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The Premier Global Conclave and Expo on

Robotics & Automation

October 17-18, 2024

London, UK

Theme:

Next-Gen Innovations: Shaping the Future of Robotics & Automation

AutoRobo Expo 2024

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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

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INNOVATIVE FEATURED SPEAKERS **12+**

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125+ EDUCATIONAL SESSIONS

WHO SHOULD ATTEND ?

Professors | Scientists | Industry Professionals | Engineers and Developers | Manufacturing Executives | Academics and Researchers | Government and Policy Makers | Investors and Entrepreneurs | Industry Associations | Technology Enthusiasts | Supply Chain and Logistics Professionals | Healthcare Sector | Education Sector | Students

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.

TYPES OF ACADEMIC REGISTRATIONS

Speaker Registration

COMBO A (Registration + 2 Night Accommodation)

COMBO B (Registration + 3 Night Accommodation)

Delegate Registration

TYPES OF BUSINESS REGISTRATIONS

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

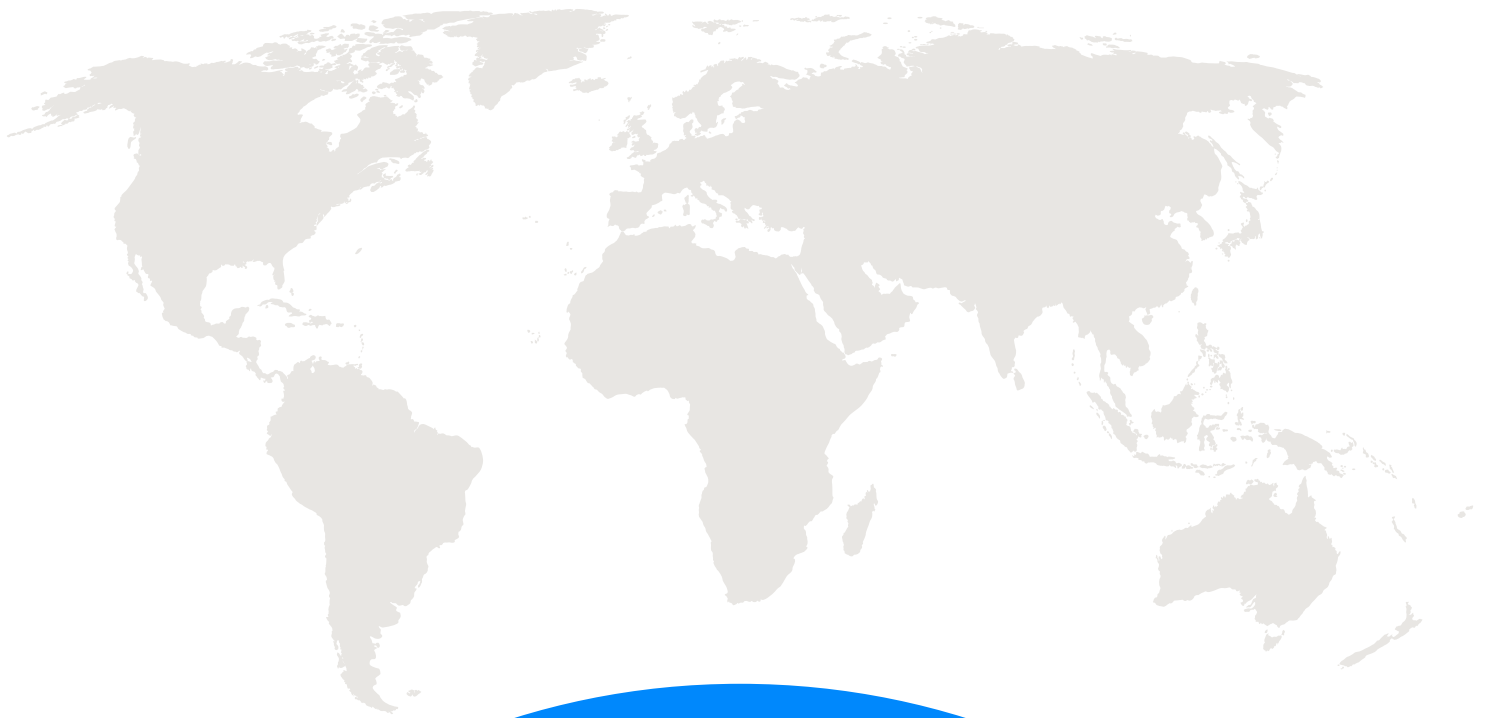Virtual Presentation

Workshops

Start-Ups

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TIME TO
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PEERS

- General Robotics
- Artificial Intelligence Integration in Robotics
- Robotics Process Automation (RPA)
- Human-Robot Interaction (HRI)

- Autonomous Robotics
- Cognitive Robotics
- Robotic Swarm Intelligence
- Evolutionary Robotics

GROUP PHOTO | COFFEE BREAK

- Bio-inspired Robotics
- Modular Robotics
- Teleoperated Robotics
- Telerobotics and Telepresence

- Robot Operating System (ROS)
- Robotic Mapping and Localization
- Machine Learning in Robotics
- Sensor Fusion in Robotics

LUNCH BREAK

- Haptic Feedback Systems in Robotics
- Real-time Robotics
- Micro and Nanorobotics
- Bionics and Humanoid Robots

- Educational Robotics
- Medical and Surgical Robotics
- Space Robotics
- Agricultural Robotics

COFFEE BREAK

- Underwater Robotics
- Military and Defense Robotics
- Logistics and Warehouse Robotics
- Construction Robotics

- Disaster Response Robotics
- Entertainment and Recreational Robotics
- Assistive and Rehabilitation Robotics

CONCURRENT EDUCATIONAL SESSIONS

- Automation
- Industrial Automation
- Factory Automation

- Home Automation
- Building and Infrastructure Automation
- Automated Material Handling

GROUP PHOTO | COFFEE BREAK

- Automated Guided Vehicles (AGVs)
- Automated Quality Control and Inspection Systems
- Supply Chain Automation

- Laboratory Automation
- Automated Agricultural Systems
- Automated Mining Systems

LUNCH BREAK

- Automated Transportation and Traffic Management
- Automated Healthcare and Medical Diagnosis Systems

- Energy Management and Grid Automation
- Smart Grids and Utilities Automation
- Intelligent Document Processing (IDP)

COFFEE BREAK

- Automated Retail Systems
- Automation in E-commerce

- Automated Content Creation
- Automated Customer Service and Chatbots

Title: Robotics in Education:Engaging Young Students in Robotics, Coding, & AI (Open-Source Boston Dynamics Robotics Scratch Coding Interface)

Speaker Name: Lori Towle
Affiliation: Code & Circuit, Inc, Full Circle Classrooms, USA

Abstract:

In a world that is being transformed innovation and robotics, today's youth need opportunities that go beyond core school subjects to prepare to lead us into the high-tech future. This engaging presentation will share cutting edge work being performed by Code & Circuit to educate youth in robotics applications, machine learning, and AI integration. By attending this workshop, you will leave with open-source access to Scratch coding for high-tech robots such as Spot, The Boston Dynamics robotic dog, along with tools for how to engage young students in AI use with robots. What is more, see how robotics can increase engagement with neurodivergent populations of students in schools through results from a pilot study that focused on robotics as a tool to reach nonverbal learners and students on the Autism spectrum.

Title: Metacognition for Military Robots

Speaker Name: Bonnie Worth Johnson
Affiliation: Naval Postgraduate School, USA

Abstract: Artificial intelligence (AI) and robotic technologies are evolving rapidly and are poised to have far-reaching impacts in nearly every aspect of society around the globe, including the military domain. AI offers cognitive reasoning and learning about problem domains—processing large quantities of data to develop situational awareness, generate solution goals, recommend courses of action, and provide robotic systems with the means for sense-making, guidance, actions, and autonomy. A new and emerging technology is poised to revolutionize AI systems and robots. This technology is metacognition which allows AI systems to become self-aware, or to think about their own cognition. Metacognition enables AI systems to monitor themselves, reason about themselves, and even control themselves. This presentation describes the potential for metacognition to improve AI systems and enable military robots with desired, trusted, transparent, safe, and ethical behavior.

Metacognitive military robots are an emerging future class of autonomous systems that leverage inherent sense-making and cognitive reasoning abilities to become self-aware and to use this awareness to dynamically regulate and control their own processes and behavior. This presentation discusses how robotic systems with metacognitive capabilities will have improved interaction with human users, will be inherently safer and more ethical, and will provide enhanced performance for military missions. A team of researchers and graduate students at the Naval Postgraduate School are exploring metacognition and how this emerging technology can be engineered into military AI systems and robots. The team is applying system engineering research methods including conceptual design, operational scenario analysis, and modeling and simulation. The team is applying futures assessment methods to explore the role of this new class of emerging metacognitive military robots in future warfare.

Title: Considering Caring as a Safeguard in Artificial Intelligence

Speaker Name: Russell Suereth
Affiliation: Salve Regina University, USA

Abstract:

The focus of this research is to consider whether a safeguard of caring can be designed into an artificial intelligent system. According to movies, books, and research experts, a superintelligence could harm humans in devastating ways. The purpose of safeguards is to keep such harmful situations from happening. The problem with safeguards in AI is that they are challenging to design. This article considers whether caring can be a safeguard in AI. It examines caring in our human world and how it has been vital to our existence. It also considers what caring could look like in AI and how we could begin to think about designing care in these systems. Additionally, it provides an overview of the LIDA cognitive architecture as a model for designing care in AI systems. The article employs a methodology focusing on a caring frame of mind and a caring environment for our work and research. This article contributes to the current research by creating a greater awareness of care as a safeguard and establishing an initial step toward designing care in AI. It shows that care is an essential aspect of our interactions with the world and how care can be a safeguard in AI.

Title: The Art of Blurring the Lines: From Passive Spectatorship to Activating Immersion for Innovative and Inclusive Climate Neutral and Smart Cities

Speaker Name: Faten Mostafa Hatem
Affiliation: University of the West of England, UK

Abstract:

The paper seeks to clarify how art could help empower the residents with higher agency and two-way communication as part of a Green Transition and more open smart cities governance (i.e. the dimension that examines bringing multiple stakeholders together to solve common problems, improve public services and digitally manage smart cities). Also, it explains the motive behind place-based and art-based methods used as part of the methodology of ongoing research at the University of West England-Bristol; Liveable Neighborhoods as Catalyst for a Green Transition through an Interdisciplinary Intervention of Art, Place and Technology. The study explains the necessary change in the design and dynamic of ways to ensure sustainable momentum in the Green Transition and interest in people`s involvement in city-making, participation and inclusive decision-making processes. Therefore, it offers a deeper insight into useful ways of exploring and reshaping different relationships in and with the smart city motivated by making the most out of human-technology interaction or purposeful synergy and collaborative intelligence empowered by place-based and art-led methods. Different systematic and non-systematic techniques and methods of data collection were used in searching and filtering resources and literature.

Title: From Pixels to Pathology: Employing Computer Vision to Decode Chest Diseases in Medical Images

Speaker Name: Muhammad Arslan

Affiliation: Royal Infirmary of Edinburgh, UK

Abstract: Radiology has been a pioneer in the healthcare industry's digital transformation, incorporating digital imaging systems like picture archiving and communication system (PACS) and teleradiology over the past thirty years. This shift has reshaped radiology services, positioning the field at a crucial junction for potential evolution into an integrated diagnostic service through artificial intelligence and machine learning. These technologies offer advanced tools for radiology's transformation. The radiology community has advanced computer-aided diagnosis (CAD) tools using machine learning techniques, notably deep learning convolutional neural networks (CNNs), for medical image pattern recognition. However, the integration of CAD tools into clinical practice has been hindered by challenges in workflow integration, unclear business models, and limited clinical benefits, despite development dating back to the 1990s. This comprehensive review focuses on detecting chest-related diseases through techniques like chest X-rays (CXRs), magnetic resonance imaging (MRI), nuclear medicine, and computed tomography (CT) scans. It examines the utilization of computer-aided programs by researchers for disease detection, addressing key areas: the role of computer-aided programs in disease detection advancement, recent developments in MRI, CXR, radioactive tracers, and CT scans for chest disease identification, research gaps for more effective development, and the incorporation of machine learning programs into diagnostic tools.
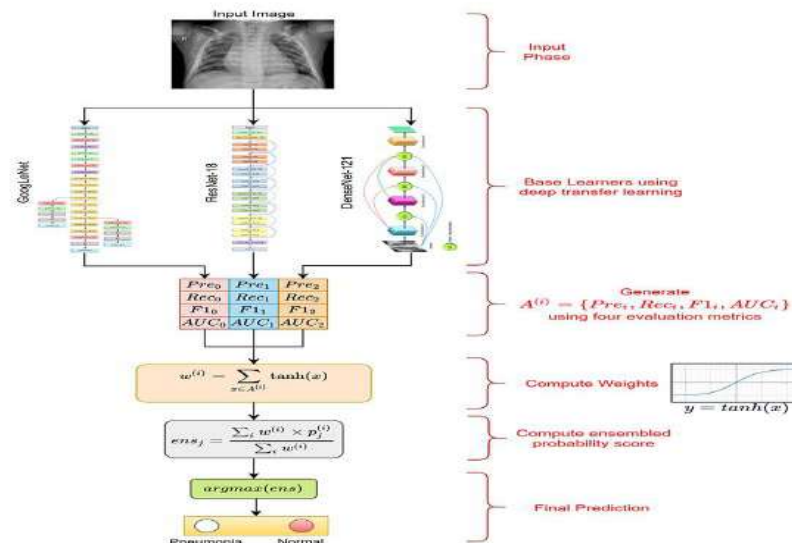
Cureus

FIGURE 3: Proposed mechanism of the pneumonia detection framework.

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In the pursuit of classifying images as either normal or indicating pneumonia, researchers leveraged binary classification techniques on a dataset of 5,856 chest X-ray (CXR) images sourced from the pediatric CXR dataset [23]. Data augmentation techniques were employed as a means of expanding the dataset. Through these efforts, a custom convolutional neural network (CNN) was trained using the accumulated data to accurately detect instances of pneumonia, achieving an accuracy rate of 83.38%. Further advancements in research have aimed to distinguish between viral and non-viral pneumonia through confidence-aware anomaly detection [24]. This investigation heavily relied on the X-viral and X-COVID-19 CXR databases. The former contained 5,977 images showcasing viral pneumonia cases, while the latter encompassed 37,393 images illustrating non-viral pneumonia cases. Additionally, the second dataset comprised 107 images that were not infected with COVID-19 and 106 images that were infected. JF Healthcare's telemedicine software was deployed across 390 hospitals for both datasets. The proposed confidence-aware anomaly detection (CAAD) model exhibited robust performance, boasting a high area under the curve (AUC) value of 87.57%. This AUC value signifies the model's efficacy in identifying instances of viral pneumonia. The utilization of an 18-layer deep convolutional neural network (CNN) method facilitated the categorization of CXR images into pneumonia or normal categories [17]. This task was executed using the pediatric CXR dataset. The resultant model achieved an impressive sensitivity (SEN) of 99.50%, accuracy (ACC) of 94.39%, and specificity (SPE) of 86.00%.

Title: Large-Scale Traffic Signal Control Using Constrained Network Partition and Adaptive Deep Reinforcement Learning

Speaker Name: Shangbo Wang
Affiliation: University of Sussex, U.K

Abstract:

Multi-agent Deep Reinforcement Learning (MADRL) based traffic signal control becomes a popular research topic in recent years. To alleviate the scalability issue of completely centralized reinforcement learning (RL) techniques and the non-stationarity issue of completely decentralized RL techniques on large-scale traffic networks, some literature utilizes a regional control approach where the whole network is firstly partitioned into multiple disjoint regions, followed by applying the centralized RL approach to each region. However, the existing partitioning rules either have no constraints on the topology of regions or require the same topology for all regions. Meanwhile, no existing regional control approach explores the performance of optimal joint action in an exponentially growing regional action space when intersections are controlled by 4-phase traffic signals (EW, EWL, NS, NSL). In this paper, we propose a novel RL training framework named RegionLight to tackle the above limitations. Specifically, the topology of regions is firstly constrained to a star network which comprises one center and an arbitrary number of leaves. Next, the network partitioning problem is modeled as an optimization problem to minimize the number of regions. Then, an Adaptive Branching Dueling Q-Network (ABDQ) model is proposed to decompose the regional control task into several joint signal control sub-tasks corresponding to particular intersections. Subsequently, these sub-tasks maximize the regional benefits cooperatively. Finally, the global control strategy for the whole network is obtained by concatenating the optimal joint actions of all regions. Experimental results demonstrate the superiority of our proposed framework over all baselines under both real and synthetic scenarios in all evaluation metrics.

Featured Speakers

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Title: Why did the French Satellite Microscope fail to prove the violation of the principle of equivalence?

Speaker Name: Abdelouahed Tounsi
Affiliation: University of Sidi Bel Abbes, King Fahd University of Petroleum & Minerals, UAE

Abstract:

Recently, the final results of the Microscope mission [1, 2] have just been published where record accuracy is shown. Indeed, the principle of equivalence has been proved with an unequaled precision of 10-15. These results demonstrate that bodies fall in a vacuum with the same acceleration regardless of their composition or their mass; the principle of equivalence therefore remains unshakable even today, nothing less than a new victory for General Relativity proposed by Albert Einstein more than a century ago.

In this presentation, we will show why the French satellite microscope did not succeed in proving the violation of the principle of equivalence.

The main cause of the failure of the satellite microscope to prove the violation of the principle of weak equivalence is due to the dimensions of the bodies tested which are at the macroscopic scale. At the macroscopic scale, all bodies fall with the same speed and the same acceleration as shown theoretically and mathematically recently by Tounsi [3]. This is due to the fact that at this scale, the strain gradient length scale parameter which varies with the nature of the material and its composition does not intervene in the physical and mechanical laws. In my opinion, even the next generation of proposed experiments such as MICROSCOPE 2 which should reach a level of precision of $\eta \leq 10\text{-}17$ will fail to prove the violation of this founding principle of Einstein's theory of General relativity if macro-bodies will be considered.

To prove the violation of this principle, it is necessary to carry out experiments on nano-bodies as is shown theoretically and mathematically recently by Tounsi.

Title: High-throughput organo-on-pillar (high-TOP) array system for three-dimensional ex vivo drug testing

Speaker Name: Jin-Ku Lee

Affiliation: Medical Research Center, Seoul National University College of Medicine, South Korea

Abstract:

Objectives & Scope: The development of organoid culture technologies has triggered industrial interest in ex vivo drug test-guided clinical response prediction for precision cancer therapy. The three-dimensional culture encapsulated with basement membrane (BM) components is extremely important in establishing ex vivo organoids and drug sensitivity tests because the BM components confer essential structures resembling tumor histopathology. Although numerous studies have demonstrated three-dimensional culture-based drug screening methods, establishing a large-scale drug-screening platform with matrix-encapsulated tumor cells is challenging because the arrangement of microspots of a matrix–cell droplet onto each well of a microwell plate is inconsistent and difficult to standardize. In addition, relatively low scales and lack of reproducibility discourage the application of three-dimensional organoid-based drug screening data for precision treatment or drug discovery. To overcome these limitations, we manufactured an automated organospotter-integrated high-throughput organo-on-pillar (high-TOP) drug-screening platform.

Methods & Results: Our system is compatible with various extracellular matrices, including BM extract, Matrigel, collagen, and hydrogel. In addition, it can be readily utilized for high-content analyses by simply exchanging the bottom plates without disrupting the domes. Our system demonstrated considerable robustness, consistency, reproducibility, and biological relevancy in three-dimensional drug sensitivity analyses using Matrigel-encapsulated ovarian cancer cell lines. We also demonstrated proof-of-concept cases representing the clinical feasibility of high-TOP-assisted ex vivo drug tests linked to clinical chemo-response in ovarian cancer patients.

Conclusion: Our platform provides an automated and standardized method for ex vivo drug-sensitivity-guided clinical response prediction, suggesting effective chemotherapy regimens for patients with cancer.

SPEAKER SLOTS AVAILABLE

Title: Extended MB Logic and its Automatic Deduction

Speaker Name: Sen Xu

Affiliation: Shenyang University of Chemical Technology, China

Abstract:

Formal analysis is usually applied to security protocols in order to ensure its security properties. BAN logic is one of the first formal methods that have ever been proposed, and gained its extraordinary success. However, BAN logic has many flaws that hinder its further applications. MB Logic extended BAN logic, which focused on authentication properties before, to handle secrecy properties. Their extension limits to secret key systems only. We extend MB logic to handle public key systems as well, and apply it to analyze security protocols such as WiMAX Privacy and Key Management (PKM) Protocols, which used public key infrastructure to authenticate principals and to distribute session keys.

The deduction by BAN logic usually requires tremendous workload of mankind. Researchers have been working on its automatic deduction and proposed several useful tools, such as Isabelle and Lean. However, these tools also require lots of human intervention and should be regarded as only semi automation. As ChatGPT has been released, researchers begin to apply Artificial Intelligent to assist automated theorem proving. Their works inspire us to use Large Language Models (LLM) to facilitate BAN logic deduction, especially on the selections of inference rules which could enable faster derivation towards the target (from the assumptions to the authentication goals). Compared to those general automated theorem proving systems, our logic deduction tool is tailored to BAN-like logic, especially to the extended MB logic. Therefore, our LLM based tool can provide better performance on security analysis of protocols using extended MB Logic.

Title: Presenting fabrics in digital environment: fashion designers' perspectives on communicating tactile qualities of the fabrics

Speaker Name: Jisoo Ha
Affiliation: Seoul National University, South Korea

Abstract:

The ongoing COVID-19 pandemic has forced the fashion industry to digitalize the conventional work system. Fashion designers were required to work from home, and textile trade shows were held online. However, fabric suppliers were unable to present their fabrics in a manner that enabled their properties to be easily understood. Visual information, such as photographs, videos, and the brief explanations provided by fabric suppliers were insufficient for fashion designers to comprehend the fabric's properties. Thus, this research aims to identify the critical information for fashion designers in their digital fabric search and to discover effective ways to present this information. The current state of online tactile information was analyzed by conducting content analysis on several online fabric retailers. Then, semi-structured one-on-one in-depth interviews with 25 fashion designers were conducted to identify the strengths and weaknesses of the existing types of visual and textual information. Results revealed the most effective ways to present fabrics online. Specific guidelines were established for photographing or writing each type of information. Finally, a conceptual framework for fabric tactile communication in digital environments was developed. This study can contribute to the improvement of a designer's experience in online fabric markets and can be used as a fundamental guide on designer's tactile perception of fabrics, which can support technologies, such as haptic devices and 3D clothing simulation software.
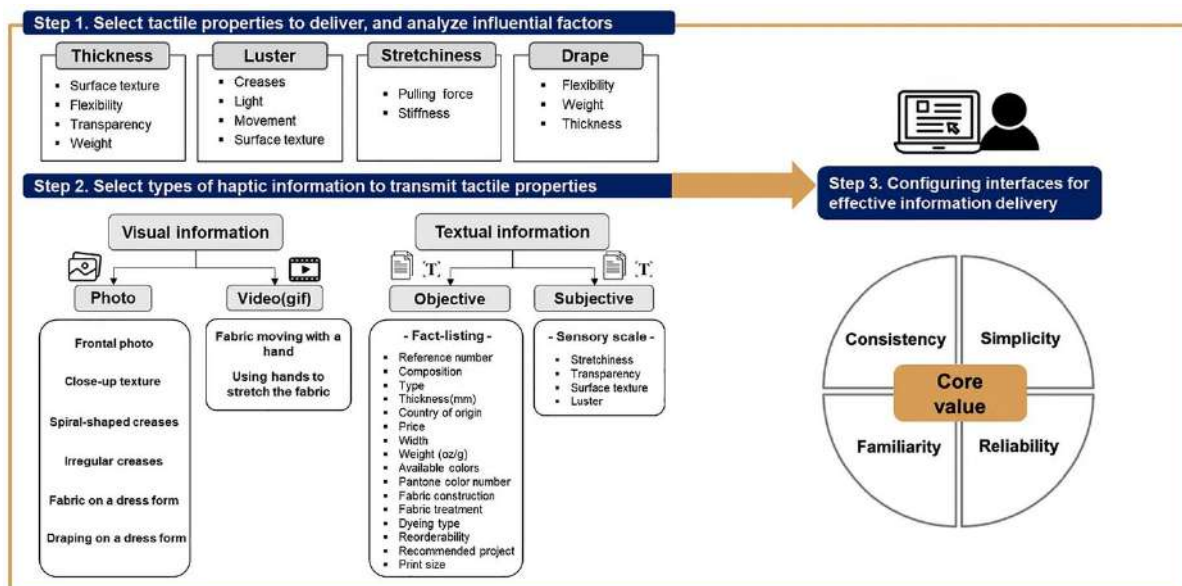
Figure 1 Conceptual framework for fabric presentation in digital environments

Title: Analysis of COVID-19 Vaccinations and Symptom Mapping Diagnostic Technique for Viral Diseases: Using Data Analytics, Machine Learning and

Speaker Name: Chikezie Kennedy Kalu
Affiliation: Jiangsu University, China

Abstract:

Background: The increasing challenge of modern medicine to continually improve to meet up with the evolving viruses, viral diseases and other forms of human diseases; requires urgent and a thorough approach for the good of humanity. Therefore, innovative measures must be applied in vaccination production and distributions, which have been identified as a most potent method to curb viral diseases and of current interest, the Corona Virus.

Objective – To analyse and measure the COVID-19 vaccination outlook in a developing country as Nigeria; and the non-clinical analysis, diagnosis, treatment and management of COVID-19 and other viral diseases, using Data/Machine Learning (ML)/Artificial Intelligence (AI) tools and Methodologies.

Methods– Using current and historical data from validated open-source data stores, analysis was carried out on COVID-19 vaccination and related economic, demographic and geo-climatic data for a developing country, Nigeria and selected countries from all Continents of the World. The methodical and data-driven analyses were carried out using the following Data/Artificial Intelligence (AI) methodologies and algorithms: Multivariate Regression Analysis, Symptom Mapping Analysis, and Grey System Analysis.

Results – The COVID-19 vaccinations expectedly do reduce the number of active covid cases and the amount or number of vaccinations for a developing country as Nigeria is affected by a good number of economic, demographic and geo-climatic factors; and so COVID-19 vaccinations strategies must be unique to a Country and take into account influencing factors not only limited to number of active covid cases.

Conclusion – Medical practitioners can provide even more efficient diagnosis and treatment of viral diseases; and also, patients can carry out personalised cost-effective diagnosis and treatment/management of viral diseases, with also the advises of medical practitioners.

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Title: Influence of Fiber Orientation on the Water and Ions Transportation of Engineered Cementitious Composite

Speaker Name: Abdullah M. Tawfek
Affiliation: Shandong University, China

Abstract:

An engineered cementitious composite (ECC) belongs to a type of high-performance fiberreinforced materials. Fiber alignment causes the anisotropy of such materials. Herein, the influence of the fiber orientation on water and ion penetration into an ECC was studied. Fiber alignment was achieved using an extrusion approach. Water absorption, sorptivity, chloride penetration resistance, sulfate attack resistance, and freezing–thawing resistance of specimens with fiber aligned horizontally (AH), vertically (AV), and randomly (R), corresponding to the direction of the exposure surface that was studied. The results showed that fibers oriented perpendicular to the water path delayed water migration into the ECC matrix. The sorptivity was significantly affected by the fiber direction. The sorptivity of the AH specimens was 35% and 13% lower than that of the AV and R specimens, respectively. After 180 days of exposure, the chloride penetration depth of the AH specimens was 5.7 mm, which is 13.6% and 20.8% lower than that of the AV and R specimens, respectively. The sulfate ingress profile indicates that the fiber–matrix interface oriented perpendicular to the penetration path can effectively delay sulfate migration. The fiber orientation also influences the compressive strength gain under immersion conditions (Na_2SO_4 solution, Na_2SO_4 + NaCl solution, and water). Compared with the AH and R specimens, the AV specimens are more sensitive to the immersion condition. In contrast, the fiber orientation has no significant effect on ECC specimens under freeze–thaw cycles. These findings indicate that controlling the fiber alignment and orientation in an ECC can improve its durability under certain exposure conditions.

Title: Interior structural change detection using a 3D model and LiDAR segmentation

Speaker Name: Hang Zhao
Affiliation: The University of Melbourne, Australia

Abstract:

Detecting changes of indoor environments with respect to a 3D model is important for building monitoring and management. Existing change detection methods based on LiDAR segmentation and comparison with 3D models are limited to simple environments without temporary changes or moving objects. The aim of this paper is to propose a novel change detection method based on LiDAR segmentation for complex environments. We formulate the problem of detecting differences between the 3D model and the real environment as the detection of differences between real LiDAR scans captured in the environment and synthetic LiDAR scans generated in the 3D model. This allows real-time building change detection and classification using a mobile LiDAR. A two-branch convolutional network is proposed to detect differences between the 3D model and LiDAR scans. Synthetic LiDAR scans are generated in the 3D model using the estimated poses of a set of real LiDAR scans. The network is trained with pairs of synthetic and real LiDAR scans and tested with new real LiDAR scans. Each point of real LiDAR scans is classified into one of four categories: unchanged, structural change, moving objects and temporary change. A comparison is performed between the performance of four backbone architectures to find a suitable backbone architecture for change detection networks. Experimental results show that the proposed approach can achieve 94\% overall change classification accuracy with the SqueezeNet-based change detection network and the trained network is transferable to comparable indoor environments. This research enables updating 3D models of complex indoor environments efficiently using a mobile LiDAR scanner.

Title: Bioelectric signal acquisition and classification system to generate intelligent prostheses

Speaker Name: David Tinoco Varela
Affiliation: Facultad de Estudios Cuautitlán (FESC-UNAM), México

Abstract:

Nowadays, in a world where artificial intelligence is found in different and very varied industrial and everyday applications, it is important to include it in control processes of devices such as prostheses, and so, such technological tools can improve the quality of life of different population sectors, such as people with different abilities. Starting from this fact, the development of a bioelectric signal acquisition system is presented. These signals are acquired from a user's arm and from which a set of characteristics is extracted. Characteristic are used to train a neural network which will be the one in charge of controlling an intelligent robotic hand. The neural network has been successful to identify 5 hand movements, replicating them in a robotic device.

The hardware for acquisition, filtering, and signal adaptation has been designed, as well as the software that processes the input data. The system extracts temporal and frequency characteristics of the signal in order to obtain input vectors that allow the artificial neural network to classify the data more accurately, achieving 93% effectiveness.

The presented proposal seeks to generate a fast and intelligent way to control different electronic, or robotic, devices through biometric elements, in this case bioelectric signals. With which it is expected to allow all types of people, including those who have lost limbs or who have suffered from an illness that limits their mobility, to interact with this type of technologies and devices in an easy way.

Featured Speakers

Title: AI in Wine Quality Prediction: A Case Study on Pinot Noir in New Zealand

Speaker Name: Don Kulasiri

Affiliation: Centre for Advanced Computational Solutions (C-fACS), Lincoln University, New Zealand

Abstract:

The wine business relies heavily on wine quality certification. We present a conceptual, AI, and mathematical framework to predict wine quality, and then validated these using a large dataset with machine learning approaches. It is worth noting that the predicted wine quality indices are in good agreement with the wine experts' perceived quality ratings. Our first goal in this research is to predict wine quality to construct a machine learning model based on the experimental data collected from different and diverse regions across New Zealand. We utilised Pinot noir wine samples with 54 different characteristics (7 physiochemical and 47 chemical features). The findings were compared using four distinct feature selection approaches. Important attributes (referred as essential variables) that were shown to be relevant in at least three feature selection methods were utilised to predict wine quality. Adaptive Boosting (AdaBoost) classifier showed 100% accuracy when trained and evaluated without feature selection, with feature selection (XGB), and with essential variables (features found important in at least three feature selection methods). In the presence of essential variables, the Random Forest (RF) classifier performance was increased. We also used sample data from Pinot noir wines from different regions of New Zealand to develop a mathematical model that can predict wine quality and applied dimensional analysis with the Buckingham Pi theorem to determine the mathematical relationship among different chemical and physiochemical compounds. This mathematical model used perceived wine quality indices investigated by wine experts and industry professionals. Afterwards, machine learning algorithms are applied to validate the relevant sensory and chemical concepts. Judgments of wine intrinsic attributes, including overall quality, were made by wine professionals to two sets of 18 Pinot noir wines from New Zealand.

Title: A micro-economic model of the market uptake of truck platooning

Speaker Name: El Mehdi Aboulkacem
Affiliation: Université Gustave Eiffel, France

Abstract:

Truck platooning is a technology allowing trucks to travel in convoy formation using wireless communications and advanced driver assistance systems. This technology is expected to increase road safety and capacity, and to decrease fuel consumption and GHG emissions; it comes with apparently important financial benefits and positive externalities. However, forecasting the market uptake of platooning is a complex economic issue, requiring a dedicated methodology.

From a micro-economic standpoint, several features of truck platooning are important. First, forming a platoon implies a coordination cost. Second, platooning requires trucks with specific and costly equipment. That makes platooning a two-layer problem. Third, the decision of one carrier depends on those of other carriers: truck platooning, as a market, is characterized with network externalities. Fourth, road freight transportation is a heterogeneous system: different vehicles follow different operation patterns.

This paper submits a micro-economic model of the uptake of platooning which accounts for all of the above points. First, a conditional sub-model of platoon formation is designed, where two trucks decide whether to form a platoon or not based on the net monetary benefits of doing so.

Then, platoon formation is modeled in a simplified, single road context, as a Markov chain. At that stage, the share of platoonable trucks entering the market is obtained with a numerical, dynamic model. Upgrading conventional trucks to become compatible with platooning is assumed impossible.

The paper concludes that due to the positive feedback loop of network externalities, market uptake is very sensitive to the economic assumptions. In addition, due to the equipment and coordination costs induced by platooning, the overall financial benefits for carriers are much lower than what they would initially appear to be; third, energy savings can be significant on the long run if the technology spreads widely.

Featured Speakers

PEERS ALLEY MEDIA

Title: Swiss CAT+, a Data-driven Infrastructure for Accelerated Catalysts Discovery and Optimization

Speaker Name: Pascal Miéville
Affiliation: EPFL SWISSCAT, Switzerland

Abstract:

The Catalysis Hub - Swiss CAT+ is a new infrastructure project funded by ETH-domain, co-headed by EPFL and ETHZ. It offers the scientific community a unique integrated technology platform combining automated and high-throughput experimentation with advanced computational data analysis to accelerate the discoveries in the field of sustainable catalytic technologies. Divided into two hubs of expertise, homogeneous catalysis at EPFL and heterogeneous catalysis at ETHZ, the platform is open to academic and private research groups. Following a multi-year investment plan, both hubs have acquired and developed several high-end robotic platforms devoted to the synthesis, characterization, and testing of large numbers of molecular and solid catalysts. The hardware is associated with a fully digitalized experimental workflow and a specific data management strategy to support closed-loop experimentation and advanced computational data analysis.

PEERS ALLEY
M E D I A

Title: Advanced architectures of Next Generation Wireless Networks

Speaker Name: Pascal Lorenz,

Affiliation: University of Haute-Alsace, France

Abstract:

Internet Quality of Service (QoS) mechanisms are expected to enable wide spread use of real time services. New standards and new communication architectures allowing guaranteed QoS services are now developed. We will cover the issues of QoS provisioning in heterogeneous networks, Internet access over 5G networks and discusses most emerging technologies in the area of networks and telecommunications such as IoT, SDN, Edge Computing and MEC networking. We will also present routing, security, baseline architectures of the inter- networking protocols and end-to-end traffic management issues.

Title: 5G Spectrum Technology for 5G Medical Robots Implementation

Speaker Name: Ugochukwu Okwudili Matthew
Affiliation: Federal University Lavras, Brazil

Abstract:

Electromagnetic spectrum infrastructures and 5G medical robots are design to work in line with the national healthcare policy to advance the society well-being and improve human life expectancy as they are adopted to fight against hospital acquired infection. In order to increase public healthcare safety, the current study investigated the biomedical technology application of ultraviolet light emitting diodes (UV-LEDs). The study used a UV light disinfection device to potentially eradicate hospital-acquired diseases brought on by bacteria, viruses, and other pathogens in the medical settings. By breaking down the ribonucleic and deoxyribonucleic acids of bacteria, viruses, and other harmful microorganisms through the dispersion of light irradiation, the UV installation guarantees the elimination of these pathogens and stops them from growing. The system uses a light wavelength to enhance environmental cleanliness, which reduces pathogenic influences that could cause infection in hospital wards and removes human error and other consequential manual chemical disinfection agents. In order to protect healthcare facilities against hospital acquired infections, the paper suggested installing an autonomous internet of things (IoT) 5G medical disinfecting device for complete hospital disinfection. This device would provide a continuous UV light sterilization of high-touch areas as medical facilities become overcrowded with patients with reference to COVID-19 global pandemic and possible future pandemic. The study examined fifteen relevant biomedical publications that covered the subject of UV-based hospital disinfection. The study found that, since the risk of hospital acquired infection is particularly high in overcrowded healthcare facilities, installing autonomous IoT 5G UV-LED devices within hospital buildings will enable infectious surveillance that will successfully prevent prevalence of hospital acquired infection in medical facilities during future pandemic similar to COVID-19 bubonic plaque.

Title: CubeSats based Global Air Traffic Surveillance through Optimized ADS-B LEO Constellation

Speaker Name: Ghulam Jaffer
Affiliation: University of Luxembourg, Luxembourg

Abstract:

The primary technique used for air traffic surveillance is radar. However, nowadays, its role in surveillance is gradually being replaced by the recently adopted Automatic Dependent Surveillance-Broadcast (ADS-B). ADS-B offers a higher accuracy, lower power consumption, and longer range than radar, thus providing more safety to aircraft. The coverage of terrestrial radar and ADS-B is confined to continental parts of the globe, leaving oceans and poles uncovered by real-time surveillance measures. We present an optimized Low-Earth Orbit (LEO)-based ADS-B constellation for global air traffic surveillance over intercontinental trans-oceanic flight routes. The optimization algorithm is based on performance evaluation parameters, i.e., coverage time, satellite availability, and orbit stability (precession and perigee rotation), and communication analysis. The results indicate that the constellation provides ample coverage in the simulated global oceanic regions. The constellation is a feasible and cost-effective solution for global air supervision, which can supplement terrestrial ADS-B and radar systems.

Title: Educational Robotic for a Sustainable Future

Speaker Name: Um Albaneen Yusuf Jamali
Affiliation: Hajer primary Girls School, MOE, the Kingdom of Bahrain

Abstract:

Sustainable development as one of the world's greatest challenges is attracting increasing attention from both researchers and educators across the world. The world has limited resources which necessitate either producing creative products or developing creative ways to benefit from these limited resources. As its apparent sustainable development and creativity are closely interlinked, and hence, the imperative need for redesigning educational curricula is felt clearly. The current paper sheds light on attempts to do so by introducing Artificial Intelligence AI and robotics into curriculum. The paper presents a research study exploring the impact of robotics programs on fostering creativity among primary school pupils. The study conducted over four months, and employed a mixed methodology combining pre-post CAP testing and interviews and observational analysis. The study sample comprised 60 female students, aged 10 to 12, from a middle socio-economic background. The participants were randomly divided into control and treatment groups. The students in the treatment group were introduced to LEGO and Arduino robotics program, while the students in the control group did not participate in any robotics program. The results from the pre-post tests indicated that the robotics program, significantly enhanced creativity thinking skills including fluency, flexibility, originality, and elaboration. The paper offers insights for education policymakers while recommends applying Robotics in the Curriculum at schools.

Title: A hybrid approach for solving a two level location allocation and a static dial-a-ride problem

Speaker Name: Kirti Sharma
Affiliation: K.R. Mangalam University, India

Abstract:

The work is concerned with the two-level modelling of the service set-up planning of a logistic service provider company. The problem discussed is a combination of location allocation problem and a static dial-a-ride problem. The objective of the upper level decision maker is to decide the location of customer service centres in a city that maximizes the service coverage. The problem at the lower level comprises of a set of pickup locations and a corresponding set of drop locations for a given set of customers. The objective of the lower level decision maker is to design routes in such a way that satisfies the needs of all the customers in the network (picking them up from pickup locations and dropping them off at their corresponding drop locations) without violating the constraints. The transportation service at second level is carried out by vehicles providing shared service. The problem consists of designing a set of minimum-cost vehicle routes satisfying capacity, precedence and pairing constraints. In this work, a solution methodology based on the combination of K-means algorithm and nearest neighbour approach is proposed to solve the proposed problem. The problem finds its application in door-to-door transportation for elderly and disabled people. The problem can also be used by private sharing cab provider companies to generate efficient routes for a given set of customers.

PEERS ALLEY
M E D I A

Title: Alphabet Sign Language recognition for Arabic and American language

Speaker Name: Fatma Zohra CHELALI
Affiliation: Speech communication and Signal processing laboratory, Algeria

Abstract:

Human machine interfaces HMI and man to man M2M communication systems mediated by machine are multimodal. The speech Modality is a central element and can be combined with other visual or gesture modalities.

Hearing impaired people, Deaf and dumb people face struggle in expressing their feelings to other people, in particular for children who have difficulty communicating in schools. Artificial intelligence aims to create a system capable of recognizing sign or speech in addition to the visual modality.

This work considers different architectures to implement the gesture recognition system, where the first architecture applies individual descriptors such as Discrete Wavelet Transform (DWT), Dual Tree Complex Wavelet Transform (DT-CWT) as well as the Histogram of Oriented Gradients (HOG), to characterize the gestures. Whereas, the second architecture combines two individual descriptors to form a new feature vector, namely DWT + HOG and DT-CWT + HOG. The resulting individual and combined features are fed to five classifiers, MLP, RBNN, PNN, SVM, as well as Random Forest classifiers, to achieve better performance in terms of recognition rate and processing time.

Experimental evaluation is performed on four datasets composed of alphabet signs and dynamic gestures. For the static form, two sign language datasets with simple background were used, the first contains 10 alphabets from the American Sign Language, and the second contains 30 alphabets from the Arabic Sign Language, for the dynamic form, we used two different datasets, the first contains 4 different classes, where each class is defined by 12 video sequences with 55 frames each, the second contains 3 different gestures, each gesture is repeated in 3 different motions, which provides 9 classes recorded with 5 different illumination settings.

 The obtained results demonstrate the efficiency of the combined features, for which the achieved recognition rates were comparable to the state-of-the-art. We have demonstrated that the combined features DT-CWT + HOG performed much better in terms of both accuracy rate and execution times than the individual descriptors. In addition, we compared results obtained with other recent work in this area.

Title: A hybrid optimization approach for intelligent manufacturing in plastic injection molding by using artificial neural network and genetic algorithm

Speaker Name: EL Ghadoui Mohamed

Affiliation: ENSAM, Morocco

Abstract:

This study presents a novel hybrid optimization approach for intelligent manufacturing in plastic injection molding (PIM). It focuses on globally optimizing process parameters to ensure high-quality products while reducing cycle time, material waste, and energy consumption. The method combines a backpropagation neural network (BPNN) with a genetic algorithm (GA) and employs a multiobjective optimization model based on design of experiments (DoE). A BP artificial neural network captures the relationship between optimization goals and process parameters. Leveraging the genetic algorithm, it effectively optimizes process parameters for achieving global optimization goals. The case study involves a polypropylene product, considering dimensional deviation, weight, cycle time, and energy consumption during the PIM cycle. Design variables include melt temperature, injection velocity, injection pressure, commutation position, holding pressure, holding time, and cooling time. The results demonstrate that this approach efficiently adjusts process parameters to meet quality standards, significantly reducing raw material consumption (2%), cycle time (12%), and energy consumption (16%). This offers substantial benefits for companies in highly competitive markets demanding swift adoption of smart production methods.

Featured Speakers

Title: Defense Against Stealthy Dummy Load

Speaker Name: Praveen Verma
Affiliation: Indian Institute of Technology Kharagpur, India

Abstract:

Load Redistribution (LR) attacks operate by adversarial manipulations of load measurements in electrical power grids. Machine Learning (ML) based detectors have been effective to detect LR attacks where the attacked load vectors are outliers of the distribution of normal load vectors. On the other hand, a recent family of attacks, known as dummy LR attacks, are capable of bypassing the ML-based detectors by choosing attack load vectors that are not outliers. This paper presents an approach for defense against such stealthy third-generation dummy LR attacks by identifying and monitoring critical loads. A case study on the IEEE 30 bus system demonstrates the effectiveness of the proposed approach for defense against dummy LR attacks. A larger case study on actual load and line power flow measurements of the Delhi Power Grid demonstrates that the proposed approach can be extended to real-world grids.

SPEAKER SLOTS AVAILABLE

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

Speaker Name: Harsimran Singh
Affiliation: Consultant in Department of Surgical Oncology at 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.

Title: Perforated H- Guide Based Solutions for Realization of Sub-THz Integrated Circuits and Systems

Speaker Name: Nagendra Prasad Pathak
Affiliation: Indian Institute of Technology Roorkee, India

Abstract: The demand for wireless data rates are increasing exponentially and thus multi–Gigabit–per–second links are expected to become a reality within the next five-six years. Large unused bandwidth at Sub-THz frequency bands motivates researchers and scientists to explore it for wireless communications and it is supposed to satisfy the hunger for much higher wireless data rates due to the large available bandwidth. The communication range at Sub-THz/THz frequencies is very short which may be further reduced if safety margin with real-world effects such as Rayleigh fading, Fresnel diffraction, atmospheric attenuation, and the day–to–day weather are included in the design. However, it supports short range high data rate communication, which can be used for fulfilling the future demand and will be used for secure indoor communication system. Along with this, chip–to–chip wireless communications are benefitted with the development of the low-loss and high speed interconnection at sub–THz frequency range that enables the data transfer rate of tens and hundreds of Gb/s or more.

To fulfill the demand, present and next–generation wireless communication systems need highly–versatile components having low–loss, and energy–efficient architecture with easy fabrication, low–cost technology, and having immunity to interference and noise that are typically present in the progressively–congested electromagnetic environments. For their implementation, advanced front-end integrated circuits with increased levels of transfer–function adaptively and enhanced electrical performance need to be developed. Among all the available technologies, dielectric integrated guides are more attractive due to their inherently low loss nature along with possibility of low cost realization. We successfully developed and tested Perforated H-guide based integration technology and some components which finds application in realizing 6G and beyond wireless systems.

Fig. 1 shows the concept of Perforated H-Guide based integrated circuits and systems for Sub-THz/THz applications.
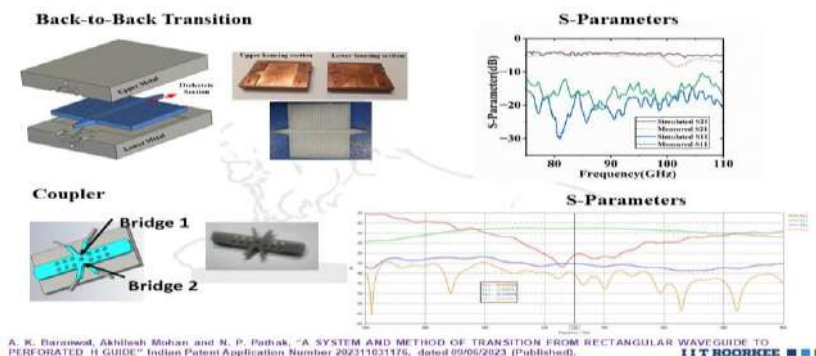
Fig. 1 PERFORATED H-GUIDE BASED WIRELESS SYSTEMS FOR SUB-THZ/THZ APPLICATIONS

PA | PEERS ALLEY
M E D I A

Title: Histo-anatomical mutilations of developing chick brain induced by in-ovo fluoride and bifenthrin exposure

Speaker Name: Syeda Nadia Ahmad
Affiliation: University of Chakwal, Pakistan

Abstract:

Comparative developing brain histo-anatomical pathologies of Fluoride ions and Bifenthrin in-ovo exposures were explored in the golden black variety of domestic chick. Three exposure groups were –the Vehicle control group (Vg); Fluoride (F) group and the Bifenthrin (Bn) group each with forty fertilized eggs and received their respective group treatment at zero day of incubation. Embryos were extracted, dissected from head region and the embryonic whole brains were recovered after 14 days of incubation. The embryonic brains were preserved in bouin fixative for 24 h for further studies. The morphological results show the atrophied and hypertrophied embryonic brain in F and Bn groups respectively as compared to Vg group. The toxicological signs of encephalic anatomy and histology of F and Bn exposure were the enlarged third ventricles, optocoeles and arachnoid mater, encephalic spongiosis and decreased neuroglial density. The morphometric data showed significant decrease ($p \leq 0.05$) in mean weight and density of whole brain in F and Bn groups compared Vg. The mean length and width of whole brain in F were significantly lower than that of the Bn and Vg. whereas, the mean breadth of third ventricle in Bn remained significantly lower than F and Vg groups. On the other hand, the mean breadth of optocoele and fourth ventricle in F and Bn groups remained significantly higher than Vg. Conversely the mean optic lobe wall thickness in F remained significantly lower than Bn and Vg. Additionally, the mean neuronal density in diencephalon, optic lobe and cerebellum in F group and Bn group remained significantly ($p \leq 0.05$) lower than Vg. Results show that low dose in-ovo fluoride or bifenthrin exposure may cause neurodevelopmental abnormalities in the developing chick embryos indicating that the Fluoride-ions and Bifenthrin harbor strong developmental neurotoxic capacity.

Title: The Effect of Mixing Components on Mechanical Properties of Eco-Friendly Strain Hardening

Speaker Name: Shirin Maleki
Affiliation: Isfahan University of Technology (IUT)

Abstract:

Many attempts over the past few decades to enhance the performance of fiber-reinforced concrete (FRC) have resulted in the development of a new class of concrete known as strain hardening cementitious composites (SHCCs). The most significant characteristics of these materials are their various cracking tendencies and strain hardening. In this research, the amount of cement used was reduced by employing high-volume slag and limestone, which made SHCC more cost-effective and environmentally benign. The purpose of this study was to investigate the effect of aggregate type and micro-silica on the mechanical properties of SHCC made of PP fibers. Six mixtures were designed and tested for flowability, density of the freshly mixed SHCC, compressive strength, and flexural strength. Three 50 mm cubic specimens and two 30 x 100 x 350 mm prism specimens were made for the compressive strength and four-point bending tests, respectively, from each mixture. The specimens were tested at 14, 28, and 60 days of age. The results demonstrated that adding 15% of the cement's weight to micro-silica improved ductility and compressive strength. The early compressive strength and the ductility of SHCC are enhanced by the use of limestone powder as a filler. SHCC's ductility, absorbed energy, and compressive strength are all negatively impacted by aggregate enlargement.

Title: Worldview-3 satellite imagery for mineral mapping is sparsely vegetated South Purulia Shear Zone

Speaker Name: Pankajini Mahanta
Affiliation: Fakir Mohan University, India

Abstract:

World view-3 satellite imagery captures the spectral details of material in 16 bands covering the visible to shortwave infrared wavelength region host significant potentiality for mineral mapping. It provides data with 1.24m spatial resolution in 8bands for visible-NIR region covering wavelength from 425nm to 950nm. Additionally, the SWIR bundle provides the data with 7.5m spatial resolution for region covering wavelength from 1210nm to 2330nm. The study area, South Purulia Shear Zone marks the boundary between Chottanagpur Granite Gneissic Complex and North Singhbhum mobile Belt is relatively unexplored promising zone of polymetallic type mineral deposits. It is marked by highly sheared and deformed rock assemblages including mica chlorite sericite schist, granite & gneiss, laterite, hydrothermal & fault breccia, amphibolite, and quartzite. Covering a vast area, SPSZ forms an East-west trending arcuate belt, stretching over 120 km in length and 4 to 5 km in width. Mineralization in this area is intricately tied to the shear zone and locally developed hydrothermal systems. Selective PCA on various band combination is utilized to map the assemblage of hydrothermal alteration minerals. Standard deviation classification proved to be an important method for highlighting the hydrothermal alteration zone of the study area. SAM and SID methods are further employed on World view 3 data for mapping various geological units. SPCA demonstrate efficacy in mapping alterations in vegetated terrains by supressing the effect of vegetation. Alteration proxies derived from SPCA (Al-OH, Fe-OH, Mg-OH, Fe2+, and Fe3+ anomaly zones), SID and SAM classification combinedly help to map the dominant alteration zones. The most commonly encountered hydrothermal alterations include argillization, ferruginisation, and silicification, with less developed zone of chloritization and sericitization. Image interpretation was validated through field inspections. Spectroscopic analysis and X-ray diffraction studies along with petrographic microscopic study support the remote sensing results by confirming the presence of various alteration mineral phases and their specific assemblages in the study area. SPCA applied with WV-3 data prove particularly useful for targeting small-scale hydrothermal-type mineral resources in the sparsely vegetated regions of the South Purulia Shear Zone. In conclusion, this research aims to contribute valuable insights and findings to the scientific community.

Title: Challenges and Opportunities in Design and Performance of Robots for Disaster and Risk Management

Speaker Name: Omkar Singh Kushwaha
Affiliation: Centre(s) of Excellence in CCUS, Energy and Sustainability, IIT-Madras, India

Abstract:

Modern emergency response techniques depend on disaster management robots. Robots are used in disaster preparedness, response, recovery, and reconstruction because of their unique qualities. Data collection by robots is crucial in disaster-prone areas, especially during preparation. Drones' high-resolution cameras and sensors enable fast airborne reconnaissance. Accurately scanning difficult environments to discover structural flaws, environmental risks, and people in need. This data aids authorities in resource allocation and evacuation planning. Robots are used in emergency response to reduce hazards and find and rescue people in difficult conditions. Ground robots like ROVs and UGVs include cameras, sensors, and manipulator arms. These robots can search wreckage, fallen buildings, and hazardous materials for survival or structure stability. Such robots can navigate tight places and fragile structures, protecting rescuers and lowering casualties.

A robot with thermal imaging cameras or gas sensors can detect life, monitor the surroundings, and detect gas leaks or fires. Subaquatic search and rescue activities during floods use AUVs and ROVs. Robots also help to rebuild after any severe disaster. They remove debris, assess infrastructure damage, and restore communication networks and utilities. Modern sensing and mapping robots ease damage assessment and urban regeneration methods by documenting impacted regions. The disaster management robots improve emergency response efficiency, productivity, and security, saving lives and protecting communities. Robotic systems can improve disaster resilience and response as technology advances by integrating with the software's such as Disaster Management Information Systems (DMIS), Incident Command System (ICS) Software, and WebEOC Resource Management Module, etc.

Title: The Experience of Using Virtua Integrated Library System in Nigerian University Libraries

Speaker Name: Glory Edet
Affiliation: University of Port Harcourt

Abstract:

This paper explored the experience of using Virtua Integrated Library System by university libraries in Nigeria for automating their library operations throughout a decade. An online questionnaire was developed and distributed to those concerned. Purposive sampling technique was employed to select the respondents. Survey method was used to collect data from systems' staff and librarians of the six universities that adopted the Virtua software. The objectives included: to determine the virtua profile of the six universities; to ascertain the types of trainings received; to determine the virtua modules implemented; to ascertain the levels of module implementation and to find out the challenges encountered in using the software. The findings revealed that majority of the libraries used Virtua for years more than any of their previous software. The initial source of funding the software and staff training was provided by the Carnegie Corporation and MacArthur Foundation. The modules implemented by the libraries include cataloguing, circulation, administration and Online Public Access Catalogue (OPAC) and serials control and acquisition were partially used. The system was friendly used by the university libraries with few challenges which included increase in subscription fees. At different periods of few years back, the libraries dropped the software and switched over to Koha, a locally developed library system respectively. Challenges encountered included operational challenges, financial challenges, amongst others. It was recommended that the University Management of the libraries should provide adequate funds to enhance the implementation and sustenance of library automation software. The study concluded that the virtua software had contributed immensely to the automation of these academic libraries and they derived value for resources expended on acquiring the software.

PEERS ALLEY
M E D I A

Title: Secure authentication protocol for home area network in smart grid-based smart cities

Speaker Name: Hafiz Muhammad Sanaullah Badar
Affiliation: Emerson University Multan, Pakistan

Abstract:

The Internet of Things (IoT) allows better solutions for managing challenges such as reliability and power quality in a smart grid environment. It also assists in adopting smart grid measures in smart city development. A smart meter in the smart grid environment must securely access services from a service provider via public channels. An adversary can pose several security vulnerabilities as the communication occurs through a public channel. Various researchers recently conducted several research types to determine the most challenging problems with the smart grid. The security features like integrity, authentication, and confidentiality are indispensable requirements of the smart grid environment. On the other hand, different objects like smart meters in the smart grid environment are resource-constrained, posing in designing lightweight security protocols. Hence, we propose a lightweight mutual authentication scheme to offer surveillance to smart meters in smart grid infrastructure. We analyze the suggested protocol against well-known security threats. Finally, we evaluate the performance of the protocol to illustrate its efficiency.

Title: Modeling cloud seeding technology for rain enhancement over the arid and semiarid areas of Ethiopia

Speaker Name: Megbar Wondie
Affiliation: Debre Markos University

Abstract:

The government of Ethiopia has started exploring different innovative approaches to tackle the scarcity of water in arid and semi-arid regions of the country. In line with this strategy, precipitation enhancement through weather modification technology is getting strong attention and some initial attempts have been made to assess its feasibility. Therefore, this paper aims to model cloud-seeding technology for rain enhancement and check its effectiveness in arid and semiarid regions of Ethiopia. Different relevant measurements including ground-based as well as reanalysis data from 2021-2022 are used to improve relevant cloud-seeded models. Reanalysis data are validated with ground-based data using different error metrics. The improved cloud-seeded modeling is developed for precipitation enhancement for the arid and semiarid regions of Ethiopia. An atmospheric moisture budget is used for improving the cloud-seeded model. The results indicated that the developed model and the direct operation are well agreed upon. The relative precipitation (RP) (after the application of cloud-seeded per before the application of cloud-seeded during spring, summer, and autumn is found 1.31, 0.98, and 1.03 respectively. The changing precipitation between cloud seeded and before seeded for spring, summer, and autumn is found at 1.38, -0.19, and 0.11 mm respectively; whereas changing temperature is found at 1.08, 1.78, and - 1.06 k respectively. In general, the model result indicated that cloud-seeded technology is effective over Ethiopia when the daily resultant wind speed is less than 1.5 m/s and cloud base height (CBH) is less than 1700 m. Furthermore, by observing RP from the improved cloud-seeded model results, rain enhancement science is applicable for Ethiopia during the spring and slightly autumn seasons. Hence, before artificial aerosol is seeded into the cloud, the operators should be nowcast and forecast the daily wind speed and CBH of the target area unless an economic crisis will have happened.

Title: TOPSIS Approach for MCGDM based on Intuitionistic Fuzzy Rough Dombi Aggregation Operations

Speaker Name: Azmat Hussain

Affiliation: International Islamic University Islamabad, Pakistan

Abstract:

Atanassov presented the dominant notion of intuitionistic fuzzy sets which brought revolution in different fields of science since their inception. The operations of t-norm and t-conorm introduced by Dombi was known as Dombi operations and Dombi operational parameter possess natural flexibility with the resilience of variability. The advantage of Dombi operational parameter is very important to express the experts' attitude in decision making. This study aims to propose intuitionistic fuzzy rough TOPSIS method based on Dombi operations. For this, first we propose some new operational laws based on Dombi operations to aggregate averaging and geometric aggregation operators under the hybrid study of intuitionistic fuzzy sets and rough sets. On the proposed concept, we present intuitionistic fuzzy rough Dombi weighted averaging, intuitionistic fuzzy rough Dombi ordered weighted averaging and intuitionistic fuzzy rough Dombi hybrid averaging operators. Moreover, on the developed concept we present intuitionistic fuzzy rough Dombi weighted geometric, intuitionistic fuzzy rough Dombi ordered weighted geometric and intuitionistic fuzzy rough Dombi hybrid geometric operators. The basic related properties of the developed operators are presented in detailed. Then the algorithm for MCGDM based on TOPSIS method for intuitionistic fuzzy rough Dombi averaging and geometric operators is presented. By applying accumulated geometric operator, the intuitionistic fuzzy rough numbers are converted into the intuitionistic fuzzy numbers. The massive outbreak of the pandemic COVID-19 promoted the challenging scenario for the world organizations including scientists, laboratories and researchers to conduct special clinical treatment strategies to prevent the people from COVID-19 pandemic. Additionally, an illustrative example is proposed to solve MCGDM problem to diagnose the most severe patient of COVID-19 by applying TOPSIS. Finally, a comparative analysis of the developed model is presented with some existing methods which show the applicability and superiority of the developed model.

Title: Beyond Borders: Navigating the Satellite Frontier for Educational Empowerment

Speaker Name: Ali Hashemi
Affiliation: Yazd University

Abstract:

In an era marked by rapid technological advancements, this study delves into the intersection of satellite technology and education, aiming to comprehensively analyze the multifaceted implications and transformative potential of satellite-based initiatives in the educational landscape. Leveraging a combination of quantitative and qualitative research methodologies, the research investigates the role of satellites in expanding educational access, enhancing teaching methodologies, and fostering global collaboration.

The study begins by providing a contextual overview of the current state of education globally, highlighting challenges such as limited access to quality education in remote areas, disparate learning opportunities, and the need for innovative solutions. Building upon this foundation, the research scrutinizes how satellite technology acts as a catalyst for overcoming these challenges. It explores the deployment of satellites for delivering educational content to remote regions, facilitating real-time connectivity, and supporting distance learning initiatives.

Furthermore, the study critically examines the impact of satellite technology on educational pedagogy, investigating the integration of satellite imagery, data, and communication tools in curricula to enhance experiential learning and cultivate critical thinking skills. The research also assesses the role of satellite-based resources in promoting STEM (science, technology, engineering, and mathematics) education and fostering interdisciplinary learning environments.

Additionally, the study investigates the socio-economic implications of satellite-driven educational interventions, considering factors such as economic empowerment, job market preparedness, and community development. Special attention is given to case studies and success stories that exemplify the positive outcomes of satellite-enabled education in diverse geographical and socio-economic contexts.

In conclusion, this research contributes to the academic discourse by shedding light on the transformative potential of satellite technology in the realm of education. By presenting a nuanced understanding of the challenges and opportunities associated with this intersection, the study offers insights that can inform policymakers, educators, and technology developers in harnessing satellite technology to create a more inclusive, accessible, and technologically enriched educational landscape.

PA | PEERS ALLEY
MEDIA

Title: Monitoring Of Ambient Air Quality Pattern and Assessment of Air Pollutants Correlation, Its Effects on Ambient Air Quality of Lahore,

Speaker Name: Waqas Ahmed Khan
Affiliation: Government College University Lahore, Pakistan

Abstract:

Industrialization, population explosion, anthropogenic activates and vehicular exhaust play a vital role in deteriorating ambient air quality over the world. Current study aims to assess the impacts on ambient air quality patterns and their co-relations in one of the world's most polluted city: Lahore, Pakistan for a time period of 28 months (March 2020- June 2022). Purpose of this study is to monitor and analyze relationship between criteria Air pollutants (SO_2, PM_{10}, $PM_{2.5}$, CO, O_3 and NO_2) through Haz-scanner 6000 and Mobile van (Ambient air quality monitoring station) over nine towns of Lahore. The Results showed an unprecedented increase in the concentration of air pollutants. Post COVID-19 period illustrate significant increase in the concentrations of SO_2, PM_{10}, $PM_{2.5}$, CO, O_3 and NO_2 in range of 100%, 270%, 500%, 300%, 70% and 115% respectively. Findings shows major peaks (pollution concentration) for PM_{10}, $PM_{2.5}$, NO_2 and SO_2 were found during the winter season. Multi linear regression model shows significant Co-relation was found among Particulates matter with NO_2 and SO_2. The ratio of increase in the Particulate matter concentration with increasing NO_2 concentration is nearly 2.5 times more than that with SO_2. Negative to positive Co-relation was found between Ozone and PM as air quality improved. A slight difference in mobile van and Haz-scanner was observed while noteworthy correlations R^2 (0.43, 0.44 & 0.59) were found between ground base observation and satellite data respectively (SO_2, NO_2 and CO). During the strict COVID-19 lockdowns reduction in vehicular and industrial exhaust, significantly increase air quality in nine towns of Lahore and reported within Punjab ambient air quality standards (PEQs). Metrological data was analyzed through different software's (Sigma Plot, MATlab) for the study time period which have the significant effect on air quality parameters (PM). This research sets the ground for further research on the quantification of total emissions and the impacts of vehicular/industrial emissions on human health.

Featured Speakers

Title: Planar dipole antenna design for industry 4.0

Speaker Name: Asiya E. Asiya
Affiliation: University of Calabar

Abstract:

In smart industries where robots and automation are applied, antenna plays a major role in accomplishing the control and automation of real-time processes via wireless communication such as those in wireless sensor network. The antenna generally occupies one-third of the total circuit advancement in the Industrial Internet of Things (IIoTs) and it comes in different shapes. Planar dipole antenna is the most suitable and attractive design for the IoTs application which can enhance industrial revolution due to its smaller in size and its thin profile. These characteristics make it suitable for mounting on mobile robots and portable industrial equipment. In this article, advance design system software was used to designed two antennae, meandered and wideband planar antennae on a PCB size of 18.8 mm × 43.2 mm and 0.8 mm thickness having a 4.6 dielectric constant. The transmission line of these antennae has a width of 1.25 mm resulting in a typical line impedance of 50 Ω. The comparative analysis of the simulated and measured results from a feed port, 1 of the meandered PIFA antenna shows a better performance of 95.43% efficiency with a gain of 2.54391dBi and a return loss of − 24.49 dB at 2.4 GHz resonant frequency than that from a feed port, 2 whose efficiency was only 73.99%. Whereas, the wideband planar antenna depicts an average bandwidth of 93.91% from 1.3 to 2.4 GHz frequency band. This range covers the GPS applications, the 2.4 GHz ISM band, the general WCDMA and the LTE 3GPP bands useable for smart industrial devices and IoT applications. The proposed antenna provides low power operation, extended range, compactness, cost-effective designs to support industrial control and automation in industries.

SPEAKER SLOTS AVAILABLE

Title: Spectral stability and dynamics of solitary waves in a coupled nonlinear left-handed transmission line

Speaker Name: Mahmoud Dahirou

Affiliation: University of Maroua, Cameroon

Abstract:

We study the dynamics of modulated waves in a discrete coupled left-handed nonlinear transmission line (LH NLTL), assuming a two-dimensional propagations variation. By means of semi-discrete approximation, we derive a two-dimensional nonlinear Schrödinger equation (2D NLSE) governing the propagation of modulated waves in the network. We derive linear boundary value problem governing the evolution of the perturbed system. We then compute numerically its eigenvalues using Fourier and finite difference differentiation matrices. Our results show that the system supports bright soliton in relatively frequency band in both transverse and longitudinal directions. We perform numerical simulations of both 2D NLSE and the nonlinear lattice model to study the stability (instability) and the propagation properties of an initial bright soliton. Our numerical results are in good agreement with the analytical predictions. The dynamics bright soliton proposed in the discrete coupled LH NLTL are competent for development of satellite and radar applications in the recent communication technology.

Title: Interplay of psychological reactance, burnout, and spiritual intelligence: A case of Iranian EFL teachers

Speaker Name: Asieh Amini
Affiliation: Ferdowsi University of Mashhad

Abstract:

Despite the fact that teaching has been construed as a profoundly emotional activity, scant information is revealed regarding the adverse emotional demands encountered by teachers or how these affect teachers' well-being. The present study aimed to examine the relationship among teacher burnout, psychological reactance, and the mediating role of spiritual intelligence in a sample of 270 English as a Foreign Language (EFL) teachers. Three scales were employed to measure the aforementioned constructs. It was revealed that there was a positive association at the individual level between burnout and reactance, and negative associations between spiritual intelligence with burnout and reactance. Further, results of bootstrapping resampling procedure revealed that spiritual intelligence mediated the relationship between burnout and reactance. It seems that paying attention to the areas of spirituality is of particular significance; perchance, there is a sense of requirement for teachers to enhance spiritual intelligence for abstaining burnout. Findings accentuate need for teacher training courses to raise awareness of emotional demands and implement strategies to promote emotion regulation skills in both experienced and recently qualified teachers.

Title: Artificial general intelligence based rational behavior detection using cognitive correlates for tracking online harms

Speaker Name: Shahid Naseem
Affiliation: University of Education, Pakistan

Abstract:

Expert systems possess human-like expertise for data analyzing as well as for decision-making. These systems are suitable in a situation, where a high level of uncertainty exists. In expert systems, for protecting sensitive information, various encryption techniques such as classical encryption and quantum encryption are used. In these systems, Artificial Intelligence (AI) is used to analyze the data at runtime and to detect unauthorized users in the early stage especially for tracking online harms. These systems are not completely secured, because the encryption techniques have some loopholes such as the algorithm's short life expectancy and less computation power. An unauthorized user destroys the precious data, as well as the system, might access these loopholes. As the confidentiality and integrity of expert systems are threatened by intrusions and real-time attacks related to privacy and cyber-security, there is a need for proposing novel methodologies to predict future attacks and identify new threat patterns. To analyze the behavior of the intruder and overcome the encryption weaknesses, this paper presents an Artificial General Intelligence based Rational Behavior Detection Agent (AGI-RBDA). The proposed system possesses human-like rationality for protecting the information like a human mind. It is exposed that the human mind does not apply any kind of encryption technique; instead, it used various cognitive correlates such as intention, perception, motivation, emotions, and implicit and explicit knowledge for the secrecy of sensitive information. In the end, the behavior of different cognitive correlates is exposed and stimulated.

PEERS ALLEY
MEDIA

Title: Recent advances in nanoparticle applications in respiratory disorders: a review

Speaker Name: Mohammad Hossein Boskabady
Affiliation: Mashhad University of Medical Sciences

Abstract:

Various nanoparticles are used in the discovery of new nanomedicine to overcome the shortages of conventional drugs. Therefore, this article presents a comprehensive and up-to-date review of the effects of nanoparticle-based drugs in the treatment of respiratory disorders, including both basic and clinical studies. Databases including PubMed, Web of Knowledge, and Scopus were searched until the end of August 2022 regarding the effects of nanoparticles on respiratory diseases. Nanomedicine as a new tool provided promising applications on treating of pulmonary diseases. The basic composition and intrinsic characteristics of nanomaterials showed their effectiveness in treating pulmonary diseases. The efficiency of different nanomedicines has been demonstrated in experimental animal models of asthma, chronic obstructive pulmonary disease (COPD), pulmonary fibrosis, lung cancer, lung infection and other lung disorders, confirming their function in the improvement of respiratory disorders. Various types of nanomaterials, such as carbon nanotubes, dendrimers, polymeric nanomaterials, liposomes, quantum dots, metal and metal oxide nanoparticles, have demonstrated therapeutic effects on respiratory disorders, which may lead to new possible remedies for various respiratory illness that could increase drug efficacy and decrease side effects.

Title: Determination of WGS84 to Adindan Datum Transformation Parameters and Assessing its effect for Geospatial Applications: Ethiopia

Speaker Name: Melese Wondatir Sisay
Affiliation: Ethiopian Civil service University

Abstract:

Datum transformation is the transformation of coordinate points from one known coordinate reference system into another. The recent practice of geospatial data collection, management, and analysis in Ethiopia is in geocentric coordinates of a point defined based on a global datum (WGS84). However, the Adindan clack 1880 datum is the locally known datum for Ethiopia. The currently recognized transformation parameters of Ethiopia are inconsistently integrated into deferent software. In addition to this, the rotation and scale changes are ignored in the transformation parameters. The main purpose of this study is to determine WGS84 to Adindan-Ethiopia datum transformation parameters. Five different models (block shift (geocentric), Bursa-Wolf (Helmert), Molodensky-Badekas, standard, and abridged Molodensky models) using ten collocated ground control points were used to define the transformation parameters by using five different height assumption scenarios like height-zero methods, orthometric height method (OHM), abridged Molodensky, EGM08, and iteration methods. In addition, the study evaluates the horizontal positional accuracy of orthophoto (x and y), second-order ground control points, and cadastral parcel corners for Addis Ababa City. A Molodensky-Badekas model is small residual (error), standard deviation and standard errors across the region of Ethiopia, within iterative height approach. The transformation parameters from WGS84 to Clarke1880 with inherent uncertainties of (168.8402 ± 0.09, 13.6708 ± 0.09, − 205.091 ± 0.09 in translation parameters in X, Y, and, Z, respectively, $3.27E-07 \pm 3.949E-07$ of scale factor, and $1.39E-06 \pm 4.656E-07$, $1.07E-06 \pm 5.1988E-07$, $4.20E-07 \pm 5.4291E-07$ in rotation parameters) parameters, with the standard deviation and residual of 1.06 m and 0.76 m, respectively. On the other hand, the positional accuracy of second-order ground control points, orthophoto, and cadastralnparcels evaluated by checkpoints is estimated as 0.47, 1.326, and 1.87 m, respectively, at a 95% confidence level. As a consequence of this research, for the coordinate transformation of high accuracy (0.24 to 1.0 m) in terms of standard error, themconformal transformations of Block Shift and 7-p Molodensky-Badekas could be used. Furthermore, these parameters are utilized as unique and constant values to improve data integrity for geospatial work such as cadastral application.

Title: GIS and remote sensing-based flood risk assessment and mapping: The case of Dikala Watershed in Kobo Woreda Amhara Region, Ethiopia

Speaker Name: Hailu Ayene Kebede

Affiliation: Wollo University

Abstract:

The most destructive natural disasters that harm both natural and man-made features on the surface of the world are floods. The study area, which is located in the low-lying areas of the Amhara Region, is characterized by intensive human activity, a steep slope, heavy summertime rainfall with high drainage density and a predominance of verti soil type, as well as proximity to rivers, all of which have been identified as factors that increase the risk of flooding. For the examination of vulnerability, data on population and land use were employed, and data on flood depth were used for further analysis. The primary goal of the study was to evaluate the flood risk in the Dikala Watershed in the Kobo Woreda Amhara Region using remote sensing and geographic information system (GIS) techniques. This was accomplished by weighing the "vulnerability" and "hazard" elements that contribute to flooding individually at various degree levels using the rank-sum approach. Using a raster calculator, the final vulnerability and hazard index was multiplied to create the risk map. The study's key findings indicated that the danger and hazard of flooding were between "moderate" and "high." Future land use and development activity should be done to reduce the risk of flooding in the study area using these flood risk maps for the river and the Dikala watershed.

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DISCOVERING

A right choice of conference destination is an important aspect of any international conference and keeping that in consideration, *AutoRobo Expo 2024* is scheduled in the Beautiful city "Landon, UK''.
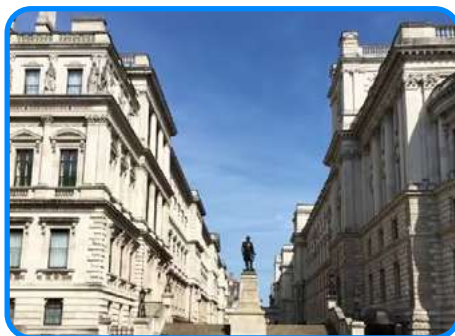

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