces. Microbial resistance is making conventional antimicrobial agents less effective, which calls for creating new antimicrobial tactics. The creation of ZnO-polyvinylpyrrolidone (PVP) nanocomposite coatings for hospital walls is the main goal of this study. These coatings are intended to offer durable antibacterial protection while preserving environmental safety and biocompatibility.

Broad-spectrum antibacterial action against both Gram-positive and Gram-negative bacteria, as well as spores resistant to harsh environments, is demonstrated by ZnO nanoparticles. Metal ion toxicity, oxidative stress through the production of reactive oxygen species (ROS), and electrostatic interactions between positively charged nanoparticles and negatively charged bacterial cell walls are all components of the antimicrobial mechanism. PVP's addition improves hydrophobicity, stability, and dispersibility, resulting in self-cleaning qualities that further prevent the formation of biofilms and bacterial adhesion.

ZnO nanoparticles were created utilising a green synthesis method that minimised harmful byproducts and ensured sustainability by employing extracts from rose flowers. The developed coatings showed a considerable suppression of microbial growth when tested for antibacterial activity against Escherichia coli and Staphylococcus aureus. Furthermore, surface characterisation methods verified that the coatings are superhydrophobic, which improves their capacity for self-cleaning.

According to the study, ZnO-PVP nanocomposites have the potential to be a novel, affordable, and environmentally friendly hospital surface coating solution that enhances patient safety and helps control infections. Large-scale implementation and long-term performance evaluations in actual hospital settings will be the main topics of future research.

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Title: Understanding The Growth of Chiral Nanoparticles

Speaker Name: Kush Kumar

Affiliation: IIT Ropar, India

Abstract:

The use of chiral organic ligands in nanoparticle synthesis is crucial for designing optically active materials with applications in biology and catalysis. To understand these complex processes at the atomic level, we developed molecular dynamics (MD) simulation models to investigate the role of the chiral decoder cysteine in shaping the growth and final morphology of chiral gold nanoparticles. Experimental studies indicate that when an Ag shell is deposited around Au bipyramidal (AuBP) nanoparticles in the presence of cysteine, the resulting structure exhibits pentatwinned bipyramidal gold. In contrast, depositing a gold shell over AuBP nanoparticles under similar conditions leads to the formation of gnocchi-like nanoparticles with a wavy lateral surface and well-defined facets at the tips. Notably, Ag-coated AuBP nanoparticles exhibit stronger plasmonic circular dichroism than their Au-coated counterparts, suggesting that cysteine plays a distinct role in modulating nanoparticle chirality. The mechanism behind these differing growth patterns remains unclear. To address this, we developed MD simulation models of various nanoparticle surfaces and employed enhanced sampling methods to simulate surface growth. Our simulations reveal that the presence of cysteine significantly suppresses the first-layer growth of both gold and silver on Au(110) facets while notably enhancing growth on Au(115) facets. These insights provide a deeper understanding of how cysteine influences chiral nanoparticle formation at the atomic level. Additionally, for chirality induction, we observed that on Au(111) facets, cysteine promotes the formation of highindex Miller facets such as (111), (110), and (100) around kink atoms, indicating an influence on chirality. In contrast, in the absence of cysteine, the nanoparticle surface predominantly exhibits repeated facets like (100) and (111), suggesting a lack of chiral influence. These findings highlight the crucial role of cysteine in directing chiral growth by facilitating the emergence of high-index facets in gold nanoparticles.

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Title: The mixed convection thermally radiated hybrid nanofluid flow through an inclined permeable shrinking plate with slip condition and inclined magnetic effect

Speaker Name: Shwetambari Yadav

Affiliation: Motilal Nehru National Institute of Technology, India

Abstract:

In this paper, we consider the slip boundary condition to analyze the radiative inclined magnetohydrodynamics mixed convection hybrid nanofluid (Al2O3−Cu/H2O) flow across an inclined shrinking permeable plate. The following model's governing PDEs are transformed into nonlinear ODEs with the help of similarity transformations. To achieve the numerical solution of ODEs, the boundary-value problem of $\boldsymbol{4\ th}$ order accuracy (bvp4c) is applied. With appropriate values for the copper volume fraction, magnetic parameter, slip parameter, and radiation parameter, the numerical results are described and graphically represented in velocity and temperature profiles. Due to the shrinking plate, the dual solutions are to be observed. For higher values of copper volume fraction, slip parameter, and magnetic parameter the first solution in the velocity profile increases and the second solution in the velocity profile decreases by increasing the value of copper volume fraction and magnetic parameter. By increasing the magnetic parameter, and slip parameter first solution of the temperature profile decreases while both the solution increases by increasing the copper volume fraction and radiation parameter.

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Title: Green synthesis of silver nanoparticles and their effect on the skin determined using IR thermography

Speaker Name: Alrabab Ali Zain Alaabedin

Affiliation: Al-Karkh University of Science, Iraq

Abstract:

This study explores the green synthesis of silver nanoparticles (AgNPs) using *Salvia officinalis* extract and evaluates their effects on skin temperature through infrared (IR) thermography. The AgNPs were characterized for their structural and optical properties using UV-Vis spectroscopy, X-ray diffraction (XRD), field emission scanning electron microscopy (FE-SEM), and transmission electron microscopy (TEM).

Methods

The synthesis process involved reducing silver nitrate ($AgNO_3$) with *S. officinalis* extract, producing stable AgNPs with an average size of 45 nm. The UV-Vis absorption spectrum confirmed an absorption peak at 400 nm, indicative of surface plasmon resonance. XRD analysis revealed a crystalline cubic structure with a crystallite size of 9.25–18.61 nm. FE-SEM and TEM confirmed the spherical morphology of the nanoparticles.

Results and Discussion

Infrared thermography was employed to measure temperature variations when AgNPs were applied to the skin in two different forms: mixed with distilled water and with commercial Vaseline. Results indicated that AgNPs in water reduced skin temperature, while those in Vaseline caused a slight temperature increase. Spectral radiance measurements demonstrated that radiation emission increased with temperature, and the maximum spectral radiation shifted toward shorter wavelengths.

The study also analyzed the radiance in two infrared bands (3–5 μm and 8–14 μm), showing higher radiance values at elevated temperatures. Radial heat diffusion from the nanoparticles was observed, indicating potential applications in medical diagnostics, particularly in detecting skin abnormalities.

Conclusion

This research successfully synthesized AgNPs via an eco-friendly method and demonstrated their impact on skin temperature. The findings suggest potential biomedical applications, particularly in thermal imaging and skin diagnostics.

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Title: Secondary mandibular reconstruction with patient specific 3D printed implant

Speaker Name: Harsimran Singh

Affiliation: C.K. Birla Hospital, India

Abstract:

Oral cancer is one of the most common cancer in India. Every year 77,000 new cases and 52,000 deaths are reported. 70% of them present in the advanced stages. Surgery in resectable locally advanced oral cancer often includes segmental /hemi mandibulectomy. Primary osseous reconstruction is definitely the preferred option but in majority of circumstances in India due to lack of resources and / or lack of adequate skill or patient having certain comorbidities, the defects are closed with only soft tissue flaps. These patients over the time develop deviation of residual mandible causing malalignment and occlusal disturbances leading to repeated traumatic ulcers which might cause another malignancy. Mandibular reconstruction at a later stage i.e. secondary settings although challenging should be considered in such situations. With advancement in three-dimensional (3D) imaging software and alloplastic technology a complete prosthetic mandibular replacement can also be done. We share our experience around this with the case discussed.

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Title: Nano Implanted Sensor Grids Utilization in the Detection of Micro Cracks in Structural Elements

Speaker Name: Aditya Singh

Affiliation: Amrita Vishwa Vidyapeetham, India

Abstract:

India is having a number of infrastructure projects in the past years for development of the country, but at the same time to maintain the development of the country, it is important to make sure that the infrastructure has structural integrity. This structural integrity is essential for making sure that the built infrastructure has long life as well as safe, particularly important in the case of critical infrastructure, which includes high risk load bearing elements like bridges, etc. However, micro level irregularities might go undetected through traditional methods of inspection, which might lead to major structural failures as time passes. This study focuses on nano implanted sensor grids which can be incorporated into structural components of given infrastructures to allow real-time detection of micro cracks as well as monitoring the health of the said infrastructures. They are especially useful in responding to deformations at the micro level due to stress in the structures, which then sends the needed data to an interpretation system powered by Artificial Intelligence to detect irregularities. The study will consider the recent published papers to find out the gaps in the current literature in the case of nano implanted sensor grids for the above case. Further, data from various sources will be presented to perform graphical analysis to support the study and understand the market along with the future scope of nano implanted sensor grids. More focus will be given on the application of nano implanted sensors grids in the infrastructural projects in the country India, in this study.

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Title: Adsorptive microplastic removal using Pinus Roxburgii derived biochar– a waste residue of Himalayan Forests

Speaker Name: Misbah Bashir

Affiliation: Islamic University of Science & Technology, India

Abstract:

The industrial revolution has led to widespread plastic production, resulting in microplastics becoming a significant environmental concern. These tiny plastic particles persist in water bodies and pose potential risks to ecosystems and human health. This study investigates the use of biochar for microplastic removal from aqueous solutions. Two types of biochars—sludge-based biochar and lignocellulosic-based biochar, specifically pine bark biochar (PBC)—were analyzed, with a focus on resource recovery from Himalayan forest byproducts. Preliminary characterization revealed that PBC had a higher carbon content (87.8%) compared to sludge-based biochar (59.8%), making it a better candidate for adsorption studies.

Further experiments examined the adsorption performance of both PBC and modified pine bark biochar (MBC) for removing polyvinyl chloride (PVC) microplastics. The highest adsorption capacity (131.5 mg/g) was observed at a pH of 10, a PVC concentration of 200 mg/L, and a 6-hour contact time. Adsorption occurred through ion exchange and physical interactions, including Van der Waals, London dispersion, and electrostatic forces. Thermodynamic analysis confirmed that the adsorption process was exothermic and spontaneous within a temperature range of 10–40°C. Isotherm and kinetic studies demonstrated a good fit with the Temkin model and pseudo-second-order (PSO) kinetics ($R^2 > 0.9$).

Notably, MBC exhibited superior performance compared to PBC, achieving an optimal adsorption capacity of 156.08 mg/g and a removal efficiency of 78%, surpassing that of unmodified PBC. These findings highlight the potential of biochar, particularly MBC, as an effective adsorbent for microplastic removal. This research provides valuable insights into biochar-based remediation strategies, offering a sustainable approach to mitigating microplastic pollution in aquatic environments.

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Title: DFT Study of $BaTiO_3$ Perovskite Compounds for Solar Cell and Photovoltaic Applications

Speaker Name: Aman Kumar

Affiliation: Swami Vivekanand Subharti University Meerut, India

Abstract:

Barium titanate ($BaTiO_3$) perovskite is a very promising material for optoelectronic applications owing to its superior electrical and optical characteristics. This paper offers an extensive examination of the structural, electrical, and optical properties of $BaTiO_3$ by density functional theory (DFT). The computations utilised the WIEN2K code, applying the Generalised Gradient Approximation (GGA) and the Tran-Blaha modified Becke-Johnson (TB-mBJ) potential to improve the precision of band gap predictions. An extensive examination of the electronic characteristics, encompassing the energy band structure and density of states (DOS), was performed. The TB-mBJ functional produced a band gap of 1.92 eV, aligning with previously documented theoretical and experimental findings. The projected density of states (PDOS) analysis shows that the Ba-p, Ti-d, and O-p states have a big impact on the electronic structure of the material. The optical properties of $BaTiO_3$ were analysed by evaluating the static dielectric constant, reflectivity $R(\omega)$, optical conductivity $\sigma(\omega)$, and refractive index $n(\omega)$. The optical spectrum indicates that $BaTiO_3$ demonstrates exceptional properties in the 4–5 eV energy range under the TB-mBJ approximation, rendering it very appropriate for solar energy harvesting. Its minimal reflectance in this spectrum further emphasises its suitability for use in perovskite solar cells and other optoelectronic systems requiring great optical sensitivity.

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Title: Green Synthesis of Nanoparticles from Plant Extracts and Novel Ionic Liquids

Speaker Name: Azeez A. Barzinjy

Affiliation: Soran University, Kurdistan Region, Iraq

Abstract:

Green synthesis of nanoparticles (NPs) is an emergent study field in nanotechnology as this process is nonhazardous, green, effective, and inexpensive when compared to other traditional physical and chemical approaches. Nowadays plant-mediated green synthesis and eutectic-based ionic liquids of NPs are obtaining more consideration among investigators worldwide. Wastewater typically contains a mixture of organic and inorganic substances, including azo dyes that can affect water quality and clarity, harmful microorganisms such as bacteria, viruses, and parasites and heavy metals like lead, mercury, cadmium, and chromium. Thus, Green synthesized NPs can be utilized in wastewater treatment owing to their high efficacy and biocompatible property.

In this keynote speech numerous NPs were biologically synthesized using both plant extract and eutectic-based ionic liquid medium. Then the mechanism of the NPs formation will be introduced and systematically explained. After that numerous characterization techniques for characterizing the synthesized NPs by both plant extract and eutectic-based ionic liquids mediums will be introduced. These techniques include UV-Vis and FTIR spectroscopy analysis, XRD and EDX analysis, SEM and TEM images, DLS and zeta potential analysis, BET surface area analysis and vibrating-sample magnetometer (VSM) dynamic technique for measuring the magnetic moment for magnetite NPs. After synthesizing the NPs, they have been used for wastewater treatment application. The antibacterial activity of the biosynthesized NPs, azo dyes degradation and heavy metal ions removing have been studied intensively. The comparison between both mediums also presented and the differences have been entirely highlighted. This study showed that the green synthesized NPs, from both medium, are highly proficient for recycling and removal of heavy metal from wastewaters without loss of their stability and degradation of a variety of organic pollutants from wastewaters and, thus, purify the wastewaters for reuse and recycling and could solve various water quality issues worldwide.

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Title: High-Temperature Deformation Behavior of Superalloy XH43

Speaker Name: Rakesh Ranjan

Affiliation: Vikram Sarabhai Space Center, India

Abstract:

High-Temperature Deformation Behavior of Superalloy XH43 With an aim to study the hot workability and establish the safe working zone for Ni-based superalloy XH43, cylindrical specimens were subjected to hot isothermal compression test at different temperatures (1173- 1373 K) and strain rates (10^{-3}-10 s^{-1}) using Gleeble thermo-mechanical simulator. Strain rate sensitivity and Zener–Hollomon parameter have been calculated. Processing maps and constitutive equations have been developed and verified with the experimental results. It is observed that dynamic recrystallization (DRX) is the principal flow softening mechanism. Strain rate sensitivity obtained through constant strain rate test (CSRT) m and through cyclic strain rate jump test (CSRJT) m' is found to have close match initially up to 0.3 strain. Subsequently at higher strain m has marginal reduction, whereas m' decreases drastically to low value. This is attributed to dynamic softening at higher strain, which is predominant in case of CSRJT where cyclic test is assisting the softening process. Activation energy Q obtained through CSRT is found to be slightly higher than activation energy (Q') obtained through dynamic test like CSRJT and jump temperature test (JTT). This indicates less dragging force for deformation of alloy in dynamic tests, which is closer to industrial practice. It is also found that alloy has good workability in the temperature range of 1173-1373 K at strain rates of 0.01-0.001 $\mathbf{s^{-1}}$. In this range of parameters, the alloy follows the constitutive equation very closely.

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Speaker Slots Filling Quickly

Title: Role of nano technology in high performance textiles – Future perspectives

Speaker Name: Narayanan Gokarneshan

Affiliation: SSM College of Engineering, India

Abstract:

Nanotechnology embodies a groundbreaking innovation for the textile and apparel industry, facilitating enhancements to the functionality and performance of textiles, including durability, resistance to water, odor, flame, stain, UV-protection, and antimicrobial properties. Nanotechnology also enables bio sensing, drug delivery, energy generation, and storage in textiles. Here, we present a comprehensive overview of the possibilities offered by nanotechnology in the context of high-performance textiles providing a roadmap for future research and development in this exciting field. We scrutinize the current research on nanotechnology in textiles, exploring various types of nano materials and their properties, the methods of incorporating nano materials into textiles, and the numerous applications of high-performance textiles across critical industries such as healthcare, military, sports, fashion, and wearable electronics. We conclude the review with an analysis of the potential health and environmental concerns arising from the use of nanotechnology in textiles, emphasizing the importance of further research in these areas.

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Speaker Slots Filling Quickly

Title: Azodye photoaligned nanolayers for liquid crystal devices: new nano technology

Speaker Name: Vladimir G. Chigrinov

Affiliation: Hong Kong University of Science and Technology, Hong Kong

Abstract:

Photoalignment and photopatterning has been proposed and studied for a long time [1]. Light is responsible for the delivery of energy as well as phase and polarization information to materials systems. It was shown that photoalignment liquid crystals by azodye nanolayers could provide high quality alignment of molecules in a liquid crystal (LC) cell. Over the past years, a lot of improvements and variations of the photoalignment and photopatterning technology has been made for photonics applications. In particular, the application of this technology to active optical elements in optical signal processing and communications is currently a hot topic in photonics research [2]. Sensors of external electric field, pressure and water and air velocity based on liquid crystal photonics devices can be very helpful for the indicators of the climate change.

We will demonstrate a physical model of photoalignment and photopatterning based on rotational diffusion in solid azodye nanolayers. We will also highlight the new applications of photoalignment and photopatterning in display and photonics such as: (i) fast high resolution LC display devices, such as field sequential color ferroelectric LCD; (ii) LC sensors; (iii) LC lenses; (iv) LC E-paper devices, including electrically and optically rewritable LC E-paper; (v) photo induced semiconductor quantum rods alignment for new LC display applications; (vi)100% polarizers based on photoalignment; (vii) LC smart windows based on photopatterned diffraction structures; (vii) LC antenna elements with a voltage controllable frequency.

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Title: Artificial Neural Networks in Dental Material Analysis: A Comprehensive Review

Speaker Name: Rohit Kumar Singh

Affiliation: National Institute of Technology Karnataka, India

Abstract:

Artificial Neural Networks (ANNs) have revolutionized data analysis and prediction capabilities across various fields. This review paper explores the applications of ANNs in the analysis and design of dental materials. Essential for dental restorations and treatments, these materials require precise characterization of their mechanical and biological properties to ensure durability, effectiveness, and biocompatibility. The paper discusses how ANNs can predict and optimize properties such as strength, wear resistance, fracture toughness, and biocompatibility. Key optimization techniques, including backpropagation, gradient descent, and the Adam optimizer, are reviewed for their role in enhancing ANN performance. Significant case studies are highlighted to demonstrate the successful prediction of behavior in dental composites, ceramics, and alloys. The paper also addresses the advantages, limitations, and future prospects of integrating ANNs with emerging technologies like big data analytics and machine learning to advance dental material science. This review underscores the potential of ANNs to transform the design and analysis of dental materials, paving the way for innovative solutions in dental research and clinical practice.

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Title: Enhanced Fluoride Adsorption by StrontiumModified Dicalcium Phosphate Dihydrate

Speaker Name: Tejaswini Mendke

Affiliation: GITAM (Deemed to be University), India

Abstract:

The present research focused on the synthesis and characterization of strontium-doped dicalcium phosphate dihydrate (Sr-DCPD) as an adsorbent for fluoride removal from aqueous solutions. The adsorbents were synthesized using a co-precipitation method and subsequently analyzed by XRD, FTIR, BET, TEM, SEM, and EDX. The XRD patterns confirmed a monoclinic crystal structure with the I1 2/a 1 space group, while SEM images showed plate-like morphology. EDX analysis verified the uniform distribution of elements. The adsorption process was best described by the Freundlich isotherm model, indicating heterogeneous adsorption, and followed pseudo-second-order kinetics. The Sr(0.05)DCPD adsorbent demonstrated exceptional fluoride removal capacity, reaching a maximum of 1428 mg/g, highlighting its potential for effective water purification.

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Title: Sunlight-Mediated Degradation of Water Contaminants with a Novel Modified Bismuth Molybdate Perovskite Photocatalyst

Speaker Name: Amruth H D Gowda

Affiliation: GITAM (Deemed to be University), India

Abstract:

In the present study, manganese-modified bismuth molybdate was developed and characterized as a photocatalyst for the sunlight-mediated degradation of diverse water pollutants. Structural, optical, and surface properties were investigated using XRD, UV-Vis spectroscopy, FTIR, SEM, BET surface area analysis, and photoluminescence spectroscopy, revealing a band gap in the range of 2.5-1.1eV. Photocatalytic degradation studies demonstrated the effective removal of various dyes, chloro-organic compounds, and pharmaceuticals. The catalyst exhibited higher activity without H2O2 compared to its performance with it. Application to real dye-containing wastewater resulted in 100% pollutant removal, with degradation kinetics following a second-order model. This work establishes the catalyst's potential for efficient and practical wastewater remediation in industrial settings.

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Title: Design and Application of Novel Nanocomposites for Water Remediation

Speaker Name: Chilukoti Srilakshmi

Affiliation: GITAM (Deemed to be University), India

Abstract:

Water pollution caused by organic compounds, heavy metals, dyes, oil spills, and fluoride contamination poses a significant threat to the environment and public health. Among these pollutants, fluoride contamination is of particular concern due to its dual nature—while fluoride is essential for human health in trace amounts, excessive intake can lead to severe health issues such as dental and skeletal fluorosis. According to the World Health Organization (WHO), the permissible limit of fluoride in drinking water is 1.5 mg/L. However, in many regions across the globe, fluoride levels in groundwater far exceed this limit, necessitating the development of efficient and sustainable fluoride removal technologies. Nanomaterials and their composites have emerged as promising candidates for water remediation due to their high surface area, tunable physicochemical properties, and enhanced reactivity. In this talk, I will discuss the design and development of novel nanomaterials and their composites aimed at removing various pollutants from water, including oils, fluoride ions, dyes, and organic contaminants. A highly efficient sorbent, PVDF/ZnAl(DS)LDH, will be presented for the absorption of oil and organics from water. Furthermore, I will highlight the synthesis and characterization of magnesium and silver-doped calcium hydroxyapatite-based adsorbents, which exhibit remarkable fluoride ion removal capabilities along with antibacterial properties. The presentation will also cover the fabrication of perovskite-based nanomaterials, such as bismuth molybdate, for the photocatalytic degradation of dyes and organics from water. The results demonstrate that these innovative materials offer sustainable and costeffective solutions for water purification, addressing both environmental and health concerns.

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Speaker Slots Filling Quickly

Title: Surrogate Model-Assisted Multi-Objective Optimization Using Morphing Techniques for Efficient FEM-Based Design Exploration

Speaker Name: Shailesh S Kadre

Affiliation: Senior Divisional Manager at Cyient Ltd, India

Abstract:

This case study leverages surrogate models as a cost-effective alternative to computationally expensive Finite Element Analysis (FEA) solvers. Given that model discretization and meshing are crucial yet time-consuming steps in FEA, the study explores the benefits of morphing techniques in parametric studies. Morphing enables efficient adjustment of design parameters and, when integrated with automated mesh generation tools, enhances model robustness and convergence.

In the associated research, the authors developed surrogate model-assisted optimization algorithms for both single and multi-objective optimization. One such algorithm was applied to a real-world engineering problem to generate the Pareto front, resulting in a 4% improvement in NHV values compared to conventional surrogate-assisted multi-objective optimization approaches. Additionally, the enhanced Pareto front was more evenly distributed, ensuring a well-balanced set of optimal solutions.

A post-optimal analysis was conducted on the final Pareto solutions to uncover hidden insights and derive simplified design rules. These relationships serve as a knowledge base, enabling designers to make informed decisions and achieve optimal designs without repeatedly solving the problem from scratch in future studies of a similar nature.

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Title: Probing the Influence of Hopping Dimerization on Persistent Currents in Cylindrical Multi-Channel Systems

Speaker Name: Ipshita Baruah

Affiliation: Gauhati University, India

Abstract:

We investigate the behavior of persistent currents in cylindrical multi-channel systems subjected to a threaded magnetic flux. These systems are constructed from vertically stacked one-dimensional (1D) rings, each exhibiting hopping dimerization modeled after the Su-Schrieffer-Heeger (SSH) framework [2]. Our theoretical formulation employs a nearest-neighbor tight-binding approach to describe the electronic properties of the system.

By tuning the dimerization strength, we explore the transition between topological and trivial insulating phases and their impact on quantum transport properties. In particular, we analyze how these phases affect the energy spectrum and the resulting persistent currents — equilibrium currents that can flow indefinitely without dissipation in mesoscopic rings [1].

Our study reveals that in topological regimes, characterized by the emergence of edge states, persistent currents are significantly enhanced and more robust. On the other hand, trivial insulating phases tend to suppress current flow. We further examine the influence of inter-ring coupling, the number of stacked rings, and different boundary configurations. The results show that these parameters jointly determine the amplitude and periodicity of the current.

This work offers insights into how topological effects in low-dimensional systems can be harnessed to control and stabilize quantum transport. Such understanding is crucial for the development of nanoscale quantum devices, where persistent currents and quantum coherence play a central role.

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Title: Nano-Boosted Chemotherapy: Anisotropic Silver Nanoparticles mediated amplification of Thiazolidinedione derivatives for Breast Cancer treatment

Speaker Name: Gaurav Ranjan

Affiliation: Central University of South Bihar, India

Abstract:

Background:
The combination of nanotechnology with targeted drug delivery has unlocked new possibilities in cancer therapy. Silver nanoparticles (AgNPs), specifically anisotropic forms, unveil unique surface plasmon resonance (SPR) and photothermal properties that can be incorporated to enhance the efficacy of thiazolidinedione (TZD) derivatives

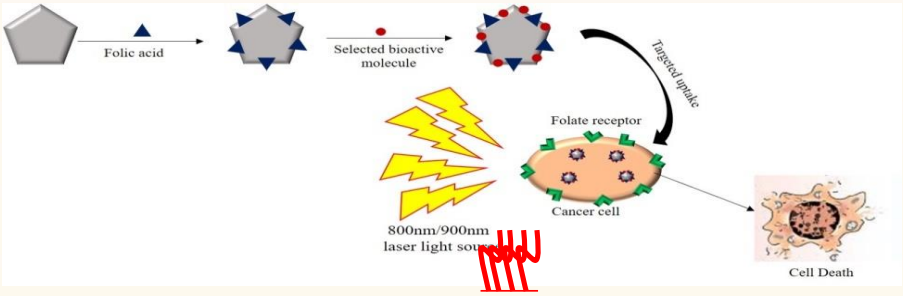

Fig. FA-Targeted Anisotropic AgNPs for Photothermal Cancer therapy

Objective:
This research explores the synergistic activity of anisotropic plasmonic AgNPs in enhancing the anticancer potential of thiazolidinedione derivatives, against breast cancer cells.

Methods:
Anisotropic AgNPs were synthesized and characterized using UV-Vis spectroscopy and HR-TEM. The interaction between AgNPs and TZD was studied for photothermal conversion efficacy and drug-loading capability.

Results:
The combined treatment significantly improved cytotoxicity and apoptosis compared to individual treatments. NIR-triggered photothermal activation of AgNPs increased intracellular ROS levels and facilitated greater cellular uptake of thiazolidinedione derivatives, leading to enhanced cancer cell death.

Conclusion:
The study validates that anisotropic AgNPs can potentiate the anticancer efficiency of thiazolidinedione derivatives by leveraging combined photothermal and cytotoxic mechanisms, offering a promising platform for advanced breast cancer treatment.

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Title: Quantum Implementation of SHA-1 and MD5 with three other Quantum Resistant Techniques

Speaker Name: Prodipto Das

Affiliation: Assam University, India

Abstract:

This paper presents the quantum adaptation of Secure Hash Algorithm 1 (SHA-1) and Message Digest 5 (MD5) using IBM's Qiskit framework, evaluating their computational performance against classical hashing techniques and post-quantum cryptographic schemes, including eXtended Merkle Signature Scheme (XMSS), Leighton-Micali Signature Scheme (LMSS), and SHAKE-256. These three algorithms are the NIST certified quantum resistant hashing techniques. Several quantum circuits are designed to implement fundamental cryptographic operations such as XOR, AND, OR, addition, and modular arithmetic, enabling

a quantum-friendly transformation of these hashing algorithms. Experimental results indicate that quantum implementations exhibit significant computational overhead due to circuit depth, gate constraints, and hardware limitations. These findings contribute to understanding the feasibility of quantum hashing and post-quantum cryptographic frameworks and their role in securing future authentication systems.

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Title: Low Cost Fabrication of electrically tunable and uniform Conducting Paper for Flexible Electronics Gayathri Gangadharan,

Speaker Name: Gayathri Gangadharan

Affiliation: Sri Sivasubramaniya Nadar College of Engineering, India

Abstract: Any fabricated material needs to have uniform and reproducible characteristics, else it loses its potential for scale-up and commercialisation and the data derived from it lose its significance for validation and comparison. Conducting Paper(CP), which is flexible, low cost, light weight, easily disposable is a potential material for future green electronic and microfluidic devices. Achieving uniform conductivity throughout the CP using facile dip coating has been a big challenge due to the mechanics of the fluid on the paper while handling. A fabrication methodology is devised to obtain uniformity, and its efficacy is proved by the electrical characterisation.

This work studies the electrical characteristics of the CP fabricated with conducting polymer poly(3,4-ethylenedioxythiophene): polystyrene sulfonate (PEDOT:PSS), the base material along with four different additives such as DMSO, organic additive (glutaraldehyde (GA)), inorganic salt (sodium periodate ($NaIO_4$)) and binding agent poly(vinyl alcohol) (PVA) are combined in five different combinations and coated on the paper to tune the conductivity. DMSO is the basic additive in all the combinations.

The significant results obtained are

(i) PVA reduces the conductivity of the combination with GA and $NaIO_4$, which can be noticed in Table 1.

(ii) Maximum conductivity of the additive solution is achieved by optimising the duration of magnetic stirring to be 17 hrs. This can be seen in Fig1.

(iii) Uniformity with less than 15% deviation in electrical conductivity among the samples as can be seen in Table 1, which is the key for scale up and commercialization, is achieved using Double side doctor blade (DSDB) setup on simple dip coated paper. An impedance variation of about 20KΩ among the samples obtained from the same paper due to the effects of fluid mechanics, has been brought down to less than 100Ω with the implementation of this effective coating method.

(iv) The operating current range of all the CPs are determined to have a lower limit of 1 μA, below which the electric field is not sufficient enough to drift the electron and an upper limit of 1 mA, beyond which the material enters an exponential conductivity regime due to internal joule heating. This observation is shown in Fig.2.

(v) Charge carrier mobility and concentration, which are important parameters in the design of electronic devices, are tuned from 4 to 21 $cm^2/V\ s$ and 10^{17} to $10^{19}/cm^3$, respectively. Electrochemical Impedance analysis shows CPs to be purely resistive with impedance having only magnitude and zero phase.

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Title: Seasonal and Lagged Effects of Temperature Fluctuation on Suicide Mortality in Seoul: A Comparative Analysis Using DLNM, LSTM, and Causal Deep Learning

Speaker Name: Ambreen Shafqat

Affiliation: Chonnam National University, South Korea

Abstract:

Understanding the complex relationship between environmental variability and suicide mortality is critical for targeted mental health interventions. This study investigates the seasonal and lagged impacts of climatic factors—particularly temperature fluctuation and dew point temperature—on suicide deaths in Seoul, South Korea, from 2014 to 2019. Summary statistics reveal consistently higher suicide rates among males and middle-aged individuals, with spring emerging as the season of highest risk across demographic groups.

Using Granger Causality and Distributed Lag Nonlinear Models (DLNM), we identified optimal lag structures, with temperature fluctuation showing the strongest effect at a 4-day delay (RR > 1.01). Stratified analyses further confirm heightened susceptibility among males and the elderly (≥65 years). To capture nonlinear and complex patterns, we implemented both Long Short-Term Memory (LSTM) and Causal Guided Deep Learning (CGDL) models across four seasons. The LSTM model generally outperformed CGDL in predictive accuracy, particularly in winter and spring, though CGDL captured broader variability in fall and summer when dew point temperature played a more dominant role.

Multivariable seasonal models revealed dew point temperature and temperature fluctuation as the most significant predictors, with CGDL achieving an R^2 as high as 0.779 in summer. Notably, when modeled individually, dew point temperature alone achieved the highest predictive performance (R^2 > 0.89), underscoring its importance as a standalone climatic determinant of suicide deaths.

These findings emphasize the need for seasonally adjusted, demographically targeted, and climate-informed suicide prevention strategies. Incorporating both acute and delayed environmental influences offers a more precise framework for anticipating high-risk periods and implementing timely interventions.

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Title: Performance of Biogenic Silica Photocatalytic Ceramic Foams and Cu-TiO2 NPs in the Degradation of Emerging Pollutants under Natural Solar Radiation

Speaker Name: Yhosmary Luisa Franco Faria

Affiliation: University of Carabobo, Venezuela

Abstract:

Emerging contaminants in drinking water supply are a growing concern due to their presence in various sources and incomplete degradation occurring in conventional treatment plants. This underscores the need to implement alternative and specialized processes for their removal. Photocatalysis, an advanced oxidation process that uses light as the sole energy source, is emerging as a promising solution. In this study, the performance of novel photocatalytic materials was evaluated: ceramic foams synthesized from biomass, specifically biogenic silica obtained from rice husk, and copper-decorated titanium dioxide nanoparticles (Cu-TiO_2 NPs). These foams were synthesized using the direct foaming method with CO_2, an efficient and sustainable approach. Their performance was evaluated in the degradation of acetaminophen (ACP), an emerging contaminant of pharmaceutical origin, achieving a removal of 91.0% with a loading of 1.5 g/L, a time of 83 minutes and using natural solar radiation. The results obtained demonstrate that these ceramic foams have the potential to overcome current limitations and represent a significant advance towards the implementation of photocatalysis on an industrial and global scale.

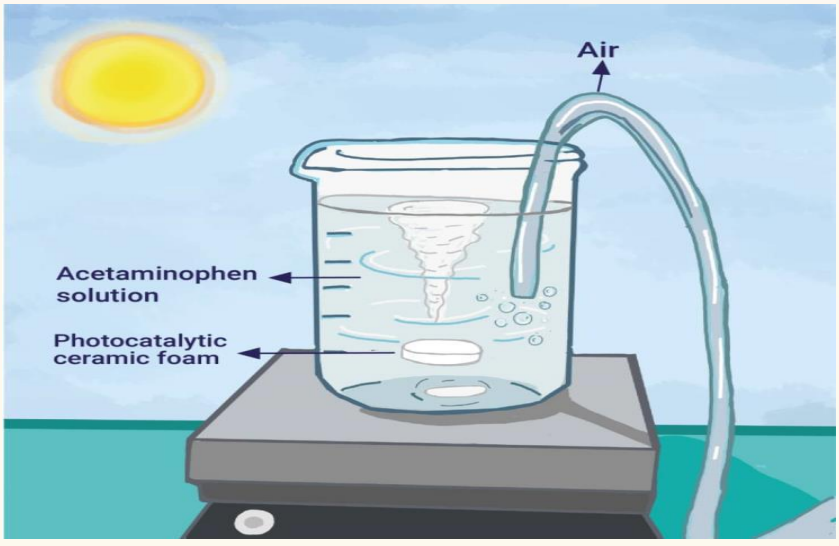

Figure 1 Photocatalytic reaction system with natural solar radiation

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Title: Optical and Structural Properties of SnO_2:Pd Doped with CeO_2 and the Possibility of Using It in Sensors

Speaker Name: Ahmed Shakir Mahmood

Affiliation: University of Baghdad

Abstract:

This research focuses on the optical and structural characteristics of SnO_2:Pd thin films doped with various concentrations of CeO_2 (0.05–0.25 wt%) and investigates their application in hydrogen sulfide (H_2S) gas sensors. Thin films were deposited using the spray pyrolysis method. Atomic Force Microscopy (AFM) analysis revealed significant changes in surface morphology, with particle shapes shifting from spherical to wire-like as the CeO_2 doping level increased. This was accompanied by a decrease in average particle size and an increase in surface roughness. Hall Effect measurements showed that all samples exhibited n-type conductivity, except for the sample with 15% CeO_2, which transitioned to p-type. Optical characterization indicated a reduction in the optical bandgap and increased absorption with higher doping levels. The sensor with 0.1% CeO_2 doping showed the highest sensitivity to H_2S gas at 200°C with a concentration of 400 ppm, delivering fast response and recovery times. These findings demonstrate that doping SnO_2:Pd with CeO_2 significantly improves structural and optical properties and enhances gas sensing performance, making it a promising material for advanced sensor technologies.

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Title: Design a CNN-GRU Model for Handwritten Character Recognition and Performance Evaluation on Char74k Dataset

Speaker Name: Madhav Sharma

Affiliation: Poornima Institute of Engineering and Technology, India

Abstract:

Handwritten character recognition plays a significant role in the fields of artificial intelligence, computer vision, and machine learning, yet it remains a challenging task due to variations in writing styles, quality, and noise. This study presents a hybrid deep learning model combining Convolutional Neural Networks (CNN) and Gated Recurrent Units (GRU) to improve recognition accuracy on the Char74k dataset, which contains a diverse set of handwritten characters. The proposed CNN-GRU model leverages CNNs for feature extraction from images and GRUs for learning sequential dependencies, providing robust performance in recognizing handwritten text. The model was trained on 60,000 samples and tested on 10,000 samples, achieving an impressive validation accuracy of 96.43% — outperforming several existing state-of-the-art methods. Through careful parameter tuning and loss monitoring, the model demonstrated strong generalization ability. The findings suggest that integrating CNNs and GRUs offers a powerful solution for handwritten character recognition, with promising applications in document digitization, postal systems, and automated data entry systems.

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Title: Optimized Design and Structural Analysis of 15-Ton Payload Trailer Using Advanced Lightweight Materials for Reduced Vehicular Emissions

Speaker Name: Pramod Ram Wadate

Affiliation: Institute Ajeenkya D Y Patil School of Engineering, India

Abstract:

This study presents the design and structural analysis of a heavy-duty trailer capable of carrying a payload of 15 tons, with a primary focus on weight reduction to enhance fuel efficiency and minimize environmental impact. The increasing demand for sustainable transportation solutions has driven the need for innovative structural designs and the adoption of advanced lightweight materials. In this context, the research investigates the application of AlBeMet AM162 Extruded Bar—a high-performance material with a superior strength-to-weight ratio—for trailer construction. The trailer structure was modelled and analysed using ANSYS simulation tools to evaluate its mechanical performance and potential for weight optimization. The results indicate a significant reduction in the trailer's structural weight, which directly contributes to lower fuel consumption and reduced CO_2 emissions. These findings highlight the effectiveness of integrating lightweight materials and advanced structural analysis techniques in achieving energy-efficient and environmentally sustainable transportation systems.

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Title: Evaluation of Antibacterial Potency of Citrus Limon (Lemon) Juice Against Some Pathogenic Organisms as Alternative Source of Chemotherapy

Speaker Name: Joel Uyi Ewansiha

Affiliation: Modibbo Adama University

Abstract:

The development of antibiotic resistance by pathogenic microorganisms have necessitated the quest for alternative drug therapy. The efficacy and safety of extract from *Citrus limon* for the development of alternative antibacterial drug using the cold-pressing extraction methods and column chromatography to obtain crude juice extracts and fractions respectively while the agar well diffusion and tube dilution methods were used to screen the juice extract and fractions for antibacterial activity against *Salmonella enterica*, *Klebsiella pneumoniae*, *Streptococcus pneumoniae* and *Streptococcus pyogenes.* A total of 277.5mL (12.313%) of juice was obtained from 2253.8g of fruit while the phytochemicals present include tannins, flavonoids, anthraquinones, alkaloids, steroids, phenols, cardiac glycoside, terpenes, resins and saponins. One hundred percent (100%) of the juice crude extract exhibited the highest activity with mean inhibition zones (MIZ) ranged from 25.00±0.57mm to 32.33±0.33mm while 25% (6.67±1.15mm to 10.00±1.00mm) exhibited the least activity. The minimum inhibitory concentration and minimum bactericidal concentration (MIC and MBC) for the juice crude extract ranged from 25% to 12.5% and 100% respectively while *S. paratyphi C, S. typhi*, *K. pneumoniae* and *S. pneumoniae* were still viable at 100%. Of the three fractions eluted, only one (JEtOAc) was active against all the test organisms with MIZ ranged from 14.00±0.33mm to 22.33±1.20mm while 27 compounds were identified in the fractions by GCMS. Notable group of compounds identified include fatty acids, terpenes, aliphatic and aromatic hydrocarbons. The MIC and MBC for the fractions ranged from 30mg/mL to 15mg/mL and >120mg/mL to 30mg/mL. Based on these findings, it can therefore be concluded that the juice extract and ethyl acetate fraction of *Citrus limon* possess antibacterial activity due to the abundant presence of secondary metabolites and they are therefore recommended for the development of alternative drugs for the control and treatment of infections caused by these organisms.

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Speaker Slots Filling Quickly

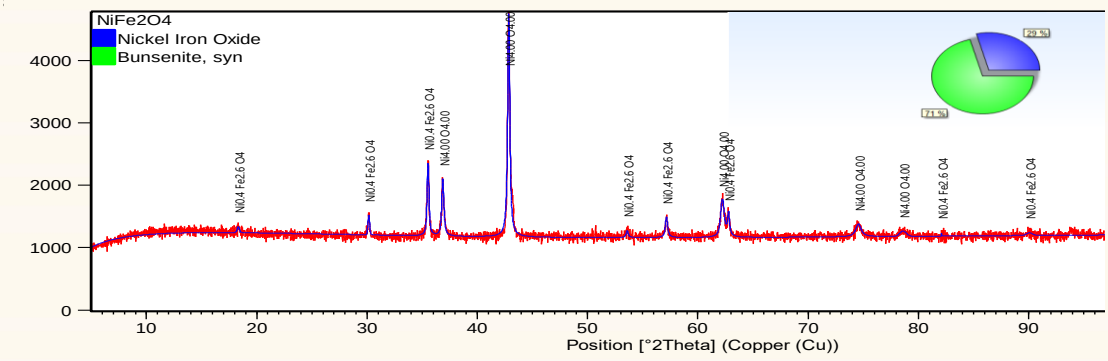
Title: Nikel ferrite $NiFe_2O_4$ synthesis on solar furnace

Speaker Name: Mukhammad-Sultan Paizullakhanov

Affiliation: Institute of Materials Science

Abstract Cobalt or nickel ferrites exhibit high dielectric constant in the high frequency region and high electrical resistance [1]. Therefore, they have a wide range of applications in catalysis [2], RF electronics [3,4], etc.

To synthesize nickel ferrite, we used a mixture in a stoichiometric ratio of components - iron and nickel oxides of analytical grade. (Fe2O3 + NiO). The mixture was ground in an agate mortar with the addition of ethyl alcohol (10 wt.%) and molded into tablets with a diameter of 12 mm and a height of 15 mm. The tablets were placed on a melting table located on the focal spot in the shape of a circle with a diameter of 30 mm of the solar furnace.



X-ray diffraction pattern of nickel feririte synthesized in a solar furnace

The crystal structure was represented as cubic spinel. The process of melting the mixture of initial reagents is accompanied by the chemical reaction NiO + Fe2O3 → NiFe2O4 with the formation of nickel ferrite. It was determined that the crystal lattice has a constant a=8.87 Å.

For nickel ferrite synthesized from a melt in a solar oven, the X-ray density value was 5.28 g/cm3. The material exhibited a soft magnetic character with parameters Hc=60 Oe, Ms=30 emu/g. While the material fired at 1100°C showed parameters Hc=80 Oe, Ms=50 emu/g. Such values of the structure and magnetic parameters suggest that the material synthesized from a melt in a solar furnace can be used in catalytic processes for producing syngas by reforming organic raw materialsshould give clear indication of the objectives, scope, results, methods used, and conclusion of your work. One figure and one table can be included in your results and discussions.

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Title: Radiative magnetohydrodynamic flow of Darcy-Forchheimer Casson nanofluid over a permeable wedge

Speaker Name: Amos Wale Ogunsola

Affiliation: Ladoke Akintola University of Technology

Abstract:

This study investigates the radiative magnetohydrodynamic (MHD) flow of Darcy-Forchheimer Casson nanofluid over a permeable wedge, with profound implications for biomedical applications. Wedge geometries are widely utilized in biomedical systems, including prosthetics, stents, drug delivery devices, tissue scaffolds, microfluidic devices, and bioimplants, where they facilitate fluid flow regulation, enhance nutrient transport, and support controlled drug diffusion.

The Casson fluid model is used to characterize the non-Newtonian rheological behavior of blood-like fluids, particularly yield stress phenomena, making the model highly relevant to biological fluids. The mathematical model formulation is derived from the fundamental principles of conservation of momentum and energy, incorporating magnetic field effects, porous medium resistance, and inertia forces through the Darcy-Forchheimer model. Radiative heat flux is integrated into the energy equation to reflect its significance in thermal transport for biomedical applications such as hyperthermia cancer treatments and heat-based drug delivery.

The governing equations are rendered dimensionless to streamline the analysis and highlight the influence of key flow parameters including Casson, magnetic, nanoparticles volume fraction, permeability, Forchheimer, Prandtl, Darcy, and radiation parameters. The Chebyshev collocation method is utilized to obtain numerical solutions due to its high accuracy and rapid convergence in boundary value problems.

The findings offer an in-depth understanding of how various flow parameters affect the situation dynamics, with direct applications in controlled drug delivery, thermal ablation therapies, magnetic cancer targeting, and blood flow enhancement in medical devices. Furthermore, the study elucidates the impact of wedge permeability on fluid behavior in implants, prosthetics, dialysis machines, and tissue engineering applications, contributing to the optimization of heat and mass transfer in advanced biomedical technologies.

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Title: Numerical Analysis on Influence of Darcy–Forchheimer $Fe_3O_4 - CoFe_2O_4 - H_2O$Hybrid Nanofluid Flow with Magnetohydrodynamic and Viscous Dissipation Effects Past a Permeable stretching sheet

Speaker Name: Asra Anjum

Affiliation: University of Technology and Applied Sciences Salalah

Abstract:

In this study, the impacts of viscous dissipation and magnetohydrodynamics (MHD) on the flow and transmission of heat characteristics of $Fe_3O_4 - CoFe_2O_4 - H_2O$ Using a hybrid nanofluid and the Darcy-Forchheimer regime, a permeable stretched sheet is used. The enhanced thermal and flow attributes of the hybrid nanofluid are investigated. It is made up of cobalt ferrite ($CoFe_2O_4$) and magnetite (Fe_3O_4) nanoparticles dissolved in water. Significantly, this opens the door to using a magnetic field to externally modify flows, enabling quicker convective heat transfer efficiencies. The governing nonlinear PDEs that consider thermal radiation, viscous dissipation, magnetic field effects, and the Darcy-Forchheimer porous medium are transformed into a system of ODEs using similarity transformations. Then, using the Bvp4c shooting technique and the MATLAB software, a computational model is created that ensures accuracy in capturing the complex relationship between magnetic field strength, resistance of the porous medium, and viscous dissipation. The results show the strong effect of nanoparticle volume fractions (ϕ_1, ϕ_2),temperature and velocity pattern on *magnetization parameter (M), Darcy-Forchheimer, viscous dissipation (Ec), thermal radiation (Rd), stretching ratio parameter (λ) and suction parameter (*S*).* According to observations, velocity is much depreciated as the (*Fr*) value increases, and the velocity decreases while the temperature increases when the (M) value improves. Furthermore, velocity increases as the (*Da*) value rises, yet temperature first falls and subsequently rises significantly. Additionally, as (*M*) enhances, skin friction (C_{fx}) appreciates substantially but when (*Da*) enhances, skin friction (C_{fx}) depreciates. Furthermore, heat transfer rate (Nu_x) dampens considerably when (*Rd*) and (*Ec*) values rise, these findings support the optimisation of hybrid nanofluids in thermal systems, particularly in energy conversion and refrigeration systems that incorporate magnetic forces and permeable substrates. The results of this work have implications for the construction and refinement of devices using nanofluids exposed to ambient electromagnetic fields, such as heat transfer devices determined by nanofluids and temperature control techniques.

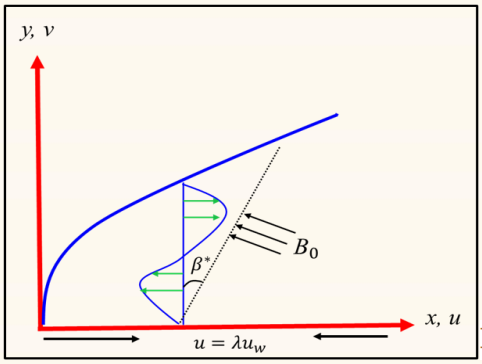

Figure 1: Geometry and Coordinate system

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Title: Performance and Economic Evaluation of Photovoltaic-Thermal Systems Using Phase Change Materials and a Parallel Serpentine Design in Dusty Environments

Speaker Name: Shouquat Hossain

Affiliation: International University of Business Agriculture and Technology (IUBAT)

Abstract: The conversion efficiency of photovoltaic (PV) systems drops significantly because of overheating and dust buildup, which in turn causes performance degradation. This research combines phase change materials (PCMs) with a unique parallel serpentine flow structure in photovoltaic/thermal (PV/T) systems to improve performance in dusty environments. Experimental evaluations were conducted on two configurations: a PV/T-PCM module and a PV/T-PCM-Dust module. The PV/T-PCM module achieved a maximum electrical efficiency of 17.52%, whereas the PV/T-PCM-Dust module reached 14.83%, and thermal efficiencies stood at 79.93% and 73%, respectively. Using PCM significantly reduces temperature variations, enhancing energy storage and extending the system's lifespan. Furthermore, an economic analysis indicates that PCM-enhanced PV/T systems are promising for sustainable energy production, especially in areas prone to significant dust accumulation. This study emphasizes the promise of PCM-based PV/T systems in tackling efficiency and durability issues in solar energy applications.

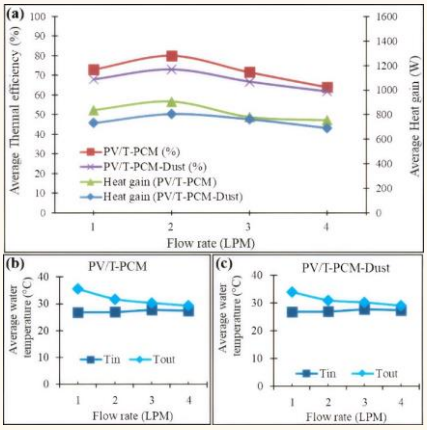

Fig. 1: PV/T-PCM and PV/T-PCM-Dust modules thermal performance; (a) thermal efficiency; (b) PV/T-PCM; and (c) PV/T-PCM-Dust inlet and outlet with mass flow rate.

Table 1: Performance comparison showing that PV/T-PCM achieves the highest efficiency among analyzed systems.

Type of system	Electrical efficiency	Thermal efficiency	Reference
PV/T and PV/T-PCM system	6.98% and 8.16%	58.35% and 69.84%	[55]
NPVT and NPV-TES	1.59% and 3.19%	x	[56]
PV/PCM and Reflector/PCM/ Nanoparticle	12.49% and 12.84%	x	[57]
PVT system	10.8%	62.37%	[58]
PV	**13.58%**	**x**	**(Present)**
PV/T-PCM	**17.52%**	**79.93%**	**(Present)**
PVT-PCM-Dust	**14.83%**	**73%**	**(Present)**

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Title: A Novel Decision Support System for Recycling of Waste Material Using Some Circular Pythagorean Fuzzy Muirhead Means

Speaker Name: Kifayat Ullah

Affiliation: Riphah International University

Abstract:

Due to the large number of the population, many countries have faced a waste material issue. Recycling waste material is an important rule because in this process waste products can be converted into new materials and objects. Recycling of waste material is the process of converting waste products into new materials and objects. But it has also brought many problems, among which the quality of recycling is the best for humans. In this article, we will discuss recycling waste material in detail, which will make opportunities for human jobs to learn engaging, inspiring, and fun for employers and improve all these thinking in the future. For this purpose, we expose the notion of circular Pythagorean fuzzy set theory, which is the advanced version of fuzzy and intuitionistic fuzzy information. We proposed Muirhead mean and dual Muirhead mean aggregation operators in the framework of circular Pythagorean fuzzy information. Further, we establish some important properties of our proposed work, methodology, and algorithm for multi-criteria group decision-making problems. Moreover, to show the reliability of our proposed work, we study a practical example of recycling waste material based on a multi-criteria group decision-making approach to illustrate the best alternative for recycling waste material. A sensitivity analysis illustrates the effectiveness and reliability of the proposed work. Finally, we adopted the comparative study and highlighted the advantages of defined works.

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Speaker Slots Filling Quickly

Title: Machine learning classifiers for the prediction of Coronary Heart Disease

Speaker Name: Shahid Naseem

Affiliation: University of Education

Abstract:

Worldwide, coronary heart disease is regarded as one of the main causes of mortality. One of the trickiest problems in clinical data analysis is predicting a heat illness. With the use of machine learning (ML) and worldwide data from the healthcare industry, one may utilize ML to make predictions and assist with diagnosis. The prediction is frequently regarded as one of the most difficult in medical data analysis and healthcare. With the use of machine learning (ML) and worldwide data from the healthcare industry, one may make predictions and offer diagnostic support. Numerous studies on the use of ML classifiers for the prediction of heart disease have been presented in this respect. We employed two ML classifiers in this study: The prediction of cardiac disease is increased when an Artificial Neural Network (ANN) employs Mutual Information (MI) to identify the important characteristics after initially using Particle Swarm Optimization (PSO) to assess the dataset. Secondly, it contrasted the basic machine learning techniques for the prediction of Coronary Heart Disease (CHD). This study also uses the National Health and Nutritional Examination Survey dataset to define CHD. Several feature combinations and well-known classification methods were employed to introduce the prediction model. The result is that the dataset is significantly unbalanced, and the SMOTE method is used to fix this particular dataset. The SMOTE technique balanced dataset is utilized for the improvement of the performance of the prediction of coronary disease. As a result, the heart disease prediction model might achieve a high accuracy of up to 97% with the aid of the suggested PSO-ANN. This proposed technique would improve heart disease research, and patients could receive the appropriate treatment.

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Title: Production of Biodegradable Biocomposites Using Cow Dung-Derived Graphene and Polystyrene

Speaker Name: Babafemi Raphael Babaniyi

Affiliation: National Biotechnology Research and Development Agency Abuja

Abstract:

Biocomposites are an emerging class of materials that integrate a matrix with natural fibers to enhance mechanical properties, providing a sustainable alternative that balances environmental benefits with optimized performance. This study investigates the production and characterization of graphene derived from cow dung through calcination, achieving a notable yield of 60%. The enhanced yield is attributed to the carbon-rich diet of cows, which increases the initial carbon content in the dung, facilitating efficient extraction. The produced graphene was characterized using Fourier Transform Infrared Spectroscopy (FTIR), which confirmed its high quality by revealing characteristic peaks associated with sp^2 hybridized carbon and oxygen-containing functional groups. X-ray diffraction (XRD) analysis indicated high crystallinity with minimal defects, while scanning electron microscopy (SEM) illustrated a porous network of interconnected graphene sheets. Graphene-based biocomposites incorporating polystyrene were developed via solvent casting and evaluated. Results indicate a direct correlation between polystyrene content and composite thickness. Water absorption tests revealed that PG1 exhibited the highest water uptake, while mechanical analysis demonstrated that PG1 provided a balance of tensile strength and flexibility, whereas PG2 enhanced stiffness. Electrochemical behavior and thermal stability were assessed through Open Circuit Potential (OCP) measurements and thermogravimetric analysis (TGA), respectively. Biodegradation studies conducted over three months indicated a progressive increase in weight loss, confirming the accelerated degradation of the composites over time. This finding highlight cow dung as a sustainable feedstock for graphene production and underscore the potential of graphene-based biocomposites for applications in environmental management, biomedical devices, and energy storage systems.

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Speaker Slots Filling Quickly

Title: Sulfate and Hydroxyl radical mediated disinfection profiles of *Escherichia coli and Enterococcus faecalis* in Solar Irradiated Wastewater System

Speaker Name: Kassim Olasunkanmi Badmus

Affiliation: Abiola Ajimobi Technical University

Abstract:

Improvement in wastewater treatment is advocated based on low energy and reduction chemical utilization. The current investigation was aimed at exploiting abundant sunlight irradiation in the presence of photocatalyst in other to achieve a green and sustainable removal of *Escherichia coli* and *Enterococcus faecalis.* The second order rate constant for solar irradiation of the *bacteria in presence of* the Graphene-Zinc Oxide Nano composite catalyst system were 4.78 (± 0.05) × 10^8 M^{-1} s^{-1} and 8.67 ± 0.1) × 10^9 M^{-1} s^{-1} for hydroxyl and sulfate radical respectively. The morphological images of both *Escherichia coli* and *Enterococcus faecalis* were examined through the scanning electron microscope (SEM) and it was observed that radicals initiate irreversible damage by oxidizing their cell membranes, consequently destroying membrane permeability and physiological functions. The disinfection models was based on the quenching ratio (Q model) for hydroxyl and sulfate radicals exhibited good performance for the disinfection of *E. coli* with Root mean square error (RMSE) of 0.052 and 0.066 respectively. Likewise, disinfection models based on the quenching ratio (Q model) for hydroxyl and sulfate radicals exhibited good performance for the disinfection of *E. faecalis* with RMSE of 0.032 and 0.054 respectively. The current investigation significantly validate the enhancement of microbial removal in contaminated wastewater using sustainable solar irradiation in presence of Graphene-Zinc Oxide Nano composite catalyst, sulfate radical as well as hydroxyl radical. The outcome highlighted the success of low-cost method in the removal of persistent pathogenic pollutant from wastewater.

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Title: Extraction and Characterization of Cellulose Nanocrystals (CNCs) from Jute Fibers with By-products Towards a Circular Economy Approach and Sustainable Applications

Speaker Name: Mubarak Ahmad Khan

Affiliation: Echotex Ltd

Abstract:

Abstract should give clear indication of the objectives, scope, results, methods used, and conclusion of your work. One figure and one table can be included in your results and discussions. Materials from renewable resources have gained tremendous attention recently due to environmental concerns and various strict legislations. Cellulose nanocrystals (CNCs) are considered one of the most potential and versatile bio-based nanomaterials for a wide range of applications. Jute is one of the most abundant natural fibers, comprising around 60–65% pure cellulose and 12–15% lignin. In this study, CNCs and other by-products were generated using an eco-friendly and sustainable method and remarkable applications. Chemical treatment such as alkalization (NaOH), bleaching (H2O2), and acid hydrolysis (H2SO4) results in the yield of CNCs (38%). Moreover, approximately 12% of the lignin and 17.8% of Glauber's salt was extracted from the black liquor after the alkalization process. Scanning electron microscopic examination revealed that average size of the extracted CNCs was around 30 nm, and spherical- shaped particles were observed. From the X-ray diffraction analysis, the crystal size and crystallinity index of CNCs were found to be 3.94-10.27 nm and 85.51%, respectively. From the Fourier transform infrared spectroscopy test, the peak at 1730 cm-1 signifies the carbon and oxygen stretching, and the peak at 1018 cm-1 indicates the lignocellulosic jute fiber, while a broad peak at 1018 cm-1 confirms that CNCs represent higher content of cellulose. The thermogravimetric (TGA-DSC) analysis showed that CNCs were 21.3% stable at 800℃. FTIR and TGA-DSC analysis also identified the by-products, such as lignin and Glauber's salt. This CNC is used for properties improvement of Sonali Bag®, bio-composite, and drug delivery.

On the other hand, lignin is converted to activated carbon and Electrospinning nano film for natural carbon fiber. This lignin can be used in energy and material engineering sector.nGlauber's salt is used for textile dying. In future CNC and lignin can be used in energy, biomedical engineering, material and textile sector for more efficient and sustainable products, development.

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Title: Plasma-Assisted Modifications and Photocatalytic Performance of $MZnFe_2O_4$ (M = Ni, Mg, Mn) Nanocomposite Ferrites

Speaker Name: Muhammad Aqib Busharat

Affiliation: University of Agriculture Faisalabad

Abstract:

This study explores the influence of non-thermal plasma treatment on the cation distribution and photocatalytic activity of $MZnFe_2O_4$ (M = Ni, Mg, Mn) nanocomposite ferrites. To improve the efficiency of the photocatalysis, surface modifications were induced using plasma treatment, which improved active site exposure and optimized the electronic structure. Crystallinity and phase purity were confirmed by X-ray diffraction (XRD), while the oxidation states and cationic distribution were altered by X-ray photoelectron spectroscopy (XPS). Scanning electron microscopy (SEM) and transmission electron microscopy (TEM) provided insights into morphological alterations induced by plasma exposure. An evaluationbof the photocatalytic performance of the treated nanocomposites under simulated solar irradiation was carried out by detecting the degradation of methylene blue. The plasma- modified $MnZnFe_2O_4$ exhibited the highest photocatalytic activity, attributed to enhanced charge carrier separation and surface oxygen vacancies. It is evident from these studies that plasma treatment has the potential for engineering nanomaterials for environmental and energy applications that is both facile and effective.

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Title: The assisted Technology dilemma: a reflection on AI chatbots use and risks while reshaping the peer review process in scientific research

Speaker Name: Wissem Dhahbi

Affiliation: University of Jendouba

Abstract:

The rapid adoption of artificial intelligence (AI) chatbots in academic peer review (PR) has sparked both excitement and concern, raising critical questions about the future of scientific integrity. This paper examined how AI tools, particularly Chat Generative Pre-Trained Transformer, are reshaping scientific PR. As these tools become more prevalent in academic evaluation, they bring both opportunities and challenges to scholarly communication. AI assistance offers valuable benefits: it can speed up review processes, help non-native English speakers express their ideas clearly, and improve overall text readability. However, our research revealed growing concerns about whether AI-assisted reviews can maintain the depth and authenticity that quality PR demands. We explored how the scientific community can balance these technological capabilities with the need for thorough, expert-driven evaluation. The potential for AI to introduce bias, overlook novel contributions, and promote uniformity in feedback threatens the nuanced insights traditionally offered by human experts. In this review we critically evaluated the ethical implications of AI use in PR, focusing on three main issues: (i) The risks associated with overreliance on AI tools by reviewers, including diminished engagement and critical thinking; (ii) The need for transparency and disclosure when AI tools assist in review generation; and (iii) The creation of ethical guidelines to balance AI's capabilities with human expertise. With AI's increasing role in academia, the academic community shall address these ethical challenges by establishing robust policies that ensure AI complements rather than replacing human judgment. We call for immediate action to develop clear guidelines governing AI's role in academic evaluation, promoting a transparent and responsible use of AI that upholds the integrity of PR, which is essential for the advancement of scientific knowledge.

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Title: Enhancing Error Detection and Improvement in Operations and Manufacturing Through App Designers

Speaker Name: Salah Ahmed Mohamed Elshourbagy

Affiliation: Tanta University

Abstract:

Modern manufacturing and operational systems demand high precision and efficiency, yet human and machine errors remain persistent challenges. This work explores the development of application-based solutions designed to enhance error detection and process improvement in industrial environments. By leveraging intuitive app interfaces, real-time data analytics, and machine learning (ML), we present a framework for reducing defects, optimizing workflows, and minimizing downtime. The study focuses on customizable app designs that integrate predictive maintenance algorithms, automated quality control checks, and user-friendly dashboards for operators. Case studies demonstrate a 30% reduction in production errors and a 20% improvement in operational efficiency when deploying these digital tools in semiconductor and pharmaceutical manufacturing lines. The results highlight the transformative potential of app-driven error detection systems in Industry 4.0 environments, particularly when combined with cloud-based monitoring and adaptive ML models.

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Title: Linear regression with Fibonacci-derived polynomials for temperature prediction model

Speaker Name: Ameen Ahmed Oloduowo

Affiliation: University of Ilorin

Abstract:

This research work explores the integration of Fibonacci-derived polynomial and linear equations from Fibonacci numbers into a machine learning framework for predictive modeling of environmental datasets, such as wind speed, temperature, and humidity. The research aims to evaluate the effectiveness of combining deterministic mathematical equations with traditional machine learning techniques to improve prediction accuracy and uncover hidden patterns in natural datasets. This novel approach was implemented on a number of models which showed a good result for further research. The linear and Fibonacci-derived polynomial equations showed features of machine learning and since the Fibonacci pat tern have been adopted in natural science, this technique of using the deterministic mathematical equation for feature engineering became fitting for natural dataset, the option of working with time series and environmental dataset have shown encouraging result and an above average accuracy.

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Title: Enhancing Education with AI: Exploring the Potential of ChatGPT, Bard, and Generative AI

Speaker Name: Anduamlak Abebe Fenta

Affiliation: Debre Tabor University

Abstract:

To explore the potential of generative AI systems, exemplified by ChatGPT and Bard, in enhancing education through personalized learning experiences, including the tailoring of content, assessments, and explanations, as well as their capacity to function as virtual tutors offering immediate feedback. This analysis considers the benefits of AI in education, such as personalized learning and automated tasks like performance analysis, alongside the challenges, notably privacy concerns arising from the necessity of personal data, ethical considerations surrounding AI use and transparency, potential job displacement for educators, the devaluation of human teaching, and the implications of rapid AI advancement for traditional curricula and the need for educator upskilling. This is a conceptual analysis based on existing literature and understanding of generative AI capabilities and educational practices. No primary data collection was involved. Generative AI holds significant promise for revolutionizing education by offering personalized learning and automating certain tasks.

However, realizing these benefits necessitates careful attention to ethical considerations, the protection of student privacy, and pedagogical implications to avoid negative consequences such as job displacement and the erosion of human interaction in teaching. Furthermore, the rapid evolution of AI demands a re-evaluation of current educational frameworks and the professional development of educators. Integrating generative AI into education requires a balanced and thoughtful approach, prioritizing ethical use, transparency, and student privacy while strategically addressing concerns about job displacement and curriculum relevance.

Careful consideration of ethical, privacy, and pedagogical factors is crucial to maximize the advantages of AI in creating more personalized and effective learning environments while mitigating potential challenges.

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Speaker Slots Filling Quickly

Title: Nucleophilic Functionalization of Tropyl Salts by Heterocyclic Amines, Amides or Hydrazides of Carboxylic Acids

Speaker Name: Pshenitsyna Olga Valerievna

Affiliation: Perm State Agro-Technological University named after Academician D.N. Pryanishnikov

Abstract:

The review provides information on new reactions of nucleophilic functionalization of tropylium salts with heterocyclic amines, amides or hydrazides of carboxylic acids.

The possibility of interaction of 2-aminopyridine with tropylium salts by replacing the hydrogen in the amino group of 2-aminopyridine with a tropylium fragment has been established. It has been established that the tropylium fragment can be displaced from N-(1'-cyclohepta-2',4',6'-trienyl)-2-aminopyridine by the more electrophilic tritylium cation. The isomers (3- and 4-aminopyridines and 4-aminoquinoline) behave identically towards the tropylium cation; as a result of the reaction, the corresponding N-tropylated products are obtained.

The interaction of tropylium salts with the pharmacophore 2-aminopyridine, 2-aminopyrimidine and 4,6-disubstituted pyrimidines occurs selectively at the exocyclic nitrogen atom of the amino group as a monosubstitution. However, the interaction of tropylium tetrafluoroborate with 2,6-diaminopyridine proceeds as a replacement of hydrogen at C3 and C5 of the cycle with the formation of 3,5-di(cyclohepta-2,4,6-trien-1-yl)pyridin-2,6-diamine, in which two amino groups remain free. The interaction of tropylium tetrafluoroborate with 2,5-diamino-1,3,4-thiadiazole or 3,5-diamino-1,2,4-thiadiazole proceeds as a disubstitution at two amino groups. The interaction of tropylium tetrafluoroborate with urea, thiocarbamide and sulfanilamide proceeds similarly.

In addition, non-benzenoid aromatic cations, when interacting with imidazole and benzimidazole, replace the hydrogen of the secondary amino group of the heterocycle with xanthilium, thioxanthilium or tropylium fragments. By reacting low-basic aromatic amines with tropylium salts in the presence of imidazole, N-tropylation products with antimicrobial activity were obtained.

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Title: On Intuitionistic Fuzzy PMS-Ideals of a PMS-Algebra Under Homomorphism and Cartesian Product

Speaker Name: Yohannes Gedamu Wondifraw

Affiliation: Bahir Dar University

Abstract:

In this paper, we use the concept of an intuitionistic fuzzy set to PMS-ideals in PMS-algebras. We discuss the notion of intuitionistic fuzzy PMS-ideals under homomorphism and Cartesian product and investigate several related properties. The homomorphism of an intuitionistic fuzzy PMS-ideal of a PMS-algebra is studied, and its homomorphic image and inverse image are investigated. The Cartesian product of any two intuitionistic fuzzy PMS-ideals is discussed, and some related results are obtained. The Cartesian product of the intuitionistic fuzzy PMS-ideals is characterized in terms of their level sets. Finally, we discuss the concept of the strongest intuitionistic fuzzy relations on an intuitionistic fuzzy PMS-ideal of a PMS-algebra and investigate the relationships between the strongest intuitionistic fuzzy relations and the intuitionistic fuzzy PMS-ideals.

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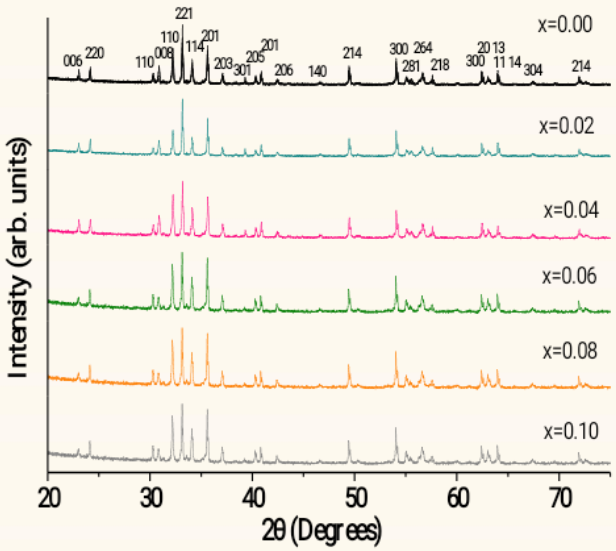
Title: Enhanced Structural and Dielectric Properties of InMn substituted M-type Hexaferrites

Speaker Name: Hassan Mehmood Khan

Affiliation: The Islamia University

Abstract:

Effect of rare earth and Divalent (InMn) substitution on the structural electrical and dielectric properties of W-type hexaferrites prepared by sol–gel auto combustion is reported. The synthesized samples were characterized by Fourier transform infrared spectroscopy, X-ray diffraction, scanning electron microscopy electrical and dielectric properties (resistivity and conductivity). The X-ray diffraction analysis confirmed single phase M-type hexa-ferrite structure. The lattice parameters were found to increase as In Mn contents increases, which is attributed to the ionic sizes of the implicated cations. The InMn seems to be completely soluble in the lattice. The results of scanning electron microscopy shows that the grain size decreases with increase of In Mn substitution. The increased anisotropy and fine particle size are useful for many applications, such as improving signal noise ratio of recording devices.



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Title: Modification of Dijkstra's Algorithm for Best Alternative Routes

Speaker Name: Omoniyi Ajoke Gbadamosi

Affiliation: Olusegun Agagu University of Science and Technology

Abstract:

Dijkstra's algorithm (DA) is a fundamental method for finding the shortest paths between points. It is widely used in various applications, including network routing protocols, irrigation line configuration, and road transportation systems. This algorithm is designed to minimize both time and distance in mission-critical operations, such as road and fire accident rescue missions. However, the conventional shortest-path finding technique proposed by Dijkstra may become inefficient due to various constraints, including queues caused by roadworks, the presence of bandits, incidents of kidnapping, or accidents, which can render the shortest path inaccessible. This study aims to develop a Modified Dijkstra Algorithm (MDA) to identify alternative routes when the most direct path from location A to location B is unavailable. The objectives of the study are to create a variant of the Conventional Dijkstra's Algorithm (CDA) and to implement and evaluate its performance. The study used a 40-node graph with varying weights and arbitrary source nodes with designated destination nodes. Both *CDA* and *MDA* were implemented in a Python environment. The probabilities of alternative routes to the shortest path were calculated using a random number generator. A comparative evaluation of both algorithms was conducted, with the results illustrated through tables, graphs, and charts. The average distance traveled, the number of routes, and the cost associated with probability were utilized as key indicators for performance evaluation. The findings deduced that the *MDA* model provided alternative routes better than the *CDA*, especially when the minimal route is impassable, and proffered a better means of navigation whenever the shortest path is under constraints for safety and accessibility. This study recommends Modified Dijkstra's Algorithm model to be used in Courier and logistic services, transportation systems, and as well as in engineering companies.

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Title: Modeling and Forecasting of Solar Power Plant Energy Production via Machine Learning: A Comparative Approach

Speaker Name: Lakhdari Lahcen

Affiliation: Tahri Mohammed Bechar University

Abstract:

This study focuses on the prediction of solar power plant energy production through a comparative evaluation of various machine learning algorithms. The primary goal is to determine which models deliver the most accurate and consistent forecasts by analyzing their performance on a real-world dataset. The dataset integrates several meteorological and environmental parameters, including distance to solar noon, temperature, wind direction and speed, sky cover, visibility, humidity, average wind speed over a given period, average atmospheric pressure, and recorded solar energy output.

To assess the predictive capabilities of each algorithm, both regression and classification approaches were explored. Regression models were evaluated using performance indicators such as Mean Squared Error (MSE) and the coefficient of determination (R^2), while classification-based predictions were assessed with metrics including accuracy, precision, recall, and F1 score. This dual analysis offers a richer understanding of each model's ability to generalize and adapt to the variability of solar energy production.

In addition to the numerical results, the study presents visual comparisons through bar charts, enabling a straightforward interpretation of the performance differences among the models. This graphical analysis helps highlight the strengths and weaknesses of each algorithm, providing valuable insights for future applications in renewable energy forecasting. Ultimately, this research contributes to the optimization of solar energy systems by identifying robust and efficient predictive models, thereby supporting better integration of solar power into energy management strategies.

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Title: Turquoise hydrogen and carbon nano-materials production from plastic waste

Speaker Name: Ahmed M. Haggar

Affiliation: Egyptian Petroleum Research Institute

Abstract:

Owing to successive worldwide energy need, fossil fuel depletion, greenhouse gases emissions, global warming of the climate, agglomeration of Municipal Solid Waste (MSW), accumulation of million tons of non-biodegradable plastic wastes, hazards for human hygiene and ecological concerns, both of sustainable energy resources and waste management demonstrated effective solutions for all the global strategies. Interestingly, an economic strategy was introduced by converting plastic waste to clean energy and valuable materials. Particularly, all renewable energy resources have to be transformed into electricity which is restricted with its capacity and stability. Even though green hydrogen production refers mainly to renewable resources, transforming plastic waste to COx- free hydrogen and valuable material such as carbon nanotubes (CNTs), carbon nanofibers (CNFs), Carbon nano onion (CNOs) and graphene nano-sheets (GNS) resemble an efficient strategy to reserve both clean energy and smart material. This study introduces an effective pathway to co-produce Co_X free hydrogen and CNMs from low density poly ethylene waste (LDPE) through green technique. Firstly, the LDPE waste undergo thermal cracking in the absence of oxygen and continuously the resultant non-condensable gaseous hydrocarbons C_{1-5} are transferred to be catalytically cracking in the second stage. Our studies concentrate on the catalyst which is main factor of the process.

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Title: Reducing bacterial adhesion on 304 stainless steel surface by Nd-YAG laser irradiation

Speaker Name: Sahar Sohrabi

Affiliation: Iran University of Science and Technology

Abstract:

Increasing the antibiotic-resistant bacteria and bacterial adhesion and grow on the surface of medical devices, leads to several problems such as increasing the cost of patient treatment and even increasing the death rate following bacterial infections discussions. Nowadays, antibacterial surfaces fabrication is in interest of scientists. There are many parameters influencing bacterial attachment to a surface including surface topography, morphology and wettability. Controllable micro/nano scale structures can be induced on a surface following laser irradiation of the sample. These structures can change the wettability, morphology and topography and as a result, bacterial adhesion rate of the surface. On the other hand, surface nanotexturing is considered as a new efficient strategy for antibacterial surfaces fabrication.

Stainless steel is a widely used in many medical applications such as implants, bone fixation, needles and syringes, sensor probes and so on. Therefore, antibacterial stainless steel fabrication is essential. In this presentation, effect of an Nd-YAG laser irradiation (as a cost-effective laser) on the morphology, wettability, roughness and bacterial adhesion rate on the surface of a 304 stainless steel is investigated. The results show that following laser irradiation, nanostructures formed on the surface. These structures change the surface to superhydrophilic one and reduce the bacterial adhesion rate. Therefore, a simple, cost-effective approach for antibacterial stainless steel fabrication using nanosecond laser irradiation, without using chemical agents is presented.

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Title: Smart mucoadhesive buccal chitosan/ HPMC scaffold for sore throat: In vitro, ex vivo and pharmacokinetic profiling in humans

Speaker Name: Muhammad Ali Syed

Affiliation: The University of Lahore

Abstract:

Sore throat (ST) is exacerbated distress of throat which causes irritation during drinking and swallowing. It is conventionally treated with throat soothing lozenges or spray for symptomatic control. However, it may effectively be cured by providing sustained delivery of locally acting antiseptic and anesthetic agents for local relief.Therefore, aim of the current research was to deliver tibezonium iodide (TBN) and lignocaine hydrochloride (LGN) for the relief of sore throat as a smart mucoadhesive buccal delivery. The gel scaffolds were developed using homogenization technique and evaluated for solid-state, mucoadhesive and pharmacokinetic parameters in volunteers. Results obtained for FTIR, DSC and XRPD revealed no abnormal peak and incompatibility between ingredients in physical mixture. Sodium alginate (SA) alone or blended with chitosan (CHI) exhibited better swelling (106.1% in MG6) but did not show sustained release, mucoadhesive strength (MS) and time (FT) profile compared with CHI and hydroxyl propyl methyl cellulose HPMC based formulations. The MS and FT were improved when CHI and HPMC were combined. The desired 6 h complete in vitro release was exhibited when CHI and HPMC were formulated at a concentration of 4 and 2% w/v, respectively. It also depicted MS and FT values of 28.34 g and 249.4 min, respectively. In volunteers, the in vivo residence time (RT) was found to be 341.82 min in volunteers. The maximum salivary concentrations (Cmax) for LGN and TBN were calculated to be 40.83 and 20.2 µg/mL at 4 h (tmax), respectively. Conclusively, LGN and TBN can delivered together to release locally till 6h as smart buccal scaffold alternative to lozenges for sore throat.

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Title: Enhancing Charging Station Power Profiles: A Deep Learning Approach to Predicting Electric Vehicle Charging Demand

Speaker Name: Youssef Oukhouya Ali

Affiliation: University Sidi Mohamed Ben Abdellah

Abstract:

The transportation sector is a primary driver of rising fuel consumption and greenhouse gas (GHG) emissions. Electric vehicles (EVs) are considered a promising solution to these environmental issues. However, due to variances in charging demands, widespread EV adoption may pose problems to the distribution network's reliability. Numerous methods are employed to forecast EV charging demand to overcome these difficulties. This study evaluates the performance of four well-known deep learning models—artificial neural networks (ANN), recurrent neural networks (RNNs), long short-term memory (LSTM), and gated recurrent units (GRUs)—in forecasting the charging demand for EV customers once a charging session begins. Additionally, the paper proposes a two-layer charging station energy management system aimed at smoothing the power profile of a charging station with high power demands by integrating solar energy from photovoltaic (PV) panels. According to the findings, the GRU regression method demonstrates a slight advantage over the remaining three models in predicting power charging requirements. Notably, the GRU regression model exhibits the lowest Mean Absolute Error (MAE) of 2.6391. These results hold the potential to aid Moroccan authorities in enhancing the dependability of the grid utility in the near term and providing guidance for the strategic expansion of charging infrastructure in the long term.

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Title: Mapping the Link between Environmental Sustainability and Electric Four – Wheelers: A Bibliometric Study

Speaker Name: V. Shunmathy

Affiliation: Vellore Institute of Technology, India

Abstract:

The objective of this study is to explore and analyze the research landscape connecting electric four-wheelers with environmental sustainability using a comprehensive bibliometric approach. In recent years, electric four-wheelers have emerged as critical components in the global effort to reduce greenhouse gas emissions, improve energy efficiency, and transition toward cleaner, more sustainable transportation systems. This study seeks to assess how academic research has evolved in this area over the past decade, particularly between 2014 and 2024.

To achieve this, a total of 542 research articles were retrieved from the Scopus database, forming the basis of the bibliometric analysis. The study employs specialized tools such as the Bibliometrix R programming package and VOSviewer software to analyze publication trends, keyword co-occurrence, author collaboration networks, institutional and country-level contributions, and influential journals. This methodological framework enables a systematic mapping of the intellectual structure and dynamics of the field.

The objective is to map the intellectual structure of research on the environmental sustainability of electric four-wheelers and identify research trends and emerging areas of research within the nexus of environmental sustainability and electric vehicle adoption and **to assess the impact and influence of research** by identifying highly cited publications, influential authors, and key research institutions. For instance, the analysis highlights that Tomaszewska A et al. (2019) is the most cited work, while Tsinghua University leads in affiliation-based output. China and Poland have emerged as leading contributors, and journals like Energies are prominent in disseminating research.

By uncovering these patterns, the study aims to contribute to the growing body of knowledge that supports sustainable innovation in the electric vehicle sector. Furthermore, the insights generated can guide researchers, policymakers, and industry stakeholders in identifying gaps, opportunities, and collaborative directions for future work. Ultimately, the study emphasizes the strategic importance of electric four-wheelers in achieving long-term environmental sustainability goals.

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Title: Synthesis, characterization and bio-efficacy of silver nanoparticles

Speaker Name: Pramod Katti

Affiliation: Environmental Management and Policy Research Institute, India

Abstract:

Pulse beetle is an important stored grain pest attacking almost all the pulses causing huge losses. The traditional and chemical management practices used by the farmers are becoming less effective. Also, using conventional pesticides has negative effects, viz., resistance development in pests, residue in grains, and harmful health impacts on humans. Hence, an alternate strategy for pulse beetle management is need of the hour. Nanotechnology is one such strategy that can be a successful pest management tool in food grains. Metal nanoparticles have good insecticidal properties due to their unique mode of action, even at the molecular level. With this background, an investigation was carried out with the objectives of synthesis, characterization, and bioefficacy studies of silver nanoparticles (AgNPs). The AgNPs were synthesized by optimizing the independent variables, viz., concentration of the AgNO3 solution, reaction pH, and temperature, using the response surface methodology tool. The size reduction was done using ultrasonicator, centrifuge, and high-pressure homogenizer. The synthesized AgNPs were characterized for their spectral properties, particle size, shape, crystalline nature, and elemental composition using UV-visible spectroscopy, zetasizer, scanning electron microscopy and high-resolution transmission electron microscopy, X-ray diffractometer, and energy dispersive spectroscopy, respectively. The obtained AgNPs had particle size and poly dispersity index of 31.80 nm and 0.126, respectively, and were spherical in shape and crystalline in nature. Later, the dry film residue technique of bioassay was done where, biosynthesized AgNPs were compared with standard AgNPs for their efficacy. The LC50 value for biosynthesized AgNPs was 1061.83 ppm, whereas it was 1650.37 ppm for standard AgNPs at 168 hours after treatment, indicating higher efficacy of the green synthesized AgNPs. Thus, the study concludes that green-synthesized AgNPs can be used as an effective and safe pest management tool for pulse beetle management in food grains without any negative effects on human health.

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Title: Green Synthesis of Zero-Valent Iron Nanoparticles for Arsenic Removal from Groundwater: Mechanistic and Kinetic Insights

Speaker Name: Gourav Mondal

Affiliation: Indian Statistical Institute, India

Abstract:

The present study presents the synthesis and characterisation of nanoscale zero-valent iron particles that have been obtained from different leaf extracts of Indian blackberry, guava, mango, and Indian lilac trees in order to remove arsenic (As) contamination from groundwater. Results indicate that green nanoparticles produced from guava leaves were the most effective in oxidizing As(III) to As(V). The study determines the optimum parameters, such as adsorbent dosage, concentration, and pH, that significantly affect As(III) removal effectiveness under various experimental setups. Kinetic studies have shown that the adsorption process conformed to a pseudo-second-order model indicating chemisorption to be the rate-limiting step of the reaction. Mechanistic studies using X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM) indicated that arsenic removal took place predominantly via surface adsorption, redox transformation of As(III) to As(V), and co-precipitation with iron oxyhydroxides generated during the oxidation of nZVI. The results confirm the efficacy of nZVI as a viable substance for arsenic remediation in polluted water systems and endorse its implementation in large-scale treatment methodologies, particularly in areas impacted by naturally occurring arsenic. Future research should concentrate on enhancing the environmental stability of nZVI and assessing its long-term efficacy in intricate groundwater matrices.

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Title: Dynamic fracture behaviour of multi-layer composite under high-strain rate loading

Speaker Name: Sobhan Pattajoshi

Affiliation: Indian Institute of Technology, India

Abstract:

Enhancing the impact resistance of protective structures in mountainous terrain is a critical challenge, particularly when construction relies on locally available materials. Recent advancements suggest that layered composite configurations can offer superior resistance against high-velocity projectile impact compared to conventional reinforced concrete (RC) and fiber-reinforced concrete (FRC) systems. This study investigates the dynamic fracture response and energy absorption characteristics of a novel multi-layered composite target composed of soil, reinforced concrete, hot-rolled (HR) steel sheet, and rubber layers. The structure is subjected to normal impact by a 1.17 kg ogive-nosed hard steel projectile with a diameter of 38.75 mm. A monolithic RC target of equivalent thickness is also analyzed for benchmarking purposes. A high-fidelity computational model is developed to simulate the impact event and capture key performance metrics, including projectile velocity decay, residual velocity, penetration depth, crater geometry, and target damage. Comparative analysis reveals that the layered composite system significantly enhances impact mitigation by delaying fracture propagation and distributing stress more effectively across different materials. The results highlight the potential of engineered layered systems in improving structural resilience under extreme dynamic loading conditions.

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Title: Green Synthesis, Characterization of Metallic Nanoparticles, and Their Multiple Biological Applications

Speaker Name: Narasimha Golla

Affiliation: Sri Venkateswara University, India

Abstract:

Nanotechnology is a novel interdisciplinary science serving as a nexus between the basic sciences. Metallic nanoparticles, Silver, Copper, Titanium, and Zirconium have been found to have applications in various biological applications, including antifungal, anti-inflammatory, antibacterial, antiviral, and bio-catalytic Properties, as well as anticancer agents and medicines. materials for electrical batteries, optical receptors, catalysis in chemical reactions, biolabeling agents, sensors, bioactive materials, and antimicrobial agents in the biomedical fields. including medical, agricultural, and environmental sectors, as bioactive and biocatalytic agents. Due to their enhanced responsiveness to environmentally friendly technology for quantifiable synthesis, several developed nations have seen significant growth in the biosynthesis of these metallic nanoparticles. The biological method, however, is the approach to preparation that is most in demand since it is quicker, safer, less expensive, and more environmentally friendly than other methods. Recent reports indicate that microbes like fungi and bacteria are more susceptible to metallic nanoparticles. In our laboratory, metallic silver, copper, zirconium, and titanium nanoparticles are synthesized through an eco-friendly biological approach with the cell-free filtrate of microbial and plant sources The synthesized metallic nanoparticles were characterized by UV-visible spectroscopy, FTIR, SEM, and DLS analysis for further examine the morphological properties, including size, shape, and stability. The metallic NPs showed good antibacterial, antifungal, antioxidant, and antiviral properties. Based on their multiple applications, MNPS could be used as potent bioactive agents for modern medical and Agricultural sectors

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Title: On Certain Volterra-Type Integral Equations Involving k, p – k and p, s, k Mittag–Leffler Functions

Speaker Name: Hemlata Saxena

Affiliation: Career Point University, India

Abstract:

In the present paper, we investigate three theorems of the Volterra type containing k, $p - k$ and p, s, k Mittag–Leffler functions. Moreover, the Laplace transforms of the k, $p - k$ and p, s, k Mittag–Leffler functions are derived here. The solutions to these problems were obtained by the Laplace transform method. In some special cases, new and known results are also obtained here. The acquired results are suitable in the fields of applied science, physics, engineering, and technology. The novelty of this work lies in their enhanced modeling capabilities, improved solution methods, and interdisciplinary applicability, making them a powerful tool for understanding complex systems across various fields. Also, the special function involved here can be reduced to simple functions; those have a variety of applications in different areas of science and technology. In the future, researchers can do more work on Volterra-type integrals and differential equations using various types of special functions.

We noticed that the k, $p - k$ and p, s, k Mittag–Leffler function is a very significant function as it arises in the solution of integral equations, which appear in various problems of applied physics, engineering, and mathematical science. By giving different values to the parameters involved, we obtained various kinds of certain interesting new and known results of Mittag– Leffler functions. These Volterra-type integral equations involving Mittag–Leffler functions have wide applicability in fields that require modeling of complex, memory-dependent systems, especially in the context of fractional calculus.

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Title: Atmospheric River Detection- A Survey on Deep Learning and Quantum Neural Networks

Speaker Name: S. Sivachitralakshmi

Affiliation: SRM Institute of Science and Technology, India

Abstract:

Atmospheric rivers (ARs) represent narrow corridors that facilitate the predominant poleward transportation of water vapor in the mid latitudes. These corridors exhibit notable features such as elevated water vapor levels and robust lower-level winds, playing a role in the expansive warm conveyor belt associated with extratropical cyclones. The meridional movement of water vapor within ARs holds significant importance for water reserves, yet their interaction with mountainous regions can lead to severe flooding events. Quantum neural networks are an emerging field combining quantum computing with artificial neural networks. The idea is that the computational advantage of quantum computing could potentially improve the performance of neural networks including those used for the complex task of atmospheric river detection.

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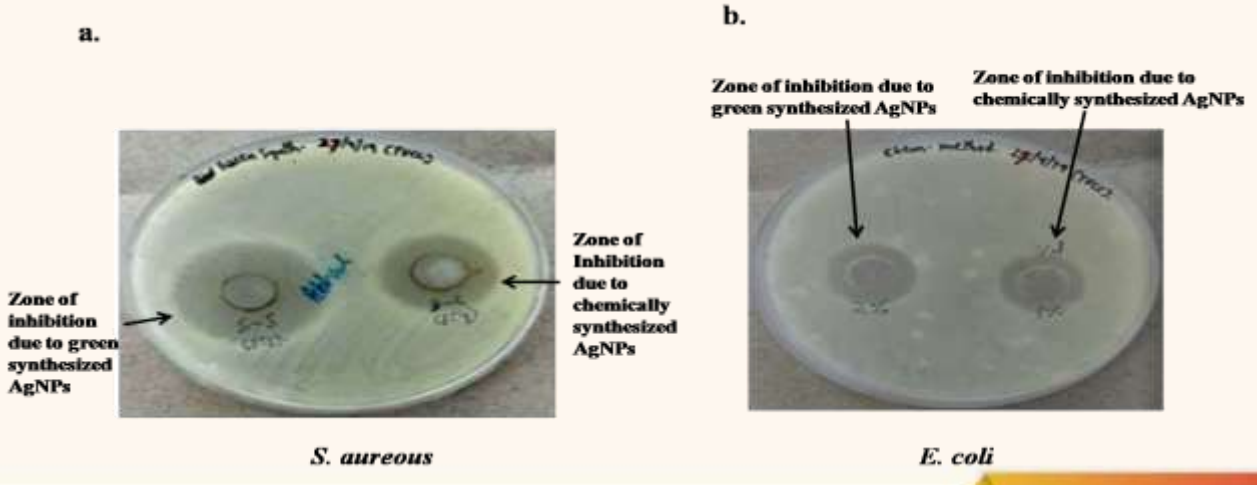
Title: Antimicrobial Activity of Silver Nanoparticles against Common Bovine Mastitis Pathogens: A Comparative Analysis

Speaker Name: Pravas Ranjan Sahoo

Affiliation: Odisha University of Agriculture, India

Abstract:

Bovine mastitis is one important metabolic disease in dairy cows caused by *S. aureus* and *E. coli* impacting huge economic losses worldwide. Silver Nanoparticles (AgNPs) possess unique electrical, thermal, optical, and biological properties, scrutinizing them as more effective antimicrobial agents. This study aimed to synthesize and evaluate AgNPs as effective antimicrobial compounds against *S. aureus* and *E. coli*. In the present work, the extract of *citrus limon* was analysed with gas chromatography-mass spectrometry (GC–MS) analysis, citric acid was found abundant in methanolic solvent. Synthesis of AgNPs was made by both green and chemical synthesis method, charctererized by UV–visible spectroscopy, electron microscopy, zeta sizing and infrared spectroscopy. The result confirmed that both green and chemical AgNPs are in nanoscale range with average size ranged from 10 to 20 nm. The zeta potential was found negative and green synthesized AgNPs resulted significantly ($P \leq 0.05$) higher antimicrobial activities than chemical synthesized AgNPs and also commercial available antibiotics. The minimum inhibitory concentration (MIC) was also evaluated and green synthesized AgNPs resulted MIC50 value of 46.10 and 49.93 while chemical synthesized AgNPs showed MIC50 value of 77.39 and 86.50 µg mL-1 against *S. aureus* and *E. coli* respectively. Additionally, green synthesized AgNPs demonstrated more cell viability (%) against RAW264.7 cells. Therefore, green AgNPs would be a potential antimicrobial agent in place commercially available antibiotics against aforesaid organisms in nearest future.



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Title: Global Behavioral Diagnosis of Stray Dogs in Oujda

Speaker Name: Choukri Snoussi

Affiliation: Mohammed First University

Abstract:

This comprehensive and meticulously conducted study aims to provide a global behavioral diagnosis of 247 stray dogs identified in the Oujda region. The results are based on quantitative behavioral data collected using an advanced artificial intelligence application designed for complex behavioral analysis. The primary goal is to identify and categorize predominant behavioral traits among these animals, including calmness, protective instincts, hunting ability, sociability, intelligence, and obedience. By applying a rigorously defined methodological framework, this research contributes to improving current urban management strategies and public health policies in affected areas. Through a novel scientific approach based on reliable and relevant data, this study offers valuable insights into the complex dynamics governing urban stray dog populations. It also highlights their multifaceted impact on local communities and the broader urban environment. The use of composite scoring systems enables a clear synthesis of behavioral dimensions and supports further exploration in canine behavioral research, breeding practices, and evidence-based policy development.

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Speaker Slots Filling Quickly

Title: 3d Bioprinting of Biomaterials for Wound Healing

Speaker Name: Dimple Sethi Chopra

Affiliation: Punjabi University, India

Abstract:

3D bioprinting have gained importance over past few years for tissue engineering, printing of artificial organs and bioprinting of 3D hydrogels for wound dressings. It is an emerging platform for development of smart wound dressings which can be loaded with antioxidants, antimicrobials and anti-inflammatory agents to accelerate wound healing rate. The main focus is on hydrogel-based biomaterials which are on toxic and biocompatible. International standard organization (ISO) defines 3D printing as fabrication of objects through deposition of a material using a print head, nozzle or another printer technology. The 3D bioprinting technologies include laser printing, stereolithography, extrusion printing, fused deposition printing and inkjet printing. 3D printing involves development of 3D virtual design of an object with the help of a computer aided software like Autodesk, on shape, AutoCAD. The digital model is converted into standard tessellation language (.STL) for 3D design. The .STL file stores the information as triangulated sections for each 3D model. 3D printer recognizes the coordinate from .STL file and converts it into G-file with the help of slicer 3D software. The print head creates a base for 3D object by moving on the X-Y axis. The print head moves on the Z axis to deposit the material layer by layer. The factors responsible for successful bioprinting will be discussed during the presentation.

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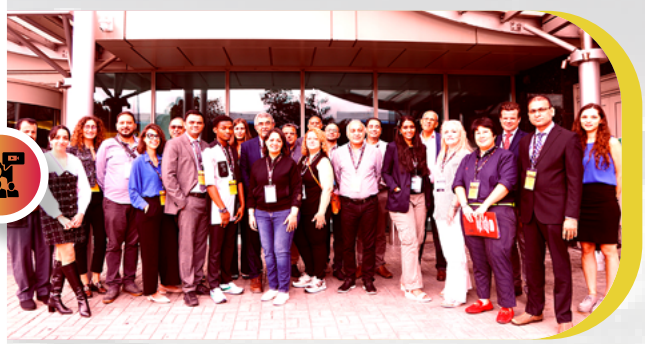

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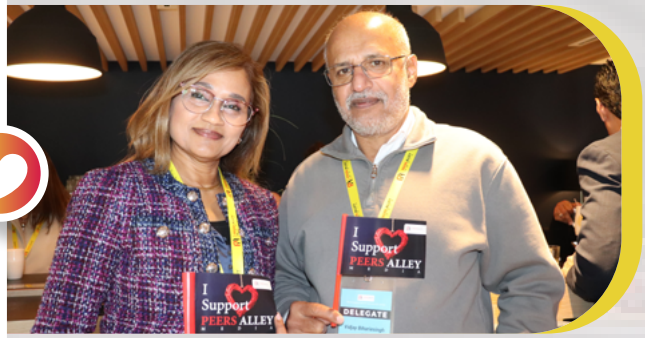

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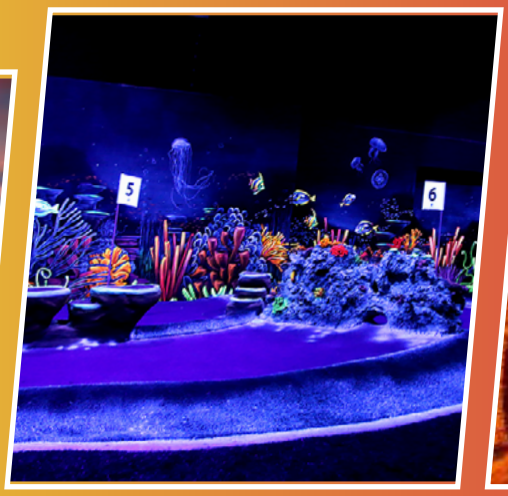

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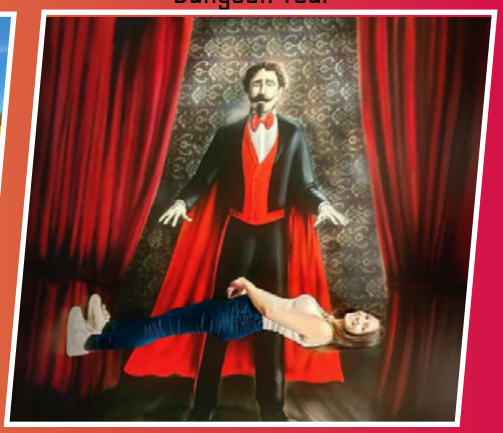

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