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ICCTCCI 2025

COMPUTING, COMMUNICATION & INTELLIGENCE

A Proceeding of ICCTCCI-2025

2nd International Conference on
**Cutting Edge Technology in Computing,
Communication and Intelligence**

28th & 29th March 2025

Editors :

Srinivas Sethi
Bibhudatta Sahoo
Suvendra Kumar Jayasingh
Deepak Tosh
Sourav Kumar Bhoi

Organized by

Department of Computer Science & Engineering



INSTITUTE OF MANAGEMENT AND INFORMATION TECHNOLOGY (IMIT), CUTTACK
A constituent college of BPUT, Govt. of Odisha, Cuttack-753008, India





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INSTITUTE OF MANAGEMENT AND INFORMATION TECHNOLOGY (IMIT), CUTTACK

A constituent college of BPUT, Govt. of Odisha, Cuttack-753008, India

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BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ODISHA, ROURKELA
(An Affiliating State University of Govt. of Odisha)

Prof. Amiya Kumar Rath
Vice Chancellor

MESSAGE

It is indeed a great pleasure to learn that **Institute of Management and Information Technology (IMIT), Cuttack** (a constituent college of Biju Patnaik University of Technology, Odisha), is going to organise the **2nd International Conference on “Cutting Edge Technology in Computing, Communication and Intelligence” on 28th & 29th of March, 2025**. Further, to commemorate the landmark occasion, the institute is going to publish a Souvenir. This literary platform is a step towards holistic development of the Institute. The Conference brings together the leading researchers, academics, practitioners, and industry experts from around the globe to share insights, discuss advancements, and foster collaborations in the fields of computer science and computational intelligence. Hope, all the participants will actively engage in the sessions, exchange their ideas, and forge new connections that will contribute to the advancement of knowledge and the development of impactful solutions to real-world challenges.

I take this opportunity to give my best wishes to the organising committee, all the faculty members, staff, students and participants who have been instrumental in bringing out this Souvenir and am quite confident that the Souvenir will meet the expectations of all its stakeholders.

I congratulate the Institute for taking up this timely initiative and wish the International Conference Success.

Amiya Kumar Rath
(Prof. Amiya Kumar Rath) 24/03/2025.

Message from General Chair

It is with great pleasure and excitement that I extend a warm welcome to all of you to the 2nd International Conference on Cutting-Edge Technologies in Computer and Computational Intelligence (ICCTCCI) - 2025, organized by the Institute of Management and Information Technology (IMIT), Cuttack.

As the General Chair of ICCTCCI - 2025, it is an honor to oversee this gathering of distinguished researchers, scholars, practitioners, and industry experts from around the world. Our conference serves as a nexus for the exchange of ideas, insights, and innovations in the dynamic fields of computer science and computational intelligence.

This year's conference theme, "Empowering Innovation Through Technology," underscores our commitment to exploring the latest advancements and trends in these rapidly evolving domains. Through keynote presentations, paper sessions, workshops, and networking opportunities, we aim to foster collaboration, inspire creativity, and drive positive change.

I encourage each of you to actively engage in the conference proceedings, share your expertise, and cultivate meaningful connections with your peers. Together, let us leverage our collective knowledge and experience to tackle the challenges of today and shape the future of technology.

I extend my heartfelt gratitude to the organizing committee, volunteers, sponsors, and partners for their tireless efforts in making ICCTCCI - 2025 a reality. Your dedication and hard work have been instrumental in ensuring the success of this event.

To all participants, I wish you a stimulating and rewarding experience at ICCTCCI - 2025. May the discussions and collaborations initiated here lead to groundbreaking research, innovative solutions, and lasting friendships.

Thank you for joining us, and once again, welcome to ICCTCCI - 2025!

Warm regards,

Prof. Bibhudatta Sahoo

General Chair, ICCTCCI - 2025

Institute of Management and Information Technology (IMIT), Cuttack

Message from Program Chairs

We are thrilled to extend our warmest greetings to all of you as the Program Chairs of the 2nd International Conference on Cutting-Edge Technologies in Computer and Computational Intelligence (ICCTCCI) - 2025, hosted by the Institute of Management and Information Technology (IMIT), Cuttack.

It is a privilege to welcome researchers, scholars, practitioners, and industry leaders from across the globe to this esteemed gathering. ICCTCCI-2025 promises to be an enriching experience, offering a platform for the exchange of ideas, insights, and innovations at the forefront of computer science and computational intelligence.

For the conference, we received 175 full paper submissions and we accepted only 71 papers. The contributing authors are from different parts of the globe that includes **United States of America, Japan, Jordan, Nepal, Egypt, Ethiopia, Oman, Malaysia and India**. All the papers are reviewed by multiple independent double-blind reviewers. All the papers are also checked for plagiarism and similarity score. It was really a tough job for us to select the best papers out of so many good papers for presentation in the conference. We had to do this unpleasant task, keeping the Taylor & Francis guidelines and approval conditions in view. We take this opportunity to thank all the authors for their excellent work and contributions and also the reviewers who have done an excellent job.

On behalf of the technical committee, we are thankful to Prof. (Dr.) Bibhudatta Sahoo, NIT, Rourkela, General Chair of the conference, for his timely and valuable advice. We cannot imagine the conference without this active support at all the crossroads of decision-making process. The university management of the host institute, the honorable Vice Chancellor, Prof. A. K. Rath, Patron of the conference and the Principal Prof. M. R. Kabat, Organizing Chair and Convenor Prof. S. K. Jayasingh have extended all possible support for the smooth conduct of the Conference. Our sincere thanks to all of them. We would also like to place on record our thanks to all the keynote speakers, tutorial speakers, reviewers, session chairs, authors, technical program committee members, various chairs to handle finance, accommodation, and publicity and above all to several volunteers. We are also thankful to Taylor & Francis publication house for agreeing to publish the accepted papers.

As Program Chair, we are committed to curating a diverse and engaging program that reflects the latest developments and emerging trends in our field. From keynote presentations by renowned experts to paper sessions showcasing groundbreaking research, our conference agenda is designed to inspire, educate, and spark meaningful discussions. We encourage each of you to actively participate in the sessions, contribute your perspectives, and forge connections with fellow attendees. It is through collaboration and knowledge-sharing that we can drive progress and innovation in our respective areas of expertise.

We extend our sincere appreciation to the organizing committee, sponsors, volunteers, press and media, and partners for their invaluable support in bringing ICCTCCI 2025 to fruition. Your dedication and hard work have been instrumental in shaping this conference into a memorable and impactful event.

To all participants, we wish you a stimulating and productive experience at ICCTCCI 2025. May the insights gained and connections made during this conference propel you towards new heights of achievement and success.

Thank you for your participation, and welcome to ICCTCCI 2025!

Warm regards,

Prof. Jibendu Kumar Mantri

Prof. Srinivas Sethi

Prof. Deepak Tosh

Program Chairs, ICCTCCI 2025

Message from Organizing Chair

It is with great pleasure and enthusiasm that I extend a warm welcome to all attendees of the 2nd International Conference on Cutting-Edge Technologies in Computer and Computational Intelligence (ICCTCCI) - 2025, hosted by the Institute of Management and Information Technology (IMIT), Cuttack.

I am delighted to welcome researchers, academicians, professionals, and industry experts from across the globe to this distinguished gathering. ICCTCCI - 2025 promises to be a platform where the latest advancements, innovative ideas, and cutting-edge research in the fields of computer science and computational intelligence will be showcased and discussed.

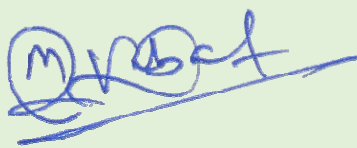
The theme of this year's conference underscores the importance of staying at the forefront of technological innovation and leveraging computational intelligence to address the challenges of our time. Through keynote speeches, paper presentations, panel discussions, and workshops, we aim to facilitate meaningful exchanges of knowledge and ideas that will shape the future of these disciplines.

I encourage all participants to actively engage in the various sessions, share their expertise, and foster collaborations that transcend geographical boundaries. Together, we can drive progress, inspire innovation, and make significant contributions to the advancement of science and technology.

I extend my heartfelt appreciation to the organizing committee, sponsors, volunteers, and everyone involved in making ICCTCCI - 2025 a reality. Your dedication and hard work have been invaluable in ensuring the success of this event.

To all attendees, I wish you a stimulating and rewarding experience at ICCTCCI - 2025. May your interactions and discussions lead to new insights, collaborations, and opportunities for growth.

Thank you for joining us, and once again, welcome to ICCTCCI - 2025!



Prof.(Dr.) Manas Ranjan Kabat
Principal
IMIT, Cuttack

Message from Convenor

It is my distinct pleasure to extend a heartfelt welcome to all attendees of the 2nd International Conference on Cutting-Edge Technologies in Computer and Computational Intelligence (ICCTCCI) - 2025, meticulously organized by the Institute of Management and Information Technology (IMIT), Cuttack.

As the Convenor of ICCTCCI - 2025, I am thrilled to see the culmination of months of preparation and dedication resulting in this prestigious event. Our conference serves as a convergence point for leading researchers, academics, practitioners, and industry professionals from around the world, fostering collaboration and innovation in the realms of computer science and computational intelligence. ICCTCCI - 2025 promises to be an enriching experience, offering a diverse array of sessions including keynote addresses, paper presentations, workshops, and networking opportunities. It is our collective aim to explore the latest advancements, share insights, and ignite discussions that will shape the future of our fields. I encourage each of you to actively engage in the conference proceedings, share your expertise, and cultivate meaningful connections with your peers. Together, let us harness the power of collaboration to address the challenges of today and chart a course towards a brighter tomorrow. I extend my deepest gratitude to the organizing committee, sponsors, volunteers, and partners for their unwavering support and tireless efforts in making ICCTCCI - 2025 a resounding success. Your dedication and commitment have been instrumental in bringing this event to fruition. To all participants, I wish you an enlightening and rewarding experience at ICCTCCI - 2025. May the discussions and interactions during this conference inspire new ideas, collaborations, and breakthroughs that will shape the future of our disciplines.

From the bottom of my heart, I express my heartiest gratitude to Shri Bhupendra Singh Poonia, IAS, Commissioner-Cum-Secretary, SD&TE for giving his consent to grace the conference as the Chief Guest. I am very much thankful to Shri Sukanta Kumar Pradhan, OAS (SAG), Additional Secretary to Govt., SD&TE to be the Guest of Honour. From bottom of my heart, I express my gratitude and hearty thanks to Prof. A. K. Rath, Honourable Vice Chancellor, BPUT, Patron and Prof. B. B. Biswal, Vice Chancellor, OUTR, Bhubaneswar, Chief Technical Speaker of the Conference. I sincerely thank Prof. Bibhudatta Sahoo, NIT, Rourkela, General Chair, Prof. Jibendu Kumar Mantri, MSCB University, Baripada, Prof. Srinivas Sethi, IGIT, Sarang, Prof. Deepak Tosh, University of Texas, Program Chairs, Prof. Manas Ranjan Kabat, Organizing Chair, Prof. Chittaranjan Tripathy, Ex-VC, BPUT & Sambalpur University, Prof. Bibhu Prasad Panigrahi, IGIT Sarang and Prof. Mrutunjaya Bhuyan, University of Malaya, the advisors for their continuous support and constant inspiration. Great thanks go to Er. Kalipada Tripathy, Data Scientist, Rakuten, Japan and Prof. Ts. Dr. Nik Zulkarnaen Khidzir, Faculty of Creative Technology and Heritage, Universiti Malaysia Kelantan who graced the occasion as Keynote Speaker. Special thanks go to the publishing committee, editorial board for their dedicated help and support. Many thanks go to all our beloved teachers, staff members, Ph. D. Scholars, M. Tech. Scholars and student volunteers whose selfless contribution has made it possible to make the conference successful.

Thank you for your participation, and welcome to ICCTCCI - 2025!

Warm regards,



Dr. S. K. Jayasingh

Convenor, ICCTCCI - 2025

2nd International Conference on Cutting Edge Technology in Computing, Communications and Intelligence - (ICCTCCI-2025)

28th and 29th March 2025

Schedule

March 28, 2025 (Day 1)

Venue – 8th Floor, World Skill Center, Mancheswar, Bhubaneswar

Timing	Events
8:30 AM	Registration, Breakfast/Tea
Inauguration	
03:30 PM	Lighting of lamp by the Guests
03:32PM	BPUT Anthem
03:35 PM	Conference address by Prof. M. R. Kabat, Principal, IMIT, Cuttack
03:40 PM	Conference report by Program Chair, Prof.Srinivas Sethi, IGIT, Sarang
03:45 PM	Address by General Chair, Prof. B. D. Sahoo, NIT, Rourkela
03:50 PM	Address by Patron, Prof. Amiya Kumar Rath, Vice Chancellor, BPUT, Rourkela
04:00 PM	Address by Chief Technical Speaker, Prof. B. B. Biswal, Vice Chancellor, OUTR, Bhubaneswar
04:15 PM	Address by Guest of Honour, Shri Sukanta Kumar Pradhan, OAS (SAG), Additional Secretary to Govt., SD&TE
04:20 PM	Address by Chief Guest, Shri Bhupendra Singh Poonia, IAS, Commissioner-Cum-Secretary, SD&TE
04:30 PM	Vote of Thanks by Dr. S. K. Jayasingh, Convenor
04:45 PM	Certificate Distribution to Paper Presenters and Session Chairs

Keynote Address

Timing	Name of Keynote Speaker	Designation	Organization	Country
12:00 Noon – 12:45 PM	Er. Kalipada Tripathy	Data Scientist	Rakuten	Japan
12:45 PM – 01:30 PM	Prof. Ts. Dr. Nik Zulkarnaen Khidzir	Faculty of Creative Technology and Heritage	Universiti Malaysia Kelantan	Malaysia

1:30 PM- 2:00 PM Lunch Break

Sessions 1

Time (09:30 AM to 11:00 AM)(Physical Presentation)

Venue: 8th Floor, World Skill Center, Mancheswar, Bhubaneswar

Track	Chair and Co-Chair	Paper Id
Image and Video Processing/ Computer Vision/ Sensors/ Pattern Recognition	Prof. Rashmi Ranjan Sahoo, PMEC, Berhampur Prof. Subasish Mohapatra, OUTR, Bhubaneswar Prof. Bikram Keshari Mishra, Silicon University, Bhubaneswar	13, 19, 25, 49, 52, 55, 68, 75, 148, 164

Sessions 2

Time (11:00 AM to 12:00 Noon) (Physical Presentation)

Venue: 8th Floor, World Skill Center, Mancheswar, Bhubaneswar

Track	Chair and Co-Chair	Paper Id
AI/ML/Healthcare/ Optimization/Big Data/Automation/Security	Prof. Satya Prakash Sahoo, VSSUT, Burla Prof. R. A. K. Das, Synergy, Bhubaneswar Prof. Pradyumna Kumar Tripathy, Silicon University, BBSR	28, 56, 70, 80, 83, 105, 106, 155

Sessions 3

Time (02:00 PM to 03:30 PM)(Physical Presentation)

Venue: 8th Floor, World Skill Center, Mancheswar, Bhubaneswar

Track	Chair and Co-Chair	Paper Id
Distributed Computing/ Networking/IoT/Communi- cation	Prof. Bharati Mishra, IIIT, Bhubaneswar Prof. Debasis Gountia, OUTR, Bhubaneswar Prof. Jayanta Kumar Dash, BPUT, Rourkela	21, 24, 26, 58, 81, 89, 141, 142, 147

March 29, 2025 (Day – 2)

Sessions 4

Time (10:00 AM to 11:30 AM)(Online Presentation)

Track	Chair and Co-Chair	Paper Id
Image and Video Processing/ Computer Vision/ Sensors/Pattern Recognition	Prof. Naresh Kumar, DMPS University of Nizwa Sultanate of Oman Prof. Ramesh Kumar Sahoo, IGIT, Sarang Prof. Satyasundara Mahapatra, PSIT, Uttar Pradesh	15, 41, 84, 122, 124, 126, 132, 136, 145, 149, 167

Sessions 5

Time (10:00 AM to 11:30 AM)(Online Presentation)

Track	Chair and Co-Chair	Paper Id
AI/ML/Healthcare	Prof. D. C. Rao, BPUT, Rourkela Prof. Sourav Kumar Bhoi, P MEC Berhampur Prof. Rajalaxmi Mishra, CIME, Bhubaneswar	11,14, 18, 23, 40, 74,85, 88, 127, 129, 140

Sessions 6

Time (11:30 AM to 01:00PM)(Online Presentation)

Track	Chair and Co-Chair	Paper Id
Distributed Computing/ Networking/IoT/Communi- cation/ Data Analysis	Prof. Rajendra Prasad Nayak, GCE, Kalahandi Prof. Tushar Kanta Samal, DRIEMS, Cuttack Prof. Anil Kumar Swain, KIIT, Bhubaneswar	12, 20, 27, 86, 107, 156, 157, 161, 162, 163

Sessions 7

Time (11:30 AM to 01:00 PM)(Online Presentation)

Track	Chair and Co-Chair	Paper Id
Optimization/Big Data/Automation/Security	Prof. Satyabrata Das, VSSUT Burla Prof. Ashok Kumar Bhoi, GCE, Kalahandi Prof. Chitta Ranjan Mallick, P MEC, Berhampur	6, 29, 45, 48, 71, 90, 91, 101, 103, 109, 158, 175

Valedictory 1:00 PM to 1:30 PM

Patron: Prof. Amiya Kumar Rath

Prof. Amiya Kumar Rath, the esteemed Vice Chancellor of Biju Patnaik University of Technology, Odisha, brings a wealth of experience and expertise to our conference on sustainable business. With a distinguished career spanning over three decades, he has made significant contributions as an educationist, researcher, author, and mentor. Previously serving as the Adviser (ICT) at the National Assessment and Accreditation Council (NAAC), Bengaluru, Prof. Rath has also held the position of Professor of Computer Science and Engineering at Veer Surendra Sai University of Technology (VSSUT), Burla.



His academic credentials include a master's degree (M. Tech.) and a doctorate in Computer Engineering, complemented by an MBA in Systems Management.

Prof. Rath has authored around 150 research papers and nine books, mentored 13 Ph.D. scholars, and supervised 20 M. Tech. graduates. He has been involved in over 150 national and international conference committees and has served as Program Chair for 15 prestigious international conferences. His contributions to education have been recognized with multiple awards and his participation in over 50 international conferences has fostered global collaborations.

Prof. Rath's leadership and dedication to academic excellence are set to provide invaluable guidance and support to our conference, ensuring a meaningful and impactful discussion on sustainable business practices. His significant contributions to academia and research have earned him four distinguished awards. Additionally, his expertise has been sought by the NAAC, where he has served as a peer team member, contributing to the evaluation of educational quality across over 50 higher education institutions in India.

With a steadfast commitment to continuous improvement, Prof. Amiya Kumar Rath's visionary leadership and expertise are poised to propel Biju Patnaik University of Technology, Odisha to new heights.

General Chair: Prof. Bibhudatta Sahoo

Dr Bibhudatta Sahoo is a computer science professor at NIT Rourkela, India, specializing in Algorithmic Engineering, Distributed Systems, Cloud Computing, Fog/Edge Computing & IoT, and Software Defined Networks/NFV. With a wealth of knowledge and expertise in these areas, Dr. Sahoo is at the forefront of cutting-edge research and innovation. Their research focuses on developing efficient algorithms and designing scalable distributed systems to address the challenges posed by modern computing paradigms such as cloud computing, fog/edge computing, and IoT.



Driven by a passion for advancing the field, they have significantly contributed to developing software-defined networks and network function virtualization. Through their research, publications, and mentorship, Dr. Sahoo has inspired and empowered countless students, fostering a new generation of computer scientists equipped with the skills to tackle complex problems in the rapidly evolving world of technology.

Organising Chair: Prof. Manas Ranjan Kabat

Prof. Manas Ranjan Kabat, Ph.D., is Professor, Department of Computer Science and Engineering, VSS University of Technology (VSSUT), Burla, Odisha. Dr. Kabat has been engaged in teaching and research for more than a decade and has published more than 20 research papers in various refereed international journals and conferences. His research interests include Wireless Sensor Networks and Cloud Computing. He is now the Principal, IMIT, Cuttack. He has likely made significant contributions to the academic or administrative spheres of the institution.



Dr. Kabat has made significant contributions to the field as an editorial member and reviewer for several renowned international journals. He is affiliated with numerous international organizations and has successfully undertaken various administrative responsibilities. An accomplished author, Dr. Kabat has published numerous research articles and books on topics related to his research interests. His expertise and leadership in both academia and administration will be instrumental in ensuring the success of our conference on sustainable business.

Program Chair : Prof. SrinivasSethi

Prof. Srinivas Sethi is Professor in Computer Science Engineering & Application, Indira Gandhi Institute of Technology, Sarang (IGIT, Sarang), India, and has been actively involved in teaching and research since 1997. He did his Ph.D., in the area of routing algorithms in mobile ad hoc network and is continuing his research work in the wireless sensor network, cognitive radio network, and cloud computing, Big-Data, BCI, Cognitive Science. He is Member of Editorial Board for different journal and Program Committee Member for different international conferences/workshop.



He is Book Editor of 4(four) international conference proceedings published in Springer, and Taylor & Francis. He has published more than 80 (eighty) research papers in international journals and conference proceedings. He completed 8(eight) numbers of research and consultancy project funded by different funding agencies such as DRDO, DST, AICTE, NPIU, and local Govt. office.

Program Chair: Prof. Jibendu Kumar Mantri

Prof. Jibendu Kumar Mantri pursued Master of Technology in Computer Science from Utkal University in year 2002 and Ph.D. degree in Computer Application from Sambalpur University in year 2010. He is currently working as Professor in Department of Computer Application, Maharaja Sriram Chandra Bhanja Deo University, Baripada, India, He is a life member of ISTE and ISCA.



He has published 5 books and more than 78 research papers in reputed international journals including Thomson Reuters (SCI and Web of Science) and conferences including IEEE and Springer. His main research work focuses on Cryptography, Software Engineering and Computational Intelligence. He has more than 30 years of teaching experience.

Program Chair : Dr. Deepak Tosh

Dr. Deepak Tosh (Senior Member, IEEE) is an Assistant Professor of Computer Science at the University of Texas at El Paso. His research focuses on addressing various multi-disciplinary networking and cyber security challenges associated to critical national infrastructures, Industrial Internet of Things, Blockchain, and tactical battlefields. He works closely with researchers from U.S. Air Force Research Laboratory (AFRL), Sandia National Lab, and Army Research Laboratory (ARL) on developing resilient data/process provenance mechanisms for industrial operational technology environments, and military applications.



His research has been funded from Department of Energy, National Science Foundation (NSF), and Department of Defense. He has authored/co-authored more than 70 peer-reviewed conference papers, book chapters, and journal papers. Two of his research works on Blockchain were also awarded as “Top 50 Blockchain Papers in 2018” at Blockchain Connect Conference, 2019. He is also a recipient of prestigious NSF CAREER award, 2022.

Convenor : Dr. Suvendra Kumar Jayasingh

Dr. Suvendra Kumar Jayasingh is working as Associate Professor and HOD in the Department of Computer Science & Engineering, Institute of Management and Information Technology (IMIT), Cuttack (A Constituent College of BPUT, Govt. of Odisha) after being selected in OPSC (Orissa Public Service Commission) in 2005. He has obtained his Bachelor of Engineering in the year 2003 from University College of Engineering (UCE), Burla (Now VSSUT). He got his M. Tech. in Computer Science & Engineering in 2007 from RVU, Udaipur and Ph. D. in Computer Science & Engineering in 2020 from North Orissa University, Baripada.



He is having 20 years of teaching experience in Computer Science & Engineering and MCA. He has published several articles, book chapters in reputed National and International journals and periodicals including Springer and Taylor & Francis and has presented research papers in National and International Seminars and Conferences. He has also participated in many National and International Workshops, FDPs, Industrial Training Programs organized by IITs, NITs and NITTTRs. His research interests include Artificial Intelligence, Data

Mining, Soft Computing, Machine Learning, Computational Intelligence, Database Management System and Algorithm Analysis and Design. He has published a book on “Introduction to Machine Learning”, by Taran Publication, New Delhi, edited book on “Computing, Communication and Intelligence” by CRC Press, Taylor & Francis, UK patent on “Smart Home Air Quality Monitoring Device” and Indian patent on AI – Based Diary Products Testing Device”. He is a life member of Indian Society for Technical Education (ISTE).

Co-Convenor: Dr. Alok Ranjan Tripathy

Dr. Alok Ranjan Tripathy is an Associate Professor in Computer Science at the Institute of Management and Information Technology (IMIT), Cuttack, having joined the institution on February 24, 2024. With a robust academic background and extensive teaching experience, Dr. Tripathy specializes in Algorithms, Security, Machine Learning, and Cloud Computing.

He earned his Ph.D., M.Sc., M. Tech., and B.Sc. degrees from Utkal University, showcasing a strong foundation in his field. His academic career has been marked by significant roles across various prestigious institutions. Prior to his current position,



Dr. Tripathy served as an Assistant Professor at Ravenshaw University, Cuttack, from July 8, 2014, to February 24, 2024. Dr. Tripathy's teaching repertoire includes advanced subjects at the postgraduate level such as Design and Analysis of Algorithms, Machine Learning, Computer Graphics, Cryptography and Network Security. His research interests lie in the areas of Algorithms, Security, Machine Learning, and Cloud Computing, reflecting a commitment to advancing these critical domains of Computer Science.

Sl. No.	Paper ID	Paper Title
1	6	HYBRID SOCIAL SPIDER AND GREY WOLF OPTIMIZATION FOR ENHANCED LIFETIME IN WIRELESS SENSOR NETWORK
2	11	A COMPARATIVE STUDY OF EXPLAINABLE ARTIFICIAL INTELLIGENCE ALGORITHMS IN LOCAL INTERPRETABLE MODEL-AGNOSTIC BASED PNEUMONIA PREDICTION
3	12	HERPEE: HYBRID ENERGY-AWARE ROUTING PROTOCOL WITH ENERGY ESTIMATION IN IOT-BASED SENSOR NETWORKS
4	13	HIGH-ACCURACY FACE MASK DETECTION IN NUCLEAR ENVIRONMENTS USING ENSEMBLE LEARNING AND XGBOOST
5	14	DETECTION OF LUNG CANCER BY CONTOURING THE LUNG IMAGES USING CNN
6	15	IMPROVING THE ACCURACY OF USED CAR PRICE PREDICTION USING MACHINE LEARNING MODELS
7	18	LEVERAGING FRACTAL PATTERNS IN MACHINE INTELLIGENCE TO CLASSIFY BRAIN TUMOR IMAGING
8	19	AN EXTREME GRADIENT BOOSTING BASED AUTOMATED SOFTWARE DEFECT PREDICTION MODEL USING DIMENSIONALITY REDUCTION TECHNIQUE
9	20	OPTIMUM RECTANGULAR DIELECTRIC RESONATOR ANTENNA FOR SUB-6GHZ IN RAPID 5G COMMUNICATION NETWORKS
10	21	LOAD BALANCING IN CLOUD COMPUTING USING MODIFIED ANT COLONY ALGORITHM
11	23	A CASE STUDY OF THE APPLICATION OF DEEP LEARNING TO DETECT SKIN CANCER
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Paper ID: 6

HYBRID SOCIAL SPIDER AND GREY WOLF OPTIMIZATION FOR ENHANCED LIFETIME IN WIRELESS SENSOR NETWORK

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Abstract : Wireless sensor Networks (WSN) is a energy limited network employed in environmental monitoring applications. Energy efficiency is the most significant consideration in all aspects of WSN operations. This work aims at developing a new metaheuristic algorithm that integrates the Improved Social Spider Optimization (ISSO) and Improved Grey Wolf Optimization (IGWO) to the WSN with better performance and energy consumption. The extended life of the network and better overall network performance are attributed to the hybrid algorithm in the selection of cluster heads and routing paths. With the combined strengths of ISSO and IGWO in the proposed system, exploration and exploitation are effectively performed for the search space and accuracy of the optimization process. The current cluster head is chosen using various parameters such as residual energy, node degree, and distance from the base station, while the routing path is chosen with parameters such as distance, energy of nodes, and transmission data rates. This two-fold strategy helps to select the most energy efficient and reliable links for data transmission. This work presented a novel solution to the energy efficiency problem that affects WSN, which enabled an effective optimization technique for different applications. The developed system can be considered as the improvement of the WSN mathematical model in a way that brings about increased performance and dependability, which promotes the use of these networks in actual applications. It presents an effective solution towards the achievement of energy efficiency hurdles inherent to WSNs, thus introducing a reliable optimization technique that can be applied in different scenarios.

Keywords: Improved Grey Wolf Optimization, Improved Social Spider Optimization, Wireless Sensor Network, Cluster Head Selection, Routing Optimization, Energy Efficient

Paper ID : 11

A COMPARATIVE STUDY OF EXPLAINABLE ARTIFICIAL INTELLIGENCE ALGORITHMS IN LOCAL INTERPRETABLE MODEL-AGNOSTIC BASED PNEUMONIA PREDICTION

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Abstract : Deep learning models have shown great success in various tasks related to medical imaging, including the detection of pneumonia from chest X-ray images. However,

the lack of transparency and black-box nature of these models raises concerns about their reliability and trustworthiness in clinical settings. Recently, explainable artificial intelligence (XAI) methods have attracted research communities to make the models trust-worthy and interpretable. In this context, this paper makes both visual and quantitative comparative study of super-pixel based explainable algorithms which are integrated to the best performing deep learning model from VGG16, LENET, INCEPTION, SPINAL, and ALEXNET using Local Interpretable Model-Agnostic Explanations (LIME) tool. Three super-pixel algorithms, Quick-shift, SLIC, and Quick-Shift with noise, are evaluated using standard performance metrics. Simulation results show that Quick-Shift with Noise algorithm performs optimally with Jaccard co-efficient value of 0.9679.

Keywords: XAI, Super-pixel Algorithms, LIME, Deep Learning Models

Paper ID : 12

HERPEE: HYBRID ENERGY-AWARE ROUTING PROTOCOL WITH ENERGY ESTIMATION IN IOT-BASED SENSOR NETWORKS

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Abstract:The usage of Internet of Things (IoT) devices has increased dramatically in recent years, especially in a variety of domains such as smart homes, industrial applications, and environmental monitoring. In a WSN-based IoT network, a clusterhead is selected from among the many IoT devices to guarantee a dependable network while preserving effective data transfer. Diverse IoT applications confront several hurdles. Efficient energy-aware communication protocols that use the variety and heterogeneity of linked devices over the Internet are the major problem. Energy conservation is crucial for green computing, especially in constrained battery energy nodes and outsourced energy nodes. This research presented a hybrid approach that combines the Hybrid Energy Aware Clustering Protocol-IoT and Software-based On-line Energy Estimation for Sensor Nodes. The HERPEE proposed model is outperforms better result than LEACH, OSAEP, and Hy-IOT in terms of Energy Consumption (Ecm), Network Life Time (NLT), and Throughputs.

Keywords: Internet of Things (IoT), WSN, OSEAP, LEACH

Paper ID : 13

HIGH-ACCURACY FACE MASK DETECTION IN NUCLEAR ENVIRONMENTS USING ENSEMBLE LEARNING AND XGBOOST

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Abstract : Keeping to tight safety standards such as face masks in a very secured environment like a nuclear power plant, holds the utmost importance for both the people and the integrity of operation. This paper discusses a high-performance ensemble-based deep learning architecture that obtains face mask detection with improved precision and reliability by combining different state-of-the-art architectures. Models like Base CNN, InceptionV3, DenseNet121 and EfficientNet-B0 are used. Then individual models get trained on wide-ranging collection of face masks images across various conditions in isolation; the individual models are thereafter combined through mechanism of a weighted ensemble using their different strengths to detect preliminary a detection accuracy with around 98.91 %. The ensemble output is further optimized using the XGBoost algorithm for boosting, thus improving decision boundaries and correcting classification errors. The proposed hybrid model resulted in 99.32% accuracy, outperforming previous state-of-the-art approaches in face mask detection. The generalization ability of the proposed system in a variety of complex lighting conditions and complex settings is also significantly improved. Hence, it is extremely appropriate for nuclear facilities deployment. Our results show the power of ensemble learning and boosting in enhancing the robustness and accuracy of safety-critical computer vision systems, thus contributing to safer industrial operations.

Keywords: Face Mask Detection, Nuclear Power Plant, Convolutional Neural Network (CNN), InceptionV3, DenseNet121, EfficientNet-B0, Ensemble Learning, XGBoost, Deep Learning.

Paper ID: 14

DETECTION OF LUNG CANCER BY CONTOURING THE LUNG IMAGES USING CNN

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Abstract: This project aims to increase survival rates by emphasizing early lung cancer detection. The effectiveness of many convolutional neural network (CNN) models, including

ResNet, DenseNet, and VGG16, in identifying and classifying lung cancer lesions from medical imaging data will be assessed. In addition to using these CNN models for detection, The U-Net model for contouring and segmentation of the identified cancerous lesions will be implemented. By leveraging advanced machine learning techniques, these models are designed to accurately identify cancerous lesions that may be overlooked by traditional methods. The study involves training and validating the models on a curated dataset of lung images, assessing their performance based on metrics like accuracy, recall, precision, F1 score and confusion matrix for segmentation. The insights gained will inform the comparative effectiveness of each architecture, potentially guide us towards future research and medical applications in lung cancer diagnosis and treatment planning. By integrating these models into medical imaging workflows, the project aims to reduce the time to diagnosis and enhance patient outcomes, thereby contributing to earlier intervention and improved survival rates in lung cancer management. Ultimately, this research seeks to transform lung cancer through enhanced diagnostic tools, offering hope for more accurate and timely interventions.

Keywords: CNN, ResNet, DenseNet, VGG16, Contouring, Segmentation.

Paper ID: 15

IMPROVING THE ACCURACY OF USED CAR PRICE PREDICTION USING MACHINE LEARNING MODELS

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Abstract: The prediction of used car prices is important in India due to the rapidly growing automotive market and the increasing demand for affordable transportation. Accurate predictions help buyers make informed decisions and enable sellers to set competitive prices, maximizing returns. Reliable price forecasts also enhance transaction transparency, boost consumer confidence and promote used car market stability. However, the lack of sufficient features such as car's condition, service history and number of services poses a challenge for ML models, leading to inaccurate price predictions. To address these challenges, feature engineering is done, various ML models are deployed and the results are compared. The performance of the models is evaluated using metrics like Mean Squared Error (MSE), Mean Absolute Error (MAE) and R². Among the models, MLP performed the best, with an MSE of 8.13, an MAE of 1.89 and an R² score of 0.90, showing high accuracy in predicting prices.

Keywords: Used car, price prediction, ML models, feature engineering, accuracy.

Paper ID: 18

LEVERAGING FRACTAL PATTERNS IN MACHINE INTELLIGENCE TO CLASSIFY BRAIN TUMOR IMAGING

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Abstract: A significant global health problem is Brain tumor (BT), with patient survival becoming increasingly challenging in advanced stages. Early diagnosis and accurate classification of BTs into distinct categories is critical for accomplishing timely preventive measures. This study proposes a novel approach combining fractal analysis and machine intelligence (MI) for classifying MRI images of brain tumor. These images will be classified into multiple categories, including meningioma (MG), pituitary (PT), non-tumor (NT) and glioma (GM) types. To perform this multi-class classification of the said images, this proposed methodology uses a hybrid (or stack) approach where it combines the Logistic Regression (LRG) with the Neural Network (NNT) algorithms. In order to find out the effectualness of this proposed approach, we conducted a comparative analysis against several established and pre published ML methods, like K-Nearest Neighbor (KNNH), AdaBoost (ADB) and Random Forest (RFS). We also used individual LRG and NNT models as well as models like Decision Tree (DTR), Support Vector Machine (SVMN). We used Python-based Orange (3.26.0) software for implementing the comparative ML techniques and our proposed method. The study employs a dataset of 400 BTMIs obtained from Kaggle, comprising 100 images each of GM, MG, PT, and NT types. Performance evaluation when conducted using standard metrics(F1,RC,CA,PR) shows this suggested hybrid method outperforms RFS,ADB,KNNH and several other machine learning based approaches suggesting its superior capability in accurately classifying brain tumor MRI images across the specified categories.

Keywords:BT Classification, Stacking, Magnetic resonance imaging (MRI), Multi-class images classification, Classification accuracy (CA), Support Vector Machine (SVMN), Precision, Recall, Fractal, Python-based Orange

Paper ID: 19

AN EXTREME GRADIENT BOOSTING BASED AUTOMATED SOFTWARE DEFECT PREDICTION MODEL USING DIMENSIONALITY REDUCTION TECHNIQUE

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Abstract: Due to its critical significance, software testing is integral to the development process. Developer-introduced f laws or mistakes are usually only fixed later in the software

development process. This delay significantly increases the impact of these problems. Early problem identification makes the best use of testing resources possible, which is essential to preventing this. Software modules are divided into two categories for defect prediction: defect-prone and non-defect-prone. An essential part of this analysis is the identification of defective software modules, and several methods have been proposed to improve and automate this process. In this research work, we have proposed a hybrid model to evaluate the likelihood of software defects. Our methodology includes preprocessing, feature dimensionality reduction, and prediction. The model is tested using a publicly available NASA datasets. We employed Principal Component Analysis (PCA) to reduce the feature vector's dimensionality. We used a combined approach of Random Forest (RF) and a boosting approach XGBoost, combinedly known as XGBRF, to increase prediction accuracy. The suggested model has been validated using several performance metrics, such as accuracy, sensitivity, specificity, F1 score, and MCC. According to the PCA+XGBRF approach, the model's average accuracy on the MC1 dataset is 98.65%. Experimental findings show that the proposed model outperforms existing models regarding Software Defect Prediction (SDP).

Keywords: SDP, PCA, RF, XGBoost, NASA

PAPER ID: 20

OPTIMUM RECTANGULAR DIELECTRIC RESONATOR ANTENNA FOR SUB-6GHZ IN RAPID 5G COMMUNICATION NETWORKS

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Abstract: The design and analysis of an RDRA(rectangular dielectric resonating antenna is reported in this study. This resonance is attained with a significant S11 value of -26 dB.The bandwidth of the antenna is 5.5 to 6.5 GHz. In addition to the antenna's gain, bandwidth, and reflection coefficient, performance metrics like VSWR, impedance, and directivity are also examined.Taking into consideration of all the performance metrics, the suggested antenna is appropriate for nowadays developed Sub-6GHz 5G communication. The results of this study have significant implications for the deployment of high-gain compact patch antennas for sub-6 GHz and sub-7 GHz 5G wireless communications and demonstrate the potential of the proposed design to enhance the efficiency in these radio frequency. Abstract. This study presents a dielectric resonator antenna (RDRA) with a rectangular form. Excellency of this work is the simultaneous employment of MATLAB and HFSS software for researchers of antenna community.The design equations are executed in HFSS and found the best suitable dimensions of the RDRA. Considering these dimensions the RDRA is designed and the simulation results with high radiation efficiency are obtained in HFSS. The RDRA is designed with dielectric resonating material Rogers RO3210 ($\epsilon_r = 9.8$) and traditional FR4 substrate. The RDRA operates in sub-6 GHz range resonating at frequency 6.1 GHz.

Keywords: Sub-6GHz, n96 (5.5–6.5 GHz) band of sub-6 GHz ,graphene,5G Communication. Rectangular Dielectric Resonator

Paper ID: 21

LOAD BALANCING IN CLOUD COMPUTING USING MODIFIED ANT COLONY ALGORITHM

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Abstract: One innovative method of internet computing is cloud computing. Although it has many advantages, a number of significant issues must be resolved if the cloud environment is to become more dependable. These are some of the issues related to cloud security, load management, and fault tolerance. This research presents an approach to improving cloud computing and managing network pressure using the ant colony technique. In order to determine the connection with the smallest load, the real-time network loads the scenario and offers a dynamic stream of data forwarding technique. The outcomes demonstrated how the load-balanced ACO approach can enhance the computational response. Compared to other methods, the Ant Colony Optimization Algorithm had an average response that was 30% lower. Ant colony optimization demonstrates the applications and positive outcomes of optimization analysis.

Keywords: load balancing, ant colony, response time, optimization

Paper ID : 23

A CASE STUDY OF THE APPLICATION OF DEEP LEARNING TO DETECT SKIN CANCER

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Abstract: Cancer is among the most dreadful illnesses that can be found. Numerous individuals lose their lives to cancer each and every year. It has been a serious problem since there are no clear indications that indicate the problem. Cancer has the potential to spread to any region of the human body via infection. Skin cancer, which is one of the most prevalent forms of cancer, is most likely caused by prolonged exposure to the sun as well as immune system reactions. Both benign and malignant forms of skin cancer are categories that may be distinguished from one another. It is not considered malignant since it is treatable and may be

cured if it is discovered at an early stage. Malignant cancer is the most serious sort of cancer; if it is not identified in a timely manner, it will likely result in death. In the event that therapy is discovered, it may start right away. Numerous machine learning techniques have been used for the purpose of early cancer detection; nevertheless, categorization is a process that takes more time and requires more effort. Deep learning techniques are used in this particular situation in order to accomplish early detection. In order to detect cancer, we made use of the ISIC public dataset in addition to ResNet-50, CapsNet, VGG,16, and MobileNet.

Keywords: Skin cancer, Deep learning, Machine learning

Paper ID : 24

MACHINE LEARNING APPROACH FOR IMAGE CAPTION GENERATION

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Abstract: This work aims to develop an advanced Image Caption Generator by integrating deep learning techniques from the available domain of NLP and computer vision. Utilizing the Flickr8k dataset, the model effectively generates descriptive captions for images by accurately interpreting visual content. The workflow encompasses meticulous preprocessing of images and captions, where images are encoded using a pre-trained ResNet50 model, and captions are vectorized to form structured data inputs. The innovative model architecture features separate processing branches for images and text, which are subsequently concatenated to yield a unified output. This paper highlights the synergistic potential of convolutional neural networks (CNNs) and recurrent neural networks (RNNs) to construct a robust system capable of generating coherent, contextually relevant captions for images. Image captioning has significant applications across various sectors. By combining the strengths of CNNs in visual recognition with RNNs' proficiency in language generation, this paper not only demonstrates the current capabilities of AI in understanding and describing visual content but also sets a foundation for future advancements in multimedia content processing and AI-driven user interfaces.

Keywords: CNN, LSTM, NLP, AI

Paper ID: 25

INTELLIGENT SYSTEM FOR CORROSION DETECTION AND PREDICTION SYSTEM USING DEEP LEARNING

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Abstract: Corrosion in infrastructure, particularly bridges, poses significant safety and economic challenges. This paper proposes an energy-efficient wireless sensor network (WSN) architecture for real-time corrosion detection and prediction, leveraging deep learning and clustering techniques. The system comprises sensor nodes strategically deployed across the bridge to monitor environmental and electrochemical parameters. These nodes are organized into clusters, with cluster heads (CHs) dynamically elected based on residual energy and proximity metrics, ensuring balanced energy consumption. Data collected by the sensor nodes is aggregated and compressed at the CHs before being transmitted to a centralized base station. A hybrid deep learning model combining Convolutional Neural Networks (CNNs) and Long Short-Term Memory (LSTM) networks is employed at the base station to analyze temporal and spatial patterns in the collected data. The model predicts corrosion rates and identifies high-risk areas with high accuracy. This approach minimizes energy consumption through clustering and sleep scheduling, prolonging the WSN's lifespan while maintaining robust monitoring capabilities. Simulation results demonstrate the system's effectiveness in reducing energy usage by 30%, extending network life, and achieving a corrosion prediction accuracy of over 90%. This solution provides a scalable and cost-effective method for proactive infrastructure maintenance and safety enhancement.

Keywords: Corrosion, Wireless sensors, Clustering, Deep Learning

Paper ID: 26

DECENTRALIZED BRAIN TUMOR DETECTION USING TRANSFER LEARNING IN FEDERATED FRAMEWORKS

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Abstract: Early detection of brain tumor by using the medical imaging, such as MRI, is crucial. However, privacy concerns limit the use of large-scale medical data for training

machine learning models. Federated Learning (FL) offers a solution by keeping sensitive information private, trains the deep learning model collaboratively with several institutes. This work presents the implementation of a transfer learning based federated architecture for brain tumor classification using the Flower framework. A comparative analysis of Deep Convolutional Neural Networks (DCNNs) such as VGG Trains the deep learning model collaboratively across multiple institutions¹⁹, ResNet-101, InceptionV3, and DenseNet-169 is conducted, with aggregated accuracies of 92.98%, 83.48%, 94.94%, and 95.06% respectively, across four clients. The system processes heterogeneous datasets that are non-IID (not independent and identically distributed). A Federated Averaging (FedAvg) strategy is used to aggregate client models, demonstrating the effectiveness of FL in preserving privacy and enhancing model performance.

Keywords: Brain tumor, DCNN, VGG19, ResNet 101, DenseNet-169, Inception V3, Federated Transfer Learning, Flower

Paper ID: 27

IOT BASED ANTI-COLLISION DEVICES FOR INDIAN RAILWAY: INSIGHTS TO IMPLICATIONS

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Abstract: Indian Railways is one of the largest rail networks in the world, but it faces challenges in ensuring safety due to accidents caused by human error, technical issues, and environmental conditions. This paper presents an IoT-based Anti-Collision Device (ACD) system designed to prevent railway accidents. Using IoT sensors, GPS, and real-time communication, the system can detect potential collisions and take automatic actions to avoid them. The proposed system collects data from sensors, processes it using cloud-based platforms, and uses smart algorithms to predict and prevent accidents. Tests and small-scale implementations show that the system improves safety and efficiency. The paper also discusses the benefits, such as saving lives, reducing costs, and making the system suitable for various railway conditions in India. It also addresses challenges like compatibility with existing infrastructure, security, and maintenance. This research highlights how IoT can modernize Indian Railways and make train travel safer for everyone.

Keywords: IoT, Anti-Collision Devices, Railway Safety, Indian Railways, Real-time Communication, Automation

Paper ID : 28

**DEEP LEARNING BASED FACE RECOGNITION SYSTEM
WITH MODIFIED MTCNN AND FACENET**

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Abstract : Now a days face recognition is a good option for using as a bio-metrics for human identification and recognition system. This technology is used in various areas like attendance, security, payment, access control, etc., in a day-to-day life. The improvements in Face recognition models are increasing rapidly by using advanced deep learning techniques for large training datasets. However, face images have large variations like poses, resolutions, occlusions which are creating great challenges in face recognition related applications. In this work, we propose an advanced face recognition system that leverages a Multi-task Cascaded Convolutional Neural Network (MTCNN) and a deep neural algorithm called FaceNet. This combination of deep learning framework achieved higher recognition accuracy. The proposed face recognition system utilizes the MTCNN model, comprising three cascaded networks (P-Net, R-Net, and O-Net), for accurate face detection and alignment. Subsequently, the FaceNet model extracts feature vectors, employing the Triplet Loss function to learn discriminative embeddings by minimizing the Euclidean distances between anchor-positive pairs and maximizing them for anchor-negative pairs. We evaluate our system on three benchmark datasets: LFW, Political Faces, and Celebrity Faces, achieving a high accuracy of 94.4% on the challenging LFW dataset.

Keywords: Mtcnn, Triplet Loss, Feature Embedding, bilinear Pooling, Multi-Head Attention, Face Verification, Data Augmentation.

Paper ID: 29

**DEVELOPING ENCRYPTION STRATEGIES AND KEY MANAGEMENT
PROTOCOLS THAT ENSURE SECURITY IN DYNAMIC GRAPH NETWORKS
THROUGH THE UTILIZATION OF ASYMMETRIC CRYPTOGRAPHY**

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Abstract: In dynamic graph networks, securing communication and managing cryptographic keys pose significant challenges due to the dynamic nature of network nodes and

connections. This research explores the design and implementation of secure key management and encryption schemes using asymmetric cryptography techniques tailored for dynamic graph networks. Key aspects include efficient key generation, distribution, and revocation mechanisms to maintain security in dynamic environments. In this paper we apply asymmetric key encryption algorithms in coronagraphs and bipartite graph along with some algebraic properties.

keywords :Cryptography, RSA algorithm, Corona Graph $C_n \odot P_m$, Bipartite Graph.

Paper ID: 40

**ADVANCED WEARABLE SENSORS FOR EARLY PARKINSON'S DISEASE
TREMOR DETECTION USING ACCELEROMETERS AND GYROSCOPES**

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Abstract: This paper presents the design and implementation of a wearable hand tremor detection system to analyze and quantify hand tremors in real time. The system integrates an Arduino UNO microcontroller, an MPU-6050 sensor for measuring 3-axis acceleration and angular velocity, and an ESP8266 module for wireless data transmission. Participants performed three tasks—hand opening, writing, and holding—with the device mounted on their dominant hand, ensuring precise measurement of motion parameters. Data collected in real time was filtered using a moving average algorithm and analyzed using statistical and frequency domain techniques. The results were visualized to identify tremor patterns and severity. The system's lightweight and non-invasive design ensures user comfort and ease of use. Validation through controlled experiments demonstrated its reliability, with results aligning closely with clinical benchmarks. This work highlights the potential of affordable, wearable devices in biomedical applications, particularly in monitoring and assessing tremor-related conditions.

Keywords: Biomedical, Hand tremor detection, Arduino UNO, MPU-6050 sensor,, wearable device

Paper ID: 41

ENHANCING MNIST DIGIT CLASSIFICATION THROUGH INTEGRATED MACHINE LEARNING AND XAI APPROACHES

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Abstract: Despite the fact that handwritten digit recognition has advanced significantly, there are still issues with recognition accuracy, which reduce productivity. In this research, the MNIST database's K-Nearest Neighbors (KNN), support vector machines (SVM), and random forest classifiers are used to classify handwritten digits. In addition, we attempt to enhance the comprehension of these models utilizing explainable artificial intelligence (XAI) tools such as LIME. Even while KNN and numerous other conventional methods perform well, we feel there are practical and theoretical benefits of adopting deep learning approaches like the Convolutional Neural Networks (CNN), which have been more successful in digit recognition. Addressing confounding concerns like gradient disappearance and saturation is done by adopting a two-layer CNN constituted of ReLU activation functions, dropout, and fully linked layers, thus boosting generalization and robustness. The results demonstrate that XAI with CNN-based models offers accurate and highly interpretable outcomes that have implications for progress in the field.

Keywords: Handwritten Digit Recognition, K-Nearest Neighbors (KNN), Support Vector Machines (SVM), Random Forest, Explainable AI (XAI), LIME, Convolutional Neural Networks (CNN), ReLU Activation

Paper ID: 45

PREDICTING HEART DISEASE USING HIGH UTILITY ITEM SETS MINING WITH AN ENHANCED SWARM INTELLIGENCE MODEL

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Abstract: Heart disease leftovers one of the foremost reasons of death around the globe, driving the requirement for efficient and correct predictive models to facilitate early diagnosis and personalized treatment. Traditional methods for heart disease prediction often face limitations in handling large, noisy, and high-dimensional healthcare datasets. These models typically struggle to capture non-linear interactions among features and do not prioritize

factors based on their impact on patient outcomes. In response to these difficulties, this study proposes a novel hybrid predictive framework that combined the High Utility Itemsets Mining (HUIM) with an Enhanced Swarm Intelligence (SI) model to achieve improved diagnostic accuracy and feature selection. HUIM is utilized to extract significant patterns from clinical and lifestyle data, identifying key combinations of difficult issues that donate to heart disease, such as elevated blood pressure, high cholesterol levels, and sedentary behavior. Concurrently, the enhanced SI model leverages the collective intelligence principles of usual systems like ant colonies and bird flocks to optimize feature selection and prediction accuracy. The combination of these methodologies results in a strong system skilled of navigating complex data landscapes while mitigating issues such as local optima and computational inefficiency. Experiments performed using the UCI Heart Disease Dataset demonstrate that the proposed framework outperforms conventional machine learning models, including decision trees, support vector machines, and neural networks, in terms of accuracy, precision, recall, and F1-score. The hybrid approach also enhances model interpretability, providing actionable insights for healthcare professionals. These results highlight the framework's possible for larger applications in predictive healthcare analytics and real-time patient monitoring.

Keywords:Heart Disease Prediction, High Utility Item sets Mining (HUIM), “Swarm Intelligence” (SI), “Particle Swarm Optimization” (PSO), “Ant Colony Optimization” (ACO)

Paper ID: 48

NEW ERA OF PRECOMPUTATION FOR BIGDATA HANDLING WITH GRAPH AND VECTOR DATABASES

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Abstract- In the era of big data, efficiently managing and retrieving large datasets is crucial. Traditional relational databases often struggle with real-time processing, creating opportunities for advanced solutions. This study explores graph and vector databases as efficient alternatives, leveraging specialized structures and algorithms to enhance data management. By adopting these technologies, organizations can achieve faster and more flexible data processing, revolutionizing big data management.

Keywords: vector database; big data; graph database; precomputing management

Paper ID: 49

HARMONY AI: A WEB-BASED ML MODEL FOR HAND SIGN LANGUAGE TRANSLATION**Aniket Saraf¹, NiyatiSahoo², Pranati Mishra³, Jyotirmayee Routray⁴, Meenakshi Kandpal⁵**^{1,2,3,4,5} Department of CSE, OUTR, Bhubaneswar, Odisha, IndiaEmail: ¹sarafaniket59@gmail.com, ²niyati.sahoo4@gmail.com ³pmpranatomishra@gmail.com, ⁴jyotirmayee.1990@gmail.com, ⁵meenakshikandpal14@gmail.com

Abstract: Sign languages need to be recognized by Natural Human-Computer Interaction (NHCI); however, accomplishing real-time dynamic and static hand-posture movements is quite challenging. While vision-based approaches offer a more natural form of interaction, issues arise when temporal and spatial information must be encoded correctly. This can be achieved through a real-time hand sign recognition system that converts sign language directly into speech or text, helping to break communication barriers. Equality and inclusivity are introduced into daily life, enabling people with special abilities to function autonomously. In this paper, a novel multi-stream deep learning architecture is presented, incorporating 3D convolutional networks with skeletal information and local region images to address sign language words. In summary, a transfer learning approach based on domain knowledge is proposed to solve the alignment and recognition challenges, using the concept of sequence-to-sequence learning on the WLASL dataset. In this way, one additional step in the alignment procedure is saved, and state-of-the-art recognition rates are achieved by closely modeling spatial-temporal information through multiple complementing data representations.

Keywords: Sign language, Deep learning architecture, Transfer learning, Sequence-to-sequence learning, Data representation.

Paper ID: 52

IMPLEMENTATION OF SUPER AI IN THE AUTOMATION OF EXAMINATION SYSTEM FOR ACADEMIC ENRICHMENT: A COMPLETE LEARNING FOR TOMORROW**¹Dr. Bhabani Sankar Ratha, ²Dr. Kailash Chandra Nayak**¹Associate Professor, NIIS Institute of Business Administration, Bhubaneswar²Associate Professor, USBM, Bhubaneswar¹bsankarrath2000@gmail.com, ²drkcnayak44@gmail.com

Abstract: Academic improvement of students basically depends upon their performance in the examination along with other curricular and co-curricular activities. All students may not have the same knowledge but whatever the education they acquired during the academic curriculum and continuous effort that they have made to bring improvisation in the academic activities is to be properly reflected in examination which is not only help to get the certificate but also create a lot of opportunities for the teachers to guide in different ways to bring them into such a platform for changes as per demand of industries. The changes either

in the form of education, technology, skills, innovation, entrepreneurship or gaining ability to fit in the recruitment environment for sustainable employability along with behaviour to bring every individual to be a good human being. A normal examination process cannot identify a student as per their best; hence there is a need to work on a dedicated artificial system to look after the academic progress from basic to best for overall performance of students. A well Artificial superintelligence (ASI) system with inclusive deep learning is capable of surpassing human intelligence by implementing cognitive skills and developing thinking ideas of its own and also to be considered as the most advanced, powerful, and intelligent type of AI that can quickly understand, analyse, process the requirement to stimulate actions and guided the guide them to bring necessary improvements in the overall development process of students as well as academic institutions.

Keywords: ASI, AI, sustainability, deep learning, cognitive skills

Paper ID: 55

BIO-INSPIRED REAL-TIME FACIAL EMOTION DETECTION USING YOLOV11

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Abstract: Facial emotion detection is a pivotal technology in the domain of HCI (Human-Computer Interaction), enabling systems to understand human emotions through facial cursor expressions. This project introduces a novel FER system that integrates bio-inspired optimization techniques with the advanced YOLOv11 deep learning model to enhance detection accuracy and efficiency. The YOLOv11 architecture is employed for its real-time object detection capabilities, while bio-inspired algorithms optimize the model's hyper parameters, ensuring robust performance across diverse datasets. The system is trained and evaluated on comprehensive facial emotion datasets, achieving high accuracy in classifying multiple emotional states. This fusion of bio-inspired optimization with state-of-the-art deep learning models presents a significant advancement in the field of facial emotion recognition, offering potential applications in domains like emotional computing, cyber security, and improving user experiences.

Keywords: Facial Emotion Detection, Human-Computer Interaction, Bio-Inspired Optimization, YOLOv11, Deep Learning, Hyper parameter Optimization, Real-Time Detection.

Paper ID: 56

**TIME-SERIES BASED DRUG EFFICIENCY AND SIDE-EFFECT PREDICTION:
LEVERAGING MACHINE LEARNING FOR ENHANCED DRUG SAFETY AND
PERSONALIZED MEDICINE**

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Abstract: Predicting drug side effects and efficacy is a critical challenge in modern medicine with significant implications for patient safety and treatment optimization. This study introduces a hybrid machine learning framework that combines Random Forest for static feature analysis and LSTM (Long Short-Term Memory) for time-series analysis. The model leverages data on patient demographics, drug properties, intake schedules, and feedback to predict side-effect intensity and assess drug efficiency trends over time. Random Forest handles static features like patient-specific attributes and drug properties, while LSTM captures temporal dependencies in drug responses, enabling predictions of drug effectiveness across sequential timeframes. By integrating these models, the framework offers actionable insights, such as the likelihood and severity of side effects and time-series trends in drug efficiency, providing a comprehensive solution for personalized medicine. Validated by metrics like Mean Squared Error (MSE) and Root Mean Squared Error (RMSE), this approach demonstrates high accuracy and holds significant potential for improving healthcare outcomes through predictive analytics, enabling data-driven treatment adjustments, minimizing adverse reactions, and optimizing therapeutic efficacy.

Keywords: Ensemble Drug side effects, LSTM, Time-series analysis, RF

Paper ID: 58

**INTELLIGENT SYSTEMS WITH CLOUD IOT INTEGRATION: A SYNERGISTIC
APPROACH FOR ENHANCED DECISION-MAKING**

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Abstract: The integration of Intelligent Systems with Cloud-based Internet of Things (IoT) platforms represents a significant advancement in the field of computational intelligence and data processing. This paper explores the potential of combining artificial intelligence (AI) techniques with IoT devices via cloud computing to enable smart, real-time decision-making in various application domains. The paper discusses the architecture, components, key technologies, challenges, and future prospects of intelligent systems with cloud IoT integration.

Keywords: Intelligent Systems, Cloud Computing, Internet of Things (IoT), Artificial Intelligence (AI), Data Analytics

Paper ID: 68

LEVERAGING AI FOR ENHANCED CREDIT SCORING IN FINANCIAL SERVICES

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Abstract: Artificial intelligence (AI) has emerged as a disruptive force in the quickly changing financial sector, most notably in credit assessment. Conventional credit rating methods frequently use scant information and simplistic algorithms, leading to potential inaccuracies and biases. This chapter explores how AI, with its advanced machine learning (ML) capabilities, is revolutionizing credit assessment by utilizing a vast array of data sources and sophisticated analytical techniques. We begin by outlining the limitations of conventional credit scoring methods and the inherent challenges they face. We then delve into the AI-driven approaches that address these challenges, focusing on their ability to process and analyse diverse datasets, encompassing unconventional sources like social media engagement and digital traces and transaction histories. By integrating these data points, AI models can generate more accurate and comprehensive credit scores, enhancing the precision of credit risk assessments. The chapter further examines the practical implementation of AI in credit scoring through real-world case studies from leading financial institutions. Finally, the goal of this chapter is to offer an intricate understanding of how AI is reshaping credit scoring, offering insights into the future directions of this critical financial process. By harnessing AI's potential, financial institutions have the ability to improve their decision-making procedures and reduce hazards, and foster a more inclusive financial ecosystem.

Keywords: AI, ML, Financial Risk Management, Fraud detection.

Paper ID: 70

ENHANCED DERMOSCOPIC IMAGE ANALYSIS FOR SKIN CANCER DETECTION USING TRANSFER LEARNING

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Abstract: Skin cancer, one of the most prevalent forms of cancer globally, requires early and accurate detection to improve patient outcomes. In this study, a robust automated system for skin cancer detection is proposed using image processing techniques combined with

advanced deep learning models. The system classifies dermoscopic images into two categories: cancerous and non-cancerous lesions. Three individual models Base Convolutional Neural Network (CNN), MobileNetV2, and EfficientNet are trained separately on the dataset to achieve accuracies of 95.17%, 96.31%, and 96.57%, respectively. To further enhance the classification performance, an ensemble model is constructed by combining the predictions of the individual models. The ensemble model demonstrates superior accuracy of 98.9%, outperforming all the standalone models. The system incorporates essential image preprocessing steps are followed to ensure optimal feature extraction. Transfer learning is employed to leverage pre-trained weights for faster convergence. The proposed ensemble approach significantly reduces false positives and false negatives, making it a viable tool for early diagnosis and clinical decision support. This method provides an effective, accurate, and non-invasive solution for dermatological diagnostics, paving the way for potential real-world applications in telemedicine.

Keywords: Skin cancer detection, image processing, deep learning, CNN, MobileNetV2, EfficientNet, ensemble model, dermoscopic images, transfer learning

Paper ID: 71

**SMART INTELLISECURE-BASED LPG AND FIRE SAFETY SYSTEM WITH
AUTOMATIC DOOR CONTROL**

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Abstract: The increase in the use of LPG, both for domestic purposes and commercial gains, has led many persons to express fears over gas leakage and fire incidents. Though conventional means of safety help to a certain extent, such as installing gas detectors and smoke alarms, they don't have a coordinated safety response system. This article suggests an innovation in smart safety systems with integrated LPG and fire hazard detection, which includes biometric-based access control, automatic door operation, and real-time monitoring. Advanced gas and flame sensors will be taken into account to continuously monitor the environment and sound alarms when any hazard exists. The door against which the operation is done will simply unlock so that it allows the evacuation or entrance of people such as the emergency responders. Biometric security, through fingerprints, only allows access to the property to authorized persons while the rest are kept at bay. An Arduino microcontroller is the power for the entire system; it is also IoT-enabled for sending out real-time alerts to users as well as emergency services, thus offering low response times and providing awareness of current situations. This may well be used in modern houses and business establishments.

Keywords: LPG, Arduino Uno, Alert

Paper ID: 74

**CONVOLUTIONAL NEURAL NETWORK APPROACH FOR GRAPE LEAF
DISEASE CLASSIFICATION**

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Abstract: Grapes are widely consumed in India and globally, making their health and quality crucial for agricultural sustainability. Early detection and accurate classification of

grape leaf diseases play a vital role in ensuring optimal production. While deep learning-based methods have shown promising advancements in disease classification, there is still potential for improving accuracy. This study presents a custom lightweight Convolutional Neural Network (CNN) designed to enhance classification performance. Evaluated on the PlantVillage dataset, the proposed model achieves 97.21% accuracy, outperforming previous approaches. The model's effectiveness is assessed using performance metrics such as the accuracy and loss curve, precision, F1-score, and class-wise analysis.

Keywords: Grape leaf diseases, Convolutional Neural Network, PlantVillage dataset, Classification, Accuracy and Loss Curve.

Paper ID: 75

HIGH-EFFICIENCY OPTICAL POLARIZER USING SILICON BASED 2D DEVICE FOR PHOTONIC INTEGRATED CIRCUITS

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Abstract: The present paper proposes an optical polarizer, based on a silicon-based 2D photonic crystal structure, demonstrates high efficiency and compatibility with photonic integrated circuits (PICs). The structure effectively polarizes the output signal across a wide range of input wavelengths (1500 nm to 1772 nm). The electric field distribution within the structure, analyzed using the Helmholtz wave equation, reveals a consistent diagonal polarization pattern. The electric field magnitudes vary with different input signals, but the overall polarization direction remains consistent. Evanescent waves are observed, but their intensity is less significant compared to the polarized component. The calculated optical bandwidths for both input and output signals confirm the efficiency of the proposed structure for polarizer applications. The input bandwidth ranges from 5 THz at 1500 nm to 3.4 THz at 1772 nm, while the output bandwidth ranges from 85,000 THz at 1500 nm to 50 THz at 1772 nm. In conclusion, the proposed silicon-based 2D photonic crystal structure offers a promising solution for high-efficiency optical polarization control in PICs, with potential applications in various optical communication and sensing systems.

Keywords : Optical polarizer Photonic integrated circuits (PICs), Helmholtz wave equation, silicon-based 2D photonic crystal structure, Optical Communication.

Paper ID: 80

GPT-4-POWERED MEDICAL RECOMMENDATION SYSTEM USING SNOMED

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Abstract : The adoption of generative AI in healthcare has significantly transformed medical recommendation systems, providing tailored, accurate, and context-sensitive support

for patients and clinicians. This research emphasizes the impact of SNOMED based GPT-4, an advanced language model, in creating a dependable system for medical recommendations. Trained on the Keivalya/MedQuad-MedicalQnADataset, SNOMED based GPT-4 exhibits remarkable performance in generating precise, contextually relevant, and safe medical responses essential for practical applications. It achieves a low perplexity score of 10.2, reflecting its ability to deliver fluent and coherent recommendations, while maintaining a minimal harmfulness rate of 1.2%, ensuring user safety and reliability. These attributes position it as an ideal candidate for powering systems that assist with tasks like symptom assessment, disease management, and patient education. The significance of such systems lies in their ability to enhance access to medical expertise, reduce delays in providing critical advice, and support healthcare professionals in managing high workloads. By accurately interpreting medical queries and offering actionable suggestions, this contributes to better health outcomes and reinforces confidence in AI-driven healthcare tools. This study highlights the growing need for reliable and secure recommendation systems within healthcare. With its exceptional performance, SNOMED based GPT-4 serves as a vital technology for bridging gaps in medical accessibility and improving patient-provider interactions.

Keywords: Generative AI, Medical Recommendation System, Healthcare Chatbot, Safety and Accuracy.

Paper ID: 81

DEEP Q-NETWORK-BASED SELF-HEALING FOR ENHANCED UE EXPERIENCE IN 5G NETWORKS

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Abstract : The deployment of 5G networks introduces challenges in maintaining network resilience and enhancing user experience (UE) due to their dynamic nature and strict performance demands. This study presents a Deep Q-Network (DQN)-based self-healing mechanism to mitigate network outages and optimize key parameters, including Maximum Transmission Power, Reference Signal Transmission Power, Pa, Pb, and Antenna Tilt. Using a dataset of 10 million samples from MAVENIR IT Company, a Deep Reinforcement Learning (DRL) framework was developed to enable adaptive decision-making for outage recovery. By formulating the problem as a Markov Decision Process (MDP), the DQN efficiently explored the action space, improving network performance. The model achieved 89.07% accuracy in predicting and optimizing parameters, enhancing coverage, capacity, and UE experience during outages. The results demonstrate the effectiveness of the proposed self-healing approach, highlighting the potential of DRL in enabling intelligent, adaptive, and autonomous management of 5G networks for improved reliability and resilience.

Keywords: Self-Healing, 5G Networks, Deep Q-Network (DQN), Deep Reinforcement Learning (DRL), Outage Compensation, Network Optimization

Paper ID: 83

MACHINE LEARNING APPLICATIONS IN PREDICTING THE DISEASE PROGRESSION IN DIABETES PATIENTS:A COMPREHENSIVE EXPLORATION

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Abstract: Diabetes is a chronic illness that is becoming more common worldwide. Because of its complications and unpredictable progression, diabetes presents serious problems for healthcare systems. With the ability to anticipate the progression of diseases, machine learning has become a potent tool for early problem diagnosis, tailored treatments, and effective treatment plans. This comprehensive exploration delves into the diverse applications of ML in understanding and managing diabetes progression, focusing on key algorithms, datasets, and predictive models. It discusses the role of ML in predicting complications like retinopathy, nephropathy, and cardiovascular diseases. To enhance the quality of life for diabetics worldwide, this study aims to provide a comprehensive assessment of the existing state of affairs and potential avenues for employing machine learning.

Keywords: Machine Learning (ML), Diabetes Disease Progression.

Paper ID: 84

A CROP RECOMMENDATION SYSTEM WITH HIGH ACCURACY UTILIZING ENSEMBLE MACHINE LEARNING TECHNIQUES

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Abstract: Improvements in precision agriculture are crucial for enhancing crop yield and fostering sustainable farming practices. This study presents a machine-learning-driven crop recommendation system created with a Kaggle dataset specifically designed for crop prediction. The dataset encompasses statistics on 22 crops, including cereals, legumes, fruits, and cash crops. A comprehensive comparison of machine learning algorithms, including Decision Tree (DT), J48, Random Forest (RF), and Kstar, was conducted. The ensemble method, integrating Random Forest and Multiple Linear Regression (MLR), attained an exceptional accuracy of 99.998%, exceeding the efficacy of standalone models. The evaluation measures, including accuracy, MCC, AUC, PRC, and F1 score, validated the model's dependability and efficacy. The study highlights the potential of ensemble methods in providing precise and context-specific crop recommendations. This approach offers a scalable solution for applying machine learning in agriculture, enabling informed decision-making to enhance productivity and optimize resources. Future efforts will focus on integrating real-time data and expanding the system to support multi-crop recommendations for diverse farming practices.

Keywords: Machine Learning, Soil Analysis, Agriculture, Environmental Data,

Paper ID: 85

LEVERAGING TRANSFER LEARNING FOR ENHANCED HANDWRITTEN DIGIT RECOGNITION USING EFFICIENTNET AND FINE-TUNED CNN**Sarvesh Kumar Soni¹, Namrata Dhanda², Satyasundara Mahapatra³**^{1,2}Department of Computer Science & Engineering, Amity School of Engineering & Technology, AUUP, Lucknow, India³Department of Computer Science & Engineering, Pranveer Singh Institute of Technology Kanpur, IndiaE-mail: ¹sarvesh8685@gmail.com, ²namratadhanda7@gmail.com, ³satyasundara123@gmail.com

Abstract: Traditional handwritten digit recognition algorithms have depended heavily on existing information and customized features. The main deep learning methods used in the handwritten digit recognition (HDR) study are convolutional neural networks (CNN) which has lately yielded revolutionary findings. The existence of distortion, blurring and diverse writing styles make it difficult to recognize and classify numerals effectively. To cope with these limitations, variety of methods have been proposed using CNNs for HDR, but these methods are facing with the problem of low computational speed and low accuracy specially in diverse datasets. Recognition accuracy can still improve because of the continuous rise in handcrafted information together with the availability of ample processing power. Here, we are proposing a model to identify handcrafted numerals by leveraging the capabilities of the Transfer Learning (TL) method. This is accomplished by first refining a pre-trained CNN model for HDR recognition. To get the best results, the pre-trained CNN model must be fine-tuned just enough once features have been extracted. This paper presents a TL strategy aimed at classifying HDR on the MNIST dataset. We implement our model on Google Colab platform using Python that utilize EfficientNet-B4, a pre trained CNN model to retrieve the features followed by fine-tuned sequential CNN as a classifier. Our suggested transfer learning model has an F-1 score of 0.9927 and an accuracy of 99.27% with a loss of 0.73%.

Keywords: HDR, Transfer Learning, CNNs, MINST

PAPER ID: 86

EFFECTIVE TASK SCHEDULING ALGORITHM BASED LOAD BALANCING IN CLOUD COMPUTING**Satyaranjan Mishra¹, Arabinda Pradhan², Prasanta Kumar Bal³**¹Research Scholar, Dept. of CSE, GITA, Bhubaneswar, Odisha,²Associate Professor, Dept. of CSE, Raajdhani Engineering College, Bhubaneswar, Odisha,³Professor, Dept. of CSE, GITA, Bhubaneswar, Odisha,E-mail: ¹dsbmsatya1@gmail.com, ²arabindapradhan1@gmail.com, ³prasantakbal@gmail.com

Abstract: Cloud computing provides various services to its user within less amount of time as well as minimum cost. Therefore, large number of users sends their request but there are

no sufficient servers are available in cloud datacenter. This issue shows load balancing problem in cloud datacenter. To solve this issue an Effective Task Scheduling Algorithm (ETSA) is proposed in this paper. To show the better performance, this ETSA is compared with other meta-heuristic task scheduling algorithm on python platform. Outcome shows that our proposed scheduling algorithm decrease the makespan time as 4.09% to 14.22% when task count is gradually increases and 9.23% to 14.99% decreases when VMs count is increases. Also it improves the accuracy as 5.82% to 7.14% when number of iteration is increases.

Keywords: Cloud computing, load balancing, server

Paper ID: 88

AUTOMATION IN HEALTHCARE: A ROBOTIC APPROACH FOR PATIENT REGISTRATION, VITAL SIGN TRACKING, AND CHATBOT INTERACTION

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Abstract: Rising nurse burnout and increasing workloads affects their performance, impacting healthcare quality. High patient stress and disease transmission risks further strain both patients and nurses. Addressing these challenges, our work proposes a robotic system for automated patient registration, real-time vital sign monitoring, and improving patient interaction. The system consists of SpO2, heart rate, and temperature sensors connected with a Raspberry Pi. A Python-based chatbot aids the patient with inquiries and engagement. Initial results demonstrate enhanced patient autonomy, remote vitals check with improved healthcare efficiency making our system a promising step toward streamlining hospital workflows optimizing resource allocation and enhancing patient-nurse interaction.

Keywords: Vital Signs, Chatbot, Patient Registration.

Paper ID: 89

ENERGY OPTIMIZATION OF LORA NETWORKS OF SMART BUILDING USING MACHINE LEARNING

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Abstract: LoRa (Long Range) networks are pivotal in enabling low-power, long-range communication for Internet of Things (IoT) applications, particularly in smart cities and rural connectivity scenarios. However, interference within such networks significantly affects their

performance and energy efficiency, posing challenges to sustainable operations. This paper explores power consumption optimization in LoRa networks under two distinct scenarios: with interference and without interference. Using a machine learning-based approach, the study develops a predictive model to optimize power usage across network nodes by leveraging Random Forest regression. The framework incorporates key network parameters, such as spreading factors, frequencies, and signal-to-interference-plus-noise ratios (SINR), to accurately estimate and minimize power consumption. Comparative analyses reveal the impact of interference on network efficiency and demonstrate the potential of machine learning techniques to enhance energy optimization in LoRa deployments. The findings underscore the importance of intelligent power management for scalable and energy-efficient IoT networks.

Keywords: LoRa, Interference, SINR, Lora gateway, Power Optimization, Machine Learning

Paper ID: 90

ADVANCING INDIAN MONSOON RAINFALL ANALYSIS USING AI-DRIVEN SPATIOTEMPORAL MODELING AND MULTI-SOURCE DATA INTEGRATION

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Abstract: The Indian monsoon, a critical driver of the country's agriculture, water resources, and economy, exhibits highly complex and dynamic rainfall variability across spatial and temporal scales. Traditional methods of analyzing monsoon rainfall often struggle to capture its intricate dependencies on atmospheric, oceanic, and land-based factors. This study introduces an advanced AI-driven framework for comprehensive monsoon rainfall analysis by integrating multi-source data, including meteorological variables, oceanic indices (such as Niño3.4 and Indian Ocean Dipole), and high-resolution satellite imagery. The proposed framework leverages a hybrid deep learning architecture combining convolutional neural networks (CNNs) for spatial feature extraction with recurrent neural networks (RNNs) for temporal sequence modeling. By fusing these data sources, the model uncovers non-linear relationships between large-scale climatic drivers and localized rainfall variability. The research utilizes historical datasets spanning 1901–2020 for training and validation, with a focus on improving the accuracy of monsoon onset, withdrawal predictions, and intra-seasonal rainfall variability across India's diverse regions. Initial results demonstrate a significant enhancement in predictive performance compared to conventional statistical and dynamical models, particularly in capturing extreme rainfall events and regional anomalies. This work contributes to advancing the scientific understanding of monsoon dynamics and holds practical implications for agricultural planning, disaster risk reduction, and water resource management in India. By offering a robust AI-based analytical tool, this study aims to support policymakers and stakeholders in mitigating the socio-economic impacts of monsoon variability while fostering climate resilience.

Keywords: Artificial Intelligence, Indian Monsoon, Multi-modal Deep Learning, Spatiotemporal Climate Modeling, Extreme Rainfall Events

Paper ID: 91

**EXAMINING THE RELATIONSHIP BETWEEN TEMPERATURE AND RAINFALL
USING AI/ML: A CASE STUDY OF HEAVY RAINFALL EVENTS IN WESTERN
JAPAN**

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Abstract: The Clausius-Clapeyron (CC) equation provides a theoretical relationship between temperature and the amount of water vapor in the atmosphere. This about an increase of 7% water vapor per degree rise in temperature, which in turn influences rainfall intensity as the atmosphere warms. In this study, we explored the relationship between temperature and heavy rainfall events in Western Japan using Artificial Intelligence (AI) and Machine Learning (ML) techniques to examine whether AI/ML models can reveal similar patterns in temperature and rainfall data obtained during two major flood events in the region. We used a combination of temperature, humidity, dew point, and rainfall data from the Japan Meteorological Agency (JMA) and develop several ML algorithms to obtain relationships between temperature and rainfall that explained the CC equation's rate. Our preliminary results showed that ML methods, particularly Random Forest and Gradient Boosting, represented complex and non-linear patterns in the data that traditional methods missed and explained better to understand how temperature influences extreme rainfall events. The Random Forest model also showed that dew point and relative humidity are important factors in explaining the extreme rainfall events to further enrich the temperature-rainfall relationship. Overall, this study highlights the effectiveness of AI/ML techniques towards the complex dynamics in climate data to explain temperature's role in extreme rainfall events.

Keywords: AI/ML technique, Clausius-Clapeyron equation, Heavy rainfall event, Temperature-precipitation relationship

Paper ID: 101

CHARACTERIZING SERVERLESS WORKLOADS IN PRODUCTION

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Abstract: The rise in popularity of serverless computing has led to increasing applications across diverse domains which generates a wide variety of workloads daily. An in-depth knowledge of various categories of workloads and their behaviors is instrumental in developing highly customized application designs, optimizing performance, and effective cost management. Workload characterization involves the process of analyzing and grouping the workloads within an execution environment. There exist various perspectives of characterization of workloads such as analyzing the sequence of system calls, making a

logical inference based on the source code and libraries used and monitoring metrics or behaviour after execution. To characterize serverless workloads, we propose a method based on classification and clustering approaches applicable in the production environment. The proposed method achieves an Adjusted Rand Index (ARI) of up to 96% for inter-function characterization and up to 97% for intra-function characterization in the production environment.

Keywords: Serverless, Workload Characterization, Serverless production, Clustering, Classification

Paper ID: 103

SMOTETOMEK ENRICHED GWO : A HYBRID APPROACH FOR DIABETES DISEASE PREDICTION

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Abstract: This paper presents a hybrid machine learning framework for binary classification that combines resampling, ensemble learning, and sophisticated feature engineering. Combining SMOTETomek resampling with Grey Wolf Optimization (GWO), such as interaction- and ratio-based features, successfully addresses class imbalance and improves predictive accuracy. Through hyperparameter optimization with Optuna fine-tuned models, Random Forest, LightGBM, and XGBoost, the models achieved accuracies of 97.49%, 96.06%, and 98.23%, respectively, with LightGBM showing the best performance. To highlight LightGBM's supremacy and capitalize on the merits of individual classifiers, a weighted ensemble technique was used. The ensemble displayed state-of-the-art performance with a precision rate 98.23% and balanced precision, recall, and F1 scores. This strategy demonstrates the main benefits of combining ensemble modeling, resampling methods, and advanced feature engineering, providing a reliable and scalable solution that performs better than standalone models for binary classification problems.

Keywords: SMOTETomek, GWO, Feature selection, Accuracy, Diabetes prediction.

PAPER ID: 105

UTILIZING MACHINE LEARNING TO ENHANCE AGRONOMIC PRACTICES AND CROP YIELD PREDICTION

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Abstract: Agricultural productivity plays a crucial role in sustaining global food security, and predictive models are essential for optimizing crop yields and agronomic practices. This

research explores the effectiveness of three prominent machine learning algorithms—Sequential Minimal Optimization (SMO), Logistic Model Tree, and Decision Table—to predict crop yields accurately. The dataset, comprising 2200 records, is sourced from the Kaggle dataset repository. By employing a voting ensemble approach, our study harnesses the collective predictive strength of these models. Notably, the Logistic Model Tree algorithm emerged as the most promising candidate for crop yield prediction, achieving an exceptional accuracy of 99.15%. This result highlights the robustness of the Logistic Model Tree in identifying intricate patterns within the dataset, making it a compelling choice for predictive modelling in agricultural practices. In comparison, the Sequential Minimal Optimization algorithm demonstrated an impressive accuracy of 97.83%, showcasing its capability to capture complex relationships within the data. The Decision Table algorithm achieved an accuracy of 93.77%, positioning it as a strong yet slightly less effective model compared to the Logistic Model Tree. Our findings strongly advocate for the adoption of the Logistic Model Tree as the preferred model for crop yield prediction due to its superior accuracy. This research holds significant implications for the agricultural sector, where early prediction of crop yields can substantially impact farming strategies and resource management. As machine learning continues to advance within agronomic analytics, our study provides valuable insights into the comparative performance of popular algorithms, aiding practitioners in making informed decisions for optimizing crop yields.

Keywords: Agricultural productivity, Crop yields, Agronomic practices, Machine learning algorithms, SMO, LMT, Decision Table, Early prediction, Agronomic analytics

Paper ID: 106

**LUNG CANCER DETECTION USING MACHINE LEARNING: A
COMPREHENSIVE APPROACH WITH LOGISTIC BOOSTING MODEL
ACCURACY**

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Abstract: In the worldwide many people are suffering a deadly forms of cancer. Early detection is crucial for improving patient outcomes. The rise in global cancer rates and the quest for effective treatments are two of the biggest challenges to sustainable healthcare. Machine learning's role in revolutionizing oncology by predicting optimal treatment plans is crucial. Using a dataset comprising 1000 observations encompassing key medical parameters—Patient Info, Environmental Factors, Genetic and Health Risks, Smoking Status, Symptoms, Severity—four distinct machine learning models (Decision Table, Bayes Net, Logistic Boosting, AdaBoost) were evaluated to forecast suitable treatment plans based on specific patient profiles by employing a voting ensemble strategy. Results showcased varying accuracies: Decision Table led with 95.12%, closely followed by Bayes Net at 97.29%, and

Logistic Boosting with an impressive 99.19%. In contrast, the simpler AdaBoost model exhibited a lower accuracy of 80.48%. These findings highlight the superiority of complex ensemble methods like Decision Table and Bayes Net in comprehending intricate relationships between genetic, environmental, and clinical factors without sacrificing accuracy. This analysis emphasizes machine learning's potential to transform oncology decision-making. By leveraging these models and existing data, predicting the most suitable treatment plans for specific patient profiles becomes a valuable tool for oncologists. This predictive approach promises to optimize treatment efficacy, resource management, and overall patient outcomes.

Keywords: lung cancer prediction, machine learning, logistic boosting, Bayes Net, decision table, AdaBoost, early detection, feature selection

Paper ID: 107

**IOT ASSISTED NOVEL ANTI-COLLISION WARNING SYSTEM FOR INDIAN
HEAVY COMMERCIAL VEHICLES**

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Abstract: India's heavy commercial vehicle (HCV) sector faces significant challenges in ensuring road safety, with frequent accidents caused by mixed traffic conditions, unpredictable driver behavior, and inadequate infrastructure. This paper presents an IoT-assisted anti-collision warning system specifically designed for Indian HCVs to mitigate these issues. The proposed system integrates cost-effective hardware, including ultrasonic sensors, cameras, and Vehicle-to-Vehicle (V2V) communication modules, with advanced predictive algorithms to deliver real-time collision alerts. A detailed cost-benefit analysis demonstrates the system's economic viability, with reduced accident-related costs, improved fuel efficiency, and enhanced fleet management capabilities. Scalability and adaptability are ensured through centralized cloud-based data management and machine learning models optimized for India's dynamic road environments. The system also aligns with India's evolving smart city infrastructure, paving the way for future integration with autonomous vehicle technologies. This innovative solution provides a transformative approach to improving road safety, operational efficiency, and sustainability in the Indian HCV sector.

Keywords: IoT, Anti-Collision Warning Devices, Heavy Commercial Vehicle, Real-time Communication, Automation

Paper ID: 109

**A SYSTEMATIC REVIEW OF COMPUTATIONAL INTELLIGENCE
APPROACHES FOR IMPROVING COMMUNICATION AND SECURITY IN
VEHICULAR ADHOC NETWORKS**

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Abstract: Vehicular Ad-hoc Networks (VANETs) enable Intelligent Transportation Systems by connecting vehicles and infrastructure. However, ensuring safe and efficient communication is challenging due to the dynamic and dispersed nature of VANETs. This review explores various computational intelligence techniques, including clustering, authentication, and machine learning, to address these challenges. It provides a layer-wise assessment of state-of-the-art solutions and evaluates existing methods for secure VANET operations. Additionally, emerging solutions such as hybrid clustering algorithms, fog computing, and cyber-twin-based attack detection are discussed. This study offers insights into communication trends and computational intelligence approaches, guiding researchers and practitioners in developing secure and reliable VANET systems.

Keywords: Vehicular Ad-hoc Networks(VANET), Vehicular Communication Technology(VCT), Computational Intelligence Techniques(CI), Clustering Computing, Authentication Process, Machine Learning (ML), Deep Learning(DL), Communication and Security Process

Paper ID : 122

**HARNESSING LSTM NETWORKS FOR PREDICTIVE ANALYSIS IN STOCK
MARKET DYNAMICS**

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Abstract :When someone plan their investment, it is not easy for them to follow the overall daily updates and analysis the complete past records as an investor. They often fall into trap of choosing their known or recommended stocks instead of choosing a stock that has

potential for giving them better result and profit based on analysis. Learning to forecast the stock market's investing strategies requires in-depth research of a large amount of data. We believe that the application of AI and machine learning techniques, which are now more prevalent than traditional methodology and approaches, can improve stock market forecasting. A recent breakthrough is the use of machine learning in the field of stock market forecasting. By training from previous values, this system generates projections depending on the stock market's current values indexes. Machine learning itself employs a variety of models to support and confirm prediction. The study focuses on machine learning using LSTM along with RNN for valuation of stock. Factors include volume, open, close, low, and high. Making it extremely challenging to predict future price changes. To comprehend the long-term dependency of stock prices, deep learning approaches, such as the LSTM approach, are utilised together lengthier data reliance and overall stock change patterns.

Keywords: Stock Market, Prediction, LSTM, RNN, Unsupervised

Paper ID: 124

HARNESSING DEEP LEARNING AND TRANSFER LEARNING FOR GEMSTONE CLASSIFICATION AND AUTHENTICITY ANALYSIS

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Abstract: Traditional gemstone authentication has mainly been based on evaluation made by experts, which is largely subjective and time-consuming. This work utilizes deep learning models based on CNNs and other pre-trained architectures for the classification and authentication of gemstones. The dataset contains 6043 images of Ruby, Turquoise, and Emerald, as well as non-genuine counterparts for classification under binary and multiclass frameworks. The models examined include VGG19, DenseNet121, GoogleNet, and Xception.

Keywords: MobileNetV3, CNNs, deep learning, transfer learning, multi-class classification, binary classification, pre-trained models, VGG19, DenseNet121, InceptionV3, GoogleNet, Xception.

Paper ID: 126

ADVANCING LAND USE AND LAND COVER CLASSIFICATION THROUGH DEEP LEARNING IN SATELLITE IMAGERY

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Abstract: Land Use and Land Cover Classification through Deep Learning in Satellite Imagery" describes a method for accurately mapping geographical features based on their

pixel-level characteristics in satellite images. This method can distinguish between various land uses (such as urban areas, forests, and agriculture) and land covers (such as vegetation, water bodies, and bare soil) on Earth's surface. This study uses deep learning techniques to increase the accuracy and efficiency of land use and cover classification in remote sensing and satellite data. Using core models such as CNNs, VGG, and MobileNet, an overall accuracy of 93% was obtained. The dataset used consists of 27,000 hyperspectral, multispectral, and RGB pictures that cover a wide range of spectral and geographical data. Using such a large dataset, the suggested technique helps efficiently overcome the challenges presented by complex remote sensing data.

Keywords: Land Cover, Deep Learning, CNN, Remote Sensing, Satellite, Change Detection, Earth Mapping.

Paper ID: 127

DEEP LEARNING BASED CLASSIFICATION OF BONE FRACTURE: A VISION TRANSFORMER-CNN APPROACH

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Abstract:Accurate and effective classification of fractured and unfractured bones in X-Ray images is essential for rapid diagnosis and treatment planning. Bone fracture in joints requires precise classification which the traditional models struggle to classify due to the complexity in the joint structures. To identify bone fractures in joints, this study presents a hybrid model that is the conjunction of Vision Transformers (ViTs) with Convolutional Neural Networks (CNNs). The program correctly detects and isolates fractures across varied bone joints locations by using a comprehensive dataset of 9,340 X-ray pictures from various joints in the upper extremities. The initial dataset is combined and is divided with a 60:20:20 split: 60% training (5,599 images), 20% validation (1,866 images), and 20% testing (1,875 images). Our suggested architecture employs a pretrained ViT model to extract global contextual characteristics, with a CNN-based classifier fine-tuned to catch detailed local patterns. The hybrid design enables strong feature learning, resulting in higher classification accuracy. The model uses binary cross-entropy loss, optimized with the Adam optimizer, and is evaluated on previously unseen test data. The results of this study indicate that the hybrid ViT-CNN model is effective where it shows 98.79% as the training accuracy, 98.72% as the validation accuracy and 98.88% as the testing accuracy in distinguishing between fractured and non-fractured X-rays. This study demonstrates the combination of the global and local feature extraction processes in leveraging the reliability and scalability of fracture detection in radiology.

Keywords: Bone fracture classification, Convolutional Neural Networks(CNNs), Vision Transformer(ViTs), Fracture Detection.

Paper ID: 129

MULTI-CLASS DISEASE DETECTION FOR SUGARCANE LEAF USING CNN AND TRANSFER LEARNING APPROACH

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Abstract: Sugarcane is one of the main crop in eastern south region and represents 21% of global production and is included in sugar production. Most sugarcane production deals with issues related to bacteria infecting plants reducing the yield and the economy that can be obtained. The traditional way for detecting the disease takes much longer time, inaccurate and more man power, so this paper proposes a CNN architecture and also pre-trained techniques such as ResNet50V2 with skip connections, DenseNet121 with reuse capability and InceptionV3's feature extraction to identify and classify sugarcane leaf disease. Publically obtained dataset contained 4 different classes of leaf disease and healthy data with total of 2521 image files belonging to 5 different classes is used for training, testing and validating. Using image dataset including images of healthy, Mosaic, RedRot, Rust and yellow leaf for classification in the ratio of 8:2. The CNN, ResNet50V2, DenseNet121 and InceptionV3 gave an accuracy of 96.52%, 96.18, 95.13% and 94.44% respectively on dataset. The models built gives reliable accuracy and confidence metrics ranging between 80-100% which can facilitate diagnostic process for detecting leaf disease, which helps in managing and take timely decision required to significantly improve the crop production. The proposed CNN architecture gave the highest accuracy is considered as total accuracy of the proposed work.

Keywords: Sugarcane, CNN, ResNet50V2, DenseNet121, Inceptionv3, confidence, Leaf disease

Paper ID: 132

IDENTIFICATION OF KEY ENVIRONMENTAL FACTORS AFFECTING ATMOSPHERIC CORROSION OF MILD STEEL USING MACHINE LEARNING TECHNIQUES

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Abstract: Corrosion of mild steel poses significant economic and structural challenges, with traditional prediction methods often lacking accuracy. This study leverages machine learning techniques, specifically Random Forest Regression (RFR) and correlation analysis (Pearson and Spearman), to enhance corrosion rate prediction. A dataset of mild steel corrosion under Indian atmospheric conditions was analyzed, identifying Minimum Relative Humidity, Temperature Variations, Rainfall, Chloride, and Sulfur Dioxide as key influencing factors. The Random Forest model outperformed conventional methods in predictive accuracy. These

findings highlight the potential of AI-driven approaches for automated corrosion monitoring and predictive maintenance, improving material longevity in industrial applications.

Keywords: machine learning, corrosion rate, Random forest, Pearson correlation

Paper ID: 136

ENHANCED PNEUMONIA DETECTION IN RADIOGRAPHIC IMAGES

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Abstract: Pneumonia remains a significant health challenge in the globe, and accounts for an accurate diagnostic tool for the timely treatment. This paper would present a novel approach to pneumonia detection, using a hybrid model that combines Vision Transformers (ViTs) with Convolutional Neural Networks (CNNs). The model enhances diagnostic accuracy and robustness by incorporating the global context comprehension of ViTs with the spatial feature extraction of CNNs. Using the radiographs of pneumonia dataset of 9,094 images, and a binary classification model for Pneumonia and Normal classes is developed. The dataset is split up into 6,362 images for training, 1,366 for validation, and 1366 for testing. The ViT-CNN hybrid model has achieved an accuracy of 98%, with a precision of 99% for normal cases and 97% for opacity cases. These results highlight the hybrid model's effectiveness in advancing pneumonia diagnostics and demonstrate the promising role of integrating transformers and CNNs in medical imaging, paving the way for the future research and clinical applications in disease detection.

Keywords: Pneumonia Detection, CNN-ViT Hybrid Model, Medical Imaging style, Deep Learning.

Paper ID: 140

ENHANCED FOOD QUALITY DETECTION USING CNN ARCHITECTURES

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Abstract: Conducting adequate inspections on food quality and safety remains an essential operational goal within present-day industrial food sectors. Traditional food assessment depends on manual inspection and chemical testing which both take up excessive time and require extensive work. Deep learning technology brings food quality detection automation breakthroughs as well as top precision levels in the speed and efficiency of automated food quality detection. The study evaluates DenseNet-121 properties alongside ResNet50 and InceptionV3 and MobileNetV3 deep learning systems for their use in food quality inspections. When compared to other models DenseNet-121 demonstrated the best performance through 96.17% validation accuracy with 9.83% validation loss. The applied ResNet50-InceptionV3 model performed competently for recognition tasks although

MobileNetV3 maintained lower accuracy due to its emphasis on building small network frameworks. Studies confirm that DenseNet-121 exhibits superior levels of generality and durability in identifying food quality variations. Current research exhibits deep learning systems effectively enhance automated food quality assessment technology.

Keywords: Food Quality Detection, Densenet-121, Resnet-50, InceptionV3, MobilenetV3

Paper ID : 141

ABC-LNN: A HYBRID TASK SCHEDULING AND LOAD BALANCING APPROACH LEVERAGING ARTIFICIAL BEE COLONY WITH LIQUID NEURAL NETWORKS IN CLOUD COMPUTING

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Abstract : Scheduling tasks along with load balancing enhance cloud computing availability, reliability, and resource efficiency. Effective approaches optimise performance, cost efficiency, and customer satisfaction, making them essential for cloud service providers and consumers. This paper aims to introduce an optimal hybrid approach, ABCLNN, which incorporates the Artificial Bee Colony (ABC) algorithm with Liquid Neural Networks (LNNs) for improved task scheduling and load balancing within a cloud computing system. The hybrid technique leverages ABC for global optimisation with LNN for dynamic task scheduling and achieved the highest performance improvements of 42.86% in Makespan, 44.44% in Latency, 60% in Throughput, along with 23.08% in Resource Utilisation Quality of Service (QoS) metrics when compared with PSO, LOA, ACO, Firefly Technique, SFO, and ABC methodologies.

Keywords: Task Scheduling, Load Balancing, Artificial Bee Colony (ABC), Liquid Neural Networks (LNNs), Cloud Computing, and Virtual Machine.

Paper ID: 142

ENERGY EFFICIENCY IN WIRELESS SENSOR-BASED INTERNET OF THINGS: AN EXPERIMENTAL ANALYSIS

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Abstract: Things are the physical items, vehicles, appliances etc. that are interconnected, often by sensors and software. These devices can collect and interact with each other through exchange of data. The Internet of Things (IoT) changes over time with the use of technology,

live and work, by extending from the virtual world to the real world. By concerning the growth of IoT, energy parameter takes a vital role at the time of primary design of a model. Most of the IoT models use the sensor which takes input from the environment with limited energy supply. This paper discusses the relating factors that influences the energy consumption of Internet of Things systems, including power management techniques, communication protocols, and hardware architecture. The duty cycling, edge computing, low-power microcontrollers, and innovative energy harvesting methods that are explained briefly here by concerning the focus point to reduce the energy consumption with increasing the operating time of the IoT devices. This experimental evaluation offers a thorough assessment of the current status of energy-efficient IoT systems by combining recent research and technology developments.

Keywords: Internet of Things (IoT), Wireless Sensor Network (WSN), Network Lifetime Maximization, Whale Optimization, Low Energy Adaptive Clustering Hierarchy (LEACH).

Paper ID: 145

**TRANSFER LEARNING BASED RESNET50 MODEL FOR EMOTION
DETECTION**

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Abstract: Emotion detection plays a crucial role in various applications, including human-computer interaction, mental health assessment, and intelligent surveillance. In this study, we propose a transfer learning-based ResNet-50 model for facial emotion recognition, leveraging a publicly available dataset from Kaggle consisting of 34,000 images spanning eight distinct emotional categories. The dataset underwent preprocessing techniques such as image normalization, augmentation, and resizing to enhance model generalization. ResNet-50, a deep convolutional neural network with residual learning, was fine-tuned for emotion classification. By freezing initial layers and fine-tuning deeper layers, the model effectively extracted high-level emotional features. The proposed approach achieved 94% precision, 94% recall, and 95% F1-score, outperforming conventional CNN models. The experimental results demonstrate that transfer learning significantly improves accuracy while reducing training time and computational cost. This study highlights the effectiveness of deep residual networks in emotion detection and provides insights into deploying robust models in real-world scenarios. Future work can focus on integrating multi-modal data, optimizing real-time performance, and exploring lightweight architectures for edge-device deployment.

Keyword: Emotion Recognition, Transfer Learning, ResNet-50, Facial Expression Analysis, Human-Computer Interaction.

Paper ID: 147

EVALUATING THE PERFORMANCE OF RCNN VARIANTS FOR MULTI-OBJECT ANALYSIS IN IMAGES

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Abstract: Object recognition remains a key challenge in computer vision and robotics. CNNs, originating in neuroscience, have become essential for object identification and recognition. The structural and functional similarities between CNNs and the brain's visual cortex make them highly effective for developing and testing object classification and identification algorithms. Although standard CNNs typically use a feed-forward structure, the biological visual system utilizes Recurrent Convolutional Neural Networks (RCNNs), which integrate recurrent connections into each convolutional layer. These recurrent connections facilitate bidirectional information flow within the network, allowing each unit in the intermediate layers to dynamically adapt its activity based on the activity of its neighbouring units. This contextual processing is essential for reliable object recognition. This study implements and assesses several leading RCNN-based object detection frameworks - namely, RCNN, Fast RCNN, and Faster RCNN - for the task of identifying mechanical vehicle parts. A customized dataset of vehicle components is employed for training and evaluation, facilitating a direct comparison of the performance of various architectures within this particular application.

Keywords: RCNN, ROI, object detection and counting, MATLAB.

Paper ID: 148

ENCODED FEATURE FUSION-BASED PNEUMONIA DETECTION USING ENSEMBLE FEDERATED APPROACH

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Abstract: A persistent and severe medical issue, Pneumonia is the primary cause of mortality for young children. A timely and precise diagnosis is essential for successful therapy. The cost, accessibility, and interpretability of chest X-rays make them a popular diagnostic tool. X-ray-based computer-aided pneumonia diagnosis techniques have been successfully developed because of deep learning and federated learning. Federated learning prioritizes data security and privacy. However, these techniques can be difficult to apply in resource-constrained environments because of their complexity, processing demands, and high skill level required for optimal performance. In this study, we have used the traditional MLPClassifier model to design an ensemble federated learning framework. In the pre-processing phase, two image segmentation and quality enhancement techniques were used.

Four distinct feature datasets were extracted using SIFT and ORB local descriptors: SIFT, ORB, fusion of SIFT and ORB, and Encoded fused dataset. With an accuracy of 96.3% using the encoded feature set, the ensemble federated technique fared better than the previous studies. Its lightweight and straightforward design allows for simpler clinical adaption without compromising data privacy or performance.

Keywords: Autoencoder, Federated Learning, Histogram Equalization, Median Filter, ORB, SIFT, Template Segmentation

Paper ID: 149

IOT-INTEGRATED WATER QUALITY SURVEILLANCE AND SMART FEEDING FOR HIGH-DENSITY PISCICULTURE SUSTAINABILITY

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Abstract: High-density fish farming, particularly using the BioFloc system, demands continuous monitoring and automation to ensure optimal water quality and feeding efficiency. This paper introduces an IoT-based automated system that combines real-time water quality monitoring and intelligent feeding to promote sustainability in aquaculture. The system employs a NodeMCU ESP32 microcontroller to track essential water parameters such as pH (6.8–7.5), total dissolved solids (TDS) (300–600 ppm), turbidity (30–100 NTU), and temperature (25–28°C), sending data to a cloud dashboard (Blynk) for remote access. A self-operating feeding mechanism powered by a NodeMCU ESP8266 ensures precise and timely feed distribution, minimizing waste and optimizing fish growth. The system is fully solar-powered, supporting off-grid operation and improving energy efficiency. Experimental results validate the system's ability to maintain stable water conditions while enhancing feeding accuracy and overall sustainability. This solution provides a cost-effective, scalable, and sustainable approach to modern aquaculture.

Keywords: IoT, Water Quality Monitoring, Smart Feeding, Sustainable Aquaculture

Paper ID: 155

ENHANCING CARDIOVASCULAR RISK PREDICTION WITH OPTIMAL PERFORMANCE OF RANDOM GRADIENT ENSEMBLE MODEL

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Abstract: Heart disease remains a major global health concern, contributing significantly to mortality worldwide, making early risk prediction critical for timely intervention and treatment. This study is dedicated to the development of a robust prediction model for heart attack risk using a large dataset sourced from Kaggle, which comprises data from 50,000

individuals, including both male and female patient of varying ages. The dataset includes 19 key parameters relevant to heart health, such as cholesterol levels, blood pressure, and lifestyle habits, we propose a novel ensemble learning approach, termed the Random Gradient Ensemble Model (RGEM), which combines the strengths of Light Gradient Boosting Machine and Random Forest within a bagging framework. This method is designed to improve predictive accuracy and generalization capabilities while reducing overfitting. The model was rigorously evaluated using standard performance metrics, and the Random Gradient Ensemble Model achieved a remarkable prediction accuracy of 97.99%. This outperforms individual models and other commonly used ensemble methods, demonstrating its efficacy in heart attack risk prediction. The high accuracy indicates the model's potential for deployment in real-world healthcare systems to assist medical professionals in early detection and decision-making. This study is leveraging advanced ensemble techniques and large-scale datasets to tackle complex healthcare challenges. Future work will concentrate on expanding the model to incorporate real-time risk assessment and exploring its applicability to other cardiovascular conditions.

Keywords: Random Gradient Ensemble Model, RF, LGBM, Bagging method and healthcare analytics.

Paper ID: 156

INERTIA WEIGHT STRATEGIES WITH TIME VARIATIONS IN PSO-BASED CLOUD TASK SCHEDULING ALGORITHM

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Abstract: Cloud computing has become the most advantageous computing platform for both industry and researchers. In the field of heterogeneous cloud computing environment, optimized task scheduling has become a significant and difficult research issue. For cloud task scheduling, swarm intelligence-based meta-heuristic algorithms are thought to be more appropriate. The local and global search are the two main parts of the swarm intelligence-based meta-heuristic optimization process. Achieving an optimal mapping approach for tasks to resources requires striking a balance between local and global search. One crucial control factor for efficiently modifying the local and global search procedure is the inertia weight. In this paper, Particle Scheduling Optimization (PSO) based task scheduling approach is proposed which takes different inertia weights as one of the inputs to the algorithm. Cloud QoS parameters like overall execution time (Makespan), average Cloud-utilization and energy consumption have been compared for variants of PSO.

Keywords: Cloud, meta-heuristic, PSO, Makespan, Cloud-utilization

Paper ID: 157

**AI-POWERED DIGITAL SIGNAGES MANAGEMENT SYSTEM:
A REVOLUTION IN DIGITAL MARKETING**

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Abstract: This paper presents artificial intelligence (AI) enabled digital advertising management system using the MongoDB, Express, ReactJS, NodeJS (MERN) stack with smart face detection module that analyzes customer interactions with advertisements displayed on digital signage screens to predict viewers' age, gender, and emotions based on the data collected after face detection. In addition to the core functionalities, this system integrates a media slot management system which enables the scheduling and organization of advertisements within specific time slots, optimizing the utilization of the digital signage screens. The digital signage boards installed in public places consists of a CPU unit, screen, high-definition and high-resolution camera, and body frame. The face of the customers standing near the screen is detected and the face image is captured on which these algorithms are processed as an output. This provides the number of people viewing advertise, age, gender, and emotion of each viewer and leads. By leveraging the MERN stack's capabilities, including MongoDB for data storage, Express.js for server-side development, React.js for interactive user interfaces, and Node.js for server-side communication, the system deals with content management system (CMS) where user drives contents or advertisements from the web panel. They also manage the location and slot for the content or advertisement. The consumers have also option to create their campaign by just few clicks. The system offers advertisers a comprehensive platform to manage and optimize their advertising campaigns, resulting in improved targeting, enhanced user experience, and better campaign performance.

Keywords: Artificial intelligence, digital advertisement, digital signages, MERN stack, web application.

Paper ID: 158

**A PARTICLE SWARM OPTIMIZATION BASED NEURAL NETWORK MODEL FOR TOURISM
MACHINATION SYSTEM**

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Abstract: Tourism informatization has become a critical driver of global tourism growth and a competitive advantage in resource allocation. As one of the world's major industries,

alongside automobiles and oil, tourism is rapidly expanding with the improvement of living standards. However, this growth has also introduced challenges such as inefficiency, errors in data management, and outdated administrative practices. To address these issues, the development of a comprehensive tourism management information system is essential to meet evolving market demands and improve efficiency. This paper presents a "smart tourism" approach by leveraging advanced technologies, including Artificial Neural Networks (ANNs) and Particle Swarm Optimization (PSO), to enhance tourism management. The study introduces a novel tourism management system based on a PSO hybridized Back Propagation Neural Network (BPNN), addressing inherent limitations of traditional BPNN such as slow convergence, susceptibility to local minima, and oscillation. Key innovations include a price-comparison decision method to optimize tourist route selection and ensure secure, reliable system functionality through rigorous testing. Experimental results demonstrate the improved efficiency and reliability of the PSO-optimized system, highlighting its potential to address critical challenges in tourism management and promote further innovation in the field. Our proposed model's prediction accuracy, according to experimental results, is 94.67% and furthermore, 96.11% is the recovery rate.

Keywords: Artificial Neural Network, Particle Swarm Optimization, Back Propagation Neural Network, Smart Tourism.

Paper ID: 161

**NEURALINK UNLEASHED: NAVIGATING THE INTERSECTIONS OF
TECHNOLOGY, HUMANITY, AND NATURE**

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Abstract: This paper explores the profound implications of Neuralink's advancements of Brain-Computer Interface (BCI) technology. Through an in-depth analysis, it delves into the multifaceted landscape shaped by Neuralink's pioneering endeavors. From ethical considerations surrounding BCI integration into smart home systems to intricate debates on autonomy and control in human-computer interactions, this research scrutinizes the complex challenges and opportunities inherent in Neuralink's innovations. Furthermore, it examines the fusion of natural and artificial intelligence exemplified by Neuralink's quest for symbiosis between humans and AI. The paper also sheds light on Neuralink's groundbreaking strides in BCI technology, elucidating its novel electrode arrays and neurosurgical robotics promising scalable, high-bandwidth neural interfaces. Through comprehensive analysis, this paper illuminates the intricate interplay between technology, humanity, and nature in the age of Neuralink, offering insights for navigating this transformative frontier.

Keywords: Artificial Intelligence, Neuralink, BCI technology

Paper ID: 162

PREDICATION OF SOLAR STILL PRODUCTION RATE USING ARTIFICIAL NEURAL NETWORK AND STEP REGRESSION MODEL

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Abstract. Solar desalination represents a promising approach to freshwater production, and this study investigates its efficacy by estimating the productivity of a solar still through experimental data analysis. The research posits that solar still output depends on multiple variables, including solar radiation, feed flow rate, ambient temperature, relative humidity, and wind speed. To model this relationship, a back-propagation artificial neural network (ANN) was developed and compared with a conventional stepwise regression method. Results revealed that the ANN model achieved superior predictive accuracy in estimating the solar still's freshwater generation rate, outperforming the regression model. This finding underscores the potential of machine learning techniques in optimizing solar desalination systems under variable environmental conditions.

Key words: Solar desalination, artificial neural network

Paper ID: 163

A BLOCKCHAIN ENABLE TECHNOLOGY FOR IOT BASED APPLICATIONS FOR ENHANCING THE SECURITY AND TRANSPARENCY

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Abstract: Blockchain technology, blended with the Internet of Things (IoT), addresses key challenges such as security vulnerabilities, lack of transparency, and inefficiencies in distributed systems. This study proposes a blockchain-based IoT framework to enhance resource monitoring and management by ensuring secure data flow, preventing tampering, and fostering trust. Smart contracts enable automated decision-making, improving security and operational efficiency. The model is evaluated through comparative analysis with traditional IoT systems, considering metrics like transaction time, block execution, and

scalability. Results demonstrate enhanced security, elimination of single points of failure, and improved system performance. The proposed model is particularly suited for high-credibility applications such as supply chains and smart cities, validating the potential of blockchain-enabled IoT solutions to transform distributed ecosystems and drive innovation in decentralized technologies.

Keywords: Blockchain, IoT, Transparency, Security, Distributed

Paper ID: 164

HEART STROKE PREDICTION USING MACHINE LEARNING APPROACH WITH CLINICAL AND DEMOGRAPHIC FACTORS

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Abstract: Heart strokes are a major global health emergency, and it requires early diagnosis to enhance patient recovery. Increased global rates of stroke and the need for successful treatments pose significant challenges to sustainable healthcare. The contribution of machine learning to transforming cardiovascular well-being through predictive optimal treatment planning is pivotal. With a dataset of 1320 observations, including major medical parameters—Patient Info, Heart rate, Systolic blood pressure, ^{Diastolic} blood pressure, Blood sugar, CK-MB, and Troponin —three different machine learning models (Random Tree, AdaBoost, and Decision Stump) were compared to predict appropriate treatment plans for given patient profiles. Findings highlighted diverse accuracies: AdaBoost took the top spot at 98.47%, with Random Tree second at 96.88%, while Decision Stump recorded a satisfactory accuracy of 87.35%. The findings indicate the merits of the AdaBoost model to identify subtle associations among genetic, environmental, and clinical factors. Random Tree and Decision Stump, as handy, recorded their shortcomings in grasping such elaborate interactions. The analysis signifies machine learning's capabilities to revolutionize cardiovascular decision-making. By using these models and available data, forecasting the most appropriate treatment plans for certain patient profiles becomes a useful resource for healthcare professionals. This predictive method has the potential to maximize treatment effectiveness, resource utilization, and overall patient outcomes.

Keywords: Heart strokes prediction, Machine learning, Random Tree, AdaBoost, Decision Stump

Paper ID: 167

MALARIA DETECTION FROM BLOOD SMEARS USING DEEP LEARNING FRAMEWORKS

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Abstract: Malaria is a dangerous disease, caused by mosquitoes, which are being transmitted from one another, yet it still kills thousands of people annually. Due to the growing number of deaths, detection is low, the workers in laboratories are not experienced, and sophisticated medical diagnostic equipment is also not available. Recently, research has focused on microscopic blood smear examination of malaria-infected RBCs with DL models as a promising point-of-care approach. In the current study, the Malaria Dataset was employed to classify and detect malaria parasites with Hybrid Deep Learning Models. Classification models include VGG19, ResNet50, CNN, and advanced RNN combinations like LSTM+LSTM, GRU+GRU, GRU+LSTM, LSTM+GRU, GRU + BiLSTM, LSTM + BiLSTM, and BiLSTM + BiLSTM, alongside Xception, NasNetMobile, and an ensemble model of Xception and NasNetMobile. For robust detection, the YOLO family, including YOLOV5x6, YOLOV5s6, YOLOV8n, and YOLOV9n, is used to identify abnormalities. The outcome shows that ensemble Xception + NasNetMobile gave better accuracy, while YOLOV9n proved more effective for malaria parasite detection. It therefore shows promising advancement in the area of automated malaria identification and also promotes reliable development of diagnostic tools for malaria control.

Keywords: Malaria, detection, classification, CNN, LSTM, GRU, Bi-directional LSTM, hybrid model, cascaded classifier.

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DEEP LEARNING-BASED STOCK FORECASTING AND RECOMMENDATION SYSTEM USING A HYBRID TCN-LSTM APPROACH INCORPORATING FUNDAMENTAL AND TECHNICAL ANALYSIS

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Abstract: Global events, investor moods, and economic conditions are some of the numerous variables that influence the stock market's extreme volatility. Due to market volatility and unpredictable fluctuations, stock price forecasting is very challenging. Sophisticated deep

learning models play a vital role because conventional forecasting methods often fail to consider these complexities. To predict stock prices and provide investment suggestions, this research suggests a hybrid deep learning model integrating Temporal Convolutional Networks (TCN) and Long Short-Term Memory (LSTM) networks. The model predicts closing prices for 30 days based on technical indicators and past price information. In addition, a recommendation engine assesses stock performance by examining fundamental financial information and generating buy or sell suggestions based on financial health and expected trends. The results show that this hybrid model efficiently detects trends in the market, improves forecast accuracy, and offers reliable investment recommendations. The system provides investors with a choice to make informed decisions by merging financial analysis with deep learning, thus enhancing their confidence in addressing market volatility.

Keywords: Fundamental analysis, Technical analysis, Deep Learning, Stock recommendation, Time series forecasting

