UCICS 2025

UNDERGRADUATE CONFERENCE ON INTELLIGENT COMPUTING AND SYSTEMS

EMPOWERING TOMORROW'S INNOVATORS

February 26-27, 2025

Varendra University, Rajshahi-6204, Bangladesh

ABSTRACT PROCEEDINGS

ISBN: 978-984-37-0220-3

ORGANIZED BY

Department of Computer Science and Engineering
Varendra University, Rajshahi, Bangladesh

Dept. of CSE
Varendra University

VARENDRA UNIVERSITY
বরেন্দ্র
বিশ্ববিদ্যালয়

MD. SAKIB ANJUM
(1997-2024)

SAKIB ANJUM: A Martyr of the July 2024 Movement and a Beacon of Bravery

In the history of Bangladesh, the July 2024 Movement will be remembered as a defining moment of resistance and sacrifice. Among the many fearless souls who stood against oppression, one name shines bright—MD. SAKIB ANJUM, a bright student of Department of Computer Science and Engineering, Varendra University, whose ultimate sacrifice has immortalized him in the hearts of his fellow countrymen.

Born on February 1, 1997, in a family that instilled values of compassion and justice, Sakib was the beloved son of MD. MAINUL HAQUE and MST. ROOKEYA KHATUN. From an early age, he was known for his humility and unwavering commitment to helping others. His kind heart and selfless nature made him a beloved friend, son, and later, a devoted husband to NISHAT SALSABIL. Sakib took admission in Varendra University in the Summer 2017 session as a student of the Computer Science and Engineering Department. He was not only a bright student but also an active participant in university activities, always striving to contribute positively to community.

When the July 2024 Movement erupted against the unjust quota system, corruption, and repression, Sakib Anjum stood firmly for justice. From the outset, he played a vital role in organizing and mobilizing students, believing in collective resistance. On August 5, 2024, as the movement neared victory, Sakib was in Talaimari, Rajshahi, when terrorists from Chhatra League, Jubo League, and Swechasebak League attacked unarmed protesters with firearms and sharp weapons. Prioritizing the safety of female protesters, he led them to shelter but was shot twice while protecting them. Wounded, he struggled toward safety but was brutally stabbed from behind. Though he managed to take refuge inside a house, the attackers surrounded the building, preventing timely medical aid. Due to excessive blood loss, he succumbed to his injuries before reaching Rajshahi Medical College Hospital, where he was declared dead.

A symbol of resilience and sacrifice, SAKIB fought not just for himself but for the dignity of future generations. His martyrdom will forever be honored by Varendra University, people of Rajshahi, and the entire nation.

Rest in peace, Sakib Anjum. Your sacrifice will never be forgotten.

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Chairman
Varendra University Trust

Chief Guest (Opening Session)

Message

It is my great pleasure to extend warm greetings to all the participants of the Undergraduate Conference on Intelligent Computing and Systems (UCICS) going to be held on 26-27 Feb 2025. On behalf of the Board of Trustees of Varendra University, I extend my warmest congratulations to the Department of Computer Science and Engineering for organizing the conference. This conference exemplifies our institution's dedication to nurturing an academic environment where innovation, research, and knowledge-sharing thrive.

UCICS 2025 provides a special and worthwhile chance for undergraduate students to showcase their research endeavors, engage in critical discourse, and connect with the broader academic community in the field of ICT outside of the classroom. Interacting with professionals from academia and business introduces students to current research trends and helps them to develop valuable skills for their future occupations.

The conference includes a broad spectrum of ICT which reflects the dynamic nature of ICT sector and the commitment to comprehensive technology education. Such a comprehensive scope underscores the importance of multidisciplinary research and collaboration to drive the progress in ICT. I have no doubt that UCICS will act as a driving force behind the innovative studies and motivate the next generations of computer scientists to make influential contributions to the society.

I want to express my gratitude to the researchers and students for their efforts as well as enthusiasm at this conference. Unquestionably, your enthusiasm for learning and creativity will result in ground-breaking concepts and successes.

I wish UCICS 2025 a great success and hope this initiative serves as a catalyst for undergraduate research and innovation across Bangladesh.

Hafizur Rahman Khan

Vice Chancellor
Rajshahi University of Engineering & Technology

Guest of Inauguration (Opening Session)

Message

It is with great enthusiasm and a deep sense of pride that I extend my heartfelt congratulations to the department of Computer Science and Engineering at Varendra University, Rajshahi, for organizing the Undergraduate Conference on Intelligent Computing and Systems (UCICS-2025) on February 26-27. This conference represents a remarkable step forward in nurturing research and innovation among undergraduate students, providing them with an invaluable platform to showcase their intellectual contributions.

In today's fast-evolving world, science and technology play a crucial role in shaping economies, industries, and societies. The pursuit of academic excellence and the continuous enhancement of research capabilities are fundamental to national progress. By fostering a culture of inquiry, collaboration, and knowledge-sharing, this conference will empower young minds to push the boundaries of scientific exploration and technological advancements.

The Faculty of Engineering has long been at the forefront of academic excellence, consistently organizing international conferences that attract distinguished scholars, researchers, and professionals from across the globe. The knowledge exchange facilitated through expert keynote addresses, interactive discussions, and groundbreaking research presentations will undoubtedly enrich the academic community and inspire the next generation of innovators.

Beyond research and learning, UCICS-2025 embodies the spirit of curiosity and perseverance, enabling students to develop analytical skills, confidence, and a visionary outlook to address real-world challenges. I have no doubt that the insights gained from this conference will contribute to fostering a dynamic ecosystem of knowledge and technological innovation.

I commend the tireless efforts of the organizing committee for their unwavering dedication in curating this esteemed event. Their commitment to maintaining a rigorous review process and selecting high-quality research contributions reflects the high academic standards of Varendra University.

I extend my best wishes for the grand success of UCICS-2025. May it inspire groundbreaking discoveries, fruitful collaborations, and a lasting impact on the future of scientific research and technological advancement.

Prof. S M Abdur Razzak

Vice Chancellor
Rajshahi Medical University

Chief Guest (Closing Ceremony)

Message

I extend my warmest congratulations with immense pleasure and profound admiration to the Department of Computer Science and Engineering at Varendra University, Rajshahi, for successfully organizing the Undergraduate Conference on Intelligent Computing and Systems (UCICS-2025) on February 26-27. This conference stands as a testament to the university's unwavering commitment to fostering a culture of research, innovation, and academic excellence among undergraduate students.

In an era where technological advancements drive progress across all sectors, the role of research and knowledge-sharing becomes more critical than ever. UCICS-2025 provides a vital platform for young scholars to present their pioneering ideas, exchange insights, and engage with leading experts in the field. Such initiatives not only enhance the research ecosystem but also inspire students to contribute meaningfully to the global scientific community.

The Faculty of Engineering at Varendra University has consistently upheld high academic standards, creating avenues for intellectual growth and interdisciplinary collaboration. The esteemed keynote speakers, thought-provoking discussions, and diverse research presentations featured in this conference will undoubtedly enrich the academic discourse and empower students to tackle real-world challenges with confidence and creativity.

Beyond its academic significance, UCICS-2025 embodies the spirit of inquiry, resilience, and innovation. It equips students with the analytical mindset and problem-solving abilities necessary to navigate the complexities of the ever-evolving technological landscape. I firmly believe that the knowledge gained, and the connections built during this conference will leave a lasting impact on participants, shaping the future of intelligent computing and systems.

I sincerely appreciate the relentless efforts of the organizing committee in ensuring the success of this prestigious event. Their dedication to maintaining academic rigor and fostering a collaborative research environment is truly commendable.

Wishing UCICS-2025 great success! May it serve as a beacon of inspiration for future research endeavors, ignite innovative thinking, and pave the way for groundbreaking technological advancements.

Prof. Dr. Md. Jawadul Haque

VARENDRA UNIVERSITY
বরেন্দ্র বিশ্ববিদ্যালয়

Pro-Vice Chancellor
Varendra University

Special Guest (Opening Session)

Message

Welcome to the Undergraduate Conference on Intelligent Computing and Systems (UCICS-2025) on Feb 26-27, 2025, at Varendra University. This conference represents a key milestone in our continuous efforts to boost the quality of undergraduate education in Bangladesh's ICT industry.

The Department of Computer Science and Engineering deserves praise for putting together this conference, which gives undergraduate students a unique opportunity to interact with innovative research subjects and gain knowledge from professionals in their domains. UCICS-2025 offers a unique opportunity for students to explore advanced research in diverse areas of Computer Science from Artificial Intelligence and Machine Learning to Cyber Security and the Internet of Things (IoT).

As we gather for these two days, I urge everyone to exploit this chance to network, exchange ideas, and gain insights into the newest technological advancements. Your participation in this conference means more than just attending sessions or delivering papers; it means joining a broader movement toward undergraduate education focused on research.

I am confident that UCICS-2025 will not only be a platform for knowledge sharing but also an inspiration for future research and innovation. I wish all participants a productive and enlightening conference experience.

Wishing you a successful, insightful, and memorable conference filled with inspiring discussions, valuable connections, and meaningful takeaways that leave a lasting impact on all participants. May this event be a platform for innovation, collaboration, and growth, paving the way for future achievements and shared success.

AKSaha

Prof. Dr. Ananda Kumar Saha

Conference Chair
UCICS 2025

Message

It is my distinct honor and privilege to welcome you all to the Undergraduate Conference on Intelligent Computing and Systems (UCICS) on Feb 26-27, 2025, organized by the Department of Computer Science and Engineering, Varendra University. This pioneering initiative aims to engage and inspire undergraduate students to gain exposure to learning about cutting-edge research in a variety of computer and technology fields at this two-day conference.

The rapidly evolving landscape of technology demands that we prepare our undergraduate students not just as learners but as future innovators and researchers. UCICS provides a unique opportunity for undergraduate students to participate in cutting-edge research fields like Artificial Intelligence and Machine Learning, Robotics and Automation, Cloud Computing, Big Data Analysis, Bioinformatics, Communication Technologies, Embedded Systems, and Cybersecurity.

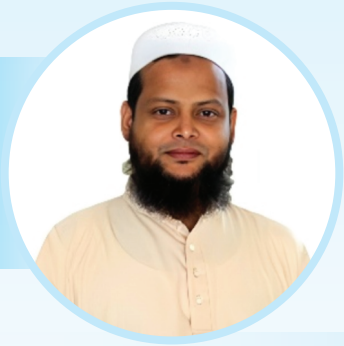
I'm very delighted about the wide variety of tracks we provide, which focus on crucial research domains that will influence technology in the future. This conference is an expression of our dedication to helping undergraduate students develop a research-oriented mindset and giving them the chance to gain knowledge from professionals in their domains.

Organizing this conference has been a collaborative effort. I express my deepest gratitude to the distinguished keynote speakers, reviewers, session chairs, paper presenters, and participants for their invaluable contributions. Special thanks go to the dedicated members of the organizing committee, whose tireless efforts have made this event possible.

I hope all participants will have a fruitful and memorable experience at UCICS 2025. May this conference be a significant milestone in your academic and professional journey.

Wishing everyone an insightful and inspiring conference experience.

Prof. Dr. Md. Khademul Islam Molla



Conference Co-Chair
UCICS 2025

Message

It is my immense pleasure to be a part of the Undergraduate Conference on Intelligent Computing and Systems (UCICS 2025), organized by the Department of Computer Science and Engineering, Varendra University. This conference serves as a remarkable platform for undergraduate students to present their research, exchange ideas, and explore the frontiers of intelligent computing and emerging technologies.

In an era where technological advancements are shaping every aspect of our lives, UCICS 2025 aims to foster a research-driven mindset among young scholars. The conference will bring together students, researchers, and professionals to discuss innovations in AI, machine learning, cloud computing, robotics, biomedical engineering, and more. By encouraging collaboration and critical thinking, we aspire to contribute to the next wave of intelligent systems and automation.

I firmly believe that the research contributions from undergraduate students in this conference will pave the way for future technological breakthroughs. Their dedication and hard work will not only enhance their academic journey but also inspire industry-driven innovations and interdisciplinary solutions.

I congratulate the organizing committee, authors, and participants for their efforts in making this event a success. I look forward to witnessing inspiring research presentations and meaningful discussions.

I wish UCICS 2025 a grand success.

Prof. Dr. Mohammad Shahidur Rahman

Contents

Program Schedule UCICS-2025

25 February, 2025

Conference Kit Distribution	February 25, 2025	15:30-17:00	Information & Kit Collection Booth

Day – 1: 26 February, 2025

Conference Kit Distribution	February 26, 2025	9:00-9:30	Information & Kit Collection Booth
Inaugural Session	February 26, 2025	9:30-10:30	Auditorium Hall

Snacks and Coffee Break (10:30-11:30)

Keynote Session-1 (Embedded Systems)	February 26, 2025	11:30-12:00	Auditorium Hall
Keynote Session-2 (Biomedical Engineering)	February 26, 2025	12:00-12:30	
Plenary Session-1 (Hybrid)	February 26, 2025	12:30-13:15	

Lunch and Prayer Break (13:15-15:00)

Technical Session-1			
Invited Talk -1 (Bioinformatics and Machine Learning)	February 26, 2025	15:00-15:15	Senate Hall
Technical Session-1.1 (Bioinformatics and Machine Learning)	February 26, 2025	15:15-17:00	
Technical Session-1.2 (Embedded Systems)	February 26, 2025	15:00-17:00	Room-311
Technical Session-1.3 (Biomedical Engineering)	February 26, 2025	15:00-17:00	Room-313
Technical Session-1.4 (Signal, Image and Video Processing)	February 26, 2025	15:00-17:00	Room-314

Tea Time

Day – 2: 27 February, 2025

Keynote Session-3 (Speech synthesis and prosody)	February 27, 2025	9:30-10:00	Senate Hall
Technical Session - 2			
Technical Session-2.1 (Signal Processing)	February 27, 2025	10:10-11:40	Senate Hall
Invited Talk - 2 (Computer Vision)	February 27, 2025	10:00-10:15	Room-311
Technical Session-2.2 (Computer Vision)	February 27, 2025	10:15-11:45	
Technical Session-2.3 (Bioinformatics and ICT)	February 27, 2025	10:10-11:40	Room-313
Technical Session-2.4 (Statistical Modeling and Computing)	February 27, 2025	10:10-11:40	Room-314

Snacks and Coffee Break (11:40-12:15)

Technical Session - 3			
Invited Talk - 3 (Brain Signal Processing)	February 27, 2025	12:15-12:30	Senate Hall
Technical Session-3.1 (Brain Signal Processing)	February 27, 2025	12:30-13.45	
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Technical Session-3.4 (Computing and ICT)	February 27, 2025	12:15-13.45	Room-314

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Keynote Session-4 (Algorithm and Computing)	February 27, 2025	15:15-15:45	Senate Hall
Technical Session - 4			
Technical Session-4.1 (Algorithm and Computing)	February 27, 2025	15:45-17:15	Senate Hall
Invited Talk - 4 (AI, IoT and Machine Learning)	February 27, 2025	15:45-16:00	Room-311
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Technical Session-4.3 (Communication and Computing)	February 27, 2025	15:45-17:15	Room-313
Technical Session-4.4 (AI, IoT and Machine Learning)	February 27, 2025	15:45-17:15	Room-314

Tea Break (17:15-17:30)

Plenary Session-2 (Industrial Insights)	February 27, 2025	17:30-18:00	Auditorium Hall
Closing Ceremony and Cultural Program	February 27, 2025	18:45-20:00	Auditorium Hall
Gala Dinner	February 27, 2025	20:00	Varendra University

Session Schedule UCICS –2025

Day – 1: 26 February, 2025

Session ID	Track	Chair	Time	Venue
Keynote session-1	Embedded System	Prof. Sawal Hamid Bin Md Ali	11:30-12:00	Auditorium Hall
Keynote Session-2	Biomedical Engineering	Prof. Dr. Mamun Bin Ibne Reaz	12:00-12:30	
Plenary Session-1	Hybrid	Prof. Dr. M. Kaykobad	12:30-13:00	

Lunch and Prayer Break (13:15-15:00)

Technical Session (TS) - 01					
Session ID	**Track**	**Paper ID**	**Chair**	**Time**	**Venue**
Invited Talk Session-1	Bioinformatics and Machine Learning	Invited-1	Dr. Shamim Ahmad	15:00-15:15	Senate Hall
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TS-1.2	Embedded Systems	11, 22, 25, 47, 49, 86	Prof. Sawal Hamid Bin Md Ali	15:00-17:00	Room-311
TS-1.3	Biomedical Engineering	48, 52, 54, 58, 69, 117	Prof. Dr. Mamun Bin Ibne Reaz	15:00-17:00	Room-313
TS-1.4	Signal, Image and Video Processing	24, 51, 83, 90, 152, 158	Dr. Md. Ekramul Hamid	15:00-17:00	Room-314

Tea Time

Day – 2: 27 February, 2025

Session ID	Track	Chair	Time	Venue
Keynote session-3	Speech synthesis and prosody	Dr. Keikichi Hirose	9:30-10:00	Senate Hall

Technical Session (TS) - 02					
Session ID	**Track**	**Paper ID**	**Chair**	**Time**	**Venue**
TS-2.1	Signal Processing	85, 88, 120, 144, 146	Dr. Keikichi Hirose	10:10-11:40	Senate Hall
Invited Talk Session-2	Computer Vision	Invited-2	Dr. Dipankar Das	10:00-10:15	Room-311
TS-2.2	Computer Vision	106, 112, 118, 153, 159	Dr. Dipankar Das	10:15-11:45	
TS-2.3	Bioinformatics and ICT	15, 70, 71, 100, 148	Dr. M. Babul Islam	10:10-11:40	Room-313
TS-2.4	Statistical Modeling and Computing	7, 32, 98, 163, 164	Prof. Dr. A.H.M Rahmatullah Imon	10:10-11:40	Room-314

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Technical Session (TS) -03					
Session ID	**Track**	**Paper ID**	**Chair**	**Time**	**Venue**
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Session ID	Track	Chair	Time	Venue
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Technical Session (TS) -04					
Session ID	**Track**	**Paper ID**	**Chair**	**Time**	**Venue**
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Invited Talk Session-4	AI, IoT and Machine Learning	Invited-4	Dr. Md. Abdur Rahim	15:45-16:00	Room-311
TS-4.2	Hybrid	33, 37, 91, 96, 165	Dr. Md. Abdur Rahim	16:00-17:15	
TS-4.3	Communication and Computing	46, 126, 151, 157, 160, 166	Dr. Md. Golam Rashed	15:45-17:15	Room-313
TS-4.4	Biomedical Instrumentation and Embedded System	1, 39, 42, 75, 108	Dr. Syed Md. Galib	15:45-17:15	Room-314

Tea Break (17:15-17:30)

Session ID	Track	Chair	Time	Venue
Plenary Session-2	Industrial Insights	Md. Khairul Alam	17:30-18:00	Auditorium Hall

Events	Time	Venue
Closing Ceremony and Cultural Program	18.45-20.00	Auditorium Hall
Gala Dinner	20.00	Varendra University

Keynote Speakers	Invited Speakers
1. Dr. Keikichi Hirose Professor Emeritus, Department of ICE University of Tokyo, Japan	1. Dr. Shamim Ahmad Professor, Department of CSE University of Rajshahi, Bangladesh
2. Prof. Dr. M. Kaykobad Distinguished Professor, Department of CSE, BRAC University, Bangladesh	2. Dr. Dipankar Das Professor, Department of ICE University of Rajshahi, Bangladesh
3. Prof. Dr. Mamun Bin Ibne Reaz Coordinator of the ICTP EAU Affiliated Centre in UKM, Malaysia	3. Dr. Md. Kafiul Islam Associate Professor, Department of EEE Independent University of Bangladesh, Bangladesh
4. Prof. Dr. Sawal Hamid Bin Md Ali Professor, Department of EESE Universiti Kebangsaan Malaysia, Malaysia	4. Dr. Md. Abdur Rahim Associate Professor, Department of CSE Pabna University of Science and Technology Bangladesh

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Sawal Hamid Bin Md Ali, PhD
Professor
Department of Electrical, Electronics and System Engineering,
Universiti Kebangsaan Malaysia

Title: System on Chip (SoC): A Practical Implementation for Healthcare System

Abstract

System on Chip (SoC) technology represents a significant shift in modern electronics, integrating multiple computing components such as processors, memory, and I/O interfaces onto a single chip. This presentation explores the structure, types, and advantages of SoC, with a special focus on Programmable SoC (PSoC)—a variant incorporating Field-Programmable Gate Arrays (FPGA) for enhanced flexibility and performance. The presentation begins with an introduction to SoC, explaining its role in compact and efficient system designs. It then categorizes different types of SoCs, including general-purpose SoCs, application-specific integrated circuits (ASICs), and programmable SoCs. A detailed comparison highlights the benefits of PSoC over traditional microprocessors and microcontrollers, emphasizing real-time processing, low power consumption, and adaptability. Key applications of PSoC with FPGA are examined, spanning automotive (ADAS, autonomous navigation), healthcare (portable EKGs, medical imaging, neuroprosthetics), and telecommunications (5G infrastructure, network security, and edge computing). Practical comparisons demonstrate how PSoC-based systems outperform microprocessor-driven solutions in real-time response, parallel processing, and power efficiency. A dedicated analysis of PSoC in neuroprosthetics showcases its ability to process neural signals with minimal latency, enabling advanced prosthetic control superior to conventional microprocessor setups. A comparative table further breaks down the advantages and disadvantages of PSoC vs. microprocessors across multiple technical aspects. The presentation concludes by discussing the future of SoC and PSoC technologies, highlighting their growing impact across industries. As programmability, efficiency, and integration continue to shape the next generation of computing, PSoCs are positioned as a key enabler of high-performance, adaptive, and power-efficient systems in cutting-edge applications.

Biography

Sawal Hamid Md Ali is a Professor of Embedded System Design at the Department of Electrical, Electronics and System Engineering, University Kebangsaan Malaysia. He received bachelor degree in Electronic and Computer Engineering from University Putra Malaysia in the year 1998, Master degree in Microelectronic System Design from the University of Southampton in the year 2004 and Ph.D degree in electrical and electronics from University of Southampton, United Kingdom in the year 2010. Dr. Sawal's work on VLSI, System on Chip and Embedded system has been published in several high quality conference proceedings and journals. He has authored and co-authored more than 200 publications and till this date has been granted four patents on technology related to embedded system and microelectronic circuitry. His interdisciplinary work involves several fields including Analog and Mixed Signal Systems, System on Chip design, circuit optimization, wearable system and embedded system. He is currently the Deputy Director for the Centre of Innovation and Technology Transfer, Universiti Kebangsaan Malaysia.

Mamun Bin Ibne Reaz, PhD
Coordinator of the ICTP
EAU Affiliated Centre in UKM, Malaysia

Title: cEMG Sensors: Shaping the Future of Muscle Monitoring

Abstract

The presentation explores the development and application of capacitive electromyography (cEMG) biosensors, a non-invasive, contactless solution for monitoring muscle activity. With applications in healthcare, rehabilitation, sports science, and human-computer interfaces, cEMG biosensors offer significant advancements over traditional needle and wet electrodes by addressing limitations like invasiveness, skin preparation, and motion artifacts. Highlighting innovative design elements, such as polyimide insulation and optimized skin-electrode capacitance, the study demonstrates low noise floors and high signal accuracy. These advancements position cEMG biosensors as a pivotal technology for wearable sensing, enabling efficient and long-term monitoring solutions across various fields.

Biography

Mamun Bin Ibne Reaz, PhD ’07, is the Dean of the School of Engineering, Technology and Sciences at the Independent University, Bangladesh and Professor in Electrical and Electronic Engineering. Previously, he was a Professor at the Universiti Kebangsaan Malaysia (UKM), Malaysia. His scientific specialisation is in the areas of IC Design, Biomedical application IC, Biomedical sensors and Smart Home. Mamun Bin Ibne Reaz has published more than 400 scientific articles and is a recipient of more than 70 research grants. His Google citation is over 15,000. Since 2020, he is listed amongst the world's top 2% scientists by Stanford University Data for "Updated science-wide author databases of standardized citation indicators". He was a Senior Associate of the Abdus Salam International Centre for Theoretical Physics (ICTP), Italy since 2008, and presently, Coordinator of the ICTP EAU Affiliated Centre in UKM, Malaysia. Mamun Bin Ibne Reaz has an undergraduate and graduate degree in Applied Physics and Electronics from University of Rajshahi, Bangladesh, and a doctoral degree in VLSI Design from the Ibaraki University, Japan.

Keikichi Hirose, PhD
Professor Emeritus
Department of Information and Communication Engineering
University of Tokyo, Japan

Title: Speech synthesis and prosody

Abstract

In recent years, great progress has been made in the field of artificial intelligence, and human-like conversations with machines come possible. As for speech synthesis, it can generate highly-natural speech in anyone's voice, if his/her original voice is available. Synthetic speech is now widely used to make video programs. However, if we go back 20 years, synthetic speech sounded machine-like and researchers were worried: "How can we generate human-like speech?" In my talk, I will first review the history of speech synthesis, starting with Voder in 1939. Although high-quality speech synthesis is achieved, researchers point out problems when "free-style" speech is targeted. Humans produce various types of speech for the same linguistic content depending on the "situation." This variation is mostly related to prosodic features of speech. Basically, prosodic features do not play a role in conveying linguistic meaning, but they do play an important role in conveying attitude, emotion, and speaker identity. Proper control of prosodic features is important to realize variable styles in speech synthesis. In the talk, I will introduce a model for fundamental frequency contours (F0 model), and show how it realizes "flexible control" in speech synthesis, taking focus control as an example.

Biography

Keikichi Hirose received the Ph. D. degree in electronic engineering in 1977 from the University of Tokyo. He was a professor of the University of Tokyo from 1994. He retired in 2015, and received Professor of Emeritus title. From March 1987 to January 1988, he was Visiting Scientist at the Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge, U.S.A. He served as a project professor at National Institute of Informatics during June 2019 - March 2023. He has been engaged in a wide range of research on spoken language processing, including analysis, synthesis, recognition, dialogue systems, and computer-assisted language learning. From 2000 to 2004, he was Principal Investigator of the national project "Realization of advanced spoken language information processing utilizing prosodic features." He served as the general chair for INTERSPEECH 2010, Makuhari, Japan. Since 2010, he served as the Chair of ISCA SProSIG until 2018. Also, he served as a board member of ISCA during 2009-2017. He is a member of International Advisory Council from January 2021 (to 2024). He received ISCA fellow grade in 2018. He became an honorary member, Polish Phonetic Association, in 2013. For his long-term and remarkable contribution to spoken language processing, he received Achievement Award from Acoustical Society of Japan in 2020. In 2015, he was honored as a Named Person of Merit in Science and Technology by the Mayor of Tokyo.

Mohammad Kaykobad, PhD
Distinguished Professor
Department of Computer Science and Engineering
BRAC University, Bangladesh

Title: ICT Research in Undergraduate Years-Some Success Stories- Inspirational Talk

Abstract

This talk is based on my personal experience in collaborating with CSE students of BUET. This has been so inspiring for me to see that our young students, starting with freshmen, are so capable of doing research and publish in international journals of repute. Young people have infinite energy- too much to be exhausted by carrying out routine tasks. Many scientists have proved their research skill in early years. I have a feeling that if inspired they can produce miracles. This will not only strengthen research activities of our universities, students having credentials enriched with research in undergraduate years will create opportunity for higher studies in reputed universities.

Biography

Dr Mohammad Kaykobad, born on 1 May, 1954 at Jabra, Manikganj. He received M.S.(Hons.) in Engineering from OMEI, now Odessa State Maritime University, in 1979. In 1982 he received an M.Eng. Degree from AIT, Thailand, and Ph.D from the Flinders University of South Australia in 1988. Dr Kaykobad is a Fellow of Bangladesh Academy of Sciences(BAS), and was an Associate Secretary of its Executive Council. Dr Kaykobad was a Professor at CSE Department, BUET since 1997, and served as its Head during 1996-1999. Since 2020 after retirement from BUET Dr Kaykoabd is a Distinguished Professor of CSE department, Brac University. He published over 40 research papers in Physical Review, International Journals of Computer Mathematics, Computers & Operations Research, Computers & Mathematics with Applications, Linear Algebra & Its Applications, Information Processing Letters, Information Processing and Management, Applied Mathematics E-Notes, Journal of Computing and Information Technology, Electronic Notes in Discrete Mathematics, Journal of International Olympiad in Informatics and Computers & Graphics. He authored, coauthored or edited 13 books. Many of these books are for inspiring young students develop either programming or mathematics skill or for developing patriotism. He is a guest co-editor of the proceedings of International Conference on Computer and Information Technology (ICCIT 2009) published by Academy Publisher. Dr Kaykobad was the Organizing Chair of the first ever international computer conference ICCIT held in the soil of Bangladesh. He is also the Chair of the Steering Committee for Workshop on Algorithms (WALCOM) proceedings of which are published as Lecture Notes in Computer Science by Springer. He has guided more than a dozen undergraduate students whose research works were published in journals of international repute. Dr. Kaykobad participated as a Resource Person in Workshop on Science Communication sponsored by COSTED and UNESCO held at Goa during 18-23 November, 2001. He is a frequent column writer in National Dailies authoring over 300 articles, most of which are related to education of the country. He has been one of the pioneers in introducing Mathematics Olympiad, Olympiad in Informatics and Science Olympiad in Bangladesh. He has been leading Bangladesh IOI team since 2008 from which Bangladesh received a silver medal in 2008 from Bulgaria, 2 bronze medals in 2012 from Italy and one from Australia. He was director of ICPC Asia Region Dhaka site during 2001-2003. He was the Chief Judge of IIT Kanpur Asia Region Site of ICPC in 2010, 2011 and 2013. He was adjudged as the outstanding coach of ICPC in 2002 at Honolulu, Hawaii. He was the only Senior Coach award recipient at the World Finals of ICPC held at St. Petersburg, Russia in 2013. He was awarded ICPC Lifetime Foundation Coach Award in 2019 at Porto, Portugal. He was also awarded a gold medal by Bangladesh Physics Olympiad. Dr Kaykobad participated in the famous Heidelberg Laureate Forum in 2013. Dr Kaykobad was a Visiting Professor at the CSE Department, the Chinese University of Hong Kong, at Kyung Hee University, Korea, ANU and Monash University, Australia and Amritapuri University, India. In year 2005 the President of the country presented him with a Gold Medal awarded by Bangladesh Computer Society for his contribution to computer programming culture in the country. In year 2006 He won BAS Gold Medal for physical sciences in the senior

group which was awarded by the Prime Minister of the country. Dr Kaykobad is a member of the Executive Council of Bangla Academy. Dr Kaykobad has been playing active role in the computerization of both public and private enterprises. He worked as a Director of Dhaka and Chittagong Stock Exchanges for many years. Currently he is an independent director of Sonali Bank PLC. Dr Kaykobad is a member of Academic Council and Syndicate of several universities, and Selection Board Member of SAU, New Deli, India. Also, he served as a board member of ISCA during 2009-2017. He is a member of International Advisory Council from January 2021 (to 2024). He received ISCA fellow grade in 2018. He became an honorary member, Polish Phonetic Association, in 2013. For his long-term and remarkable contribution to spoken language processing, he received Achievement Award from Acoustical Society of Japan in 2020. In 2015, he was honored as a Named Person of Merit in Science and Technology by the Mayor of Tokyo.

Invited Talk-1

Dr. Shamim Ahmad
Professor
Department of Computer Science and Engineering
University of Rajshahi, Bangladesh

Title: AI and Proteomics: Unlocking Biological Insights with Machine Learning

Abstract

Proteomics, the large-scale study of proteins and their functions, has greatly benefited from advancements in machine learning (ML). ML algorithms are increasingly leveraged to analyze complex proteomic data, enhancing protein identification, structural prediction, and functional annotation. Deep learning models, in particular, have transformed mass spectrometry-based protein identification. In our research, we have applied ML techniques to predict protein subcellular localization and identify post-translational modification (PTM) sites, as PTMs are closely associated with various major human diseases, including cancer, Alzheimer's disease, diabetes, Parkinson's disease, chronic renal failure, chronic lung disease, and sepsis. Additionally, our work addresses critical challenges in managing heterogeneous and imbalanced datasets.

Biography

Shamim Ahmad (Member, IEEE) received his B.Sc. and M.Sc. degrees in Applied Physics and Electronic Engineering from the University of Rajshahi, Bangladesh. He then pursued post-graduate research in the Department of Computer Engineering at Inha University, South Korea. He earned his D.Eng. degree in Electrical Engineering from Chubu University, Japan. Currently, he is a Professor in the Department of Computer Science and Engineering at the University of Rajshahi. His research interests include bioinformatics, embedded systems, and biomedical signal processing.

Dr. Dipankar Das
Professor
Department of Information & Communication Engineering
University of Rajshahi, Bangladesh

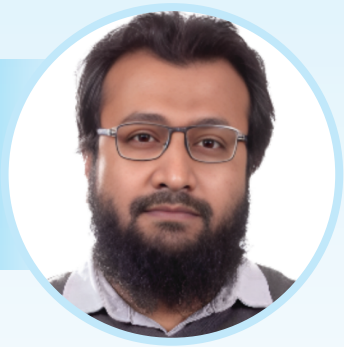
Title: Sensor's Data Correction with General Graph Optimization (G2O) Technique

Abstract

In autonomous driving of construction machinery such as construction crane, the sensor systems such as LiDAR need to be attached with the crane's boom for localization and mapping. Thus, the sensor system may be vibrated or swinging and point cloud data may be distorted. For proper localization and mapping, the distorted point cloud data need to be corrected. In this research, we propose a graph optimization-based method for correcting the distorted data due to the LiDAR sensor's swinging. The proposed method extracts different types of planes, such as horizontal and vertical planes, and construct a pose graph using plane constraints as external nodes and sensor's pose as internal nodes. The constructed pose graph is optimized using general graph optimization (G2O) technique. The optimized sensor's poses are then used as transformation matrices for correcting the distorted data. We propose an iterative optimization approach for improving the data correction results after each iteration. We also propose a successive addition of plane constraints with the combination of iterative process after each iteration in more complex environment and more distorted data. An extensive experimental evaluation has been done in Gazebo simulation environment with or without crane with 2D LiDAR sensor. The experimental results reveal that the proposed method is able to correct distorted data. We also apply the proposed method for correcting the 2D SICK LiDAR sensor's data collected from the real construction site.

Biography

Dr. Dipankar Das is a Professor in the Department of Information and Communication Engineering, University of Rajshahi, Bangladesh. Dr. Das was a former head of the Department of Information and Communication Engineering, University of Rajshahi. He completed his PhD from the Saitama University, Japan. He worked under the Toyhashi University of Technology (TUT)-Kobelco Construction Machinery joint project for developing Autonomous Construction Vehicle as a researcher from January 2020 to December 2021. He also worked as a post doctoral researcher in the JST CREST (Core Research for Evolutional Science and Technology, Japan Science and Technology Agency) project from October 2011 to March 2014. His current research is heavily focused on Autonomous Driving, Human-Robot Interaction and Natural Language Processing for Low Resource Languages. He has over 100 publications, including 9 book chapters, 33 journal articles, and 58 international conference publications. He also delivered more than 10 invited talks including talks in Caltech Vision Lab and UCLA Vision Lab, Los Angeles, USA



Dr. Md. Kafiul Islam
Associate Professor
Department of Electrical & Electronic Engineering
Independent University, Bangladesh

Title: Machine Learning Model for Computer-Aided Depression Screening among Young Adults Using Wireless EEG Headset

Abstract

Depression is a disorder that if not treated can hamper the quality of life. EEG has shown great promise in detecting depressed individuals from depression control individuals. It overcomes the limitations of traditional questionnaire-based methods. In this study, a machine learning-based method for detecting depression among young adults using EEG data recorded by the wireless headset is proposed. For this reason, EEG data has been recorded using an Emotiv Epoc+ headset. A total of 32 young adults participated and the PHQ9 screening tool was used to identify depressed participants. Features such as skewness, kurtosis, variance, Hjorth parameters, Shannon entropy, and Log energy entropy from 1 to 5 sec data filtered at different band frequencies were applied to KNN and SVM classifiers with different kernels. At AB band (8–30 Hz) frequency, 98.43 ± 0.15% accuracy was achieved by extracting Hjorth parameters, Shannon entropy, and Log energy entropy from 5 sec samples with a 5-fold CV using a KNN classifier. And with the same features and classifier overall accuracy = 98.10 ± 0.11, NPV = 0.977, precision = 0.984, sensitivity = 0.984, specificity = 0.976, and F1 score = 0.984 was achieved after splitting the data to 70/30 ratio for training and testing with 5-fold CV. From the findings, it can be concluded that EEG data from an Emotiv headset can be used to detect depression with the proposed method.

Biography

Dr. Md Kafiul Islam has received his B.Sc. in EEE from Islamic University of Technology (IUT), Gazipur, Bangladesh in 2008 and completed his PhD from Dept. of ECE, NUS, Singapore in Neural Signal Processing area back in 2015. Currently he is serving as an Associate Professor in the Dept. of Electrical and Electronic Engineering of Independent University, Bangladesh. His research interests include biomedical instrumentation and signal processing, neural signal processing, brain-computer interface (BCI), etc. He is actively involved as a TPC member of many international conferences, and he reviews Journal articles frequently. He is also involved as a member of the Editorial Board of several journals. He is an Associate Editor of IEEE Access, Guest Associate Editor of Special issue in Frontiers in Computational Neuroscience. He has served as TPC Chair of ICAEE 2019, TPC Secretary of ICAEE 2017, Publication Chair of IEEE SPICSCON 2019, Track Co-Chair and Session Chair of IEEE TENSYMP 2020, Track Co-Chair of ICAICT 2020. He is a Senior Member of IEEE, IEEE EMBS and IEEE SPS Society. He served as the Branch Counselor of IEEE IUB Student Branch between 2020 and 2023 and won the Best branch counselor award from IEEE BD Section in 2020 and 2022. He is an active Professional Volunteer of IEEE Bangladesh Section. He is a Publons/WoS Academy Mentor and winner of Publons/WoS Top Reviewer in the Multidisciplinary area in 2017. He is also serving an honorary position as Associate Director, Quality Assurance at the Board of Accreditation for Engineering and Technical Education (BAETE) under Institute of Engineers, Bangladesh (IEB). He has published more than 55 (in total) peer reviewed journal articles, conference papers and book chapters with Google Scholar Citations of 1950+ and impact factor contribution of around 60+. Dr. Islam has won several best paper/presentation awards in IEEE conferences such as ICCIT 2018 and 2024, ICDPR 2020 at NTU, Singapore, ETCCE 2020, ICCCAS 2022 and 2023 in Singapore, and Best Abstract in IEEE CS BDS Summer Symposium 2022. His research has also been recognized by IUB during Employee Recognition Awards in 2020 where he has won Publication Excellence in all three categories: journal articles, conference proceedings and book chapters.

Dr. Md. Abdur Rahim
Associate Professor
Department of Computer Science and Engineering
Pabna University of Science and Technology, Bangladesh

Title: Hand Gesture-based Non-touch Interface for Human-Computer Interaction Using Machine Learning Techniques

Abstract

The non-touch system is an advanced computer-interface technology designed to enhance human-computer interaction by enabling data input and control through hand gestures. This research proposes a non-touch interface system that allows users to securely and efficiently manage an on-screen virtual keyboard using hand gesture recognition. The system consists of two key components: (a) hand gesture recognition and (b) a character input system utilizing a flick input method. Hand gestures are identified based on hand position and state (open or closed), allowing users to perform functions such as "delete," "add space," "insert new line," "select language," and "backspace." This reduces the need for recognizing many complex gestures. The proposed system is evaluated based on character selection, recognition accuracy, and input speed. A convolutional neural network (CNN) extracts gesture features, while a support vector machine (SVM) ensures precise classification. Experimental results demonstrate high recognition rates of 98.61% for characters and 97.5% for motion functions, proving the system's effectiveness in improving non-touch human-computer interaction.

Biography

Dr. Md Abdur Rahim received his PhD in 2020 from the Graduate School of Computer Science and Engineering at The University of Aizu in Fukushima, Japan. He completed his Bachelor of Science (Honours) and Master of Science (M.Sc.) degrees in Computer Science and Engineering at the University of Rajshahi in Bangladesh, graduating in 2008 and 2009, respectively. Currently, he serves as an Associate Professor and the Head of the Department of Computer Science and Engineering at Pabna University of Science and Technology in Pabna 6600, Bangladesh. His research interests encompass human-computer interaction, pattern recognition, computer vision and image processing, human recognition, and machine intelligence. He has published numerous papers in major journals (SCI and SCIE indexed) and conferences, as well as reviews for several SCI/SCIE indexed journals and international conferences. He is actively involved in various social and extra-curricular activities. Currently, he serves in several key roles, including Director of the ICT Cell, Training Coordinator of the PUSTCSE Digital Skills Training Program under the ICT Division, Technical Focal Point for GST Admission Test at PUST, Convener of various administrative sub-committees, and General Secretary of the PUST Teacher's Association. In addition, he has previously held the following positions: a) Secretary, Teacher-Officer Club, PUST b) Joint Secretary, Teacher's Association, PUST c) Member, Teacher's Association, PUST d) Assistant Proctor, PUST e) Member, Campus Network Sub-Project, BdREN, PUST f) Coordinator, MCSE Evening Program, CSE, PUST.

PID: 1

ChatGpt Content Detection: A New Approach Using Xlm-Roberta Alignment

Tanvir, Md Tasnin*; Dash, Santanu Kumar

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Abstract— The challenge of separating AI-generated text from human-authored content is becoming more urgent as generative AI technologies like ChatGPT become more widely available. In this work, we address this issue by looking at both the detection of content that has been entirely generated by AI and the identification of human text that has been reworded by AI. In our work, a comprehensive methodology to detect AI-generated text using XLM-RoBERTa, a state-of-the-art multilingual transformer model. Our approach includes rigorous preprocessing, and feature extraction involving perplexity, semantic, and readability features. We fine-tuned the XLM-RoBERTa model on a balanced dataset of human and AI-generated texts and evaluated its performance. The model demonstrated high accuracy and robust performance across various text genres. Additionally, we conducted feature analysis to understand the model's decision-making process, revealing that perplexity and attention-based features are critical in differentiating between human and AI-generated texts. Our findings offer a valuable tool for maintaining academic integrity and contribute to the broader field of AI ethics by promoting transparency and accountability in AI systems. Future research directions include exploring other advanced models and expanding the dataset to enhance the model's generalizability.

PID: 7

Forecasting Wind Energy Potential in Chattogram, Bangladesh: Statistical Modeling Incorporating Rayleigh and Weibull Distributions

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Abstract— The purpose of this study is to investigate the wind energy capacity in Chattogram, Bangladesh, by using statistical modeling techniques that integrate Rayleigh and Weibull distributions. As the demand for renewable energy rises, wind power is becoming an attractive option for sustainable electricity generation in Bangladesh. Proper evaluation of wind energy potential is needed for effective planning and implementation. We collected historical wind speed data from diverse sources, including scholarly journals, publications, the World Bank, the Bangladesh Renewable Energy Agency (BREA), and the Bangladesh Bureau of Statistics (BBS), and analyzed it using statistical techniques based on Rayleigh and Weibull distributions. By utilizing the data this study aims to predict the potential of wind energy by analyzing the distribution of wind speeds and calculating important factors such as the average wind speed, Weibull shape factor, and scale parameter. We used advanced statistical analysis to examine the regional and temporal variations of wind energy resources of Chattogram. The findings from this study enhance comprehension of the practicality and profitability of wind energy projects in the coastal areas by enabling well-informed decision-making for sustainable energy development efforts in Bangladesh.

PID: 11

Machine Learning in Healthcare: Key Applications and Insights from Recent Studies

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Abstract— This manuscript provides a systematic review of machine learning (ML) applications in healthcare, focusing on disease prediction, medical imaging, and sentiment analysis. Supervised ML is extensively used for disease diagnosis and prediction. These models can play a crucial role in disease diagnosis, identifying patterns, and decision-making. Deep learn_x0002_ing (DL), has enabled advances in medical imaging, allowing the identification of complex patterns in diagnostic images for diseases such as cancer and infectious diseases. Pre-trained models and custom architectures have been fine-tuned to enhance their performance in clinical applications. In addition, sentiment analysis with Natural Language Processing (NLP) techniques has been used to analyze social media data, clinical texts, and audiovisual records to detect psychological and neurological conditions. Despite significant progress, challenges such as limited dataset size, lack of diversity, interpretability of complex models, and biases in data and algorithms persist. This paper highlights the applications of these ML techniques in

healthcare and examines their potential to improve clinical decision-making while addressing existing limitations to enhance the reliability and applicability of these technologies in real-world settings.

PID: 15

Crop Recommendation System Using Machine Learning Classifiers

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Abstract— A major contributor to the nation's economic development and growth is agriculture. Farmer's poor crop selection is the main and most significant factor affecting agricultural productivity. A crop recommendation system that employs the technique of machine learning is to be created in order to increase crop productivity. By using the predictions of several machine learning models, the ensemble technique creates a model that can accurately select the best crop based on the kind and characteristics of the soil. Logistic Regression, Decision Tree, Random Forest, Gradient Boosting, AdaBoost, Bagging, K Nearest Neighbor (KNN), Multilayer Perceptron, XGBoost, LightGBM, CatBoost, Naive Bayes, and SVM are the independent base learners that are employed in the ensemble model. With a respectable level of accuracy, each classifier produces a unique set of class labels. Last but not least, the Random Forest algorithm is quicker and more precise in this area. The suggested system makes use of a number of characteristics, such as soil composition and climatic data, to precisely forecast which crops will be best suited for a certain area. This technology has the potential to transform crop recommendation, improving crop yields, sustainability, and overall profitability for farmers of all sizes. By training and testing models with different configurations of machine learning algorithms, we have achieved near-perfect accuracy through exhaustive examination of a vast historical data set. Across all models, we routinely show accuracy above 95%, with the best accuracy of 99.2%.

PID: 18

Deep Learning-Based Classification of Eggplant Leaf Diseases Using Fine-Tuned CNN Models

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Abstract— Eggplant, or aubergine, is a vital crop valued for its nutritional and economic importance. However, its cultivation is often hindered by leaf diseases that significantly affect yield and quality. Early and accurate detection of these diseases is crucial for effective management and sustainable agriculture. This study leverages deep learning techniques to classify eggplant leaf diseases using convolutional neural network (CNN) models. A curated dataset of 3,159 high-resolution images from Mendeley was used, categorized into seven classes: Healthy Leaf, Insect Pest Disease, Leaf Spot Disease, Mosaic Virus Disease, Small Leaf Disease, White Mold Disease, and Wilt Disease. Preprocessing techniques, including dataset augmentation and gamma correction, were applied to improve dataset quality and variability. The fine-tuned ResNet50 model achieved high accuracy of 97.01%. Its architecture was enhanced with a Global Average Pooling layer and a Dense layer with 1024 units for better feature extraction and classification. Training optimization involved Early Stopping and Model Checkpoint callbacks to prevent overfitting and improve convergence. The obtained results confirm the superiority of the fine-tuned model compared to the recently developed model.

PID: 22

Electronic and Micro-Web based Approaches in Queue Management System with Prediction on Waiting Time

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Abstract— This paper presents two distinct approaches to the development of a Queue Management System (QMS). The first approach outlines the design of an electronic QMS using an ATmega 32 microcontroller as the central control unit, capable of

serving up to 99 customers per counter and effectively displaying the average waiting time. The second approach introduces an advanced QMS leveraging a web environment, eliminating the need for complex electronic circuitry. This web-based system operates within a local area network, allowing customers to request queue tokens, check predicted waiting times, view the current service status, and receive call notifications via a web browser. Both approaches implement a Diffused Queuing Enhanced First Come, First Serve (DQE-FCFS) scheduling mechanism, optimizing the customer service process. The comparative analysis highlights the advantages and trade-offs between the electronic and web-based QMS implementations.

PID: 24

A Hybrid Deep Learning Framework For Suspicious Activity Detection in Video Surveillance

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Abstract— Over the last few years, video surveillance has become an essential means of ensuring security and safety in numerous domains. However, the detection of unusual and suspicious behaviors or movements in surveillance video still poses a significant problem due to the dynamically complex nature of human activity and context. While traditional methods are better at extracting spatial features, they don't include temporal attributes that are necessary to model how to find suspicious activity. To overcome these limitations, this paper proposes a novel deep-learning architecture called ConvGRU, combining Convolutional Neural Network (CNN) and Gated Recurrent Unit (GRU). This approach builds on the fact that CNNs are inherently capable of extracting spatial features, while GRUs seek to capture temporal dependencies; hence, the proposed method is more general in a framework than using CNNs only for crime and suspicious activity detection. In experiments on multiple video surveillance datasets, the model achieves an increased accuracy of 99.52%, in particular, it is effective in distinguishing among suspicious behaviors.

PID: 25

Enhancing Civic Mobility: The Synergy of IOT Road Data Monitoring and Artificial Intelligence in Smart Urban Infrastructure

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Abstract— Smarter cities will benefit from real administration of the vehicular activity, which challenges a real and urgent situation demanding imaginative highlights to comprehend. The paper proposes an AI work overseeing street stream in real-time through the correlative study of IoT-based activity information. IoT edge sensors combined with machine learning calculations such as bolster vector machines, calculated relapse, k-nearest neighbors, and profound learning models such as long short-term memory empower more exact short-term and long-term determining of activity. The results outperform state-of-the-art methods and enable real-time monitoring for proactive decision-making and active activity management. The research shows how IoT and AI can be very much capable in the clearance of congestion, making stride urban mobility and constituting keen transportation framework in shrewd cities.

PID: 26

Real-Time Pothole Detection Using YOLOv8-seg: A Deep Learning Approach to Smart Road Monitoring

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Abstract— Transportation systems are anchored by road infrastructure directly impacting economic growth, safety, and mobility. Despite this, the poor conditions on roads, particularly potholes, are impediments to road degradation that cause increased vehicle operating costs, heightened accident risks, and decreased transportation flexibility. Generally, pothole detection and road maintenance is expensive and time-consuming with conventional methods that depend on manual inspections or specialized sensors. This study addresses these challenges using an automated pothole detection system based on an advanced deep learning

model optimized for real-time object detection and segmentation: You Only Look Once version 8 (YOLOv8 seg). The model was trained on a large dataset originating from Kaggle, with annotated images and video data, ensuring that it performs well in lit or unlit, rainy or sunny, conditions. Model generalization had been enhanced by data preparation, involving augmentation methods including flipping, rotation, and brightness modifications. Strong detection abilities were demonstrated by the proposed YOLOv8-seg model, which achieved a fitness score of 0.92 and a mean Average Precision (mAP) of 0.72 for both bounding boxes and masks. The system is appropriate for real-time road monitoring applications due to its consistent precision-recall curves, low latency, and effective segmentation accuracy, based on performance inquiry. In addition, this integrative method makes it easy to integrate with maintenance procedures, enabling prompt repairs as well as improving infrastructure management and road safety in general. The outcomes show how deep learning-based systems can revolutionize the traditional road monitoring procedures into effective, scalable, and reasonably priced solutions.

PID: 27

Cybersecurity in Electric Distribution Systems: A Strategic Approach to Securing Intelligent Electronic Devices (IEDs)

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Abstract— The rapid integration of Intelligent Electronic Devices (IEDs) in electric distribution systems has transformed the way power grids operate, offering advanced monitoring, control, and automation capabilities. However, this increased reliance on digital technologies has also introduced significant cybersecurity vulnerabilities. Unlike the Bulk Electric System (BES), where critical assets are regulated under stringent North American Electric Reliability Corporation (NERC) standards, distribution systems and their associated IEDs often lack equivalent levels of protection. This oversight presents a growing risk to grid reliability, as cyberattacks targeting these devices could lead to widespread disruptions. This paper identifies the pressing need to address cybersecurity challenges specific to IEDs, both within substations and in field deployments. It examines the limitations of current security practices and outlines a robust framework for safeguarding these devices against evolving threats. Central to this framework is the implementation of IEEE 1686 standards, which provide baseline requirements for security capabilities in substation intelligent electronic devices. The framework also incorporates centralized Authentication, Authorization, and Accounting (AAA) services to streamline access management, secure authentication protocols to prevent unauthorized access, and advanced encryption techniques to protect data integrity and confidentiality. In addition to exploring technical measures, the paper emphasizes the importance of adopting a holistic approach that includes regular risk assessments, continuous monitoring, and incident response planning. By proactively addressing these cybersecurity challenges, the proposed measures aim to enhance the resilience of electric distribution systems, ensuring the continued reliability and security of modern power grids in the face of emerging cyber threats.

PID: 31

Revolutionizing Fire Safety: Real-Time Fire Detection in Buildings Using YOLOv8

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Abstract— The research ambit of the present study aims to develop improved real-time fire detection systems in buildings, which can reduce threats to human life, property, and the environment. Fire incidents are considered some of the most dangerous events that lead to great economic losses and put people in jeopardy almost every year. Most conventional fire detection systems are not able to warn users instantly. They live with delayed information and reduced accuracy and thus aggravate the damages due to fire even further. Hence, we proposed a solution that relies on using YOLOv8 deep learning model for real-time fire detection. The system is trained with a custom-made dataset, which includes different scenarios such as bright, dark, smokey, and noisy environments to make it perform well in all these conditions. We integrated an automated alarm and a system for emergency call notifications that would immediately get alerts to administrators on the occurrence of a fire. Experimental results showed that the model trained obtained an average precision of 91.2%, which proves its high accuracy and reliability. The main contributions of this research work include a cost-effective, high-speed fire detection system, improved detection sensitivity in harsh environments, and integration of IoT-based remote alert mechanisms. It will take future smart buildings toward advanced and real-time fire safety systems and greatly improve safety and response efficiency.

PID: 32

Machine Learning Approaches for Rainfall Trend Analysis: Insights from Precipitation and Meteorological Data

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Abstract— Abstract- Rainfall significantly impacts agriculture, water resources, and natural disasters like floods and droughts. Understanding rainfall trends is crucial for effective planning and mitigation. This study analyses rainfall trends using machine learning models trained on precipitation data and four meteorological features: temperature, specific humidity, relative humidity, and wind speed. Five models Linear Regression, KNN, SVR, Random Forest and Gradient Boosting were evaluated using k-fold cross-validation and performance metrics, including Mean Squared Error (MSE) and R^2 Score. Among these, Random Forest outperformed the others with the lowest MSE (15.79) and the highest R^2 Score (71.69%), demonstrating its ability to capture seasonal trends. Gradient Boosting is followed closely by an R^2 a score of 68.68%, while KNN achieved a moderate prediction accuracy with an R^2 Score of 67.97%. These findings highlight the potential of machine learning models for rainfall prediction, offering valuable insights for water resource management, disaster preparedness, and agricultural planning.

PID: 33

RFID-Based Secure Smart Parking System with Mobile Application Integration

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Abstract— With ever-growing urbanization and the increasing number of vehicles on the road, vehicle owners face significant challenges in finding parking spaces, ensuring security, and preventing theft. Considering the above, we have addressed all of these issues in this study and attempted to provide a solution. Using a mobile application, users can easily locate available parking spaces. The system features a servo motor-operated gate for authenticated entry, ultrasonic sensors to detect vehicles, and IR sensors to monitor of a smart parking slot is that a vehicle cannot exit the parking area without RFID verification. The implementation of the parking system the slot availability. RFID technology ensures secure exits, while a 16×2 LCD at the parking entrance displays slot status in real-time. Users can view the availability of parking spaces, register an authorized vehicle owner for reservation, and obtain a confirmed or canceled reservation via the mobile app. A unique feature involved a prototype with different slots, whose status could be accessed remotely through a mobile application.

PID: 34

Implementation of a UC3843 PWM-Controlled Buck Converter for Precise Speed Regulation of a DC Motor

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Abstract— This paper is concerned with the design and implementation of a pulse-width modulation-controlled buck converter using an integrated circuit, namely the UC3843, for precision speed regulation of a DC motor. The research work investigates the efficiency of PWM in controlling voltage levels to ensure constant operation of the motor under varied load conditions. The high-performance features of fast reaction time and effective current control that become important in dynamic applications of motors are the basis for choosing UC3843. The most crucial component in power electronic applications is the DC buck converter, which efficiently steps down a greater input voltage to low, regulated output voltage settings. These converters are used in embedded systems, LED drivers, and battery charging, to name a few areas where effective power conversion could be necessary. This project will outline the design and implementation of a buck converter utilizing easily accessible and reasonably priced components. One of the primary inputs taken from the UC3843 PWM controller provides a constant and adjustable output voltage. Other major components involved in this project are the IRFZ44 MOSFET for main switching, the MBR2060CT for the freewheeling current diode, various capacitors and resistors for filtering and stability, and a 220 µH inductor for energy storage and ripple reduction. The brushless DC (BLDC) motor is characterized by its high torque density, high power, and small size. The

motor may run at a variety of high-efficiency speeds. Consequently, the motor is appropriate for electric car applications. Additionally, a BLDC motor in an electric automobile has low speed, strong torque, low electromagnetic interference, high endurance, and carbon-free brush maintenance. In this paper, the contribution of each component is highlighted before describing how the converter was assembled and tested.

PID: 35

Securing Android Ecosystem: Refining Ransomware Detection with Stacking Models and Explainable AI

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Abstract— As Android devices confront an escalating ransomware threat, this study introduces a refined defense mechanism using ensemble stacking models. Utilizing a comprehensive Android network dataset rich in diverse network features, we explore the nuances of ransomware detection. While traditional machine learning and deep learning models exhibit commendable performance, our pursuit of heightened accuracy and true positive rates leads us to craft a bespoke ensemble model. Demonstrating remarkable achievements, particularly a high accuracy rate, this approach is fortified by explainable AI, specifically LIME (Local Interpretable Model-agnostic Explanations), offering transparency into the models' decision-making processes. This study not only elevates the standards of Android ransomware detection but also highlights the imperative for precision and resilience in contemporary cybersecurity.

PID: 37

A Review of AI-Powered Autonomous System Using Machine Learning

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Abstract— This study explores the concept, significance, and strategies of AI-Powered Autonomous Systems, focusing on machine learning frameworks. It integrates ideas like grayscale normalization, AI in bioinformatics, in-vehicle passenger monitoring, advanced robotics, autonomous driving, blockchain for training vehicles, and visible light communication. A comparative analysis highlights the advantages and limitations of these systems in various contexts. The study examines their applications across industries such as transportation, healthcare, manufacturing, and agriculture, emphasizing efficient decision-making, process optimization, and safety improvements. Leveraging machine learning algorithms, including ANN, DL, MLP, CNN, RNN, and SVM, these systems achieve high levels of automation and innovation. The study concludes by identifying research goals to advance the capabilities and trends of AI-Powered Autonomous Systems.

PID: 39

IoT-based Smart Plant Monitoring and Animal Detection with YOLOv8

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Abstract— This study proposes a novel system that integrates the IoT and AI into a unified framework to enable simultaneous plant monitoring and security. The proposed solution introduces an efficient IoT-based application for agricultural monitoring that, addresses critical challenges while ensuring portability and secure access. The system is designed to help farmers effectively monitor and track environmental changes. We used an ESP8266 microcontroller in conjunction with the YOLOv8, MediaPipe, and Blynk platform to monitor plant health, as well as to detect threats in the form of animals and humans. Traditional plant monitoring systems rely on manual oversight; however, this smart system automates tasks and enhances accessibility through mobile compatibility. Users can remotely monitor the plant security and ensure peace of mind. By providing real-time updates, reducing labor requirements, and optimizing water usage, the system promotes sustainable farming. It offers a cost-effective and scalable solution suitable for home gardens and large-scale agriculture, thus addressing the demand for efficient and sustainable technologies.

PID: 41

A Deep Learning Approach: To Detect the Breast Cancer

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Abstract— In contemporary healthcare, breast cancer represents one of the most nebulous and formidable fields. In recent years, the issue has progressively escalated, leading to a substantial increase in mortality, with approximately fifty per cent of the impacted female patients perishing from the sickness. A machine learning technique has been used to facilitate the early and precise identification of breast cancer, addressing this essential problem. This research examines the effectiveness of three deep learning models—Convolutional Neural Network (CNN), VGG16, and ResNet-50—in classifying breast cancer photos. The models underwent training and evaluation on a labelled dataset over 40 epochs to measure their performance. The CNN model attained an accuracy of 85%, demonstrating its capability to identify critical characteristics. VGG16 surpassed the other models' accuracy of 96%, owing to its more profound architecture and pre-trained weights. ResNet-50, using residual connections to address vanishing gradients, achieved an accuracy of 82.28%. The results indicate the efficacy of various deep learning methods in enhancing breast cancer diagnosis, with VGG16 identified as the most precise model. Future studies intend to strengthen the resilience of these models and investigate multimodal strategies to augment diagnostic accuracy.

PID: 42

A Sentiment-Focused Approach for Cross-Domain Multimedia Recommendations

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Abstract— Recommendation systems often underutilize the sentiment data available across diverse social media platforms, limiting their ability to deliver personalized experiences. Existing methods primarily focus on single-domain data and lack the ability to analyze precise emotional signals from multiple sources. This study presents an approach incorporating sentiment insights from structured reviews and unstructured social media posts. Feature engineering and an Support Vector Machine based sentiment classifier integrate user interaction data with sentiment categories, providing a detailed understanding of preferences and engagement patterns. Exploratory data analysis (EDA) uncovers statistical relationships, identifying temporal and sentiment-based trends. The SVM classifier achieves 85.23% accuracy, effectively capturing dominant sentiment categories. Positive sentiments, such as admiration and accomplishment, are associated with higher engagement metrics. These results highlight the potential of sentiment-driven personalization to improve recommendation approaches by aligning strategies with user behaviors and preferences.

PID: 46

Screen Dependency and Brain Health: Investigating the Effects of Technology on Cognitive Performance

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Abstract— The usage of digital devices, prominently computers, and mobile phones has been booming and it is a quite significant part of our life. But people are inherently not used to this technological approach in our daily lives. To analyze the influence of digital devices, this study uses primary data analysis to understand the impact and secondary data is used as references from entities from various academic articles and journals. Correlation and regression models are used to analyze the impact on the brain. By examining the data, this study has figured out that the use of digital devices has a substantial impact on students' cognitive function and psychological well-being, depending on screen time and digital activities. Too much time in front of a screen might interfere with sleep, which can harm one's memory and conduct. Furthermore, several studies show that those who are addicted to the internet or games experience grey matter atrophy. In conclusion, the influence of technology on our brain health is substantial, bringing about advantages as well as drawbacks. Although gadgets such as smartphones and computers can improve our skills and connections with others, excessive usage may have impacts on our mental functions. It is essential to grasp this equilibrium as we incorporate technology into our routines.

PID: 47

Development of an Automated Line-Following Robot for Intelligent Plant Irrigation

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Abstract— An autonomous line-following robot designed for intelligent plant irrigation. The device incorporates a line-following mechanism that employs infrared sensors for path following, two ultrasonic sensor - one for obstacle detection and avoidance and another one for plant tubs detection, and a soil moisture sensor for precise irrigation. The robot is engineered to autonomously navigate specified pathways, detect plant tub, and regulate watering according to prevailing soil moisture levels, thereby optimizing water utilization and reducing human intervention. Testing findings have evidenced competence in accurate navigation, efficient obstacle evasion, and successful regulation of optimal soil moisture levels. The system's modular architecture and economic sustainability render it appropriate for many agricultural and horticultural applications, improving resource efficiency and production.

PID: 48

Prediction of Chronic Kidney Disease Using Ensemble Learning and Feature Engineering

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Abstract— Early detection of Chronic Kidney Disease (CKD) is crucial for improving patient outcomes, but traditional diagnostic methods often fail to detect CKD in its early stages. In this study, we propose a robust predictive framework using ensemble machine learning (ML) techniques and advanced feature engineering for CKD detection. We apply Random Forest and Gradient Boosting models, along with Recursive Feature Elimination (RFE), to optimize predictive accuracy. Our experiments show that the ensemble model achieves a 95% accuracy, outperforming other models in identifying CKD. We also discuss the potential impact of integrating ML models in clinical decision-making. The results indicate that our approach is both effective and computationally efficient, offering valuable insights for healthcare applications.

PID: 49

Fetal Health Diagnosis: Application of ML and DL Algorithms with Feature Optimization

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Abstract— Fetal health monitoring is a critical aspect of prenatal care, directly influencing the health outcomes for both the mother and the baby. The early and accurate detection of potential fetal health issues can significantly reduce the risks associated with childbirth, including premature delivery, fetal hypoxia, and stillbirth. Conventional diagnostic techniques, though successful, frequently depend significantly on expert analysis and could be restricted by subjectivity and inconsistency in outcomes. In recent years, the advent of machine learning (ML) and deep learning (DL) techniques has opened new possibilities for automated and more accurate fetal health classification. This paper explores various machine learning and deep learning models to classify fetal health using a dataset of 2,126 instances and 22 features. The evaluation involves selecting features, comparing classification algorithms, and utilizing deep learning techniques like Feedforward Neural Networks (FNN), Convolutional Neural Networks (CNN), Long Short-Term Memory (LSTM), and Gated Recurrent Units (GRU). The best-performing model achieved an accuracy of 94% using the Gradient Boosting algorithm. Feature selection methods improved model performance, especially in complex deep learning architectures.

PID: 51

Automated Detection and Classification of Colon Cancer Using Transfer Learning with Deep CNN

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Abstract— Now-a-days Cancer became a most common cause of death and cancer of the colon and rectum is the fourth most common cancer in the world and the second most common cancer for both male and female. About 1.93 million new cases and 1 million dies of colorectal cancer. CNN are being used to identify and classify the colon cancer using whole-slide imaging (WSI). Accurate identification is diseases the prerequisite of the treatment. Our objective is to promote a system for detecting and classifying clone adenocarcinomas by applying transfer learning technique of convolution neural network. This paper proposed some transfer learning models for the automated detection and classification of colon cancer. Leveraging a dataset of 10,000 images categorized into 2 types of colon adenocarcinoma and benign colonic tissue. The study evaluates the performance of various Convolutional Neural Networks (CNNs), including VGG19, Resnet152V2, DenseNet201 and InceptionResNetV2. Each model is trained using transfer learning techniques with fine tuning, optimizing for accuracy and loss. The results demonstrate the effectiveness of deep learning in enhancing diagnostic accuracy, with VGG19, Resnet152V2, DenseNet201 and InceptionResNetV2.

PID: 52

Automated Detection and Classification of Gastrointestinal Diseases Using Transfer Learning

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Abstract— Cancer is the most common cause of death nowadays. About 5 million new patients are affected, and 2 million patients die of gastrointestinal diseases worldwide. Till now, video endoscopy is an improved medical imaging technology, and this modality today has gained popularity for the diagnosis of gastrointestinal problems that include bleeding, stomach ulceration, and polyps. This technology uses a flexible, lighted tube to take high-definition visualization and real-time images of the digestive system for close examination and exact diagnosis of several gastrointestinal problems. Continuous monitoring of endoscopic images by an expert is the primary issue with video endoscopy, as the procedure lasts around 30 minutes, which can be costly and prone to human error. This paper presents a comprehensive analysis of deep learning models to detect and classify 5 types of gastrointestinal conditions automatically. The study evaluates the performance of various convolutional neural networks (CNNs), including VGG19, Resnet152V2, DenseNet201, InceptionResNetV2, and InceptionResNetV2, and a combination of DenseNet201 and ResNet152V2. Each model is trained using transfer learning with fine-tuning techniques optimized for accuracy and loss. The results demonstrate the effectiveness of deep learning in enhancing diagnostic accuracy, with the combination of DenseNet201 and ResNet152V2 performing better than other models. This work underscores the potential of AI in clinical settings for early disease detection and improved patient outcomes.

PID: 54

Deep Learning Model-Based Schizophrenia Disease Detection by Analyzing Brain EEG Signal

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Abstract— A mental illness called schizophrenia (ScZ) is characterized by abnormalities in the social, behavioral, perceptual, cognitive, and other domains of life. ScZ is traditionally diagnosed by an experienced psychiatrist conducting patient interviews, which is a laborious, subjective, and biased procedure. Researchers have recently demonstrated that the diagnostic accuracy of ScZ may be improved by integrating the deep learning (DL) model into the detection process. EEG signals offer more thorough insights into the underlying neural mechanisms and brain biomarkers of ScZ than other modalities like computed tomography (CT) scan or functional magnetic resonance imaging (fMRI). The use of EEG signals as an efficient biomarker is still being studied, despite the fact that deep learning models demonstrate encouraging results in identifying ScZ. For automatic ScZ detection using only EEG signals, a thorough evaluation of Extended 1-Dimensional Convolutional Neural Network (Ex-1DCNN) models and Recurrent Neural Network (RNN) deep learning models have been developed. The EEG signals are preprocessed by

ICA (Independent Component Analysis) to remove artifacts and noises. The results show that the RNN model outperforms the Ex-1DCNN in terms of test loss, F1 score, and accuracy (86.44% vs 64.78%), making it a better option for ScZ classification.

PID: 58

Detection and Classification of Acute Lymphoblastic Leukemia Utilizing Deep Transfer Learning

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Abstract— A mutation in the DNA of a single cell that compromises its function initiates leukemia. This leads to the overproduction of immature white blood cells, which encroach upon the space required for the generation of healthy blood cells. Leukemia is treatable if identified in its initial stages. Nonetheless, its diagnosis is both arduous and time-consuming. In this study, a novel approach for diagnosing leukemia across four stages—Benign, Early, Pre, and Pro—utilizing deep learning techniques. We employed two Convolutional Neural Network (CNN) models: MobileNetV2 with an altered head and a bespoke model. The custom model has multiple convolutional layers, each paired with corresponding max pooling layers. We utilized MobileNetV2 with ImageNet weights, and the head was adjusted to integrate the final results. The utilized dataset is a publicly available collection of blood cell smear images titled "Acute Lymphoblastic Leukemia (ALL) image dataset", and then used the Synthetic Minority Oversampling Technique (SMOTE) to augment and balance the training dataset. Which attained an accuracy of 98.6% with the custom model, while MobileNetV2 achieved a superior accuracy of 99.69%. The pre-trained model exhibited encouraging results and an increased likelihood of real-world application.

PID: 60

Seizure Detection from EEG Signals Using Low Dimensional Convolutional Neural Network

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Abstract— Seizure is a neurological disorder and electroencephalography (EEG) is a commonly employed clinical technique for its diagnosis. However, neurologists are heavily burdened by the time-consuming and tedious procedure of manually inspecting EEG readings. Many automated approaches have been put out to identify seizure using traditional methods in order to overcome this issue. In this work, a deep learning-based method for automated seizure detection from EEG signals using a low dimensional convolutional neural network (LD-CNN) is presented. The suggested model differentiates between ictal (seizure) and preictal (non-seizure) states using the CHB-MIT dataset, which consists of EEG recordings from 24 individuals. To improve the data, a thorough preprocessing step was carried out which included signal normalization and noise reduction. The model exhibited outstanding performance, attaining an accuracy of 99.91%, a precision of 99.81%, a recall of 100%, and an F1-score of 99.90%. The suggested strategy also outperforms current deep learning architectures and conventional machine learning techniques, demonstrating its superiority in seizure detection according to a comparison analysis.

PID: 63

Edible Mushroom Classification Using Advanced Machine Learning Approaches

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Abstract— Mushrooms, as a dietary component, offer immense nutritional and medicinal benefits. However, their classification into edible or poisonous categories is critical due to the severe health risks associated with consuming toxic varieties. Misidentification can result in adverse effects ranging from gastrointestinal distress to fatal poisoning. This study utilizes Machine Learning (ML) algorithms to tackle the problem through analysis of an extensive dataset comprising 22 mushroom attributes. The dataset was analyzed using seven machine learning models: Logistic Regression (LR), Support Vector Machine (SVM),

LightGBM, XGBoost, AdaBoost, Random Forest (RF), and k-Nearest Neighbors (KNN). Most models achieved perfect classification with 100% accuracy and an AUC of 1.00, demonstrating their ability to distinguish between edible and poisonous mushrooms effectively. AdaBoost exhibited near-perfect performance with minor misclassifications. These results highlight the robustness of ML-based systems in ensuring food safety and preventing mushroom-related poisoning incidents. Future work will focus on scaling this approach to larger datasets, incorporating explainable AI techniques, and deploying these models in real-world applications for automated mushroom identification.

PID: 64

Air Quality and Pollution Assessment Using Advanced Machine Learning Techniques

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Abstract— Air pollution is a critical environmental and public health issue, with significant impacts on human well-being and ecosystems. Accurately assessing air quality is essential for effective pollution mitigation and policymaking. This study proposes a machine learning-based approach to classify air quality levels using six classifiers: Logistic Regression, Support Vector Machine (SVM), Gradient Boosting, AdaBoost, Random Forest, and K-Nearest Neighbors (KNN). The dataset was preprocessed through feature scaling, label encoding, and one-hot encoding, followed by hyperparameter optimization using grid search. Model performance was evaluated using metrics such as accuracy, precision, recall, F1 score, confusion matrices, and AUC values. Gradient Boosting emerged as the best-performing model with an accuracy of 96% and balanced performance across all metrics. The results highlight the effectiveness of machine learning methods in air quality classification tasks. Future work will explore incorporating additional features, advanced deep learning techniques, and real-time deployment for enhanced air quality monitoring and decision-making systems.

PID: 66

Artifact Suppression from EEG Signal Using Sub-band Thresholding Approach

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Abstract— EEG recordings are typically influenced by different artifacts originating from non-neural sources, complicating subsequent precise signal classification. The reliable detection and removal of artifacts from EEG signals using an automated signal processing technique is a prominent study domain. This study presents a wavelet-based approach for the suppression of artifacts in EEG data, which identifies ideal threshold values to enhance artifact removal efficacy. In the suggested algorithm, iterated over the threshold settings until optimal accuracy or minimal distortion is attained, utilizing a reference dataset for decision-making. The criteria for optimum selection rely on matrices that measure the signal-to-noise ratio (SNR), mean square error, and other factors. The technique is evaluated on a genuine dataset of EEG signals containing ocular artifacts. The results indicate a 16.93 dB enhancement in the SNR, confirming that adaptively determining optimal threshold parameter values yields superior performance compared to using any predefined threshold parameters. This research will provide the EEG signal analysis community with a platform to further investigate the issue of selecting wavelet settings effectively.

PID: 67

Data Augmentation Approach to Frequency Recognition of SSVEP Using Mask Encoding Combination Based Deep Learning

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Abstract— Steady-state visual evoked potential (SSVEP) based brain computer interfaces (BCIs) are promising technique for real time communication and control. Utilizing transfer learning technique, this investigation introduces a novel classification method that incorporates mask encoding combination (MEC) data augmentation and convolutional neural networks (CNNs). The method's superior classification performance is achieved by processing harmonics, channels, and temporal sub-bands, which enhances the robustness of multi-channel EEG signal analysis. In a 1s time window, the approach obtains a maximal accuracy of 94.69% and a peak information transfer rate (ITR) of 193.14 bits/min when evaluated on a benchmark dataset of 35 subjects and 40 characters. These findings surpass those of conventional methodologies, emphasizing the potential of integrating data augmentation and transfer learning to accelerate the development of SSVEP-based BCIs.

PID: 68

Recognition of Frequencies of Short-Time SSVEP Signals Utilizing an SSCCA-Based Spatio-Spectral Feature Fusion Framework

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Abstract— A brain-computer interface (BCI) facilitates direct communication between the brain and external equipment through EEG, which is preferred for its superior temporal resolution. Among EEG techniques, the steady-state visual evoked potential (SSVEP) is favored due to its robust signal-to-noise ratio, minimal training demands, and elevated information transmission rate. Frequency detection in SSVEP-based brain computer interfaces commonly employs canonical correlation analysis (CCA). SSCCA (spatio-spectral canonical correlation analysis) augments CCA by refining spatial filtering. This paper presents a multistage feature fusion methodology for short duration SSVEP frequency identification, employing SSCCA with template signals derived via leave-one-out cross-validation (LOOCV). A filterbank generates bandpass filters for stimulus frequencies and their harmonics, whereas SSCCA calculates correlation coefficients between subbands and templates. Two phases of non-linear weighting amalgamate these coefficients to discern the target stimulus. This multistage methodology surpasses traditional techniques, attaining a accuracy of 94.5%.

PID: 69

Continuous Cuffless Blood Pressure Monitoring with Deep-Learning Techniques Utilizing PPG and ECG Features

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Abstract— Regular blood pressure (BP) monitoring provides critical insights into an individual's health status. However, traditional cuff-based BP measurement methods are bulky and unsuitable for constant monitoring. This study presents an algorithm for precise and continuous systolic and diastolic blood pressure (DBP) measurement, leveraging statistical features extracted from physiological signals. The proposed methodology encompasses signal segmentation, feature extraction, and pattern analysis to establish a strong correlation between photoplethysmogram (PPG), electrocardiogram (ECG) characteristics and BP levels. The framework computes BP values using a combination of physiological parameters and holistic signal representations by processing these vital signals. A publicly available dataset is employed to train and validate a deep-learning model that accurately predicts BP readings. Performance is evaluated using key metrics, including mean absolute error (MAE) and root mean

square error (RMSE), demonstrating the model's reliability. The findings reveal the potential of PPG and ECG signals for real-time, noninvasive BP monitoring, paving the way for advanced healthcare applications and next-generation wearable technologies.

PID: 70

RA-UNet: A Deep Learning Approach for Precise Colorectal Polyp Segmentation

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Abstract— Colorectal cancer remains a significant health concern, contributing to a high number of cancers diagnoses and mortality worldwide. Early detection through colonoscopy is critical for identifying and removing precancerous polyps before they progress to malignancy. However, the manual examination has inherent limitations, necessitating automated methods for improving operational effectiveness and finding accuracy. Here a framework using deep-learning (DL) is suggested for detecting and segmenting colorectal polyps, leveraging an enhanced UNet architecture integrated with attention gates and residual blocks. Residual blocks mitigate the challenges of training deep networks by enabling the straight flow of gradients over skip connections, preserving fine details, and capturing complex features. Attention gates amplify informative regions in feature maps, improving model focus on relevant structures while suppressing noise. These architectural enhancements allow for precise delineation of polyps in colonoscopy images. Our approach demonstrates unmatched performance on standard datasets, with a Dice coefficient of 85.2% and IoU of 79.2% on Kvasir-SEG and a Dice coefficient of 92.3% and IoU of 84.12% on CVC-ClinicDB. These results emphasize our approach's probability of improving colorectal cancer screening by enabling accurate, efficient, and early detection, ultimately contributing to better patient outcomes and reduced mortality rates.

PID: 71

Skin Disease Detection and Classification of Actinic Keratosis and Psoriasis Utilizing Deep Transfer Learning

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Abstract— Skin diseases can arise from infections, allergies, genetic factors, autoimmune disorders, hormonal imbalances, or environmental triggers such as sun damage and pollution. Skin diseases such as Actinic Keratosis and Psoriasis can be fatal. These are treatable if identified early. However, its diagnostic methods are expensive and not widely accessible. In this study, a novel and efficient method for diagnosing skin diseases using deep learning techniques has been proposed. This approach employs a modified VGG16 Convolutional Neural Network (CNN) model. This model includes several convolutional layers. The VGG16 model has been employed using ImageNet weights and modified top layers. The top layer is modified by fully connected layers and a final softmax activation layer to obtain the result. The dataset analyzed is publicly available and titled “Skin Disease Dataset”. The VGG16 architecture does not include augmentation by default; data augmentation is typically performed through rotation, shifting, and zooming during preprocessing prior to model training. The proposed methodology achieved 90.67% accuracy using the modified VGG16 model, demonstrating reliability in classifying skin diseases. The modified pre-trained model showed promising results, increasing its potential for real-world applications.

PID: 73

A Deep Learning Approach to Bengali Handwritten Digit Recognition Using Transfer Learning

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Abstract— This paper presents a robust and efficient approach for Bengali handwritten digit recognition using transfer learning model. The original RGB dataset is converted to grayscale to reduce complexity, followed by preprocessing to replicate the

grayscale channel three times to align with the RGB input requirements of pretrained models. Leveraging transfer learning, the InceptionResNet model is fully retrained with custom dense and dropout layers to optimize feature extraction and classification. Extensive experimentation on a large dataset yielded exceptional performance metrics, achieving 98.87% training accuracy, 98.72% validation accuracy, and 98.26% testing accuracy. The proposed approach significantly outperforms traditional methods and contemporary deep learning architectures, offering a reliable solution for automated Bengali digit recognition. This study underscores the effectiveness of transfer learning and fine-tuning in addressing challenges posed by complex handwritten scripts, establishing a foundation for future advancements in multilingual handwritten character recognition.

PID: 75

A Hybrid CNN-LSTM Framework for the Early Detection of Pox and Similar Skin Conditions

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Abstract— Poxviruses are very infectious and can lead to skin blisters as well as other health problems which necessitates early detection to ensure effective treatment. Since the skin lesions caused by different varieties of pox may initially seem identical, it becomes difficult to reliably identify the type of pox. This paper introduces a novel CNN-LSTM hybrid approach for classifying and detecting five types of skin diseases including monkeypox, cowpox, chickenpox, measles and hand, foot, and mouth disease. The suggested technique combines CNN's feature extraction capabilities with the sequential learning process of Long Short-Term Memory (LSTM) networks. The model has an overall accuracy of 97% and an AUC of 99.7%. Grad-CAM analysis demonstrates the system's effectiveness by producing heatmaps that illustrate sections of the picture that influence the projected class score, although the overall performance is slightly reduced for chickenpox. The findings of this study confirmed the proposed system's superiority over pre-trained models, highlighting its potential for rapid and accurate skin condition identification.

PID: 76

The Detection and Classification of Schizophrenia Using DL and ML Methods: An Overview of the Recent Works

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Abstract— Schizophrenia (SZ) is a psychotic disorder in which people face delusion, hallucinations and various behavioral problems. It is very difficult to identify a patient with this disease by only observing the external physical features. Therefore, advanced technology should be introduced to identify and classify the problem. Recently, Machine Learning (ML) and Deep learning (DL) methods have manifested a great improvement in the field of detection and classification of this disease. Both Magnetic Resonance Imaging (MRI) and Electroencephalography (EEG) data could be effectively classified using these methods. This review includes the evaluations of the ML and DL methods, datasets, limitations and distinctions of the models. The comparative study between used models, their effectiveness and future scopes will help the researchers to explore this field of research. Also, by comparing the models and methods used in the previous work, a practical useable model could be defined which would help to an early detection of the disease.

PID: 78

Recent Progress in Human Emotion Recognition Using EEG Signals: A Brief Review

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Abstract— During the cognitive and emotional activities, the rhythmic, spontaneous impulses of neurons in the brain generate electrical potentials. These electrical potentials can be detected as brain waves using various instruments. Among those instruments, EEG is widely used for emotion recognition. The process of EEG-based emotion recognition generally consists of several steps: data collection using EEG, preprocessing the data, feature extraction, feature dimensionality reduction, and classification. With the advancement of information-technology, these steps have been improved significantly. New approaches such as new machine learning and deep learning models are being employed in this field. Moreover, through continuous research,

new theoretical ideas of emotions are being proposed for the use of EEG based emotion recognition. In recent years, the field of EEG-based emotion recognition has seen significant progress. This article explores these advancements and gives an overview of current trends and progression in EEG based emotion recognition.

PID: 80

Investigating Different Machine Learning Techniques for Alzheimer's Disease Classification

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Abstract— Alzheimer's disease affects about 45 million individuals globally, underscoring its importance as a global health concern. This degenerative brain disease, which primarily affects elderly persons, has a complicated and poorly known etiology. A major contributing factor to Alzheimer's disease, dementia causes progressive brain cell deterioration, impairing cognitive abilities like reasoning, memory, and comprehension.By facilitating early disease diagnosis and prediction, machine learning offers a solution. The primary objective of this study is the use of several machine learning algorithms to identify dementia in patients. The Open Access Series of Imaging Studies (OASIS) dataset, despite its small size, provides valuable information for creating diagnostic models using techniques like logistic regression, random forest, decision tree, and support vector machine (SVM).The best outcomes 88.00%, were obtained using random forest and logistic regression.

PID: 81

Predicting Obesity Prevalence in Bangladesh Using Machine Learning Approach to Demographic and Lifestyle Factors

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Abstract— Obesity represents an increasing global health concern, with its incidence escalating swiftly in both industrialized and developing nations. This tendency is seen in Bangladesh, where increasing rates among adults and children provide considerable public health challenges. This study analyses the demographic and lifestyle factors affecting obesity prevalence in the Rajshahi region, using a dataset of 750 individuals classified into Obese and Non-Obese categories. The study utilized machine learning algorithms, including Binary Logistic Regression (BLR), Random Forest (RF), Decision Tree (DT), and Support Vector Machine (SVM), to identify significant determinants of obesity: age, family history, intake of water, sleep duration, and lifestyle habits. RF exhibited the highest prediction accuracy among the models at 96%, underscoring its effectiveness in elucidating complicated relationships within the data. The results underscore the necessity of focused treatments and policy reforms to address obesity.

PID: 83

Deep Learning-Based Classification of Real and Fake Face Images Using Convolutional Neural Networks

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Abstract— Fake image detection, aiming to differentiate between real and fake images, a crucial task in combating image manipulation and ensuring the reliability of visual content across various applications. A convolutional neural network (CNN) model is used in this study to classify binary images. To authenticate images and stop tampering, this fake image detection technique can be used in digital forensics, facial recognition software, content moderation, social networking platforms, and e commerce. Following training, a classification report and a confusion matrix are used to assess the model's performance, offering information on its accuracy, recall, F1-Score, and general efficacy in detecting fake images. The model shows its practical

usefulness in identifying modest image modifications with a validation accuracy of 80.60%. This CNN-based algorithm works well for identifying images that have been altered, guaranteeing the legitimacy of visual content in a variety of applications.

PID: 85

Convolutional Neural Network based Tumor Classification Using Brain MRI Images

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Abstract— Classifying brain tumors is essential for precise diagnosis and treatment planning in medical imaging. In hospitals, research facilities, and AI-driven diagnostic tools, tumor classification helps with early diagnosis, individualized treatment planning, and tracking the course of the disease to enhance patient care and results. A CNN specifically designed for medical imaging tasks is the model used for this categorization.Using cutting-edge deep learning techniques, this study uses a convolutional neural network (CNN) to accurately classify brain MRI data into four groups: pituitary, meningioma, glioma, and no tumor. The model's validation accuracy of 95.27% after 50 epochs is validated by a confusion matrix, precision, recall, and F1-score.This scalable approach saves time and improves healthcare delivery by assisting physicians in making faster diagnoses, enabling more targeted treatments, and improving patient outcomes.

PID: 86

EEG Feature Analysis and Statistical Insights for Schizophrenia Detection: Identifying Alpha/Beta Ratio as a Potential Biomarker

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Abstract— This study explores EEG-based methods for spotting schizophrenia, emphasizing data pre-processing, feature extraction, and statistical analysis. Feature extraction is an essential step in machine learning and data analysis. It changes raw EEG data into valuable and measurable information. We look at EEG power by focusing on important features: the Theta/Alpha Ratio (TAR), Beta/Delta Ratio (BDR), Alpha/Beta Ratio (ABR), and Theta/Beta Ratio (TBR). Statistical tests show that ABR is noticeably different in healthy people compared to those with schizophrenia, suggesting it could be used as a potential biomarker. Machine learning methods confirm the differences in EEG power trends between the groups, showing that EEG can be useful for detecting schizophrenia.

PID: 88

Functional Connectivity Alterations in Major Depressive Disorder: Insights from EEG-Based Beta Band Connectivity Patterns

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Abstract— This paper compares the cerebral functional connectivity patterns of healthy and major depressive disorder patients by analyzing electroencephalogram recordings obtained during eyes-closed conditions in the beta-frequency band. Balanced and symmetrical connectivity was observed in healthy individuals' default mode network (DMN), indicating sound-established brain function. Conversely, MDD patients showed increased connectivity in the frontal regions, whereas reduced connectivity was observed in the posterior brain regions. The referential promise of connectivity derived from EEG concerning MDD diagnosis holds excellent potential for a better understanding of the neurophysiological processes underlying them. Its application would also boost EEG integration with other technologies to continue searching for improved diagnostic accuracy.

PID: 90

Classification of Cancer from Breast Ultrasound Images Using Vision Transformer

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Abstract— Breast cancer occurs when breast cells mutate and form tumors. While ultrasound imaging is a valuable tool for detecting and evaluating breast masses, its effectiveness is limited by operator dependency and a restricted field of view. In recent years, deep learning methods have been employed to address these limitations. Among them, Vision Transformer (ViT) models have emerged as a powerful approach for image classification, offering accurate and efficient results. This study leverages ViT to enhance breast cancer detection, ensuring reliable outcomes with reduced time requirements. In this paper, we presented tailored Vision Transformer based encoder model, to identify and effectively classify the benign, malignant and normal classes of image from Breast Ultrasound Images (BUSI) dataset. The proposed approach was compared to actual vision transformer model and it was found that our customized model performs better in every way. In our approach, we addressed class imbalance, ensuring fair evaluation across all classes in BUSI dataset. The results are measured with the performance metrics: accuracy, precision, recall and f1_score accordingly. The accuracy of the algorithm was obtained 96.98%, with 97.96% precision, 95.46% recall and f1-score as 96.71% respectively. This proposed method would be much more time efficient as well as better than other classification algorithms for breast cancer prediction.

PID: 91

SmartPark: An IoT- Driven Urban Car Parking Solution Using NodeMCU and Android Integration

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Abstract— In today's world, more parking spaces are required as a result of growing car ownership and population congestion. Road congestion in emerging nations makes it challenging to achieve minimum parking requirements. The majority of parking lots are subterranean, which wastes electricity and damages equipment. Large parking spaces are also required due to the growing number of car owners. However, it can be difficult to locate vacant parking spots and deal with unauthorized parking. Due to the difficulty drivers face finding parking spaces and the increase in traffic, which results in fuel loss, smartparking facilities can help address this problem. An Internet of Things (IoT)-based smart parking system is presented in the study to solve urban parking problems like wasteful space use and traffic congestion. Through web-based applications, this system offers real-time updates on parking availability. Additionally, sensors, RFID (Radio Frequency Identification), and micro -controllers were utilized in the construction of this system. An efficient parking tracking system, smartphone apps for booking, online payments, and user verification are some of the main features. In addition, the system provides a working prototype for real-time data transfer and energy-efficient solutions. This innovative idea improves road safety while making the most of urban parking infrastructure.

PID: 96

Breast Cancer Detection via Advanced Deep Learning Networks

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Abstract— Breast cancer happens when healthy breast cells grow abnormally, creating lumps or masses. It is the second leading cause of cancer deaths among women worldwide and the top cause among Hispanic women. Detecting breast cancer early, often using mammography (a type of X-ray), greatly improves treatment success and survival rates. Current methods for analyzing mammograms rely on traditional machine learning, which struggles to process complex and high-dimensional data. This often leads to lower accuracy when identifying benign and malignant cases. To address these challenges, this study proposes a deep learning-based approach combining Convolutional Neural Networks (CNNs) with transfer learning techniques to enhance the accuracy and reliability of breast cancer detection. The novelty of the work lies in employing advanced pre-processing methods and optimizing key parameters, such as kernel sizes, hidden layers, and learning rates tailored for mammographic data. Benchmark datasets, including the MIAS database, were used for training and validation, with models like VGG16 and DenseNet achieving

accuracies of 96% and 98%, respectively. These results demonstrate the potential of the proposed method to overcome the limitations of existing approaches, offering robust and efficient diagnostic solutions for early breast cancer detection.

PID: 97

Machine Learning-Driven Time Series Modeling for Temperature Prediction in Bangladesh

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Abstract— The increasing unpredictability of temperature poses significant risks to environmental sustainability and socio-economic stability. This study focuses on forecasting temperature in eight districts of Bangladesh—Barishal, Chattogram, Dhaka, Khulna, Rajshahi, Rangpur, Mymensingh, and Sylhet—using monthly data from January 1970 to December 2022, collected from the Bangladesh Agricultural Research Council (BARC). Time series models, including SARIMA (1, 1, 1)(1, 1, 1)12, are applied to capture seasonal patterns. Additionally, advanced machine learning models such as Long Short-Term Memory (LSTM) networks, and Random Forest regression are employed to detect non-linear trends and improve prediction accuracy. Results indicate significant seasonal fluctuations in temperature, particularly during extreme weather periods. These findings underscore the necessity for data-driven climate adaptation strategies and sustainable resource management. The combination of traditional statistical models with modern machine-learning techniques ensures robust and precise forecasting. Future research can extend this approach by including other climatic variables and using ensemble models for enhanced accuracy. This study offers critical insights for policymakers in climate-sensitive regions.

PID: 98

Machine Learning Modeling for Rainfall Prediction in Bangladesh.

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Abstract— The increasing unpredictability of rainfall poses significant risks to environmental sustainability and socio-economic stability. This study focuses on forecasting rainfall in eight districts of Bangladesh—Barishal, Chattogram, Dhaka, Khulna, Rajshahi, Rangpur, Mymensingh, and Sylhet using monthly data from January 1970 to December 2022, collected from the Bangladesh Agricultural Research Council (BARC). Time series models, including SARIMA(1,1,1)(1,1,1)1212, are applied to capture seasonal patterns. Additionally, advanced machine learning models such as Long Short-Term Memory (LSTM) networks are employed to detect non-linear trends and improve prediction accuracy. Results indicate significant seasonal fluctuations in rainfall, especially during the monsoon season. These findings underscore the necessity for data-driven water management strategies and climate adaptation policies. The combination of traditional statistical models with modern machine learning techniques ensures robust and precise forecasting. Future research could extend this approach by including other climatic variables and using ensemble models for enhanced accuracy. This study offers critical insights for policymakers in climate-sensitive regions.

PID: 100

Predictive Insights into Depression and Suicide Through Machine Learning Models

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Abstract— This study explores the relationship between depression and suicide using machine learning models, including SVM, Random Forest, XGBoost, and Naïve Bayes. By analyzing psychological, social, and behavioral data, we identify key patterns linking depression severity with suicidal tendencies. Among the tested models, Naïve Bayes and XGBoost demonstrated the highest predictive performance, achieving strong accuracy and cross-validation metrics. These findings highlight the potential of machine learning in mental health research, offering scalable, data-driven frameworks for early risk detection and intervention.

PID: 101

Exploring Machine Learning Techniques and Imbalanced Classification for Credit Card Fraud Detection

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Abstract— Credit card fraud is an alarming criminal offence that causes significant harm to both individual identities and financial institutions. For this reason, it is crucial for financial institutions to identify and stop fraudulent activity. However, fraud prevention and detection are often costly, labor-intensive, and time-consuming procedures. This exploration provides an extensive experimental study of the methods that handle the imbalanced classification problem faced by fraud detection. Using a labeled credit card fraud dataset, standard machine learning techniques for fraud detection were evaluated, their weaknesses were identified, and the results were carried out. The experiments analyze how well the Support Vector Machine (SVM), Gaussian Naïve Bayes (GNB), Decision Trees (DT), Adaptive Boosting Regression (ABR), and Logistic Regression (LR) perform on highly skewed credit card fraud data. The skewed data goes through an oversampling technique. The results show that the SVM, ABR, LR, GNB, and DT classifiers have Overall Accuracy (OA) of 0.9995, 0.9992, 0.9995, 0.9789, and 0.9993, respectively. Comparative analysis shows that Logistic Regression performs better than the other methods based on OA, precision, recall, F1-score, and kappa score.

PID: 105

Modeling & Predicting Air Quality Index of Bangladesh and India Using Machine Learning Approach

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Abstract— Air pollution is a growing concern, particularly in developing countries like Bangladesh and India, where rapid urbanization and industrialization have significantly affected air quality. Poor air quality impacts public health, contributes to global warming, and harms ecosystems. This paper focuses on modeling and predicting the Air Quality Index (AQI) using machine learning techniques to provide accurate and timely forecasts. By utilizing data analysis from environmental sensors, the study analyzes various factors of air pollution, such as location, time, and key pollutants like Carbon Monoxide (CO), Sulphur Dioxide (SO_2), and particulate matter. Machine learning models, including Random Forest, DNN, ARIMA, and SARIMA, are employed to predict AQI levels and pollutant concentrations effectively. The results demonstrate that Random Forest provides the best predictions, with a coefficient of determination of 0.88 for India, though it performs less effectively for Bangladesh (0.28). The DNN, ARIMA, and SARIMA models show poor performance, with negative or low coefficient of determination values, highlighting the challenges in predicting air quality in different regions. These findings emphasize the importance of model selection and provide valuable insights for policymakers in improving air quality management.

PID: 106

Revolutionizing Brain Tumor Diagnosis: Leveraging Transfer Learning and Deep Neural Networks

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Abstract— Early detection of brain tumors helps to save a patient's life to a greater extent. Artificial intelligence-driven deep learning techniques, already achieved remarkable accuracy in diagnosing brain tumors, with a trained large dataset of magnetic resonance imaging (MRI), which is the gold standard for brain tumor diagnosis. However, the complicated structure of the human brain forms significant challenges in this process. This study explores the potential of deep transfer learning architectures to

enhance the precision of brain tumor diagnosis. The advanced transfer learning architectures such as MobileNetv3, DenseNet169, VGG19, and ResNet152—were meticulously evaluated using a Kaggle dataset, employing five-fold cross-validation for robust results. To address dataset imbalances, image enhancement techniques were applied, ensuring equal representation across four categories: pituitary tumors, normal scans, meningiomas, and gliomas. Among the models, DenseNet169 arose as the top performer, achieving an impressive accuracy of 99.75%, beating the others. These findings give priority of the groundbreaking potential of deep transfer learning in revolutionizing brain tumor diagnosis, offering hope for more accurate and efficient medical imaging solutions.

PID: 108

A Hybrid Approach for Semantic Similarity of Long Bangla Texts Using BERT and Custom Transformers

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Abstract— Semantic text similarity estimation between two long Bangla texts is a critical task issue in the field of NLP. Current similarity measuring methods such as Bert is not quite reasonable for the long texts' similarity due to the limitation of tokens(512). Due to that limitation of Bert, it cannot capture fully semantic information from the composite complex structure of long texts, turning the loss of information into a loss of accuracy in the similarity score. In this paper, we have proposed a method that is a combination of our custom transformer encoder and Bert that can directly contribute to the better accuracy of similarity scores between two long Bangla texts. Preliminary results demonstrate that our proposed method is more accurate in the Bangla long texts semantic similarity measurement task, achieving an F1 Score of 0.9939 and a Test Loss of 0.0297 during the evaluation stage, compared to the only Bert approach with common evaluation data. These evaluation insights highlight that our proposed similarity calculation framework serves as a dominant power in semantic similarity calculation tasks.

PID: 110

Autism Spectrum Disorder Diagnosis Using Eye-Tracking with Machine and Deep Learning Techniques

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Abstract— Autism Spectrum Disorder (ASD) is a lifelong neurodevelopmental disorder characterized by significant impairments in social interaction, communication, and cognitive functions, including linguistic and object recognition abilities. Early diagnosis is crucial as it can significantly improve an autistic child's social communication skills and overall quality of life. One of the characteristic hallmarks of ASD is the difficulty of making or maintaining eye contact. This paper uses Machine Learning (ML) and Deep Learning (DL) approaches to analyze ASD diagnosis through eye-tracking data. This work uses Artificial Neural Networks (ANN), Decision Tree (DT), Support Vector Machine (SVM), and K-Nearest Neighbor (KNN) to differentiate between ASD and Typically Developing (TD) individuals. This study achieved a notable accuracy of 98% using the Decision Tree (DT) model, marking a significant improvement over previous works. Other models, such as SVM, KNN, and ANN, achieved accuracies of 93.37%, 92.46%, and 73%, respectively.

PID: 112

Comparative Study of DAE-Based CNN and CSP-SVM for Motor Imagery Classification

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Abstract— Brain-Computer Interfaces (BCIs) enable people with motor impairments to communicate and control their environment; nevertheless, the performance of electroencephalography (EEG) based motor imagery (MI) classification is still limited due to low signal-to-noise ratios, differences between individuals, and the complexity of datasets. This study investigates two methodologies, the classic Common Spatial Patterns (CSP) used with Support Vector Machines (SVM) and a deep learning approach that is composed of a Denoising Autoencoder (DAE) and a Convolutional Neural Network (CNN). We demonstrate

these techniques applied to the BCI Competition IV 2a and 2b datasets. The results show that the DAE-CNN framework achieves an accuracy of 65.4% on the BCIC IV 2a dataset. While the CSP and SVM approach achieved 72.8% accuracy on the BCIC 2b dataset. This study provides meaningful insights for improving MI classification and paves the way for hybrid models that can increase BCI performance.

PID: 114

Enhanced Fraud Detection in Credit Card Transactions with Data Balancing and XGBoost

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Abstract— Credit card fraud detection presents a significant challenge in the financial sector due to the rarity of fraudulent transactions and the need for real-time accurate classification. Fraudulent transaction detection using traditional manual approaches is ineffective and time-consuming. This research introduced a model that combines XGBoost and an oversampling method to solve imbalanced classification in fraud detection. Using a labeled credit card fraud dataset, the performance of this model is compared to other machine learning models. This evaluation brings out the impact of techniques such as feature engineering, class imbalance handling, and parameter tuning in improving results and demonstrates the proposed model's superiority over other approaches. According to comparison findings, XGBoost with oversampling other models such as Logistic Regression (LR), Support Vector Machine (SVM), and Decision Tree (DT). The results show that the SVM, DT, and LR classifiers have overall accuracies (OA) of 0.9941, 0.9992, and 0.9992, respectively, while XGBoost classifiers have an OA of 0.9996.

PID: 117

Comparative Analysis of Machine Learning Algorithms for Chronic Kidney Disease Prediction

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Abstract— In recent days, chronic kidney disease (CKD) is recognized as one of the most significant health problems globally. The defining feature of CKD is a progressive deterioration in renal function over time. Since kidney damage develops slowly over a long period of time, early detection and appropriate treatment may be able to save the lives of many. Machine learning classifier algorithms have emerged as a reliable tool to identify the disease at its early stages, providing a means to intervene and manage it sooner than other methods. In this paper, the performance of 10 models is evaluated on the dataset of CKD collected from UCI ML repository for the classification of CKD. The training data in this study was augmented by applying the SMOTE technique and Gaussian noise. In case of missing values handling, for numerical and categorical variables KNN imputation and mode imputation for features were utilized respectively. Combining the filter, wrapper and embedded feature selection strategies led to the identification of the most important 13 features. Extra Tree Classifier, XGBoost, Gradient Boosting and Random Forestperformed better than other algorithms with an accuracy of 99.17%. When compared to the other nine methods, Extra Tree Classifier performed extremely well in case of precision, recall and F1 score. For this proposed approach, the error rate and training time were all comparatively low as 0.0083, and 0.0787 seconds respectively. This paper illustrates the performance comparison of ten different machine learning (ML) algorithms and the importance of feature selection for predicting CKD.

PID: 118

A Comprehensive Overview of Machine Learning Based Feature Extraction Techniques for Hyperspectral Image Classification

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Abstract— Hyperspectral imaging using remote sensing techniques captures important details about the things on Earth by exploiting hundreds of adjacent, tiny spectral bands. The performance is hindered when all the bands are taken into consideration

for categorization. Therefore, it is essential to lower the HSI bands, generally by feature selection and extraction. One popular unsupervised feature extraction method is Principal Component Analysis (PCA). Nevertheless, it ignores the local structure of the data in favor of taking into account global variance. Another feature reduction technique Nonnegative Matrix Factorization (NMF), approximates the data in a low-dimensional subspace. The Incremental PCA (IPCA) exploits Singular Value Decomposition (SVD) to transform data to lower space and is suitable for large datasets. Another dimensionality reduction technique Factor Analysis (FA) eradicates band-to-band correlation preserving the vital spectral information. This study investigates the performance among these for feature extraction techniques for effective HSI categorization. The rigorous analysis proves FA as the superior among the other techniques providing an Overall Accuracy of 92.70%, while PCA, NMF and IPCA provide 82.36%, 82.44% and 80.15% respectively.

PID: 120

Classification of ADHD and Healthy Children Using Multi-Band and Spatial Features of EEG

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Abstract— Attention Deficit Hyperactivity Disorder (ADHD) is a common neurodevelopmental disorder in children, characterized by difficulties in attention, hyperactivity, and impulsivity. Early and accurate diagnosis of ADHD is critical for effective intervention and management. Electroencephalogram (EEG) signals have emerged as a non-invasive and efficient tool for ADHD detection due to their high temporal resolution and ability to capture neural dynamics. In this study, we propose a method for classifying ADHD and healthy children using EEG data from the benchmark dataset. There were 61 children with ADHD and 60 healthy children, both boys and girls, aged 7 to 12. The EEG signals, recorded from 19 channels, were processed to extract Power Spectral Density (PSD) and Spectral Entropy (SE) features across five frequency bands, resulting in a comprehensive 190-dimensional feature set. To evaluate the classification performance, a Support Vector Machine (SVM) with the RBF kernel demonstrated the best performance with a mean cross-validation accuracy of 98.2% and a standard deviation of 0.0089, indicating high robustness and precision. These results highlight the potential of spatial features in conjunction with machine learning for accurately classifying ADHD using EEG data. This work contributes to developing non-invasive, data-driven tools for early diagnosis and assessment of ADHD in children.

PID: 121

IoT-Based Cost-Effective Smart Car Parking System for Middle-Income Countries

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Abstract— In recent times, the automatic car parking system is gaining popularity. Every smart city needs this concept to save car drivers time and decrease the complexity of parking. This project proposes an automatic, cost-effective car parking system for middle-income countries. In this project, an Arduino board is used as a processing and main circuit board connected to all types of necessary devices, and an ESP-32 board is used as a communication board to add IoT features. Every necessary data shows on LCD, Web application, android app, and all data stored in the computer as an Excel sheet. This project is mainly developed for middle-level garages and middle-income countries. So very high-level devices and complex programming languages are not used.

PID: 123

Hybrid Model-based Bangla Sign Language Recognition Using Machine Learning and Deep Transfer Learning Techniques

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Abstract— Sign language serves as a critical communication medium for deaf and nonverbal individuals; however, its limited use by hearing individuals creates a significant communication gap. This study introduces a hybrid model for automated recognition of Bangla Sign Language (BdSL) to tackle this challenge. The proposed approach integrates an efficient gesture classification system using a Support Vector Machine (SVM) classifier and a convolutional neural network (CNN) leveraging deep transfer learning for feature extraction. By combining the strengths of traditional machine learning with deep learning, especially in scenarios with limited training data, the hybrid model achieves enhanced accuracy. When tested on the KU-BdSL dataset, the model demonstrated an exceptional accuracy of 99.7%, underscoring its effectiveness. This research highlights the potential of hybrid models in advancing sign language recognition and facilitate interaction among hearing and deaf communities.

PID: 126

A Comparative Analysis of Pre-Trained Convolutional Neural Networks for Melanoma Early Detection

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Abstract— One of the most prevalent and lethal types of cancer in the world is skin cancer, especially melanoma. Improving patient outcomes requires early detection, and automated systems powered by deep learning (DL) have demonstrated significant potential to support medical professionals. Several pre-trained convolutional neural network (CNN) models used for melanoma early detection are compared in this study. They are VGG16, MobileNetV2, EfficientNetB7, and DenseNet121. The HAM10000 dataset, which includes a wide range of skin lesions, was used to assess these models. The aim was to find the best pre-trained model for the classification of melanoma. We compared the accuracy, precision, recall, and F-1 scores of various models to assess their capacity to extract reliable features from the dataset. The CNN (2D) model performed the best, according to the data, in terms of accuracy (87%), precision (86%), recall (85%), and F1-score (88%). By thoroughly contrasting the most widely used pre-trained models and revealing their relative advantages and disadvantages for melanoma diagnosis, this study advances the field. According to the results, these pre-trained models can greatly improve automated melanoma detection, facilitating early diagnosis and offering dermatologists and other healthcare professionals invaluable assistance.

PID: 127

Iterative Design and Optimization of a Star-Shaped Fractal Antenna for 5G Applications

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Abstract— This study presents the iterative design process of a compact star-shaped fractal antenna tailored for super wideband (SWB) 5G applications. The antenna design underwent eight evolutionary iterations, starting from a simple rectangular microstrip patch to a sophisticated star-shaped fractal structure. Using the Rogers RT5880 substrate, the final design achieved a frequency range of 20 GHz to 40 GHz with a fractional bandwidth of 165%. The iterative approach optimized critical performance metrics such as the reflection coefficient (S11), Voltage Standing Wave Ratio (VSWR), gain, and radiation patterns. Simulated using CST Microwave Studio, the final antenna exhibited an average gain of 6.4 dBi and a peak gain of 10 dBi. This paper details the step-by-step design process, highlights the improvements achieved across iterations, and discusses the antenna's potential applications in 5G communication systems.

PID: 136

Advancing Plastic Pollution Detection in Underwater Environments Using CNN Architectures

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Abstract— Most of the plastic debris from land that ends up in the ocean originates from human waste, making ocean pollution one of the most serious environmental problems. The creatures, the local economy, and the equilibrium of the marine ecosystem are all at risk from these contaminants. Aquatic life and humans will undoubtedly be impacted by this. Various advanced models and approaches are used to detect and measure plastic pollution in the water. This research focuses on a number of well-known methods, such as VGG16, MobileNetV2, DenseNet, and a bespoke convolutional neural network (CNN) architecture. Using these cutting-edge models, we want to improve the precision and effectiveness of plastic garbage detection in underwater environ ments. MobileNetV2, which demonstrated its better performance with 80% accuracy and computational efficiency in this setting, produced the most promising results among the tested models.

PID: 138

Human Emotion Recognition Utilizing Transfer Learning

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Abstract— Facial Emotion Recognition (FER) is a crucial area of research in the field of Computer Vision (CV) and Deep Learning (DL), aiming to identify and classify emotions such as happiness, sadness, anger, and surprise from facial expressions. This study focuses on developing a model for recognizing facial emotions using DL techniques along with Transfer Learning (TL). For this work, we have used CKPLUS dataset. We have used two pre-trained State-of-the-art (SOTA) Convolutional Neural Network (CNN) models, InceptionV3 and MobileNet, to transfer their learning in the task of feature extraction from our image data. For the classification task, we have used extracted features from these models both individually and fusing them together. For classifying these sets of features, we have used multiple classifiers, namely, Logistic Regression, a custom 1dimensional (1D) CNN, and hard voting classifiers that ensemble the decisions of Linear Support Vector Machine (LSVM), Logistic Regression, perceptron, quadratically penalized SVM, and SVM with quadratically smooth loss. The fused features extracted from InceptionV3 and MobileNet achieve the highest performance when classified using the voting classifier, with a classification accuracy of 98.48%, a weighted precision of 99.53%, a recall of 98.57%, and an F1-score of 98.48%. This work indicates the ensemble learning technique outperforms individual models across the dataset, identifying and classifying human emotion from an image of facial expression more accurately.

PID: 144

Attention-Based LSTM System for Epileptic Seizure Detection from EEG Signals

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Abstract— The electroencephalogram (EEG) has become one of the most important tools for clinicians to detect seizures and other neurological irregularities of the human brain over the past few decades. An accurate diagnosis of epilepsy is essential due to its unique characteristics and the adverse consequences of epileptic seizures on individuals. An urgent need exists for an automated epilepsy detection system utilizing electroencephalography (EEG) for clinical use. This paper employs the Discrete Wavelet Transform (DWT) to decompose EEG signals into multiple subbands. Various features used to discriminate spike events and extracted from each subband signal of an EEG trial. The attention mechanism augments the network's capacity to concentrate on discriminative features and temporal steps within the feature sequence, thereby enhancing interpretability and detection precision. The weighted number of features effectively distinguishes the underlying characteristics of EEG signals indicative of seizure and non-seizure events. The attention mechanism utilizing Long Short-Term Memory (LSTM) is employed to classify seizure and non-seizure EEG signals. The effectiveness of the proposed method is assessed through multiple experiments utilizing

a public dataset acquired from the University of Bonn. The experimental findings indicate that the proposed seizure detection method obtains a classification accuracy of 99.65%, outperforming the performance of current techniques. The efficacy of the LSTM with attention model is compared with support vector machine classifiers, which exhibit a classification accuracy of 98.52%. Thus, the proposed method is validated as a potential indicator for EEG-based seizure detection.

PID: 146

Optimizing SSVEP Frequency Recognition in BCI by Doubling and Averaging Trial Data for Robust Reference Signals

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Abstract— Steady-state visual-evoked potential (SSVEP)-based brain-computer interfaces (BCIs) provide a non-invasive method to interact using high-speed indicating systems. Correlation Component Analysis (CORRCA) is used to recognize the frequency of steady state visual evoked potential (SSVEP) for the implementation of brain computer interface (BCI). The performance of CORRCA is degraded when lower training data is used. On the other hand, BCI implementation becomes more effective when it uses lower data length which is lower calibration time. This paper presents an improved reference signal generation based frequency recognition of short-time SSVEP signals. By concatenation the training data has been increased for better fit of using CORRCA. The CORRCA is used to recognize the frequency of short-time SSVEP. The performance of the proposed method is evaluated using publicly available dataset. The accuracy of this proposed method is 92.28%. The experimental results show that this technique enhance performance of SSVEP Frequency Recognition.

PID: 148

Enhancing Online Learning - Distraction Detection and Engagement Monitoring with Transfer Learning CNNs

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Abstract— It is now more important than ever to measure student attentiveness precisely and spot distractions in the midst of the massive change from offline to online learning. Effective remote student monitoring is quite difficult for many universities. This paper provides a thorough examination of deep learning methods to address these issues, filling in the gaps in previous studies. This study uses state-of-the-art convolutional neural networks (CNNs) as feature extractors, such as DenseNet121, Xception, VGG16, VGG19, ResNet50, and EfficientNet-B2, through transfer learning methodologies, using a newly curated dataset created for the online learning environment. Tests were carried out in 15 different classes, and the astounding accuracy of 97.67% was obtained. This study contributes significantly to educational technology by providing insightful information about how to increase student focus and engagement in the digital age.By showcasing the effectiveness of these advanced CNN models, this study paves the way for the development of more robust monitoring and support systems in online education, ensuring that students remain focused and engaged in virtual learning environments.

PID: 150

FusionNet: A Comprehensive Framework for Automated Deepfake Detection Using Multi-Modal Integration

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Abstract— Advances in deep generative models have led to the spread of deepfake media, which poses a serious danger to information authenticity, privacy, and trust in digital media forensics. In order to meet the increasing demand for reliable deepfake

picture identification, this study uses the publicly accessible Kaggle Deepfake Dataset to investigate hybrid deep learning approaches. Initial experiments with standalone Keras models, including DenseNet121, Xception, NASNetMobile, and MobileNetV2, achieved accuracies ranging from 89% to 90% over 20 epochs. To push the boundaries of performance, we developed a novel hybrid model that concatenates feature maps extracted from DenseNet121 and DenseNet169. This method greatly improved classification performance, obtaining a 91.22% accuracy rate with high precision 90.82%, 94.37% recall, and 92.56% F1- score with error rate 8.78%. Confusion matrices, classification reports, and ROC curves were used to thoroughly assess the model, which showed that it was effective at differentiating real photos from ones that had been altered, with an AUC value of 0.98. Our findings underscore the effectiveness of combining pretrained CNN architectures for deepfake detection and contribute to the advancement of scalable, reliable solutions for safeguarding digital media integrity.

PID: 151

Deep Learning-Based Jute Leaf Disease Identification

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Abstract— One of the most valuable crops which has potential in environmental concern as well as in economic revolutions is jute. However, significant losses come from the inability to spot jute leaf diseases using hand observations alone. Deep learning and machine learning prove good strategies to solve this issue. For disease detection, the sample set was constructed of 1820 jute leaf images, consisting of both normal and diseased observations. SVM, Random Forest, XGBoost and custom pre-trained CNN classifier were combined with DenseNet121, ResNet152, Xception, VGG19 feature extractors. To enhance the given dataset, additional techniques like CLAHE, normalization and Laplacian filtering were applied. The performance was evaluated using AUC-ROC, F1 score, recall rate, accuracy and precision. Resnet152 with the Custom Classifier was determined to be the model with the highest accuracy of 98.41%, and AUC of 0.9988 with custom classifier and DenseNet121.This research proves that deep learning can successfully diagnose Jute leaf disease and therefore improve disease management and consequently improve agricultural yields. We contribute in enhancing different methods of disease control and overall jute farming yields.

PID: 152

Brain Stroke Detection with Machine Learning on CT-Scan Images

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Abstract— Day by day brain diseases are increasing because people are now focusing on their work too much not focus on health. Stroke is also a serious brain disease which commonly occurs at any age, people. The severity can decrease by detecting early and starting treatment early. This model with ML that will detect Stroke from a CT-Scan image that a brain stroke or not. Use Laplacian, CLAHE as image preprocessing and use Feature extractors DenseNet169, DenseNet121, DenseNet201, VGG16, Xception with several classifier SVM, CustomClassification, XGBoost, Logistic Regression. After that got a truly best result 99.67% which was rare on this field and previous work. At present, hope this result is the highest in the basis of accuracy.

PID: 153

Bone Fracture Classification in X-ray Images: A Deep Learning Approach Leveraging Transfer Learning

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Abstract— Bone fractures are one of the most prevalent concerns in medical diagnostics but are often diagnosed on Xray imaging for detection. However, interpreting those X-ray images can be susceptible to human error and affect treatment. In that place, artificial intelligence (AI) is coming innovatively to solve this challenge. Our study explores the approach of incorporating the latest SOTA convolutional neural networks (CNNs) for fracture detection using deep learning. We employed pre-trained models such as DenseNet169, DenseNet121, VGG16, VGG19, ResNet50 and ResNet101 trained on larger datasets to extract high-level features from X-ray images. We used classifiers such as Logistic Regression, Random Forest, XGBoost, and a custom feed-forward network (FFN) to analyze these features. Among multiple combinations tested, VGG16 combined with the custom FFN produced the best results, reporting an overall accuracy of 99.37%, Area Under the Curve (ROC-AUC) score of 99.98%, precision of 99.37%, recall of 99.37%, and F1 score of 99.37%. This strategy highlights the potential value of AI technology in improving diagnostic accuracy, providing a fast, reliable tool for medical professionals to use to improve patient care.

PID: 155

Face Mask Detection Using Deep Learning

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Abstract— In late 2019, a VIRUS named COVID-19 spread initially from Wuhan, China to the world. During this period, many people were affected by this VIRUS. COVID-19 spreads when an infected person breathes out droplets and tiny particles containing the virus. Other people can breathe in these droplets and particles, or these droplets and particles can land on other people's eyes, nose, or mouth, resulting in infection from the VIRUS which results in the world getting affected by VIRUS so quickly. Here, the Face Mask Plays a Crucial Role in stopping the spreading of the VIRUS. For detecting the Face mask with the help of deep learning and images we have created a system that can determine if a person wears the mask properly, improperly, or has not worn any. For building this system we use One Dataset containing three types of Images a total of 853 images. With this system, we have been able to detect if a person wears the mask properly, improperly, or not wearing any mask with about 96.

PID: 156

An IoT Based Automated System for Aeroponic System

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Abstract— Intelligent sensor technologies have drawn a lot of interest in agriculture in recent years. It is used in agriculture to effectively organize a variety of tasks and missions while making use of scarce resources and minimizing human intervention. Nowadays, a lot of producers are growing plants utilizing modern agricultural techniques. Nonetheless, aeroponics is one of the contemporary agricultures, which is a widespread activity worldwide. By substituting a little mist of the nutrient solution for the soil, the method allows plants to grow in the growth chamber under total control. Periodically, the nutritional mist is released through atomization nozzles. Temperature, humidity, light intensity, water nutrient solution level, pH and EC value, CO2 concentration, atomization duration, and atomization interval time are some of the factors that must be properly attended to during plant cultivation in order for the plants to grow flourishingly. In our paper, we have developed a model where all these parameters can be observed automatically.

PID: 157

Chest X-ray Based Pneumonia Diagnosis Using Deep Learning Technique

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Abstract— Pneumonia is a common respiratory illness. This study utilizes deep learning techniques to analyze chest X-ray images for pneumonia diagnosis, integrating four pre-trained feature extractors—DenseNet169, DenseNet201, MobileNet, and InceptionResNetV2—with classifiers like Random Forest, Support Vector Machine (SVM), and XGBoost. We employ various libraries for image processing, machine learning, deep learning (TensorFlow/Keras), and explainability methods like CLAHE and Laplacian filters to enhance images before model input. Our evaluation focuses on key metrics, including accuracy, precision, recall, F1-score, and AUC. The combination of DenseNet201 and Custom Classification has shown the highest accuracy in detecting pneumonia, highlighting its potential to improve diagnostic practices and healthcare outcomes. Overall, chest X-rays are highly effective for diagnosing pneumonia.

PID: 158

Bangla Sign Language Digitization

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Abstract— The focus of this research is to use minimal available resources for classifying Bengali sign language letters অ (a), আ (A), ই (i), ঈ (I), and এ (e) using advanced image processing and Machine learning. Image processing techniques such as CLAHE, and Laplacian filter were used to prepare the data. Feature extractors including DenseNet121, DenseNet169, DenseNet201, ResNet50, ResNet101, and ResNet152, are employed for meaningful feature extraction from sign language images. These extracted features are classified using machine learning classifiers such as custom keras classifier, XGBoost, SVM, and Random Forest. The best result was found through the densenet family and a custom classifier from a limited dataset. The study aims to enhance the recognition accuracy and efficiency of Bengali sign language classification for improved accessibility and communication for the deaf and speech-impaired community.

PID: 159

Brain Tumor Classification with MRI Images Using Deep Learning Technique

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Abstract— Brain tumors are very common in both children and adults. According to the latest data from the World Health Organization, Asia has the highest number of brain tumors and deaths. A life-threatening disease. A brain tumor is an abnormal growth of brain cells inside the skull which later takes the form of brain cancer. Tumor detection is very difficult due to the heterogeneity of tumor cells. Convolutional Neural Network CNN stands for virtual learning and is the most widely used machine learning algorithm for tumor detectionTumor can be identified through this. This research paper has four types of MRI images.They are glioma, meningioma, pituitary and no tumor. EfficientNet CNN architecture is widely used in brain tumor diagnostic testing and research.In the brain tumor dataset 3264 images are used.80% images are training images and 20% images are testing images.The images are resized 244-by-244 and normalized the range of [0, 1] 255 to improve the Convolutional Neural Network(CNN) during the teainig period. Deep learning and meching learning technique are used to find the Confusion Matrix, precision, recall, f1-score, support, accuracy, AUC-ROC curve. The highlight accuracy 99.82% are the custom classifier.

PID: 160

An Effective Deep Learning Approach to Plant Disease Detection

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Abstract— Plant diseases are considered a major problem that has an immense impact on agriculture and the economy. Early detection of plant diseases can result in less crop loss and significantly decrease financial losses. This study identifies plant diseases using deep learning (DL) and machine learning (ML) methods with plant leaf images. DL methods such as DenseNet121, DenseNet169, DenseNet201, and VGG19 are used. Aditionally, ML methods including Support Vector Machine (SVM), Random Forest (RF), and Logistic Regression (LR) have been implemented. The plant leaf images are collected from the PlantVillage dataset. DenseNet201 with SVM appears as the outperformer and provides the best results of 100% accuracy with precision, recall, F1-score, and AUC.

PID: 161

Skin Cancer Detection Using Deep Learning

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Abstract— Skin cancer detection has become a crucial area of research due to its increasing prevalence and the need for early diagnosis. In this study, we leverage deep learning techniques to classify skin cancer images, focusing on a comparative analysis of feature extractors and classifiers. Models such as DenseNet121, ResNet50, MobileNetV2, and DenseNet169 were paired with various classifiers including Logistic Regression, XGBoost, Random Forest, and custom neural networks. DenseNet121 combined with a custom classifier achieved the highest performance with an accuracy of 93.5 percentage and an AUC of 0.9842, demonstrating its potential for practical applications.

PID: 163

A Deep Learning Approach to Detect Diabetic Retinopathy Using Retinal Fundus Images

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Abstract— Diabetic retinopathy (DR) is a leading cause of blindness worldwide, requiring early detection to prevent severe vision loss. This paper presents a deep learning-based approach to automate DR detection using retinal fundus images. Advanced convolutional neural networks (CNNs), including DenseNet121, DenseNet201, DenseNet169, Xception, and VGG16, were finetuned for hierarchical feature extraction. These features were classified using Custom Classifier, Support Vector Machine (SVM), XGBoost, and Random Forest. Evaluation metrics, including Accuracy, Precision, Recall, F1-Score, and AUC, assessed model performance. The DenseNet121 with a Custom Classifier achieved the highest accuracy of 97.91% and an AUC of 99.28%, highlighting its robustness. This study demonstrates the feasibility of deploying automated DR detection systems to improve diagnostic efficiency, reduce dependency on skilled professionals, and enhance healthcare accessibility globally.

PID: 164

Smartphone Addiction Rate Prediction of People and Their Impaired Mental Health at Rajshahi

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Abstract— In our society, the number of smartphone addictions increases day by day, resulting in people facing various problems. By conducting research on all the people of Rajshahi district, we find that a significant portion of the population is addicted to smartphones, with nearly half experiencing some level of dependency, raising concerns about their impact on mental health, social relationships, and physical well-being. The study examines these effects by analyzing behavioral changes, social connections, and perceived addiction among individuals. It finds significant associations between smartphone use and sleep disturbances, family distance, headaches, increased social isolation, and difficulty focusing. Anxiety related to not checking updates and trouble concentrating shows moderate correlations with smartphone behaviors. Regression analysis identifies sleep disturbances and focus-related issues as key predictors of perceived addiction. To mitigate these adverse effects and improve well-being, interventions focus on reducing screen time and improving sleep hygiene practices to alleviate associated mental health challenges like anxiety due to excessive phone use. Additionally, fostering meaningful social engagement through community programs or family activities counters feelings of loneliness stemming from over-reliance on smartphones for interaction, ultimately requiring a balanced approach that maximizes technology's benefits while minimizing its negative impacts on overall well-being.

PID: 165

A Proposed Model for Early Detection of Sleep Disorders Through Brain Wave Monitoring During Daily Activities Across Professions

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Abstract— Sleep disorders have a significant impact on mental and physical health worldwide and it is closely related to various professions and daily activities. This study represents and analyzes brain wave patterns using EEG signal to identify and monitor sleep related issues. Brain waves like alpha, beta, theta and delta bands can alter among different profession based on different daily activity. The proposed model identifies special feature from EEG signal and stores time changing temporal feature. Theoretically, the hybrid model will be able to find out the initial stage or symptom of sleeping disorder like insomnia, obstruct sleep apnea and warn people of the risk timely.

PID: 166

Credit Card Fraud Detection Using Convolutional Neural Network and Data Fragmentation

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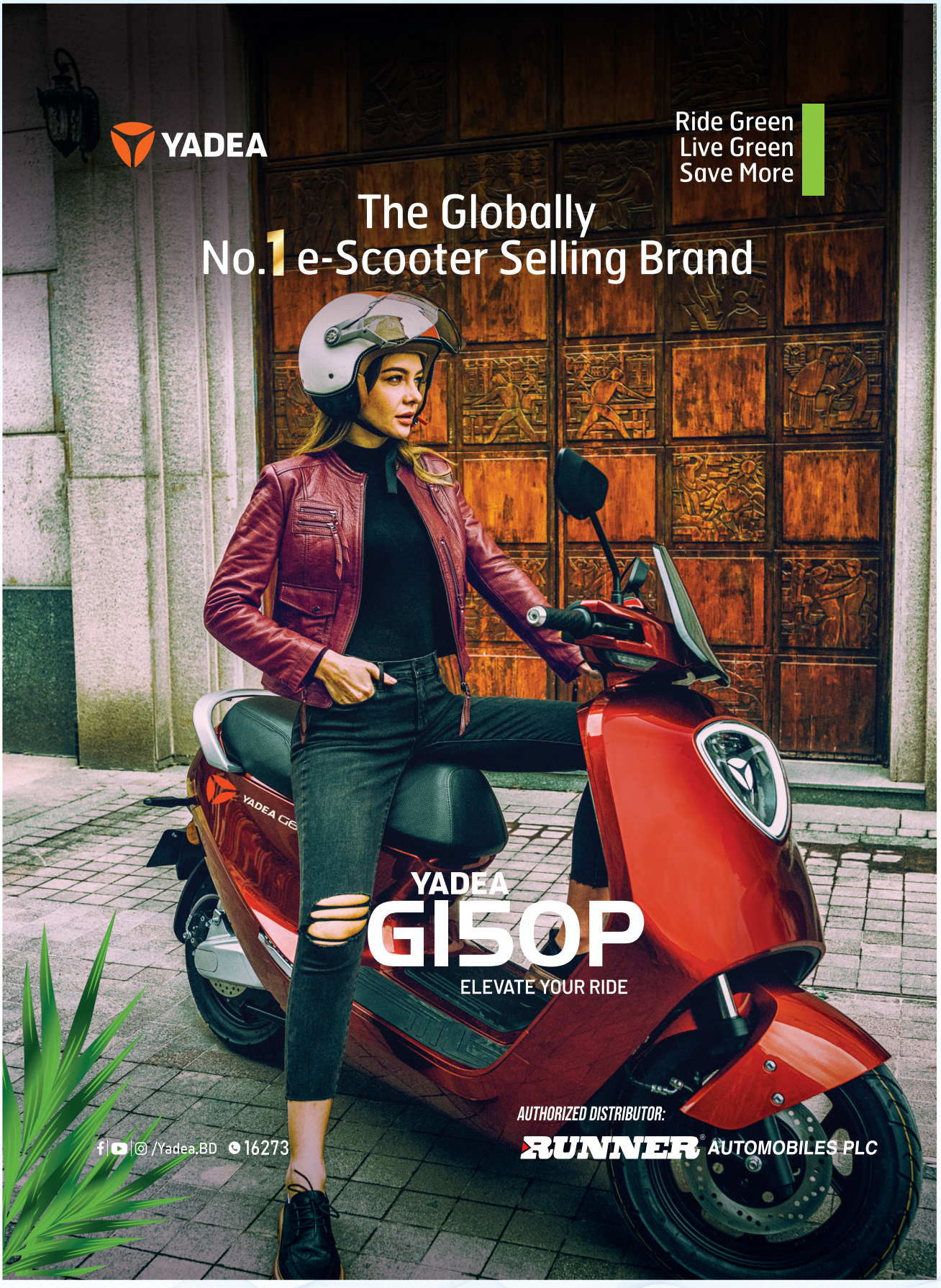
Abstract— In today's computerized financial systems, when unauthorized transactions cause large financial losses, emotional distress, and harm to company reputations, credit card fraud is a serious problem. Fraud detection systems must adjust to changing transaction patterns and avoid address imbalance, when genuine transactions far outnumber fraudulent ones. This study offers a machine learning-based method for user authentication and fraud detection during credit card transactions via the use of a Convolutional Neural Network (CNN) model. Our application uses data fragmentation to scan the inputs of the person performing a transaction and compare them to stored data. If an imbalance is discovered, a unique anomaly detection feature activated in, quickly disabling the card to stop unauthorized use. Although representative transactions require owner permission, transactions continue if no anomaly is found. The outcomes of the experiment illustrate improved transaction security, faster fraud detection, and a reliable, scalable solution for banking organizations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