Contributions of Remote Sensing - Geographic Information System (RS-GIS) & Artificial Intelligence (AI) on opening new research sphere in Biological Sciences
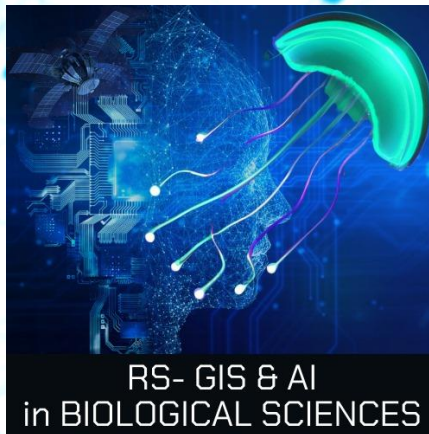
22nd March 2024

ABSTRACT VOLUME

Organized by
Department Of Zoology (UG & PG) & IQAC,
Asutosh College, Kolkata

In Collaboration with
Department Of Zoology & IQAC,
Ramakrishna Mission Vidyamandira,
Belur, Howrah (Our MoU Collaborator)

RS- GIS & AI
in BIOLOGICAL SCIENCES

Biological Science is a melting pot of modern technologies. It makes use of them for the expansion of understanding the complex interaction of events. Prediction of future trends in environmental impacts, climate change issues, landscape alterations, health hazards, disease outbreaks, etc. is becoming a hotbed of technology reinforced research. Artificial intelligence (AI), currently a cutting-edge concept, has the potential to improve the quality of life of human beings. As the field of AI matures with more trained algorithms, the potential of its application in epidemiology, the study of host–pathogen interactions and drug designing and customized medicine has opened new horizons. Precise and advanced diagnosis and cost-effective treatment are some of the biggest goals of AI-based technologies. Similarly, Remote sensing-geographical information systems (RS-GIS) coupled with AI, are contributing immensely to the field of agriculture, predicting seasons, forecasting weather, and increasing output. Moreover, the use of AI through machine learning (ML) and deep-learning-based applications is approaching complex dynamics of the body for example cognitive neuroscience. Collectively we can say, that the coming days are going to be an interdisciplinary confluence of multiple scientific avenues. With this in focus, we are looking forward to creating a forum for discussing these technological interventions in the backdrop of biological sciences in the august presence of all participants.

RS-GIS & AI Symposium
Organizing Committee
Asutosh College, Kolkata
& RKM Vidyamandira, Belur

Message

 I extend my warm greetings to everyone attending the ***One-Day National Level Satellite Symposium on "Contributions of Remote Sensing - Geographic Information System (RS-GIS) and Artificial Intelligence (AI) in Opening New Research Spheres in Biological Sciences***". Hosted by the Department of Zoology, Asutosh College, Kolkata, in collaboration with the Department of Zoology, Ramakrishna Mission Vidyamandira, Belur, Howrah (our esteemed MOU collaborator college), this symposium promises to be an enlightening and enriching experience for all.

In the rapidly evolving landscape of biological sciences, the integration of modern technologies such as RS-GIS and AI has become imperative. These technologies not only aid in understanding the intricate interactions within ecosystems but also pave the way for predictive analysis and informed decision-making in various fields including environmental studies, epidemiology, agriculture, and healthcare.

This symposium serves as a forum for exchanging ideas, sharing insights, and forging partnerships that transcend disciplinary boundaries. Through our collective efforts, we aim to harness the transformative potential of technology to address the multifaceted challenges facing our planet and pave the way for a brighter, more sustainable future.

I extend my heartfelt gratitude to the organising committee, distinguished speakers, dedicated presenters, and enthusiastic participants for their invaluable contributions towards making this symposium a resounding success. Their passion for knowledge and commitment to excellence inspire us all.

Furthermore, on behalf of Asutosh College, Kolkata, I would like to express my gratitude to the Department of Zoology, Ramakrishna Mission Vidyamandira, Belur, Howrah, for their unwavering support and dedication in co-organising this symposium. This collaboration exemplifies the power of partnership in fostering academic excellence, interdisciplinary dialogue, and innovation. Together, we have created a platform for knowledge exchange, collaboration, and collective learning that will undoubtedly shape the future of biological sciences and contribute to addressing global challenges.

Therefore, amidst the backdrop of technological innovation and scientific inquiry, let us embrace the spirit of collaboration and interdisciplinary dialogue. May this symposium become a resounding success, fostering enlightening discussions, forging meaningful connections, and providing ample opportunities for collaborative growth. Together, let us embark on a journey of exploration and innovation, harnessing the power of technology to unravel the mysteries of life.

With warm regards,

Dr. Manas Kabi
Principal,
Asutosh College, Kolkata

Message

Dear Esteemed Participants,

On behalf of Ramakrishna Mission Vidyamandira, it gives me immense pleasure to extend a warm welcome to all the distinguished guests, scholars, researchers and participants to the One - Day National Level Satellite Symposium on "Contributions of Remote Sensing - Geographic Information System (RS-GIS) and Artificial Intelligence (AI) on opening new research spheres in Biological Sciences."

We are happy to host this prestigious symposium in collaboration with the Department of Zoology (UG & PG) and IQAC, Asutosh College, Kolkata. This collaborative effort, as an activity under the MoU signed between two institutes, is a testament to our collective commitment to fostering interdisciplinary dialogue and advancing scientific research in the realm of Biological Sciences.

The convergence of Remote Sensing, Geographic Information System, and Artificial Intelligence has revolutionized the way we explore and understand the intricate dynamics of

our natural world. This symposium serves as a platform to delve deeper into the innovative applications of these technologies, particularly in the context of biological research. As we embark on this intellectual journey,

I am confident that the discussions and insights shared during this symposium will not only enrich our understanding but also pave the way for groundbreaking research endeavors. The exchange of ideas and experiences among the participants from various academic and research backgrounds is invaluable in driving progress and innovation.

I extend my heartfelt congratulations to all the participating members for their dedication, passion and scholarly contributions to this field. Your presence and active engagement are instrumental in making this symposium a resounding success.

I would like to express my gratitude to the organizing committee, collaborators, sponsors and volunteers for their tireless efforts in ensuring the smooth execution of this event.

May this symposium be a catalyst for transformative discoveries and collaborative endeavors that will shape the future of Biological Sciences. Once again, a warm welcome to Ramakrishna Mission Vidyamandira, and I wish you all a fruitful and enlightening symposium experience.

With warm regards,

Swami Mahaprajnananda
Principal,
RKM Vidyamandira, Belur
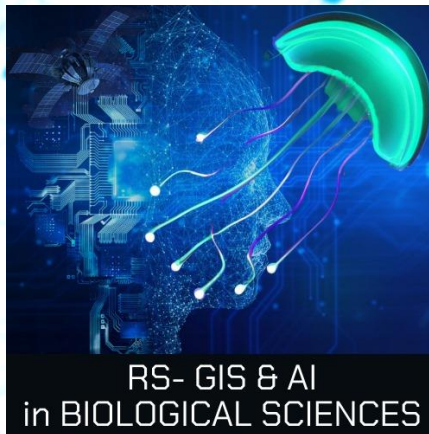
Acknowledgements

On behalf of the entire RSGIS-AI Team we sincerely thank all of you for being a valuable part of our symposium. Your participation has enriched our event and we truly appreciate it. We have received an overwhelmingly positive response from students, researchers and faculty members from different academic and research institutes. In near future, we plan to organize symposiums and workshops that are primarily focused on the holistic growth of students, and we believe that your cooperation and guidance would be invaluable to us.

Resource persons from Zoological Survey of India (ZSI), Indian Space Research Organization (ISRO) and Adamas University were generously extended their expertise to direct the young enthusiasts. Senior professors from various fields had remained integral part of the organizing committee and blessed us with their foresight and advises. We extend our heart-felt acknowledgements to our advisors from Asutosh College, Kolkata and Ramakrishna Mission Vidyamandira, Belur for making this event a grand success.

Please find the youtube link of the entire event. Thank you once again and we will soon follow up with the report of the symposium.

Yours sincerely,

RS-GIS & AI Symposium
Organizing Committee
Asutosh College, Kolkata
& RKM Vidyamandira, Belur

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Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

Applications of AI in modern day life

Monitoring Safety: Ensuring Trustworthy Autonomous Systems

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Abstract

The concept of Cyber-Physical Systems encompasses engineered, physical, and biological systems that are supervised or regulated by an integrated computational centre. These systems exhibit behaviour characterized by the dynamic change of physical properties and distinct states. The recent advancement in technology has given rise to Autonomous Cyber-Physical systems (CPS) that utilize Artificial Intelligence (AI) to respond to feedback and unforeseen changes in the environment without much human intervention. These intelligent systems alleviate human workload by leveraging information technology leading to immense growth and impact across various sectors today, such as healthcare (anaesthesia model), transportation (autonomous vehicles), etc. However, these systems are safety-critical, i.e., a failure of any kind of these systems can lead to catastrophic outcomes. So, their increasing prevalence in modern-day life also raises associated safety concerns. Although significant efforts have been made in the study of techniques for the verification of such systems, the inherent complexity of CPS models restricts formal verification of safety, especially for larger instances. Monitoring emerges as a lightweight yet feasible verification technique, particularly for larger models where formal methods encounter challenges. It involves the use of various algorithms that analyse the log of a system and determine whether at any given instant the system violates a specification (e.g. a safety property), especially in the presence of uncertainties in the environment. Here, we provide a comprehensive review of various methodologies that can be used for both online and offline monitoring of these safety-critical systems. Although, autonomous systems provide a promising pathway away from the more manual and often inefficient practices, safety concerns impede the progress toward achieving higher autonomy levels, particularly in safety-critical domains. In this review, we recognize the potential of these autonomous systems, while also shedding light on the diverse approaches for their effective monitoring essential for ensuring their safety and reliability.

Keywords: Artificial Intelligence, Autonomous Cyber-Physical System, Monitoring, Reliability, Safety-critical, Verification

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Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
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RS-GIS-AI-24-P02

Opportunities and Challenges of Artificial Intelligence in Education System

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Abstract

Artificial Intelligence (AI) is revolutionizing teaching and learning methods worldwide, with innovative solutions that require advanced infrastructures and a thriving ecosystem of innovators. The potential of AI to transform the education system is immense, offering a wide range of opportunities along with significant challenges. In the digital age, education standards have evolved, providing students with easier access to research and learning resources. Children as young as 8 to 15 are using smartphones and educational apps to work on projects, while digital books, audiobooks, and videos on various websites help them grasp complex ideas and concepts. AI-enhanced assessment tools are providing real-time feedback, tracking student progress, and identifying areas for improvement. Moreover, AI-powered tools such as gamification, simulations, and virtual reality are making learning more interactive and engaging. AI can analyze vast amounts of data to provide insights into student performance, helping educators tailor their teaching strategies. It also supports lifelong learning by offering personalized recommendations for further study and skills development based on individual interests and career goals. However, the adoption of AI in education also presents challenges. AI-powered solutions may widen existing inequalities, as not all students have equal access to technology or the internet. There are concerns about data privacy and the security of sensitive information collected and analyzed by AI systems. The quality of AI-generated educational content is another concern, as it may vary in accuracy and relevance. Ethical considerations, such as bias in algorithms and the role of AI in decision-making processes, need to be addressed. Integrating AI into education requires training teachers to use these technologies effectively, which can be challenging and time-consuming. Additionally, implementing AI in education can be costly, particularly for schools and institutions with limited resources. In conclusion, while AI offers numerous opportunities to enhance the education system, addressing the challenges associated with its implementation is crucial. Ensuring that AI benefits all students and contributes to the overall improvement of education worldwide requires careful consideration and proactive measures.

Keywords: Artificial intelligence, education system, challenges, teaching, innovators, learning, opportunities, solutions

RS-GIS-AI-24-P03

Navigating the Synthetic Landscape: Detecting AI-Created Fakes in Images

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In the contemporary digital landscape, the pervasive influence of social media has become integral to daily life. Platforms such as Twitter, Snapchat, Facebook, and Instagram serve as conduits for the widespread dissemination of images and videos. Among these media types, images stand out as particularly prevalent in social media interactions. However, the ease with which images can be manipulated with the assistance of artificial intelligence (AI), also known as deepfakes and circulated poses significant challenges, jeopardizing the credibility of information and public trust in social communication channels. Identifying such forms of image manipulation presents a formidable challenge for the naked eye of human observers. Recognizing this urgent need, this study endeavours to present a methodology for the classification and authentication of digital images to unveil instances of manipulation. This research aims to develop a model capable of discerning threatening or falsified digital images, thereby mitigating potential societal and national security risks. The model's foundation lies in advanced AI based deep learning algorithms, notably convolutional neural network (CNN) and the Xception network, leveraging transfer learning techniques. The two branches of the method diverge: one focuses on discerning inconsistencies among local image regions through the extraction of shallow features, while the other utilizes a deep Xception network to extract deeper features. To gauge the effectiveness of this approach, we conducted evaluations using the well-established CIFAKE: Real and AI Generated Synthetic Images, a public standard dataset. Our results demonstrate a remarkable accuracy of 95.77% and an AUC score of 98.57%, challenging many state-of-the-art methods in the field. These findings promise invaluable contributions to the ongoing efforts aimed at monitoring social media content, identifying anomalies, and safeguarding against electronic threats and attacks.

Keywords: Artificial Intelligence (AI), Convolutional Neural Network (CNN), Deepfakes, Image Forgery, Xception network

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**Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences**

The ubiquity of AI as a therapeutic weapon to pioneer societal welfare

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Abstract

The objective of this review is to assess the transformative role of Artificial intelligence in revolutionizing drug delivery mechanisms. AI has a significant role in the formulations of drugs, their behaviour in the body, targeting mechanisms, and improving the outcomes for patients. Diabetes mellitus, characterized by elevated blood glucose levels, affects millions of people. The increasing prevalence of diabetes has become a global public health concern in the 21st century. The escalating incidence of diabetes, coupled with the preventable morbidity and mortality resulting from diabetes and its complications, underscores diabetes as a considerable health challenge on a global scale. Despite advancements in insulin formulations and delivery devices, achieving optimal glycemic control remains a complex and ongoing challenge for individuals living with diabetes. AI methods in combination with the latest technologies, including medical devices have the potential to enable the creation and delivery of better management services to deal with diseases like diabetes. The integration of AI represents a paradigm shift in personalized medicine, offering treatment solutions that address the unique. A systematic and comprehensive literature search using academic databases such as PubMed, Science Direct has been done. Some relevant keywords, such as & AI & drug delivery was used to search about the topics to be covered. Relevant data on AI in drug delivery was extract was organized into thematic categories.

In the exploration of AI's role in enriching drug delivery systems for diabetes management, our study established significant progressions. Through the integration of machine learning algorithms, personalized insulin dosing recommendations were enhanced, where progressive machine learning algorithms were engaged. These outcomes accentuate the transformative prospect of AI in crafting a more personalized, proficient, and effective approach to diabetes care, notably improving the field of drug delivery and disease management.

Keywords: Artificial intelligence, drug delivery, Diabetes mellitus

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Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

RS-GIS-AI-24-P05

Exploring the impact of artificial intelligence in modern day life

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Abstract

Artificial intelligence (AI) is an important technology that supports our daily needs as well as large industrial requirements. AI has become very important and helpful technology in recent times. This work is aimed in investigating the role of AI in modern day life. Here we have discussed few most popular and helpful AI based technologies used by us on regular basis. AI has brought massive change in almost all spheres of life from large industry to minute household utensils. In recent times, educational institutions & offices use the AI software for attendance and security purpose, using Image and Facial recognition. Probably the best Virtual assistance used by modern men is SIRI & ALEXA, which works on AI. They rely on natural language processing and machine learning, two subsets of AI, to improve performance over time. Amazon's Alexa is a voice – controlled system that works alongside with the echo speaker that receives the spoken request. Another beneficial AI based technology is the Auto driving car. Such cars are fully controlled by the AI software that senses the signals, road angles, obstacles and dives smoothly without human control. Probably the most popular and well accessed AI support for humans is CHAT GPT. It is used for Text generation, Language translation, content creation, Coding assistance. In summery it can be said that AI has changed our daily life for good and we have explored few fields supported by AI technology, extensively used by modern people.

Keyword: Artificial intelligence, CHAT GPT, facial recognition, virtual assistance

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Scope of technologies in Biological Sciences

RS-GIS-AI-24-P06

Advancements in 3D Bioprinting: A Comprehensive Review of Applications in Tissue Engineering and Regenerative Medicine

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Abstract

The development of 3D bioprinting technology has led to tremendous advancements in tissue engineering and regenerative medicine. This abstract provides a summary of the most recent developments, challenges, and its applications in tissue engineering and regenerative medicine. Using biomaterials and bioactive substances, 3D bioprinting makes it possible to precisely create intricate three-dimensional structures. A variety of bioprinting methods, such as extrusion-based, laser-assisted, and inkjet bioprinting, provide special benefits in terms of resolution, speed, and suitability for various biomaterials. In tissue engineering, it enables the creation of scaffolds that mimic native tissue environments, facilitating cell growth, differentiation, and tissue regeneration. Bio printed structures have been effectively employed in the engineering of many tissues and organs, such as blood vessels, skin, bone, cartilage, and even intricate organs like the liver and heart. One of the main challenges in 3D bioprinting is integrating vascularization and innervation for large-scale tissue structures, optimizing printing parameters, and choosing appropriate polymers. Also, in order to guarantee safety and effectiveness, regulatory and ethical problems pertaining to the use of bio printed tissues for therapeutic purposes must be carefully considered. Future directions include investigating new bioprinting methods, combining cutting-edge imaging techniques, and improving bioink functionality. All things considered, 3D bioprinting has the potential to completely transform healthcare, but more study and research are required to get over the present obstacles and reach this ultimate goal.

Keywords: Bio printing, Organs, Regeneration, Tissue Engineering

A machine learning approach towards predicting the torsional energy barrier of antioxidant molecules

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Abstract

Antioxidants are a special class of molecules which scavenge free radicals and protect human being from ageing and a plethora of diseases. Fruits and vegetables are sources of antioxidants. Antioxidants have a generic chemical structure having three rings commonly denoted as A, B and C. Whereas A and B rings are aromatic, C ring which is fused with the A ring is non-aromatic. B ring is connected to the C ring through a single bond and can rotate around this bond. Study of this rotational flexibility of different antioxidants is essential for exploring the mechanism of action of these in free radicals scavenging activities. A set of twenty one commonly used antioxidants among which fourteen are flavones and seven are flavonols have been used in this study whose electronic structure have been explored and the torsional potential energy profile and barrier to rotation have been determined. A training set and a test set have been built among these twenty one molecules to establish a machine learning model which has been used to predict the torsional energy barrier of other antioxidant molecules. The predicted energy barrier for these antioxidant molecules have been compared with that obtained from the electronic structure calculation.

Keywords: Ageing, Antioxidants, flavonols, machine learning

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**Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences**

The role of AI in understanding receptor-ligand binding interactions

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Abstract

Artificial Intelligence (AI) is the development of computer systems able to perform tasks that normally require human intelligence. The roles of AI in patient monitoring, drug discovery and drug delivery are increasingly significant, revolutionizing traditional approaches in pharmaceutical research and development. Ligand-receptor interactions play a pivotal role in numerous biological processes, ranging from signalling cascades to drug development. AI algorithms can be used to identify targets for new drugs and optimise their interactions with real-time molecular analysis predicted by these systems. Novel chemical structures with desired pharmacological properties using generative models can be achieved now using AI tools. This accelerates the discovery of drug-like molecules with optimized drug-likeness and bioavailability profiles. Potential toxicity of drug candidates based on their chemical structures and biological properties can also be determined. Computational models can evaluate physicochemical properties and drug-release kinetics to tailor formulations for specific delivery routes and therapeutic applications. AI facilitates the design of targeted drug delivery systems that selectively deliver therapeutics to diseased tissues or cells while minimizing off-target effects. Nanoparticle-based carriers, liposomes, and polymer conjugates engineered using AI-driven approaches enhance drug localization and therapeutic efficacy. It also facilitates the design of targeted drug delivery systems minimizing off-target effects. Therefore, it plays a pivotal role in transforming drug discovery and drug delivery by leveraging advanced computational techniques to accelerate the development of safe, effective, and personalized therapeutics. Integrating AI-driven approaches into pharmaceutical research and development pipelines holds immense promise for addressing unmet medical needs and advancing precision medicine initiatives. In one of our studies, we have shown the receptor-ligand interaction between a novel anti-cancer drug, Artemisinin and an inhibitory immunoreceptor, C-type lectin receptor domain family 12 members A (CLEC12A). Artemisinin can favourably bind to the ligand binding site of CLEC12A, analysed by docking studies from computationally generated models.

Keywords: Artificial Intelligence (AI), drug discovery and analysis, drug targeting and specificity, receptor-ligand interactions

RS-GIS-AI-24-P09

Artificial Intelligence (AI) and Nanotechnology for larvicidal efficacy of green synthesized metallic-nanoparticles against mosquito vectors (Diptera: Culicidae): Current status and future perspectives

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Abstract

Artificial Intelligence (AI) can be defined as a section of computer science that can follow human intelligence. It is implemented in machines, so that it can perform tasks that actually require human intelligence. During the last decade AI tools are getting along in nanotechnology research. In nanotechnology, green synthesis has become the eco-friendly, sustainable, cost-effective technique for the synthesis of metal nanoparticles. Zika virus, West Nile virus, Chikungunya virus, dengue, malaria, filarial etc. are commonly spread by the bite of infected female mosquitoes. These life-threatening diseases are called mosquito-borne diseases. The rate of mortality in this world is increasing day by day through these diseases. Different types of insecticides are being used to control the life-stages of mosquitoes, but research work confirmed that most of these insecticides are causing pollution to the environment. Not only this, human, plant, animals suffer various types of severe diseases. The mosquitoes have developed their resistance towards most of these controlling agents. So, it's going to be tough to control these vectors. For this reason, researchers develop eco-friendly, biodegradable, low-cost, target specific agents which can be used to control and/or kill the vector. The study was carried out to set up the green-synthesized metallic-nanoparticles as larvicidal activities against *Culex quinquefasciatus*, *Aedes aegypti*, *Anopheles stephensi* as target species using AI. Virus, bacteria, yeast, fungi, algae and various medicinal plants' parts (leaves, root, bark, seed etc.) function as substrates for the green synthesis of nanomaterials. The mortality data were subjected to determine the LC50 values of treated larvae of the respective species using R, Excel AI. The mostly used metals for the green synthesis process are gold (Au), Silver (Ag), Platinum (Pt), Zinc (Zn), Cerium (Ce), Iron (Fe), Copper (Cu), Titanium (Ti) and also using their compounds like hydroxides, oxides, sulfides, phosphates, chlorides, fluorides. The obtained nanoparticles were characterized by different available spectroscopic techniques such as XRD, TEM, SEM, DLS etc.

Keywords: AI, environment-friendly, Green-synthesis, Nanotechnology, metallic-nanoparticles, mosquito vectors

RS-GIS-AI-24-P10

Artificial Intelligence, a dynamic tool in detecting Synaesthesia and its subtypes: An emerging approach

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Abstract

Objective: This poster attempts to understand synaesthesia and its subtypes, enumerate the methods to train AI algorithms in detecting this neurological phenomenon in individuals, and deep learning models in uncovering patterns associated with synesthetic experiences. Interesting case studies related to this condition have also been explored in this poster.

Background: Initially disregarded as pathological, synaesthesia, is an extraordinary way of perceiving the world, in which the stimulation of one sensory system leads to an associated involuntary response of an unstimulated sensory system. It can arise from genetic differences in developmental synaesthesia or sensory loss-induced plasticity in acquired synaesthesia. Grapheme-colour synaesthesia, in which the synesthetes associate colours with written language or graphemes, and tone-colour synaesthesia, in which the synesthetes associate notes or chords with colours are the two most extensively studied areas. According to a review article, the condition is more common than expected and affects up to 5% of the population. Deep learning AI models in the analysis and detection of synaesthesia are still evolving.

Methodology: The information has been collected through rigorous study of numerous review articles and research papers from web sources like Google Scholar, PubMed, and Science Direct.

Results: Supervised deep learning methods like automatic image colorizations can replicate the synesthetic experience using Convolutional Neural Networks (CNN). Generative adversarial networks (GANs) are generative machine learning models that can create substantial output from similarities in learned feature associations. Detecting minute structural brain differences using FMRIM FSL VBM tools through voxel-wise whole brain optimized VBM style can distinguish synesthetes from non-synesthetes. A theory proposes grapheme-colour synaesthesia develops partly to help recognize and differentiate between letters, in children. Thus, further understanding may open new avenues for exploring human perception, memory, and information arrangement.

Limitations: The exhaustiveness of this poster is not claimed.

Keywords: Synaesthesia, Synesthetes, Non-Synesthetes, Artificial intelligence, Convolutional Neural Networks (CNN), Grapheme-colour

RS-GIS-AI-24-P11

Machine learning approach to support taxonomic species discrimination based on helminth collection data

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Abstract

The helminths are worm-like parasites. Helminths are endemic in more than half of the world's countries, raising serious public health concerns. Accurate diagnosis of helminth infection is crucial to control strategies. The clinically relevant groups are separated according to their general external shape and the host organ they inhabit. There are both hermaphroditic and bisexual species. The definitive classification of helminth is on the external and internal morphology of egg, larval, and adult stages. In medically oriented schemes the flatworms or platyhelminths include flukes and tapeworms. Roundworms are nematodes. These groups are subdivided for convenience according to the host organ in which they reside, e.g., lung flukes, extra-intestinal tapeworms, and intestinal roundworms. Kankanet was used to detect eggs of the three most common soil-transmitted helminths: *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworm. An artificial intelligence-based digital pathology (AI-DP) device is prototyped to explore automated scanning and detection of helminth eggs in stool prepared with the Kato-Katz (KK) technique, the current diagnostic standard for diagnosing soil-transmitted helminths (STHs; *Ascaris lumbricoides*, *Trichuris trichiura* and hookworms) and *Schistosoma mansoni* (SCH) infections. The Kato-Katz technique is used for qualitative and semiquantitative diagnosis of intestinal helminthic infections. It is performed using a small spatula and slide template that allows a standardized amount of faeces to be examined under a microscope and the eggs to be counted. Loop mediated isothermal amplification (LAMP) assay, a sensitive, simple and rapid method was therefore developed for detection of helminths. The technique is highly specific and increases the amount of amplified DNA even up to a billion copies over less than an hour, compared to a million copies yielded by the PCR. Isothermal amplification can be performed without advanced laboratory equipment, such as in a dry block heater or a water bath. Another innovative aspect of LAMP is its high specificity due to the use of several primers (from four to six), which can distinguish up to eight specific locations on the DNA template, compared to only two in typical PCR. These are some methods for the detection of Heminthic infections.

Keywords: Helminths, Loop mediated isothermal amplification (LAMP), Machine learning

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Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

Role of AI in patient monitoring, drug discovery & drug delivery

RS-GIS-AI-24-P12

Putting AI into play: Designing therapeutic drug for IPF

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Abstract

Artificial intelligence (AI), defined as computer-based emulation of human intellectual processes, plays a pivotal role across various stages of drug discovery and delivery. AI revolutionizes drug discovery by identifying therapeutic targets, screening chemical libraries, modeling structure-activity relationships, designing novel compounds, optimizing candidates, and repurposing drugs.

More recently, using AI driven methodology, multiomic target discovery system has shown efficacy in identifying targets for cancer and age-related diseases such as IPF. IPF (Idiopathic pulmonary fibrosis) is a severe, slowly progressing lung disease identified histologically by increased fibroblast activity (TGF-β being a primary driver of myofibroblast differentiation) and significant deposition of ECM. Commercially available drugs: Nintedanib (inhibit FGFR) and Pirfenidone (downregulates TGF-β expression) has side effects such as nausea, diarrhea, weight-loss, difficult urination, change in taste and smell perception, painful mouth ulceration, reduction in WBC count etc.

Therefore, to combat the limited availability of anti-fibrotic treatments for IPF, AI pipeline was employed to tackle the unmet clinical demand. The generative AI platform has pinpointed TNIK inhibition as a robust anti-fibrotic approach and aided in the development of a highly targeted TNIK inhibitor named INS018_055.The PandaOmics target-discovery platform was utilized to analyze datasets involving "protein and receptor kinase" approach, resulting in the generation of target hypotheses. Using this approach, TNIK emerged as the top target, exhibiting notably high values across various parameters including network neighbors, causal inference, pathways, interactome community, expression, heterogeneous graph walk, and matrix factorization scores.Chemistry42 platform application was used to generate small-molecule leads targeting TNIK. The compounds were chosen based on criteria such as synthetic accessibility, novelty, and medicinal chemistry properties, and subsequently synthesized. Therefore, generative AI platforms provide efficient solutions for swiftly generating target-specific drugs and biomarkers even when prior evidence is lacking. Finally, In vitro validation was performed followed by validation in fibrosis animal models.

Keywords: AI, Chemistry42, IPF, PandaOmics, TNIK

RS-GIS-AI-24-P13

Role of AI in patient monitoring, drug discovery & drug delivery

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Abstract

AI plays a pivotal role in healthcare, revolutionizing patient monitoring, drug discovery, and drug delivery. Intelligent algorithms analyze real-time patient data, enabling proactive interventions and personalized care. In drug discovery, AI accelerates the identification of potential drug candidates by analyzing vast chemical databases and simulating molecular interactions. Additionally, AI optimizes drug delivery methods, improving targeting and minimizing side effects, ultimately enhancing patient outcomes and advancing medical research.

AI algorithms analyze mammograms and other imaging modalities to pinpoint suspicious areas within breast tissue, such as masses, micro-calcifications, and architectural distortions. By carefully examining intricate details, AI can identify subtle anomalies indicative of carcinoma, like irregular borders or clustered micro-calcifications. Additionally, AI is capable of recognizing patterns within breast tissue images that signify the presence of cancer, even if they are challenging for human radiologists to discern. By analyzing vast amounts of data, AI learns to recognize these patterns, enhancing diagnostic accuracy and efficiency. Through this process, AI acts as a highly sensitive detector, flagging areas of concern for further evaluation by healthcare professionals.

AI accelerates cancer drug discovery by analyzing molecular interactions. For instance, it predicts drug-target interactions to identify potential compounds for specific cancer types. By rapidly screening vast databases, AI expedites the process of finding novel therapeutics. This precision-driven approach enhances the development of targeted cancer treatments, potentially improving patient outcomes and advancing personalized medicine in oncology.

In cancer treatment, AI enhances drug delivery by tailoring chemotherapy formulations based on patient data and tumor characteristics. AI begins by identifying cancerous cells, analyzing patient-specific data to customize drug dosages and delivery methods. Utilizing advanced nanoparticle delivery systems, AI precisely targets cancer cells, minimizing collateral damage to healthy tissue. Real-time monitoring facilitates adjustments to treatment protocols, ensuring optimal outcomes. This integration of AI in cancer drug delivery offers patients safer, more effective, and personalized interventions, transforming treatment approaches and significantly improving success rates in oncology

Keywords: drug discovery acceleration, cancer drug discovery, healthcare revolution, imaging analysis, personalized drug delivery, treatment optimization

RS-GIS-AI-24-P14

From Data to Devising: Impact of AI on Patient Monitoring and Personalised Drug Discovery

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Abstract

Artificial intelligence (AI) is an entity, able to receive inputs from the environment, interpret or learn from such inputs, and exhibit related yet flexible actions that help to achieve targeted objective over a period of time. The application of AI in patient monitoring and drug discovery within the healthcare domain is highly consequential. The integration of AI technologies enables more efficient and accurate patient monitoring by analysing diverse data sources including electronic health records, wearable devices, and medical imaging. Additionally, AI-driven drug discovery facilitates the identification of novel therapeutic targets, prediction of drug interactions, and acceleration of the drug development process. AI plays a crucial role in patient stratification, which is a process that involves dividing patients into different groups based on certain characteristics, such as disease severity, individual genetic and physiological make-up or response to treatments. It helps healthcare professionals tailor treatments and interventions to individual patients, improving outcomes and optimizing resources. AI has revolutionized drug discovery by accelerating the process and making it more efficient. With the help of AI algorithms, researchers can analyse vast amounts of data, identify potential drug targets, and predict the effectiveness of new compounds, which saves time and resources, allowing scientists to focus on the most promising candidates. AI has also made significant advancements in health monitoring with the help of wearable devices and sensors, AI algorithms can analyse real-time data on vital signs, activity levels, and sleep patterns. AI-powered health monitoring systems can provide valuable insights to both patients and healthcare providers, promoting proactive and preventive healthcare. By leveraging AI techniques, healthcare professionals can enhance patient care outcomes, optimize treatment strategies, and advance pharmaceutical innovation. Our present review highlights the transformative potential of AI in revolutionizing patient monitoring and drug discovery, ultimately contributing to improved healthcare services and personalised treatment outcomes.

Keywords: Artificial Intelligence (AI), drug discovery, patient monitoring, personalised medicine, pharmaceutical advancement.

RS-GIS-AI-24-P15

Prospects of Computational Biology Programs and Artificial Intelligence in Understanding Disease Pathophysiology, Drug Design and their Administration

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Abstract

Understanding the three dimensional conformation and elucidating the arrangement and organization of proteins and other important biomolecules have emerged as prominent fields of interdisciplinary research. There are several computational methods to comprehensively analyse the conformational dynamics of the biomolecules and the functions and interactions of them, by using various methods like modelling, docking and simulation. The field of computational biology has been thoroughly studied and is widely used for a multitude of purposes, from explaining metabolism and evolutionary lineage to determination of important gene sequences, mutations, polymorphisms, interactions between nucleic acids and other biomolecules, especially proteins and the basis and chemistry behind complexation, chelation, supramolecular assembly, modifications, sequestration, synthesis, oligomerization and polymerization of certain molecular species. Computational biology tools accomplish this by algorithms which represent the conceptualization of physics, chemistry and statistics amalgamated with programming language and artificial intelligence. Different areas of physics and mathematics, as wings of computational biology, help the scientists to conceive ideas of experiments related to bio-macromolecules. There is ample scope for customization, visualization and experiencing of the conditions necessary for discovering all the possibilities of an event, which otherwise is impractical and unfeasible in wet lab experiments. Such computational methods and artificial intelligence are exceedingly used in gene sequencing techniques, data interpretation and research on gene expression, proteomics, carbohydrate and lipid metabolism, metagenomics, epigenetics, fluxomics, pathogenesis and pathophysiology. This poster aims in highlighting the multidimensional contributions of computational programs and artificial intelligence resources in studying symptomology of diseases and their possible cure, along with demonstration of the principles and construction of the programs and algorithms. Due to their extraordinary advantages and the range computational methods can cover, they are used in concert with artificial intelligence in drug designing, drug administration and studies from the perspectives of biochemical toxicology, manifestations, immunology, pharmacokinetics and pharmacodynamics.

Keywords: Algorithms, Artificial Intelligence, Computational Biology, Drug design Pathophysiology

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Early Detection of Oral Cancer using Smartphone-based White Light Image

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Abstract

Oral cancer is one of the most prevalent cancers having lowest survival rates worldwide. Diagnosis of oral potentially malignant disorders (OPMDs) becomes difficult due to the numerous varieties, various forms and overlapping features. Conventional oral examination techniques require specialists and health resources which are scarce especially in rural settings. In the present study, a simple yet effective diagnosis method has been suggested using the rapidly developing imaging system in smartphones. With the help of a hand-held smartphone camera, oral cavity image can be easily captured. Then fixed region of interest method is employed to crop discriminative parts of an oral lesion and filter irrelevant backgrounds to obtain ROI image. In the preprocessing stage, pixel intensity and contrast are enhanced. Oral dataset has been collected from healthy individuals and persons diagnosed with aphthous ulcers, OPMD or oral cancer. All oral images fall into one of five categories, namely normal, aphthous ulcer, low-risk OPMD, high-risk OPMD or oral cancer. In the final stage, image classification is done based on CNN technology using the recently developed high resolution representation learning network (HRNet). The final training set consisted of 1596 normals, 1575 aphthous ulcers, 1458 low-risk OPMDs, 1335 high-risk OPMDs and 1575 cancers. In this method, the HRNet-W18 network showed a sensitivity of 83.0%, specificity of 96.6% and precision of 84.3%. This AI-diagnosis system can be very effective especially in rural setting where the doctor has less experience and for self-pre-diagnosis of patients with oral lesions.

Keywords: Oral cancer, early detection, CNN technology machine learning

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**Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences**

Revolutionized pharmaceutical technology: Innovations in drug delivery design through artificial intelligence

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Abstract

Artificial intelligence (AI) has emerged as a powerful tool that harnesses anthropomorphic knowledge and provides expedited solutions to complex challenges. AI technology and machine learning present a transformative opportunity in the drug discovery, formulation, and testing of pharmaceutical dosage forms. The analysis of extensive biological data, including genomics and proteomics, using AI algorithms allow researchers to identify disease-associated trajectories. By utilizing this, drug discovery can be more efficient and targeted, which increases the chance of successful drug approvals. By optimizing research and development processes, AI has the potential to reduce development costs. Machine learning algorithms aid in experimental learning. This capability allows for the prioritization and optimization of lead compounds, which reduces the need for extensive and costly animal testing. The analysis of vast amounts of patient data in real-time using AI-powered systems can enable early detection of health issues and personalized treatment recommendations. The utilization of AI in medical devices such as X-rays, CT scans, smart watches, fitness trackers, biosensors, and surgical devices has made it possible to analyze medical imaging data, monitor vital signs, detect anomalies, alert healthcare providers to intervene when necessary, and aid surgeons during procedures. AI has brought about a revolution in the field of drug research and discovery by virtual screening of vast chemical libraries to identify drug candidates, establishing links between the chemical structure of compounds and their biological activity (Structure-activity Relationship Modelling), optimization of drug candidates, drug repurposing, and toxicity prediction. AI optimizes drug delivery through personalized drug delivery systems which improves drug formulations and enhances targeted drug delivery to specific tissues or cells. Customization of drug dosage and delivery schedules based on genetics, metabolism, and disease progression can be done by analysing patient data using AI algorithms. AI reshapes drug delivery technologies by enabling targeted and adaptive therapies through its data analysis capabilities.

Keywords: Artificial intelligence, drug discovery, machine learning, patient monitoring, and drug delivery

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Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
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RS-GIS-AI-24-P18

Patient monitoring, drug discovery & drug delivery – expanding horizon for AI

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Abstract

Artificial intelligence (AI) has revolutionized the field of healthcare by offering innovative solutions for patient monitoring, drug discovery, and drug delivery. In this abstract, we explore the role of AI in these critical areas and the impact it has on improving patient outcomes and advancing medical research. Patient monitoring is a crucial aspect of healthcare. It involves continuous tracking of vital signs and other health parameters to ensure timely medical intervention and personalized care. AI-powered monitoring systems have the ability to analyse extensive amounts of data in real-time, enabling healthcare providers to recognize the early warning signs of deterioration and make decisions accordingly in time. AI prevents delay and also completely removes the issues that may prevail due to human bias or emotions. By utilizing machine learning algorithms, AI can predict patient outcomes and identify patterns in patient data. This will help provide actionable insights for better treatment strategies. In the field of drug discovery, AI has emerged as a game-changer by accelerating the process of potential candidate identification and optimizing drug design. Traditional drug discovery methods are time-consuming and costly due to the trial   and error experiments taking place in real time and space, often resulting in high failure rates. AI algorithms can analyse large datasets to predict drug-target interactions and design the appropriate desired molecules, and optimize drug formulations. This not only speeds up the drug development process but also increases the chances of success by targeting specific disease mechanisms more effectively. The efficiency rate is significantly increased and the rate of success also higher. AI plays a crucial role in drug delivery by enhancing precision and efficiency in administering medications to patients. Using AI algorithms, healthcare providers can structure drug dosages based on individual patient characteristics, such as genetics, metabolism, and response to treatment. This personalized approach minimizes the risk of adverse reactions and maximizes the rate of success for medications. AI-powered drug delivery systems can automate drug administration processes, ensuring accurate dosing and timely delivery of medications to patients. The rate of precision is very high which results in faster recovery of the patient.
In conclusion, the integration of AI in patient monitoring, drug discovery and drug delivery has the potential to revolutionize healthcare like never before by improving patient outcomes, reducing healthcare costs, and advancing medical research. As technology continues to evolve, AI will continue to play a vital role in transforming the field of healthcare and keep bringing new innovations in the realm of patient care.

Keywords: Drug delivery, drug discovery, healthcare, innovation, outcomes, patient monitoring,

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Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

AI-based predictive modeling for environmental & epidemiological monitoring

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RS-GIS-AI-24-P19

Use of AI in predicting outbreak probabilities of emerging infectious diseases: Learning from COVID-19 pandemic

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Abstract

The COVID-19 pandemic has proven the importance of artificial intelligence (AI) in analyzing and responding to newly emerging infectious diseases. Growing viremic ambience, climate change, and global transportation have set the stage for emerging infectious diseases of unknown health risks. Lessons learned from the COVID-19 pandemic and other epidemics to explore how AI techniques may be applied to the understanding and management of emerging diseases. Artificial Intelligence has become a potent tool for anticipating, monitoring, and identifying new illnesses at the earliest. To quickly identify new infections and possible disease outbreaks during the COVID-19 pandemic, AI-driven models have been employed to analyze various information, including genomic sequences, epidemiological data, and social media communications. Real-time monitoring of disease transmission has been made easier by machine learning algorithms, which have also aided in the creation of preventative strategies to lessen transmission and lower rates of morbidity and mortality. Furthermore, epidemic forecasting has changed as a result of AI-powered platforms' increased capacity to precisely predict disease trajectories and pinpoint hotspots. Through predictive modeling and sophisticated data analytics, AI systems can forecast disease patterns and offer early therapies. Campaigns to promote public health are more effective as a result. AI has proven crucial not only for surveillance and prediction but also for reaction to outbreaks and containment measures. Artificial intelligence (AI)-driven technologies such as natural language processing and image recognition have enabled large-scale clinical data analysis, prompt diagnosis, and therapeutic decision-making. Furthermore, AI-powered contact tracing tools have made it easier to identify transmission chains, allowing for more focused actions to stop the spread of disease. AI has proven its adaptability in assessing and mitigating various new diseases, such as Zika, Ebola, and influenza, in addition to COVID-19. Artificial Intelligence (AI) technologies provide essential insights into disease dynamics, transmission patterns, and successful intervention techniques through the use of big data analytics, machine learning, and predictive modeling.

Keywords: AI-driven technology, COVID-19, emerging infectious, diseases, epidemiological data

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Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

AI-based predictive modeling for environmental & epidemiological monitoring

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Abstract

Artificial intelligence (AI) is a vast field of computer science that encompasses numerous subfields and techniques, such as machine learning, neural networks, data science, deep learning, natural language processing, and general intelligence. Predictive modeling combines statistical models and machine learning techniques. ML algorithms examine a variety of data sources, including social media and electronic health records, to find patterns and forecast the spread of diseases. EHR analysis is now increasingly using deep learning algorithms, which can evaluate complex data and produce highly accurate predictions. Instead of simple machine learning and artificial intelligence approaches, most researchers and writers now use advanced and complex algorithms for early warning systems, air quality prediction and environmental quality monitoring. Machine learning algorithms, sensor networks, and satellite imagery enable real-time monitoring and early detection of environmental hazards. While the opportunities of ML and AI in environmental & epidemiological monitoring are promising, the growth of complex data-driven prediction models requires careful quality and applicability assessment before they are applied and disseminated in daily practice. Also, issues related to data security, algorithmic biases, and the ethical use of AI are critical considerations that need to be addressed. A balanced approach thus needs to be adopted that respects individual privacy and data security while leveraging the benefits of AI for public health.

Keywords: Data security, Machine learning, Prediction models, Real-time monitoring

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Application of AI in the field of Neuroscience

RS-GIS-AI-24-P21

Artificial Neural Network (ANN) and its application in animal call pattern differentiation and species identification - An inspired solution from personalized marketing and facial recognition

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Abstract

Scientific data processing through integration of disruptive technologies are increasingly being considered a part of mainstream research studies due to the virtues of high accuracy and flexibility. The dynamic nature of biodiversity based studies has been faced with challenges of low quality data to differentiate species abundance for decades through the conventional manual techniques of data management and handling. Habitat and differentiation specific characterization of species diversity can be achieved through distinctive features including variations in call pattern and mating behaviours. This review has specifically focused on the area of animal call pattern differentiation for species identification as an effort to support biodiversity and conservation.

Artificial Neural Network based detection, abbreviated ANN, is a technological intervention used extensively in determination of variations in the bird call pattern. The machine learning based intervention is an interconnected network of nodes or units with an input and output interface that can be used to transform a large dataset of raw bird call audio samples into observable data with common visible patterns. The training data is initially fed into the Neural Network in order to assign weights and values to each node within the hidden layer, termed bias. Then activation function is assigned to each bias as a primary step in the data identification process. Consecutive forward and backward propagation to analyse errors in the training data is performed to increase the predication accuracy. Through a comparative analysis of training data samples with the raw input data alongside use of features including noise clearance and amplification, it is possible to identify bird calls with significant accuracy. ANN is an advantageous machine learning method as it allows production of output even in case of inadequate data. Thus the present study has been focused towards utilization of the mechanism of bird call identification technique to develop a database for other animal call patterns as an initiative to understand species diversity within a habitat.

The current study has also focused on overcoming the gaps in ANN that includes over fitting, high computational burden, imbalances in database or constraints of computational resources to accurately determine call patterns of animals. The main motive is to understand the beneficial aspects of the innovation to overcome the constraints of manual data handling and misinterpretation of animal call characteristics.

Keywords: Artificial neural network, biodiversity, call pattern recognition, conservation, species identification

Application of AI in Studying and Predicting Neurodevelopmental Disorders (NDDs)

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Abstract

Neurodevelopmental disorders (NDDs) pose significant challenges owing to their early onset and profound impact on individuals' lives. Conditions like autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD), intellectual disability (ID), and specific learning disorders (SLD) affect brain function, cognition, behavior, and social interaction. Timely identification and intervention are crucial for managing these disorders effectively. Artificial intelligence (AI) has emerged as a powerful tool for studying and predicting NDDs, offering innovative approaches across various domains.

AI applications in NDDs range from early detection and diagnosis to personalized treatment planning. Machine Learning (ML) algorithms analyze diverse data sources, including behavioral assessments, genetic information, brain imaging, and speech patterns, to detect early signs and symptoms. For instance, serious games like the Smart Speech project evaluate children's speech and linguistic responses to predict neurodevelopmental disorders effectively.

Predictive modeling based on longitudinal data integrates genetic, environmental, behavioral, and neuroimaging data to forecast the trajectory of NDDs and inform treatment strategies. AI algorithms analyze neuroimaging data to identify structural and functional brain alterations associated with these disorders, providing insights into their underlying neurobiology. Personalized treatment planning utilizes AI-driven decision support systems to tailor interventions to individual needs.

Additionally, AI facilitates behavioral interventions through virtual coaches and therapeutic agents, enhancing social skills and cognitive development. It enables risk assessment during pregnancy, aiding in early interventions. Assistive technologies powered by AI enhance independence and quality of life for individuals with NDDs.

Challenges such as variability, heterogeneity, and ethical considerations persist in implementing AI in clinical practice. Nonetheless, ongoing research and collaboration among AI scientists, clinicians, and neuroscientists promise to harness AI's full potential in addressing the complex challenges of NDDs. As AI continues to evolve, its role in understanding and managing neurodevelopmental disorders will undoubtedly expand, offering hope for improved outcomes and quality of life for affected individuals.

Keywords: Artificial intelligence (AI), Detection, Diagnosis, Neurodevelopmental Disorders, Predictive modelling, personalized treatment

~ ONE DAY NATIONAL LEVEL SATELLITE SYMPOSIUM ~
Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

Acknowledging the human mind without a human mind: Neuroscience inspired AI

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Abstract

Artificial intelligence (AI), a branch of computer science dealing with the machine has problem-solving and decision-making capability, very similar to the stimulation of human intelligence. We know about AI and neuroscience; they develop in their paths but are destined to intersect. This has drawn a lot of attention recently through data analysis and neuroimaging techniques. Neural networks are central to both AI and the human brain. We can stimulate our cognitive processes through AI-assisted learning. The brain-computer interfaces, connecting the brain to the external devices, have the potential to transform the lives of the people by helping a paralyzed person to operate their prosthetics and interact to the world with their thoughts. The healthcare system benefits a lot from the convergence of AI and neuroscience. As there are challenges to diagnose the neurological disorders, the AI outshines here by using machine learning a vast number of databases and markers that can escape a human observation. As a result the diagnosis accuracy increases causing better patient outcomes. Despite diagnostics, AI in neuroscience can also be used for treatment by its analysis of the brain character taking into account the unique complexities of each patient's brain. Meanwhile, these possibilities are exciting enough, they raise serious ethical concerns. Brain data contains very personal information that needs strict privacy safeguards. AI can detect the pattern of emotions which requires sensitive handling. A balance between advancing knowledge and protecting privacy should be maintained by bringing onboard the ethicists, neuroscientists and AI experts. Brain-machines bridge the gap between AI and neuroscience that can reshape human capabilities making limitless potential in near future which brings us closer to unravel the mysteries of human brain.

Keywords: Artificial intelligence, cognitive process, neurological disorders, neuroimaging, neuroscience

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**Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences**

RS-GIS-AI-24-P24

Mapping the Unseen: Application of AI in Brain Computing Associated with Neurological Disorders

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Abstract

Artificial Intelligence (AI) is primarily considered as a branch of computer science that focuses on creating machines and systems which can perform tasks with the application of human intelligence and thus the synergistic outcome is more elevated compared to manual response. In relation to present review, brain mapping refers to the process of creating detailed structural images of brain highlighting the functional significance. Whereas Brain Computing Interface (BCI) is a new technology that allows the brain and computer talk to each other by transforming brain signal into relevant information in real time. Recent researches have focused in this area and elaborate its influence across various fields including neurological disorders. Till date, several attempts are being made to associate AI and BCI together and search for some better results that are beneficial for humanity. Before the era of AI, areas of work on brain mapping in neurodegenerative and neuropsychiatric disorders, related patient monitoring, recognition of cognitive abilities and enhancement of emotional well-being were not up to the mark. AI and BCI have really explored new pathways in the treatment and management of diseases in this sector. BCI interprets neural signals, facilitating communication between the brain and external devices like prosthetics or chip-based biosensors. Due to obligatory human error, these processes might not be efficient enough. Application of AI will significantly reduce the chances of manual error. It polishes the accuracy, efficiency, and personalization in controlling these devices, enabling new possibilities for individuals with the disorders. AI-driven insights from brain mapping include rising versatility of personalized medicine, early diagnosis of neurological conditions, and targeted interventions for brain disorders. In the future, AI can help us understand the brain better by analysing its data and patterns. This could lead to early diagnosis and treatment of brain-related disorders, improved usage of prosthetics and bio sensors in this field, and deeper insights into areas of brain function, which are still beyond our imagination.

Keywords: Artificial Intelligence (AI); Brain Computing Interface (BCI); Brain mapping; Neurological disorders

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Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

Application of AI in the Field of Neuroscience

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Abstract

Neuroscience is a part of science that deals with the biological neural system i.e., the brain, its structure, and its cognitive function. Artificial intelligence (AI) is a computer system that is a simulation of human intelligence, gaining problem-solving and decision-making capabilities to that of the human brain. AI and neuroscience share a long, intertwined history of collaboration. The artificial neural network (AI) has versatile applications that led to significant advancement in visual processing, accurate models of working memory, computational psychiatry, and analysis of a large number of neuroscience datasets. Neuroscientists also actively utilize large-scale simulations based on artificial intelligence to test their hypotheses. One such application of AI is in the field of Neuro-oncology. A sub-discipline of AI, Radiomics is the analysis and interpretation of various medical imaging data such as Magnetic Resonance Imaging (MRI), Computed Tomography (CT), and Positron Emission Tomography (PET) scans to detect and characterize brain tumors. By analyzing image data and clinical information and extracting hidden patterns from patient scans in a vast database of known cases. AI algorithms can potential diagnosis and prognosis assisting oncologists and radiologists in accurately assessing tumor size, location, and characteristics. Since the imaging data are automated and computer-generated data, compatibility increases independent of the experience level of the evaluating clinician. AI can recommend personalized treatment strategies tailored to individual patient profiles by analyzing patient-specific data such as genetic information, clinical history, imaging results, and clinical parameters. This aids oncologists in creating an optimal treatment plan that includes determining adequate chemotherapy or radiation regimens, selecting appropriate surgical approaches, and locating potential targets for targeted therapy. Furthermore, AI algorithms allow healthcare providers to predict disease progression by identifying biomarkers associated with prognosis and survival so that the treatment plan can be adjusted accordingly. Another application of AI is accurate drug discovery and development of brain tumors. In conclusion, AI in the field of Neuro-oncology and Neuroscience holds tremendous potential to revolutionize the diagnosis and treatment that ultimately improves patients' quality of life. However, continued research is essential to validate and realize the full potential of AI technologies in Neurosciences.

Keywords: Artificial intelligence (AI), Neuro-oncology, Neuroscience, Radomics

RS-GIS-AI-24-P26

Natural and artificial intelligence - neuroscience inspired deep-learning

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Abstract

Development of neuroscience and AI are coupled since AI draws inspiration from the brain configurations and functions. In fact, networks in AI are modeled after the neural circuits in the brain. Artificial neural networks (ANN) are brain-inspired, multi-layered, hierarchical information processors that can receive, process, deep-learn from data, recognize patterns and make decisions. Cognitive ability of brain is one of the highest features that are nowadays replicated by AI to incorporate deep-learning attributes to conventional algorithms. This bidirectional relationship between neuroscience and AI enhances our understanding of both fields. Achieving biological plausibility, neuromorphic computing abilities, brain-computer interfaces (BCIs) are the ultimate goals of AI. In course, Preparation of a software integrated to hardware, as a solid or a hologram model, aiding in the understanding of the neural mechanisms and regions in detail has been proposed. Therein, an inbuilt program will be able to encapsulate the stimuli to different responses as commands that in turn can be sequestered within the model revealing the area activated for response. For that, the AI will draw information from every web-based source and attest each stimulus to a specific brain parts. A congregation of such responses of related stimuli can help us map the region that is precisely associated with a specific activity initiated by a specific stimulus. This will be the stepping stone to understand the activity and expression of the spatially regulated genes and validated in a relevant animal model like that of a zebrafish. Since the growingly intense architecture of AI deep-learning platform are more perceivable to science unlike that of brain, it can start feeding back to neuroscience and help neuroscientists to address the unsolved problems.

Keywords: Artificial neural networks (ANN), deep-learning, commands, hologram model, neuroscience, zebrafish

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**Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences**

RS-GIS-AI-24-P27

Unrevealing the potential role of Artificial Intelligence in Parkinson's and Disease: from Disease Diagnosis to Treatment

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Abstract

Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized by motor and non-motor symptoms, affecting millions of people worldwide. PD results from the selective loss of dopaminergic neurons in SNpc region of midbrain. Presently PD has no cure and early detection and management of PD still continues to be a challenge. The application of Artificial Intelligence (AI) in PD has emerged as a promising avenue, offering innovative solutions to improve patient care and outcomes. This work investigates the implication of AI based technology in PD diagnosis, management and treatment. Researchers have used machine learning (ML) with metabolomics data and developed interpretable neural network framework to accurately predict PD from blood plasma much before the appearance of the clinical symptoms. ML was used to analyze the MRI data and was found to distinguish PD from healthy controls in just one minute. Using the breathing pattern, AI based technology is now capable of detecting and assessing PD. Wearable devices equipped with AI algorithms track motor fluctuations, medication adherence, and disease progression in real-time, facilitating timely adjustments to therapy regimens In recent years Deep brain stimulation (DBS) has emerged as an effective symptomatic treatment of PD. DBS is a surgical method recommended for advanced PD patient. However many factors affect the success of DBS, including candidate selection, accurate placement of electrodes, and programming process. AI is now being used to extract parameters and predict the appropriate program for each patient which can play an essential role in improving the outcome of DBS. Despite significant progress, challenges such as data privacy, model interpretability, and clinical integration hinder the widespread adoption of AI in PD care. In conclusion, the application of AI in PD detection, management, and treatment holds great promise for revolutionizing clinical practice and improving patient outcomes.

Keywords: Artificial Intelligence (AI), Parkinson's disease (PD), neurodegenerative disorder, Deep brain stimulation (DBS), patient care

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Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

RS-GIS-AI-24-P28

Artificial intelligence: yet not a match for human intelligence

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Abstract

Although initially promising to imitate the human brain, artificial intelligence (AI) encounters fundamental barriers to meeting its desired goal, yet it attempted to simulate brain-like neural networks, decision making and information processing. AI has emerged and has been evolving as a remarkable tool for the human race to ease voluminous, repetitive work patterns, and somewhat substitute human intelligence. Although AI is profoundly inspired by the neurobiological representation of the brain, surprisingly, these brain-mimicking models have never achieved a satisfactory performance, likely due to their over-simplification of the real neural system. Compared to an average three-pound human brain AI systems often have shortcomings since they rely on binary computing while the former works on quantum computing. Quantum equivalent computing in the brain solves complex programs whereas AI is still trying to overcome binary limits. Moreover, recently discovered mirror neurons present a new fresh approach to the cognitive ability of the brain. The auditory and visual inputs can both activate mirror neuron clusters of the brain. The interaction of the motor with mirror neurons remains an ongoing challenge towards research in brain functions. Using fMRI studies in autism and normal individuals mirror neurons are marked as responsible for emotion, empathy, recognition and complex cognition. The present age of AI fails to explain the understanding of consciousness of the human brain. AI has certainly been inspired by brain configuration yet it is not quite able to interpret the softer functioning of it. This may be in the binary limitation or its computing matrix. The future evolution of AI will surely attempt to overcome all these difficulties, and in unfolding time, we can hope to encounter more robust and conscious versions.

Keywords: Artificial intelligence, Binary limits, Human intelligence, Mirror neurons, Quantum computing

RS-GIS-AI-24-P29

Scope of Nanotechnology using silver Nano particles and Neuro-Degeneration

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Abstract

Nano particles are small particles majorly of spherical shape, ranging in the size of 10-500 nm. Over the years they have been used quite a lot for their high surface area to volume ratio. In the recent era their main application includes the treatment of neurodegenerative diseases like Alzheimer and Parkinson's disease. The prevention of metastasis of Cancer cells have apparently proved to have revolutionized the world, but very little have been thought of or experimented regarding their ill effects in our body specially on neuron. Among all the nano particles used over these years, there has been a trend to use metallic nanoparticles for their low cost but higher functional capabilities, but these pose even more danger to our body. In our body the Blood Brain barrier separates the Blood from cerebrospinal fluid. They restrict the entry of Hydrophilic compounds into our brain but these nano particles due to their extreme small size and evasive nature can penetrate through the Blood brain barrier and enter our brain causing devastation. For instance, the CdSe nano particles cause huge elevation in $ca2^+$ level and causes complete impairment of Na^+ channel in hippocampal neuron. The CB nano particles which are an important constituent of Nano tube escalates the glutamate and ATP release activating the Connexin and Pannexin hemichannels in astrocytes. Iron Oxide nanoparticles eventually leads to Alzheimer while the silver nanoparticles lead to Parkinson's disease. In this poster we discuss about the potential threats posed by silver Nano particles on our neuronal system.

Keywords: Neuro degeneration, Nano particles, Blood Brain Barrier, Alzheimer and Parkinson's disease.

~ ONE DAY NATIONAL LEVEL SATELLITE SYMPOSIUM ~
**Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences**

Application of Remote sensing & GIS in studying animal distribution, migration ecology & habitat mapping

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Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

RS-GIS-AI-24-P30

Harnessing Artificial Intelligence for Advancements in Ethology and Wildlife Biology

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Abstract

The integration of artificial intelligence (AI) and machine learning (ML) into wildlife and animal behaviour or ethology research is transforming our understanding of the animal kingdom. This review delves into the innovative applications of AI in studying animal behaviour and wild life biology. Researchers are now leveraging AI to explore how animals move, sense their environment, migrate, and more, marking a significant shift from conventional research methodologies to more advanced, technology-driven approaches. AI is now being used to predict how moth neurons respond to different chemical mixtures. AI is also used to track individual bumblebees, monitoring their behaviour in high temperatures that simulate heat waves. Such studies not only provides insights into how bees adapt to changing environmental conditions but also highlights the role of AI in addressing broader ecological challenges. A notable application of AI in the realm of conservation biology is the study of zebra movements. An open-source tools that utilize AI for capturing and analyzing animal behavior in the wild is used to gain insights into migration patterns, social structures, and habitat use. This information is crucial for developing effective conservation strategies, ensuring the protection of these species and their ecosystems. The future of biological research, powered by AI, promises not only a deeper understanding of the natural world but also practical solutions to some of the most pressing challenges in wildlife biology and animal behaviour. The journey of AI in biological research is an exciting testament to the limitless potential of collaboration between technology and the natural sciences

Keywords: artificial intelligence, machine learning, ethology and wildlife.

RS-GIS-AI-24-P31

RS-GIS can reveal dynamics of Island Land Use Land Cover Patterns to Monitor Mangrove Forests and associated Biodiversity in Sunderbans

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Abstract

Sunderbans experience continuous silt deposition and erosion resulting in continuous change in the Islands' landcover patterns. Mangrove vegetation and associated biodiversity also experience rapid decline or shift with the changing geo-morphology. Across this vast landscape of inaccessible island systems and dense mangrove forests, it often becomes difficult to monitor the reserve physically. Using satellite imagery of higher spatial resolution by RS-GIS technique better management plans can be designed and implemented in micro-level forest management. Haliday Island Wildlife Sanctuary is one of the smallest protected areas of India converted from a British Game Sanctuary on a Southernmost Island of Indian Sunderbans. This island harbours a unique landscape with Ecotone biodiversity of Mangrove Forest and Intertidal Ecosystem. From the satellite imagery available, it is clear that with time the area of the mangrove forest on this island has decreased (more than 99% decrease in landcover) and the intertidal zone increased subsequently. There must be a shift in the faunal composition and diversity simultaneously. Since the designation of Haliday Island as Wildlife Sanctuary, there was no biodiversity data available which induced the present attempt for an extensive survey of the island both for flora and fauna. The survey was conducted in three different seasons to document diversity and understand seasonal fluctuations. Total 8 species of Mangrove trees, saplings and propagules and nearly 120 species of animals were recorded during the survey. In addition, several old tree trunks exposed due to erosion, human artefacts, animal and human remains were found during the expedition. Our observation indicates similar results from the GIS about the gradual shift in the faunal composition from mangrove forest and mudflat towards an intertidal ecosystem. Further RS-GIS data can help to monitor the island and other similar islands within the biosphere reserve in similar manner for better conservation and restoration planning.

Keywords: Haliday Island Wildlife Sanctuary, Sunderbans, Satellite Imagery, Google Earth, Island.

RS-GIS-AI-24-P32

Ants habitat mapping using Remote Sensing and GIS

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Abstract

Ants' form one of the very dominant & largest section of the insects belonging to the endopterigota group with more than 10,000 described species. Ants reveal the status of the ecosystems and are considered as good biological indicators. This necessitates spatial distribution analyses along with mapping of its habitats. This helps to understand ant geography and also to determine the kind of the stress levied on the ecosystem. This research is being carried out in the tribal people-residing areas of Purnapani and Jorum forests of Jhargram District (formerly Paschim Medinipur) of Jangalmahal under Binpur-I and Binpur-II blocks (22036'0 North, 86055'0 East) in the West Bengal State, India. To analyze the spatial distribution of ants, a converging sampling strategy was adopted in four radial directions. Each of those were marked using a GPS (Global Positioning System). The ants were then identified and the pooled data of various sampling techniques (pitfall traps, leaf litter, etc.) were quantified to compute Land Scape Element wise species richness and composition. Data analysis results reveal that ant species richness increased where a mosaic of habitats (more diverse habitats) were present. Arboreal ants as *Oceophylla smaragdina* and Polyrhachis species are present in heterogeneous forest patches but are totally absent in monocultures (like plantations, etc.). Scrub jungles are deprived of all species of Leptogenys. This reveals the intra and inter linkages of landscape elements with species distribution, which is essential for conservation of endemic, rare and endangered species of flora and fauna. This endeavor demonstrates the application of the spatial analyses tools such as GIS, GPS and remote sensing data in habitat mapping and spatial distribution analyses of biodiversity. These exercises help in evolving the appropriate conservation and restoration strategies for the sustainable management of ecosystem.

Keywords: Ants, biodiversity, global positioning system, Jangalmahal, Jhargram, habitat mapping

Remote Sensing and GIS: Pioneering methods for the Tripartite Study of Animal Distribution, Migration and Habitat Mapping

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Abstract

The methods to achieve reduction in biodiversity loss, conservation and protection of species include gathering information about the extent of habitats, studying migratory routes, species richness and diversity in a geographical region. Data in regard to these attributes can be monitored using remote sensing and Geographic information system (GIS). These computer-based tools incorporate data into analytical figures, graphs and charts associated with the movement and distribution of animal species, explaining species–environment interactions. GIS and remote sensed imagery review the presence of dominant and cover species, their abundance and richness, besides tracking their routes and modelling habitat quality and ecosystem health. These tools allow precise monitoring of animal movements, habitat distributions over spatial extents of large geographical areas and places where traditional data collection systems fail to suffice the time and resource constraints. Remote sensed imagery resolved using GIS facilitates the assessment of habitat suitability, identification of migration corridors, and evaluation of anthropogenic impacts on wildlife. The use of satellite telemetry to monitor the movement of terrestrial and avian species across continents provides predictive ability in identifying new habitats and abandoned spaces. It further explores how habitat mapping aids in identifying critical areas for protection and formulating conservation strategies. Geoinformation Science for habitat quality analysis have evolved from isolated experimental designs and become actively operational in vegetation classification, restoration planning, migration ecology and conservational biology. Remote sensing and GIS are expected to be frontiers in delineating new methods that would contribute to active field research in community ecology. This paper tries to delve deeper into the role of remote sensing & GIS in tracking seasonal migration ecology, habitat mapping and understanding of wildlife patterns. Thus, they can serve as indispensable tools in wildlife conservation and formulation of conservation strategies, offering a holistic approach to preserving biodiversity and ensuring ecosystem sustainability.

Keywords: Biodiversity, Conservation, Migration, Geographic information system, Remote sensing

RS-GIS-AI-24-P34

A GIS Approach to Understand Fish Distribution, Migration and Remote Sensing in Fish Habitat Mapping

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Abstract

Remote sensing and GIS are robust tools which offer the ability to derive information on fish habitats across broad geographic areas and have the potential to transform approaches for better monitoring. An attempt to improve information regarding fishing grounds and educational outreach is through modelling the oceanographic parameters like Sea Surface Temperature (SST), Sea Surface Height (SSH), Sea Surface Salinity (SSS), Chlorophyll-a (CHL-a) which can be derived from MODIS/Aqua images of fish distribution using GIS. These parameters heavily affect the fish migration pattern and thus depicting the overall habitat of a specific fish species like Salmon, Tuna, Swordfish, Mackerel, Trout, Lamprey etc. Application of GIS, remotely-sensed imagery and statistical models in fisheries oceanography are also widening the scope of marine studies in time and space. The identification and protection of habitat is of critical importance to the management and conservation of fish species. Across the globe, there has been a marked increase in the variety of platforms to mount remote sensors. The platforms range from ground-based sensors which help to acquire optical or LiDAR data to UAV's. Space-based platforms can include stand-alone satellite platforms such as International Space Station. Acoustic remote sensing techniques sample the aquatic environment producing images which describe the vertical distribution of resources. Some of the applications of this process are fish stock assessment, habitat mapping, migration and spawning pattern analysis, biodiversity monitoring and conservation planning. Some of the image processing and GIS software available to analyze remotely-sensed oceanographic data are ArcGIS, Erdas Imagine and Idrisi which are commercially available. On the contrary, generic mapping tools (GMT), SeaDAS and GRASS are freely available to download from the internet.

Keywords: GIS, GIS Softwares, Fish Habitat, Remote Sensing

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Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

GIS & AI in Agroecology, Forestry, Entomology & Fisheries Science

Journey from traditional fish farming to smart fishing: Impact of Artificial Intelligence (AI) and Geographic Information System (GIS)

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Abstract

"Smart fish farming" refers to a new scientific discipline that aims to maximize resource efficiency and sustainable growth of aquaculture. Traditional fish farming methods include data collection via fisheries logbook and human observations; both displaying certain limitations. Though these methods serve the purpose and give rise to huge data but it often has several discrepancies, both qualitative and quantitative in nature. Thus, resulting in illegal fishing, improper fishing grounds, inappropriate cultivation techniques to name a few. To overcome these problems, both Artificial intelligence (AI) and Geographic Information System (GIS) tools have provided a new impetus towards better fish farming. They are used for a faster and more accurate data monitoring system that leads to better results in aquaculture. To utilize the full functionality of these high - end softwares, marine environment and climate change must be checked along with proper social development, policy making and awareness among fishermen. These AI and GIS tools have various applications in each step of a successful aquaculture farm. AKVA Observe is software that uses AI to help feed fish more efficiently. eFishery smart feeder is an automatic feeder that senses hunger level of fish and shellfish. FarmMOJO is an AI-powered mobile application (app) that is used to improve efficiency in aquafarming. AquaCloud is an innovation platform that combines the knowledge of fish health managers, researchers, and data scientists to provide fresh insights. Softwares such as XGBoost, LightBGM etc. are used to monitor the fishing vessel behaviour as a part of vessel monitoring system (VMS) and Automatic Identification System (AIS). VMS and AIS are also helpful tools that assist in the searching of proper sites for fish harvesting. Other AI tools such as Drones, Robotic cages are also used for monitoring and checking the water conditions and providing the fish ingredients that are important. AI and GIS have the potential to drive the future of aquaculture, addressing the global food security challenges while minimizing the environmental impacts. The aim is to attain sustainable growth in aquaculture and move towards the goal of achieving the coveted blue revolution by the year 2050.

Keywords: Artificial Intelligence (AI), Automatic Identification System (AIS), Fisheries, Geographic Information System (GIS), Smart Fishing, Vessel monitoring system (VMS)

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Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

Forest fire prediction and prevention - mixed niche for remote sensing and artificial learning

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Abstract

Wildfire has a dynamic role in ecological processes such as in succession events. However, they cause huge damage to biodiversity and ecosystem services. Accurate predictions of wildfire incidences are immensely important since events of extreme wildfires have become increasingly frequent in recent years. Factors which determine wildfire growth rates depend on numerous meteorological factors, topography, fuel characteristics, fuel load, fuel moisture content (FMC), invasive species as well as man-made. Fire progress can be slow, up to a few meters/hour, or rapid, consuming several hectares/ hour. Though various wildfire risk indices for managing such disasters are being used in different parts of the globe, there is no foolproof model for all weather and geographical conditions. With the advent of artificial intelligence (AI) coupled with the progress of remote sensing – geographic information system (RS-GIS), ecological disaster management has started to evolve for precise prediction and deploying combating strategies. Advanced machine learning (AML) models showed promise in predicting non-linear phenomena where plenty of factors interact with each other, non-linearly. Wildfire behaviour was found to be the outcome of non-linear interactions, thus recognized as a fit case for AML. Global wildfire datasets and predictors such as temperature or relative humidity are processed through AML computation systems to predict fuel characterization, fire detection, wildfire preparedness and response, fuel treatments etc. Additionally, the pre-fire conditions (fuel type, fuel moisture content, topography, proximity to roads and urban areas) can be monitored using remote sensing. The use of optical and thermal remote sensing comes in handy for wildfire hotspot mapping. Normalized difference vegetation index (NDVI), fire weather index (FWI) drought-related variables, greenness data, evapotranspiration rates etc. are remotely retrieved as satellite data contribute to wildfire prediction and prevention. Successful application of all these could transform our wildfire combat strategies and keep biodiversity resources intact from devastation.

Keywords: Artificial intelligence, advanced machine learning (AML), remote sensing, wildfire

Recent Trends in Fishery Management and Conservation: Role of GIS and Remote-sensing

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Abstract

RS-GIS is the coalition of hardware, software, data and personnel which helps in the collection, storage, manipulation, analysis and display of certain data. The spatiotemporal nature of fishery problems can be well understood and addressed with RS-GIS technology as an important analytical tool involving spatial and temporal data management. The unique capability of RS-GIS to integrate multi-disciplinary data set brings in new approach in the establishment and implementation of analyzed data for the betterment of fisheries industry. Fisheries RS-GIS is the integration of GPS and Remote Sensing technology with the different disciplines of modelling and geospatial statistics. In the geo-reference data can be in picture or vector format and can be used in the monitoring of fisheries component or proposing of fisheries management schemes. Monitoring includes the monitoring of fisheries production through different data mapping, oceanographic processes, social economic information and fisheries law and policies. RS-GIS help to understand the important relations between the species population dynamics and oceanic process or the species abundance and fisheries socioeconomics or the species population dynamics and fisheries policies. The application of Remote Sensing and RS-GIS in fisheries can be said to be as the site selection for aquaculture or mariculture, modelling of fish activity and movement, management and conservation of marine resources to find potential fishing zones and many more to be listed. RS-GIS can help to clarify the problems and lead to the solutions with the help of many spatial components that can be used for monitoring and analysing factors that pose significant operational and management challenges to fisheries.

Keywords: Data management, Fishery conservation Fishery socioeconomics, Geospatial statistics, Population dynamics

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**Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences**

Remote Sensing & GIS as A Tool For Sustainable Aquaculture Management using Predictive Disease Transmission Model

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Abstract

Remote Sensing and Geographic Imaging System (GIS) are extremely beneficial tools in terms of analysing and assessing various parameters in fishery sciences and aquaculture management. Remote sensing data, such as satellite imagery, can provide valuable information for selecting suitable sites for aquaculture operations. On the other hand, GIS can be used to analyse various factors such as water quality, temperature, salinity, and proximity to pollution sources which can be utilized to formulate predictive models to forecast the spread of diseases based on various environmental conditions. The space borne satellites or airborne drones equipped with several automated sensors like Coastal Zone Colour Scanner (CZCS), Multi-spectral scanner (MSS), Thermatic mapper (TM), High resolution visible imaging system (HRV), Lidar, Radar etc. provide researchers with high quality photographs and information related to surface temperature, vertical and horizontal circulation features, salinity, oil pollution, sea state and other surface optical properties viz. total suspended matter, chlorophyll pigments, macrophytes etc. GIS incorporated with an expert knowledge system can also help in tracking and monitoring the spread of dangerous diseases across a collection of fish farms, which is further confirmed by several recent studies. Studies suggest that RL (Reinforcement Learning) framework, enhanced by the Multi-Armed Bandit (MAB) technique, stands out as a powerful mechanism for effectively managing the flow of virus transmissions within farms at a ~96% accuracy rate. By integrating data on environmental conditions, aquaculture practices, and historical disease outbreaks, predictive models can estimate the likelihood of disease spread within aquaculture facilities and neighbouring water bodies. This information enables aquaculturists and farm managers to implement targeted control measures and develop effective biosecurity protocols to prevent any further transmission.

Keywords: Aquaculture management, Biosecurity Protocol, Disease transmission, Multi-Armed Bandit technique, Reinforcement Learning, Water quality parameters

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Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

Role of artificial intelligence in development of Anti-Poaching strategy to conserve wildlife

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Abstract

According to a report from the UN, animal poaching is a global business. It is lucrative, with high demand driving high prices and extremely widespread. The need to stop wildlife trafficking has gained momentum in recent times. Thanks to AI, organizations and state governments can leverage technology to make use of limited resources and take a better approach to catching poachers and to conserve wildlife. AI and machine learning are playing a key role in assisting law enforcement to take a smarter approach to tracking poachers by being several steps ahead of them. AI can use previous poaching data to identify patterns and predict where the poachers will strike next. One of these systems is PAWS (Protection Assistant for Wildlife Security). PAWS (Protection Assistant for Wildlife Security) is a system which uses poaching data from the WWF's open SMART (Spatial Monitoring and Reporting Tool) and uses game theory in which the player must optimize limited resources to maximize protection against threats and attacks. Artificial intelligence (AI) has been identified as one of the 'top three rising technologies being used in conservation' today, eliminating the manual task of gathering wildlife data and

helping park rangers protect endangered species from being poached. AI could be the solution needed to effectively monitor and safeguard vast landscapes across globe until now, have been protected solely by patrolling. Computer vision cameras are great tools that can help park rangers and organizations detect and prevent animal poaching. TrailGuard AI offers cameras that can stop poachers in their tracks. It is already being used in national parks to protect wildlife, apprehend poachers and even help government agencies break up illegal organizations that are profiting from the illegal trade of animals. The TrailGuard AI camera uses tiny Intel Movidius Vision Processing Units (VPUs) for image processing, running deep neural network algorithms for object detection and image classification inside the camera. If the camera detects humans among the motion-activated images, the camera triggers electronic alerts to park personnel so they can mobilize rangers. Thus AI nowadays is considered as digital patrolling system and is going to contribute a great deal in wildlife conservation near future.

Keywords: Artificial Intelligence, Anti-Poaching, Digital Patrolling Wildlife conservation,

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Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

RS-GIS-AI-24-P40

Role of remote sensing & GIS in climate change, green cover analysis, aquatic ecosystem monitoring & assessment

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Abstract

Geographic Information System (GIS) helps the user to create multi-layered interactive maps for complex data visualization and spatial analysis. It performs geographic analysis much better and faster through satellite imaging and mapping. Remote Sensing (RS) helps in observing the earth surface and atmosphere from space through satellite or from air using drones to record electromagnetic energy reflected or emitted by the earth's surface. In agriculture the major threat posed to crop production is the pest infestation and disease occurrence that could reduce global food security. But through GIS & RS early detection, monitoring and accurate prediction of the agricultural field can be done, helping the farmers to optimize control strategies and prevent loosing of crops, with better advancement in crop production. The climate change is a measure threat in recent years, thus GIS data is useful for predicting and understanding the environment and climate in making strategic decision. Forest disaster risk analysis & carbon management also be done. In monitoring water quality and aquatic ecosystem, GIS & RS plays a major role. With these systems the checking of water quality parameters such as suspended matters, phytoplankton, turbidity, and dissolved organic matter and also the water pollution measurement can be done. Therefore, GIS & RS utilization in understanding climatic condition, agricultural measurements along with aquatic ecosystems and water quality is a great advancement of scientific world to create a better nature and ecosystem.

Keywords: agriculture, aquatic ecosystem, geographical survey, climate change, GIS, RS

RS-GIS-AI-24-P41

Revolutionizing capture fisheries through implementation of AI-powered mobile application system: prospects for new age fisher-folks

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Abstract

Capture fisheries play a pivotal role in the livelihoods of fishermen worldwide, serving as a primary source of income, sustenance, and cultural identity, over 59.6 million people globally Due to lack of scientific alternatives, the mechanism, periodicity, yield and successive economic benefits of capture fisheries was significantly depleted, specifically in developing countries. This comprehensive overview tried to demonstrate the demo on the development of artificial intelligence (AI)-powered mobile based application for successful and guided commercial fish harvesting. The integration of AI can revolutionize fisheries management by enhancing the monitoring and prediction of fish stocks, enforcement of regulations, promoting sustainable practices. This application can map and predict the fish population from the baseline secondary data taken through several online sites, indirect/direct market survey and customize data generation techniques. Fishermen can easily take the review on spatial and temporal availability of fishes through navigation and the simultaneous selection of the fish gears will also be suggested by the application through prediction modeling. The selection of gear is immensely useful to minimize the caught and death of juvenile/pre-reproductive fish population. Even though, the species-specific market of value of collected fishes will be generated through continuous data surveillance modeling. Traditional methods for assessing fish populations often involve manual data collection, which can be time-consuming, labor-intensive, and prone to errors. By harnessing AI technology, fishermen can streamline this process, improving the accuracy and efficiency of population mapping while reducing the ecological impact of data collection activities. Additionally, the incorporation of meteorological monitoring system helps to guide the fishermen to select the proper collection spot and time. As a result, this application plays as welcome ticket and safeguard for upcoming youths in fisheries industries and foster sustainable enhancement of blue economy will be significantly through technological supremacy.

Keywords: Artificial intelligence, capture fishery, fishermen sustainable, yield

Application of AI and GIS: A Review Study on Recent Advancement in Fisheries and Aquaculture

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Abstract

Artificial Intelligence (AI) has been emerged as a giant techno revolution by associating with different experimental fields throughout the world day by day. Besides this, each year, there is a significant rise in demand for global food production due to population increase and a rise in demand for protein food sources. Thereby, fish is preferred as the best option for protein resource. Eventually AI has an immense application in aquaculture and fisheries like detecting water quality and chemical changes for screening of fish diseases, conservation of endangered fish species etc. On the other hand, application of Remote Sensing (RS) and Geographic Information System (GIS) is greatly important for mapping and visualizing fish species distribution and abundance, measuring rates of fish movements that provides information to manage population and for assessing habitat suitability in relation to physical (e.g. flow, depth, substrate) and chemical (e.g. temperature, dissolved oxygen) conditions. AI collaborating with RS-GIS, has a great impact in development of smart monitoring system which includes several cameras, sensors and data analytics tools. This whole system continuously collects correct data related to fish behavior, water quality etc. without providing any manual labour. RS-GIS plays great role in reading the fishes through vibration-based sensor and acoustic signal. Various feeding devices help the farmers to detect the appetite of the fishes. AI even also helps in tracking global fishing activity and maintaining sustainability in open sea fishery. Both AI and RS-GIS helps greatly in preventing illegal, unreported and unregulated (IUU) fishing cases in oceans throughout the world. In aquaculture, wastage of inputs can be managed through AI and cost can be reduced up to a beneficial rate. The aim of this review study is to discuss the importance of AI and RS-GIS applications for advancement of aquaculture and fisheries through its recent innovative techniques.

Keywords: Artificial intelligence, geographic information system, remote sensing, sustainability.

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Mapping the Invisible: Unveiling Termites & World with GIS and AI

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Abstract

This article/poster talks about differential spatial distribution of termites using AI and GIS remote sensing. Termites are the ecological engineers. In here, we have compared the fluctuations in termites species richness and abundance around the world, i.e., African Savanna, with different regions of India, i.e., Eastern regions, Kerala, Karnataka, Paschim Midnapur, Purulia, Andal, Kolkata. We are also going to discuss the termite migration (swarmming) structure of termatarium (w.r.t to size chambers and choice of environment) and how to differentiate mature and newly formed ones. Termites are eusocial animals having distinct division of labour inside their colonies. We can use advanced mid-infrared spectrometry and photogrammetry imagery to observe the colony structure from inside. The cross-sectional image analysis can reveal incredible design of termite colony. This briefly gives idea how we can predict habitat patches of termites using technology like they prefer damp habitats. The comparison will also reveal the importance of various environmental factors that regulate termite distribution. Why termites and termatariums are important and what their significant roles in ecosystem are also going to be discussed here. By this poster, we want to address the importance of termites as these tiny builders have immense ecological roles like soil and ground water indicators, help in bioturbation, etc. This also suggests implementing modern GIS and AI methods into India similar to Africa as India has still not used this, which is more precise.

Keywords: AI, Mid-infrared spectrometry, Bioindicator, Bioturbation, Remote sensing-GIS, Swarmming, Termatarium

RS-GIS-AI-24-P44

Exploration of Web Forming Behavior of Spider by AI, a Potential Approach for Better Utilization of Spider Webs in Biological Control of Insect Pest

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Abstract

Being a generalist predator, spiders are the most important component of biological pest control mechanism in both natural and agricultural ecosystem including caterpillars, beetle, bugs and others. A large segment of spider commonly known as web builder predate by means of the web formed through their spinneret, spigots, legs and other associated structures. Despite variability of web conformation in different niches, these webs are proteinaceous in nature, highly tensile and with many adaptive features to deceive their prey and trap them immediately. So, the most promising option for utilizing the predatory characteristics of web builders for the biological control of insect pests is to augment their webs within or surrounding crops to capture pests as much as possible like an artificial trap. Additionally, webs without presence of spider can catch prey. Architecturally, spider webs are utilized to cover the greatest surface area using the least amount of material. But as the web builders are nocturnal, the details of web building in different species except a few are almost unknown. Majority of scientists have studied orb weavers only. Artificial intelligence in conjunction with night vision can play an important role to reveal this. The ability to record in low light allowed the researchers to monitor and document every motion made by the web forming spider's leg. As a result, an algorithm that helps to explain how spiders can construct intricate, elegant, and geometrically precise webs have developed. It further explains how variations are created and how the web's catching technique flourish in nature
.

Keywords: AI, Biological control, Insect pest, Spider's web

RS-GIS-AI-24-P45

Application of Artificial Intelligence in the Surveillance of Beehive to Ensure Food Security

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Abstract

Almost one-third of the world's food supply is directly dependent on honeybee pollination. However, these honeybee colonies have alarmingly declined by nearly 40 % over the past decade due to several factors, including habitat loss, diseases, pests, pesticides, environmental changes, climate change and human intervention. Human inspection for monitoring beehives is disruptive and time-consuming in nature. To overcome these limitations, scientists are using Artificial Intelligence (AI) to track diseases and count bees. They are focusing on the methods of automated beehive monitoring particularly on the pollen and Varroa mite detection. It also observes bee traffic monitoring, which improves beekeeping and in turn saves money. An advanced high-resolution camera module can even listen to bee sounds and look at images to spot health problems and provide detection of entrance and exit events at the entrance of hives. An Attention-based Multimodal Neural Network (AMNN) is developed by integrating image and sound data in a comprehensive bee health monitoring system. This approach provides a more efficient solution for the early detection of bee diseases and the conservation of bee colonies. It further improves pollination services and maintains food security and ecological balance in the environment.

Keywords: AI, Beehive, Diseases, Food security, Surveillance

AI to Track Bark Beetle Has Revolutionized the Management of Agricultural and Forest Ecosystem

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Abstract

Bark beetles cause damage to forest mainly of cedar, fir, pine & spruce throughout the world particularly in Europe, America, China & a few areas of India. The amount of damage caused per year is US$ 2 billion in USA. To check these damages caused by bark beetles various control measures like physical, cultural, biological, behavioural and chemical etc. are applied. Among these, chemical method is widely used and reliable. However, it has some serious drawbacks like non-target species loss, environmental damage, high cost and involvement of large trained manpower. Under these situations, artificial intelligence is being used to track bark beetle in agriculture & forest ecosystem as well as to detect the health of the forest. Computer models can identify beetles present in crop fields & forest ecosystem in infested area only through image. AI assists to interpret the beetle's data capture by drone & it is more efficient than traditional camera or human eye. In a case study, two morphologically different bark beetles *Trogoderma variabile* Ballion & *Lasioderma serricorne* (Fabricius) were chosen for test detection. The study successfully achieved its goal to detect & identify small scale beetle, achieving a confidence level of atleast 70 % using a side-by-side comparison. The ability of the system to identify insects accurately could lead to more effective pest management practices, reducing harmful chemicals & improving crop yields & forestry.

Keywords: AI, Bark beetle, Damage, Forest, Management

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Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

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Application of GIS and AI in Agroecology, Forestry, Entomology and Fishing Science

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Abstract

Over the past years there has been an emergence of AI in combination with the GIS in many fields of science and technology as well as in our daily lives too. Combining AI with geographic information system (GIS) technology delivers real-world context to various operations in agroecology, forestry, entomology and fishery science. The application of AI has become an attractive alternative to traditional statistical methods for prediction and decision making in forestry. These methodologies help to analyse the past data and real-time information to accurately predict scenarios for risk, growth, or optimising operations for the same. Modern technologies like AI have contributed to remote sensing in agriculture, enhancing crop productivity and understanding climatic changes. Remote sensing supports the determining spectral signature of plants and helps to identify the stressed areas and impacts the sustainable development of the social economy, carbon cycle, climate change, ecosystem services, and food security. Geostatistics represent a valuable tool to investigate the spatial pattern of insect populations and to support pest control, which serves a potential approach in the context of IPM (Integrated Pest Management) in relation to future perspectives in future. The mapping potential fishing grounds off the coast using vessel trajectories and speeds as proxies for identifying migration patterns of fishes and fishing behaviour of inshore trawling vessels, where the vessel depicted steaming behaviour in this study and the characteristic of a recreational vessel with high speed, moving in straight paths rather than a trawling vessel whose movement occurs in slower and erratic trajectory patterns. Future research is required to be conducted to determine the emerging role of AI and GIS for the aforementioned. In addition there are more studies to be done in this field to unladen emerging technologies and their applications.

Keywords: Remote-sensing, IPM, Vessel-trajectory, Agriculture, AI-GIS, Forestry

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Study of Avifaunal Distribution: A Basic GIS Approach

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Geographic information system or GIS can help to understand various features on the earth such as roads, rivers, forests, states, animals, etc. on a computer. GIS is an important tool for wildlife management professionals to envision wildlife movement and their habitat ranges. It is now known for its extensive use in studying avifaunal diversity. In this present paper, point count survey data coupled with the GIS variables has been shown to predict the occurrence for each species of birds. India has approximately 1250 species of birds among which about 300 species of birds migrate across Himalayas from Tibet, China, Europe and Siberia during winters. Some of these birds fly over 5000 km and above 8500 metres high to reach India. The arrival of migratory birds starts from the month of November in different water bodies of India. By the end of February these migratory birds gradually start leaving for their respective destinations. Some resident birds stay here round the year, do nesting and lay eggs. Migratory Birds, such as, Pintail, Gadwall, Shoveller, Common Teal, Cotton Teal, Red-Crested Pochard, Brahmani duck, Coot and Mallard etc. are to be found in various places mentioned here. Besides these White Ibis, Black Ibis, Whistling Teal, Open billed stork, Spoon bill, Pheasant tailed jacana, Bronze winged Jacana, Purple moorhen, White breasted water hen, Indian Moorhen, Grebe, Cormorant, Darter, Lapwing, Egret, Purple heron, Pond heron, King fisher, vulture, Kite, Koel, Dove, Pigeon, Munia, Golden oriole, Barbet. Babbler, Indian roller, Bee eater, Parakeet, Drongo, Finch, etc. are the local birds. The current study is the basic approach to know how the avian diversity of different areas can be assessed with the help of GIS.

Keywords: GIS, avifauna, migratory, local

Application of Remote Sensing & GIS in Studying Animal Distribution, Migration Ecology & Habitat Mapping or GIS & RS: The Game Changer and Savior in the Field of Ecological Habitat Conservation, Animal Distribution and Migration

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Abstract

Geographic Information System (GIS) and Remote Sensing (RS) are used to capture, analyze, manage and represent different types of geographic data including the ecology of animal habitats, their migration and distribution. In the vast geographic area there are many wildlife habitats that are inaccessible through conventional methods as they are located in the zones, hard to reach. This causes a major problem in studying and gathering information of those habitats. This problem is solved by the satellite imaging and mapping and drone photography through GIS and RS. Due to changing environment and Global Warming, mainly due the man-made influences, animal migration face some difficulties, but GIS and RS can also sort out this problem by locating the migration routes, time and month and the habitat sites, that help in predicting the present and future problems to overcome. GIS and RS also helped in the survey related to animal habitat, their abundance, survival, endangerment and their conservation efforts, that lead the scientists to consult
for better management and assessment. Therefore GIS and RS systems play a role of game changer in recent time of conservation of the wildlife ecology and ecosystem.

Keywords: GIS, RS, Habitat, Migration, Conservation, Wildlife Ecology

Role of AI (Artificial Intelligence) in the Detection of Agricultural Pest

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Abstract

Agriculture plays an important role in economy and it is the backbone of the economic system for developing countries. Although there are many sophisticated technologies in the field of agriculture, still there is no proper technology to control the problems related to pests. To overcome this particular problem, an AI based pest detection model is designed. Artificial intelligence (AI) is the intelligence of machines or software, as opposed to the intelligence of living beings, primarily of humans. The purpose of this model is to further illustrate, through classification using an artificial neural network,
the effectiveness of acoustic approaches in pest detection. Visible inspections and trapping are two typical but time-consuming ways of pest detection, however they are only based on subjective perceptions. By collecting data on insect numbers and behaviour, the integration of cameras and sensors in AI-based pest monitoring systems enables more precise and rapid identification of infestations. IR sensors and sound sensor are employed to identify the presence of insects. Using artificial intelligence (AI) and the IoT (Internet of Things) is a primary focus of applied engineering research to improve agricultural efficiency. In this study, artificial intelligence and image recognition technologies are combined with environmental sensors and the Internet of Things (IoT) for pest identification. Real-time agricultural meteorology and pest identification systems on mobile applications are evaluated based on intelligent pest identification and environmental IoT data.

Keywords: AI, Biosensors, IoT, IR, Pest Detection

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Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

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Gajraj: An AI-Based Approach for Preventing Collision between Trains and Wild Elephants

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Abstract

Gajraj, an AI-based system, addresses the collision crisis between trains and wild elephants in key elephant corridors of India. Implemented primarily in 16 States/UTs, including Andhra Pradesh, Arunachal Pradesh, Assam, Chhattisgarh, Jharkhand, Karnataka, Kerala, Maharashtra, Meghalaya, Nagaland, Odisha, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, and West Bengal, the project focuses on reducing elephant mortality due to train collisions. Before the implementation of Gajraj, a total of 186 elephants were killed after being hit by trains across India between 2009-10 and 2020-21, highlighting the urgent need for effective interventions. It utilizes advanced AI algorithms, including computer vision and predictive modeling, to detect and track elephant movement near railway tracks. By analyzing historical data on elephant sightings and train schedules, Gajraj predicts potential collision hotspots and alerts railway authorities in real time. This proactive approach aims to reduce accidents and minimize elephant mortality. It offers a promising solution by leveraging AI to enhance situational awareness and enable timely interventions. Integrating Gajraj into existing railway and wildlife monitoring systems facilitates effective collaboration among stakeholders. This holistic approach aligns with conservation goals while ensuring safe transportation in elephant habitats.

Keywords: AI, Collision, Conservation, Gajraj, Elephant

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Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

AI based approach to conserve tiger - a paradigm shift

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Abstract

AI Technology has emerged as a promising strategy to help conserve wildlife, as it offers the capacity to deliver real-time data, enable swift responses, avert conflict and enhance the efficiency of wildlife-human interaction management. The technology, which sends alerts in real time, has been also developed in India. It was announced by the Global Tiger Forum, National Tiger Conservation Authority, Clemson University and NGO RESOLVE. RESOLVE claimed that the camera is small enough to be concealed along trails and can relay the photos of humans and animals to wildlife offices through GSM, long-range radio, or satellite networks. Tigers, known for their territorial nature, were once commonly observed as solitary creatures occupying a 100 sq km area. However, the rising tiger population, coupled with the diminishing forest cover and a decline in herbivorous prey, has posed challenges for these majestic beasts in their hunting endeavours. According to central government, the population of tigers in India has increased from 1,411 in 2006 to 3,682 in 2022. This has resulted in an elevated occurrence of tigers venturing into human settlements in search of easier prey. In response to the pressing issue, Valiance developed 'Wildlife Eye', an AI for Bharat initiative aimed at addressing real-world challenges in rural areas. This patent-pending, innovative, and first-of-itskind solution utilizes a combination of computer vision and artificial intelligence to identify potential animal encroachments and dispatch early alerts to first responders and villagers. TrailGuard is also an advanced AI based approach which is now used though out the world for combatting tiger poaching AI based smart camera was installed on the periphery of villages and human habitats that sends out alerts whenever it senses an approaching beast. That's exactly how this innovation works. Through a blend of computer vision and artificial intelligence (AI), potential animal encroachments are identified. The setup's smart AI cameras, hooters, red lights, LED lights, edge analytics, and power and communication panels facilitate the meticulous tracking and monitoring of individual tigers to such a degree that even specific behavioural shifts are identified. The AI camera has been placed in five tiger reserves, including Kanha-Pench in Madhya Pradesh. The help of Artificial Intelligence is being taken to reduce conflict between humans. The Main purpose of World Wildlife Day 2024 is "Connecting People and Planet: Exploring Digital Innovation in Wildlife Conservation. Prime Minister of India during his last address to the nation through his radio programme, Mann Ki Baat, said that digital innovation has been kept paramount in the theme of World Wildlife Day this year.

Keywords: Artificial Intelligence, Tiger conservation, Tiger-human conflict, Digital innovation

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AI-based bioinformatics tools is a new emerging area in fishery sciences: An in-silico analysis of Melanocortin Receptor (MC4R) of *Carassius auratus*

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Abstract

Bioinformatics and genomics are closely related areas of computational system biology in which artificial intelligence (AI) can exercise its full potentiality. Compared to conventional computational approaches in bioinformatics, AI offers an advanced toolbox that facilitates in problem-solving in various fields of biological sciences. Implementation of such an emerging area in fisheries can be useful for betterment of fishery sciences. For example: *Carassius auratus* commonly known as goldfish is one of most attractive fish used as ornamental fishes throughout the world. From the ancient times, the melanocortin system is considered to be conserved ranging from teleosts to mammals. Various researches in several fish species presented melanocortin receptors 4 (MC4R) is involved in different functions in fish body. Therefore, in-silico analysis on AI based bioinformatics tools of MC4R of *Carassius auratus* has been presented in the study to know the physicochemical properties and 3D structural confirmation of the protein. Sequence containing accession number XM_026207258.1 was taken from National Center for Biotechnology Information (NCBI) and then processed by various AI based algorithms of different web-servers to analyse its physicochemical characterization, secondary and 3D structural prediction of the concerned protein. The results suggested MC4R is a stable, hydrophobic and slightly basic nature of protein. The secondary structure of the analyzed MC4R protein suggested presence of 50.77% alpha helix, 19.69% extended strands and 3.38% beta turns along with 26.15% random coils. Moreover, it might be resolved from the Ramachandran plot that the structural prediction of MC4R is correct in prediction. Further, predicted 3D structure of MC4R protein can also be utilized for docking and simulation studies by utilizing more sophisticated AI based tools in bioinformatics area. Moreover, such studies reduce the gap between the sequence data and solved structures by X-ray crystallography and NMR spectroscopy, which are also tedious and expensive laboratory techniques as well.

Keywords: Artificial intelligence, Bioinformatics, Proteins 3D Structural Prediction, Utility in fisheries.

RS-GIS-AI-24-P54

AI tools in ethology – making investigations speedier, cost-effective and precise

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Abstract

Artificial intelligence (AI) is a rapidly evolving domain, engaging advancements in several arenas. The list includes the advancements in field of ethology too. This literature review aims to explore the usage of AI in ethological studies across the animal kingdom. Right from insects to mammals, there has been an array of published work that has used AI. Starting from tracking locations, AI algorithms have been used in data collection techniques, data decoding and predictive modeling such as the barcode based tracking of honey bees to that of larger mammals with the help of GPS to decoding video footages to identification of intricate behaviours in animals more effortlessly and accurately compared to the human eye. Moreover, AI algorithms can recognize alliances hierarchies that may not be immediately identified by human observers. Another such innovation is the introduction of the cutting edge tool- LabGym. Furthermore, deep learning models have been used to process a large amount of imagery data in fish behavior in a more time and cost-effective manner. Recent AI advances on fish behavior applied to fishing gear improvements such as Long Short-Term Memory (LSTM), Generative Adversarial Network (GAN), coupled networks shows the potency of AI to help meet the demands of fishing policies and sustainable goals. Inspite of AI being an efficient player in the field of ethology, it has some potential drawbacks to consider. AI systems heavily rely on data, and if the data used to train these systems are biased or incomplete, it can lead to skewed results. Relying too heavily on AI technologies can lead to a reduction in traditional observational methods in ethology. The application of AI in ethological studies look rather promising but whether this can be applied across all species is still an unanswered question. Overall this work summarizes the recent advancement of ethological studies that incorporates AI in exploring animal behavior.

Keywords: Ethology, AI algorithms, GPS, LabGym, LSTM, GAN

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Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

Role of AI in fish growth and health status monitoring

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8-Role of artificial intelligence (AI) in fish growth and health status monitoring

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Abstract

In the era of advanced technology, AI (Artificial Intelligence) tools are very helpful and scientific. Particularly in the field of fishery science, AI tools are more innovative for determining fish growth & health status. With the help of some advanced AI tools, we can evaluate more exact data regarding fish growth. In aquaculture industry, keeping fishes hazards & disease free is more essential. To maintaining fish growth it is useful to measure water parameters (Like: DO, Salinity, pH, Water temperature etc.) And maintain the right percentage of them. The water parameters are also useful because, if we can keep fishes disease free the rate of the chances of keep them alive is increases and maintaining right quantity of diet of fishes can directly related with the fish growth and health status. Some AI tools are catch recognition systems, aquaculture monitoring system, fish echo sounders with AI analysis. With the help of these we can determine the growth rate and good health status of a fish fauna.

Keywords: Artificial intelligence, Aquaculture, echo sounders fish growth

RS-GIS-AI-24-P56

Conservation of Fish and Fish Habitat: Role of Artificial Intelligence (AI) and Geographic Information System (GIS) in Sustainable Fish Growth

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Abstract

Fishes are one of the most promising aquaculture resources in our wide array of rich biodiversity and hence their conservation holds a special place in sustainable development of aquaculture. Conservation issues in fisheries can be addressed by combining approaches like telemetry i.e. attachment of electronic tags to fishes to track their movement, study of fish habitat with the help of Geographic Information System (GIS), that is a computer-based tool that allows us to create, manipulate, analyse, store and display information based on its location. Electronic tags can be non-lethally attached to fish and signals emitted from those can be recorded wirelessly by using a mobile receiver or stationary loggers. Some of these tags include Radio tags, Passive integrated transponder tags (PIT) and Global positioning system tag (GPS). GPS can be used to receive the actual spatial position of the fish via satellites. Data storage tags (DST, also termed archival tags), are tags with sensors that store the recorded information, Pop-up satellite archival tags (PSAT) and Predation Transmitter (acoustic tag) that are sensitive to predation events are also in use. When we talk about the conservation of fish habitats, the term microplastics is very important. They are currently a major threat to aquatic habitats because their ingestion by fishes reduces their fitness and increases mortality. These can be tagged with GIS to identify areas laden with microplastics so that increased conservation efforts are directed towards those areas. All of the data acquired through these sensors needs to be analyzed in order to act upon it. This analysis imposes a problem as huge amount of data must be analyzed and it becomes a cumbersome process for humans to manage such huge databases. Nowadays specialized statistical approaches like computing system R have been developed to assess spatial correlation and do movement data analysis. Similarly, there are softwares for analyzing data from GIS also. For example, ArcGIS software is a cloud-based mapping which is used to make 3D maps of the microplastic laden areas tagged with GIS. MODIS AQUA, based on the principle of theoretically elevated near-infrared (NIR) reflectance is used to identify microplastics based on their unique spectral signature. Tracking movement of fishes helps us to correlate their physiological processes, habitats, population and even exposure to predators and help us to learn about the quality of their environment through GIS. All this can further help us plan the conservation strategies. In conclusion, we can say that analyzing the data collected by electronic tagging and GIS by non- lethal sampling would act as a powerful tool in conservation practices of fishes and further enhance their growth and productivity.

Keywords: Artificial Intelligence (AI), Electronic Tags, Fisheries, Fish Conservation, Geographic Information System (GIS), Telemetry

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**Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences**

Transforming the Future of Aquaculture with Modern Day Technology - AI and GIS

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Abstract

This poster highlights the contribution of AI and GSI in aquaculture. Aquaculture is a significant industry that has grown rapidly all over the world, but it is not as simple as it may appear. Fish farming technology has reasonably advanced to improve itself and pave the door for other technologies to enter its field with the appearance of novel aquaculture technologies and with the increasing demands of aquaculture products technological applications that allow population densities management and optimizing culture management are currently the one possible solution to ensure production efficiency. Artificial intelligence in aquaculture is one such technology which will substantially free up human resources, increase current manufacturing efficiency, and aid in increasing output, product quality, and other conveniences. It can intelligently detect animals of various weights and stages, feed them differently increasing the output rate. "AI Sumagatsuo" using AI systems developed by Umitron with the goal of reducing production costs, in particular feed, and ensure a stable supply of fish, while encouraging more fish farmers to adopt AI powered by the Fish Appetite Index (FAI). GIS has been used in aquaculture studies to evaluate the suitability of coastal areas for farming activities. Aquaculture management issues such as the multiple uses of estuarine waters, studies about the impact of water quality and habitat availability aquatic life growth can be studied using GIS. The study on the need for biophysical, socioeconomic and environmental information on aquaculture potential suitable sites in the Lake Tana basin for aquaculture development using GIS, which serves as a great example showing the importance of GIS in aquaculture.

Keywords: GIS, AI, "AI Sumagatsuo", FAI

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Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

Role of Artificial Intelligence in Public Health Management

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Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

AI in the surveillance of Public health diseases

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Abstract

Public health surveillance plays a crucial role in early detection, monitoring and response to infectious disease outbreaks. Traditional surveillance methods often suffer from limitations such as delays in reporting and insufficient data. The integration of Artificial Intelligence techniques has revolutionized the field of public health surveillance by offering innovative solutions to overcome these challenges. Various AI approaches including machine learning, deep learning, natural language processing and data mining are utilized in the public health surveillance for effective and timely detection of public health threats. Technological and digital innovations have enabled the incorporation of climate data into surveillance systems, enhancing their capacity to predict trends in outbreak prevalence and location. Several countries face the challenges in maintaining surveillance due to their population pressure, financial and structural resources.

Keywords: AI, Public health, Surveillance

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**Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
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Artificial intelligence in diabetes detection and management

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In the current century, AI is the best analytical tool which is used to establish statistical predictions based on large amounts of data which can be used in the medical field. Machine learning can give maximum accuracy of statistical prediction. Depending on this, "Body guardian", the first AI based medical device, introduced by the US Drug Administration (FDA) in 2012. Currently many devices are approved for different medical diagnoses. AI is getting used in the management of diabetes through retinal screening, clinical diagnosis support and patient self-management tools. It gets text data, images or video data or biometric data as an input. In the second step the input data can be analysed by machine learning or deep learning. Finally, medical diagnosis, risk prediction and feedback control can be done. AI can be used for such populated countries like India where the people under 30-34 are highly diabetic and 46 % are prediabetic. So the risk factor and the prevalence can be measured by utilising genomic data and can be diagnosed by electronic health record (EHR) data. This technology is highly effective for type 1 and type 2 diabetes that can predict hypoglycemic and hyperglycemic stages by continuous glucose monitoring or CGM data. The AI algorithms can detect food habit carb counting and predict future blood glucose value. In recent time Artificial intelligence are focusing on clinical data , electronic health record data for detecting the risk factors, automate the insulin ingrain on the basis of continuous glucose monitoring (CGM) data, detection and prediction of the risk of retinopathy and diagnosing the complications by directly identifying the stage of risk with the help of biochemical data. Currently many studies use machine learning to make data charts about diabetes. China, USA, Turkey are aiming to provide personalised hyperglycemic medication protection through AI.

Keywords: Artificial intelligence, glucose monitoring data, genomic data, machine learning, type 1 and type 2 diabetes

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Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

Role of artificial intelligence in public health management & pharmaceutical research

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Abstract

Artificial intelligence (AI) represents a specialized field within computer science, empowering computer to efficiently process and analyse complex aggregated data. In recent time, a massive wave in AI-focused research has notably accelerated, particularly in its growing role within healthcare services and research. This review draws attention to the manifold opportunities and challenges of AI in the realms of healthcare and pharmaceutical research. The article extensively explores the implementation of AI in various healthcare aspects such as disease diagnosis, digital therapy, personalized treatment, drug discovery and the anticipation of upcoming epidemics and pandemics. The AI technology delves into such computational technique that includes deep learning and neural networks from human speech and diverse intricate data. The review spotlights the crucial role of advancing AI technologies in inducing rapid, precise and cost-effective healthcare and pharmaceutical research. The anticipated outcome is an improved delivery of services to the general public, reflecting the transformative impact of AI on scientific ventures.

Keywords: Artificial intelligence, disease diagnosis, drug development, healthcare, pharma industry

RS-GIS-AI-24-P61

Augmenting Human Health with Artificial Intelligence

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Abstract

Artificial Intelligence (AI) is a ground breaking technology that is sweeping all sectors of life in meteoric development, in particular the biological sciences by augmenting research, health, development and sustainability processes. In this study we explore the advancements in three facets of human health such as drug design and discovery, neuroscience and public health management that have been contributed by AI.

Deep learning- a way of processing data that is inspired by the human brain as well as machine learning- a way of using data and algorithms imitating the way humans learn and improve in accuracy have had profound impact in the fields of drug discovery, drug design, drug repurposing and screening of small molecules. Language models have had a favourable impact on global public health management and data acquisition, notably, during the Covid-19 pandemic. In case of neuroscience, it has a symbiotic and symbolic relationship with AI. The use of neural networks in AI is a direct consequence of appropriation of the way the human brain works. AI is being used extensively in learning behavior and cognition as well as in the diagnoses of neural diseases like Alzheimer's disease and Parkinson's disease.

In this study we also highlight Alphafold, eXplainable Artificial Intelligence (XAI) in Alzheimer's disease, blood-brain-barrier negotiation and Smart Health Monitoring (SHM) as precedents of AI technology in human health and biological sciences.

Keywords: Alphafold, Artificial Intelligence, Drug design, Drug discovery, Smart health monitoring, XAI

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**Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences**

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Role of Artificial Intelligence in Public Health Management

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Abstract

Public health management faces numerous challenges, ranging from disease surveillance
and outbreak detection to resource allocation and policy formulation. In recent years, the
integration of Artificial Intelligence (AI) has emerged as a transformative force in
addressing these challenges.
AI technologies, including machine learning and data analytics, enable the real-time analysis
of vast and heterogeneous datasets, facilitating early detection of disease outbreaks,
prediction of health trends, and optimization of resource allocation. AI-powered predictive
analytics facilitate resource allocation by identifying high-risk populations and optimizing
the distribution of healthcare resources, such as vaccines, medical supplies, etc. and to areas
most in need. By leveraging electronic health records, social media, wearable devices, and
environmental sensors, AI provides timely and actionable insights, enables policymakers to
make informed decisions, prioritize limited resources, and mitigate the spread of infectious
diseases while minimizing social and economic disruptions. This proactive approach not
only improves emergency response capabilities but also enhances the efficiency of public
health interventions, ultimately saving lives and reducing healthcare costs.
However, the widespread adoption of AI in public health management presents challenges
related to data privacy, algorithmic bias, ethical implementation, and equitable access to
healthcare resources. Moreover, the digital divide and disparities in access to healthcare
resources may exacerbate existing health inequalities, underscoring the need for inclusive
and equitable AI-driven solutions.
Despite these challenges, the integration of AI offers promising opportunities to
revolutionize public health management, providing valuable insights and enabling more
effective responses to emerging health threats.

Keywords: Artificial Intelligence (AI), Healthcare resources, Policy formulation, Public
Health.

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**Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences**

Role of Artificial Intelligence in Public Health Management

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Abstract

Organs-on-chips (OoCs) are systems containing engineered or natural miniature tissues grown inside microfluidic chips. To better mimic human physiology, the chips are designed to control cell microenvironments and maintain tissue-specific functions. Combining advances in tissue engineering and microfabrication, OoCs have gained interest as a next generation experimental platform to investigate human pathophysiology and the effect of therapeutics in the body. There are as many examples of OoCs as there are applications, making it difficult for new researchers to understand what makes OoCs more suited to an application than another. This abstract will help us to understand the use of OoCs to extract biological information, it's current and future applications.

Keywords: cell microenvironments, Organs-on-chips (OoCs), tissue engineering, therapeutics

Convergence of Artificial Intelligence in cancer biology towards the detection and remission of cancer

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Abstract

Artificial intelligence (AI) is a term with a broad aspect that implies to mimic human intelligence. Nowadays it is becoming an interesting topic of research. Machine learning is a field of research belongs to AI. Deep learning is a subfield of machine learning. With increasing technologies and ideologies, artificial intelligence (AI) is remodelling oncological research in an interesting manner. In recent years AI has proved its vast contribution in almost every aspect of biology including oncology. From basic research to detection, diagnosis, treatment and drug designing using of AI is becoming popular in case of cancer and other diseases. High dimensional database along with high performance computation leading to a diverse application of AI in cancer research. It is an inter-disciplinary approach targeting molecular biology, computer science, oncology, pathophysiology and radiology to increase the efficacy of cancer therapy via classification, disease diagnosis, screening, drug repurposing and treatment. AI technology including machine/deep learning, computer vision and language processing and robotic process automation is developing day by day to facilitate oncological research. Still there are so many challenges and obstacles in AI based cancer therapy. But we can predict a paradigm shift of cancer therapy converged with AI. Different models are used based on AI, which include data acquisition, data processing, data extraction, classification, and segmentation methods in case of various cancers. Depending on these data, AI enabled machine can perform critical surgical treatments in case of cancer. Here we are going to present different applications of AI relevant to oncology and different hurdles facing by AI in oncological research.

Keywords: Artificial intelligence, automation, diagnosis, machine learning, oncology, robotic process

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Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

Computational Algorithms in Action: Identifying ALDH1A1 Inhibitors for Overcoming Chemotherapy Resistance

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Abstract

The identification of novel therapeutic strategies to combat chemotherapy resistance in cancer remains a critical pursuit in oncology research. Aldehyde dehydrogenase 1A1 (ALDH1A1), recognized as a cancer stem cell marker, has emerged as a pivotal player in conferring resistance to chemotherapy, thereby posing a significant clinical challenge. Intensive research efforts are underway to discover synthetic inhibitors targeting ALDH1A, however none have successfully transitioned past clinical trials. In this study, we pursued a drug repurposing strategy involving FDA-approved drugs from a wide range of therapeutic categories, encompassing antibiotics, anti-virals, anti-fungals, anti-diabetics, and anti-hypertensives, to explore their potential as inhibitors of ALDH1A1 activity. Employing computational techniques such as molecular docking based on the Lamarckian genetic algorithm, differential evolution algorithm and simulated annealing genetic algorithm, we screened a plethora of approved drugs to explore their inhibitory potentials against ALDH1A1. Molecular dynamics simulation was used to monitor and validate the interaction between the drugs and protein. Moreover, MM PBSA binding energy calculation was performed to elucidate their binding affinities. Notably, our analysis identified three drugs—telmisartan, irbesartan, and maraviroc—as promising candidates capable of impeding the catalytic activity of ALDH1A1. The rational selection of these drugs, based on their existing clinical usage and favorable repurposing potential, underscores the feasibility of leveraging established pharmaceutical agents for novel therapeutic indications. This study exemplifies a strategic integration of computational methodologies with drug repurposing principles, offering a cost-effective and expedited approach to drug discovery and development. Further preclinical and clinical validation of these repurposed drugs is warranted to validate their efficacy and safety profiles, paving the way for potential translation into clinical practice.

Keywords: ALDH1A, drug repurposing, cancer, molecular docking

Artificial Intelligence Technologies for Leukaemia Discovery and Methodologies

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Abstract

Artificial intelligence (AI) technologies which is based on computer microscopy, used in the diagnosis of leukaemia specifically acute lymphoblastic leukaemia (ALL). Leukaemia is the most common blood cancer. Many people suffering from this deadly disease which diagnosis process is time-consuming and complicated and manual analysis is expensive and sometimes error-prone outcomes and for this reason. Artificial intelligence (AI) can significantly assist clinicians in detecting leukaemia early through automatic detection using computer-aided diagnostic models. Artificial intelligence (AI) can expose the new way of cancer treatments which is based on drug screening and whole-exome sequencing experiments. The concepts of deep learning (DL) the entire community must overcome the explainability limit that's why the concept of "black box" in AI limits the potential of this approach to be translated into the clinical practice, but there is a lack of compulsion and trust in the outcomes. At that case explainable artificial intelligence (XAI) can solve this problem via interpreting the predictions of AI systems. The usage of nearby interpretable model-agnostic explanations (LIME) to guarantee validity and reliability and additionally assist to explains the purpose of a selected classification. In this review we focused about the methodologies of AI that demonstrate the diagnosis of acute lymphoblastic leukaemia that will helps in medical science and public health management.

Keywords: Acute lymphoblastic leukaemia, artificial intelligence, black box, deep learning

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Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

Public health management: the potential role of Artificial Intelligence

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Abstract

In recent years, the integration of Artificial Intelligence (AI) in public health management has revolutionized the field of disease diagnosis, management, treatment and prevention. This work provides an overview of the multifaceted role of AI in enhancing public health outcomes. AI-driven technologies enable real-time disease surveillance through the analysis of diverse data sources, including social media, healthcare records, and environmental data. By detecting and tracking outbreaks promptly, public health authorities can implement timely interventions to mitigate the spread of diseases. Furthermore, AI facilitates early detection and diagnosis of diseases by analyzing medical images, genomic data and patient records. Through predictive analytics, AI models forecast disease trends, resource needs and healthcare demands, enabling proactive planning and allocation of resources. In the realm of drug discovery and development, AI expedites the process by identifying potential drug candidates, predicting their efficacy, and optimizing clinical trials. Additionally, AI enables personalized medicine by tailoring treatment plans based on individual patient characteristics, thus improving treatment outcomes and minimizing adverse effects. Moreover, AI enhances healthcare management by automating administrative tasks, optimizing workflows, and improving patient care. Behavioral analysis powered by AI identifies population behavior patterns, enabling targeted interventions for promoting healthier lifestyles and preventing diseases. In conclusion, the integration of AI in public health management offers unparalleled opportunities to enhance disease prevention, diagnosis, treatment, and management. However, it also raises important ethical, privacy, and regulatory considerations that must be addressed to ensure the responsible and equitable deployment of AI technologies in public health.

Keyword: Artificial intelligence, disease surveillance, drug discovery, public health

Artificial Intelligence, CGM Biosensors and Diabetes Care

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Abstract

Diabetes, a prevalent chronic metabolic disorder, affecting millions worldwide and it demands innovative approaches for effective management and prediction. Therefore, it is important to monitor glucose levels in diabetic patients. This review focus on artificial intelligence (AI) and its integration into diabetes care. AI allows a continuous monitoring of the patient's symptoms. Continuous glucose monitoring (CGM) is an important tool for obtaining diabetic patient-specific big data sets to help better lifestyle behavior and personalized therapy. A typical CGM system usually consists of a glucose recognition element, a transducer element, a transmitter element, and a receiver. CGM biosensors can be used in accessible biofluids such as ISF, tear, sweat, and saliva. The most popular AI algorithms in diabetes care are machine learning (ML). The combination of machine learning in CGM has shown its promise in different application scenarios for diabetes management such as calibration, decision support systems, patient self-management tools. This will help in the management of diabetes.

Keywords: Artificial Intelligence (AI), Diabetes, CGM biosensors

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Contribution of Remote Sensing - Geographic Information System (RS-GIS) and
Artificial Intelligence (AI) on opening new research sphere in Biological Sciences

Remote sensing & GIS in climate change and green cover analysis, monitoring of aquatic ecosystems and assessing the changes

Landuse analysis of the catchment area of River Teesta to study piscine distribution

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Abstract

Riparian condition and landscape uses are micro/proximal and macro/distal indicators of environmental disturbance, assemblage structure and dynamics. Highly altered riparian zones impoverish riparian cover and river habitats and decrease the diversity and complexity of aquatic biota. Landscape land use has a close relationship with riparian and river habitats and, consequently, with aquatic communities. Intensive land uses such as urbanization and row crop agriculture decrease riparian cover and increase physical habitat degradation, sedimentation, hydrographic alterations, temperature oscillations, and contaminant and nutrient concentrations. Therefore, land use assessments are important for understanding environmental gradients and factors that structure fish assemblages, and such information is necessary for comprehensive ecological assessments of aquatic systems and their fish assemblages. In a case study, GIS analyses of satellite-derived land use data in the catchments revealed that along the whole-longitudinal stretch of River Teesta in West Bengal (divided into eight equal zones), land use was largely composed of gradients in primary, secondary and open forests followed by agriculture Other land uses including scrub land, water mud, secondary water mud and settlement categories represented relatively minor components of the watershed (< 5% combined). Land-use dynamics was analysed for the catchments of the streams studied for fish using spatial remote sensing data. Increased anthropogenic activities increases contaminants, suspended solids, nutrients, water temperature, and flow and channel alterations, as well as decreased dissolved oxygen and riparian structure and function. Destruction of riparian vegetation leads to habitat simplification and consequently limits aquatic communities. Therefore, future research should include studies explicitly designed to test these potentially important interactions. Regional landscape analyses should be employed up front to identify sites and watersheds that reflect the pertinent contrasts and to control for other, potentially confounding variables.

Keywords: Aquatic systems, GIS, landscape, remote sensing, riparian, river Teesta

RS-GIS-AI-24-P70

Assessing Future Climate Change Impacts on Biodiversity in India: Trends, Gaps, and Best Practices in Species Distribution Modelling

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Abstract

Climate change poses a significant threat to global biodiversity, impacting species distribution, phenological cycles, and physiological traits. It is expected to become the primary driver of biodiversity loss by the end of the century. Species unable to adapt may face extinction, prompting the need for predictive models like Species Distribution Modelling (SDM) to assess future distribution changes. Despite global attention, regional-level studies, particularly in biodiversity-rich countries like India, remain limited. India, hosting a diverse range of species across its biogeographic zones, faces severe threats from climate change. There are some studies related to SDM, focusing on India's biodiversity under different climatic scenarios, aiming to identify trends and gaps in research. A systematic literature search yielded 106 relevant publications from 2011 to 2022. Analysis revealed an increasing trend in publications, with the Himalaya region being the most studied. Plants dominated taxa-wise studies, while there was a paucity of research on amphibians, reptiles, fishes, and fungi. Model reproducibility assessment highlighted shortcomings in reporting essential details, hindering reproducibility and comprehension. The study underscores the importance of comprehensive reporting in SDM studies and the need for more research, particularly in underrepresented taxa and regions. By leveraging SDM and addressing research gaps, India can better predict and mitigate the impacts of climate change on its biodiversity, aligning with international commitments.

Keywords: SDM, Biogeographic zone, Data gaps, ENM, Climate envelope modelling, Climate change

"Intelligence is the mightiest and nothing is beyond its reach"
– Rig Veda

"Success in creating AI would be the biggest event in human history. Unfortunately, it might also be the last, unless we learn how to avoid the risks."

– Stephen Hawking, Theoretical Physicist, Cosmologist, and Author