



3RD INTERNATIONAL CONFERENCE ON APPLIED INTELLIGENCE AND INFORMATICS (AII2023)

Fostering Reproducibility of Research Results

29 - 31 OCT 2023, DUBAI, UAE



3rd International Conference on Applied Intelligence and Informatics (AII2023)

Conference Programme Book

October 29-31, 2023

In-person and Online Conference

<https://aii2023.org/>

Hosted by



كليات التقنية العليا
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Programme Snapshot

All times are in **GMT+4 (UAE time)**

Zoom Session:
ID: [83100719716](https://us02web.zoom.us/j/83100719716)
Passcode: 102023

Registration link: <https://forms.gle/8hEFvhyDUDa9iM9R9>

Zoom session link: <https://us02web.zoom.us/j/83100719716?pwd=ZzNHaE5VS0NQNJBTXBGNHVZYW5FQT09>

| Day 1: October 29, 2023 (Registration and Welcome) | | |
|---|---|--|
| 16:00 - 18:00 | Registration | Registration, kit collection and welcome networking |
| Day 2: October 30, 2023 (Main Conference Day) | | |
| 08:30 - 09:00 | Inauguration | Conference Inauguration |
| 09:10 - 10:00 | Keynote | Prof El-Sayed M. El-Alfy, KFUPM, KSA |
| 10:00 - 10:50 | Session I | Prof David Brown, Nottingham Trent University, UK |
| 10:50 - 11:10 | Coffee Break | |
| 11:10 - 12:00 | Keynote | Prof Bing Xue, Victoria University of Wellington, NZ |
| 12:00 - 12:50 | Session II | Prof Stefano Vassanelli, University of Padova, IT |
| 12:50 - 14:30 | Lunch Break | |
| 14:30 - 16:00 | Invited Session I | Tutorial on: Application of Artificial Intelligence in Alzheimer's Disease Detection |
| 16:00 - 16:30 | Coffee Break | |
| 16:30 - 18:00 | Invited Session II | Panel Discussion on: Application of Artificial Intelligence Towards Inclusiveness and Personalisation for Students with Learning Disabilities and Autism |
| 19:00 - 22:00 | All2023 Banquet | |
| Day 3: October 31, 2023 (Technical Sessions Day) | | |
| 09:00 - 10:30 | Technical Session I | Track 1: Emerging Applications of AI and Informatics (Paper IDs: 10204, 10217, 10234, 96149, 96155, 96156 = 6 papers) |
| 10:30 - 11:00 | Coffee Break | |
| 11:00 - 12:30 | Technical Session II | Track 2: Application of AI and Informatics in Healthcare (Paper IDs: 10202, 10207, 10211, 10232, 10236, 96151, 96152 = 7 papers) |
| 12:30 - 14:00 | Lunch Break | |
| 14:00 - 15:30 | Technical Session III | Track 3: Application of AI and Informatics in Pattern Recognition (Paper IDs: 10206, 10216, 10219, 10233, 96150, 96153 = 6 papers) |
| 15:30 - 16:00 | Coffee Break | |
| 16:00 - 17:20 | Technical Session IV | Track 4: Application of AI and Informatics in Network, Security, and Analytics (Paper IDs: 10205, 10210, 10214, 10218, 10220, 10228 = 6 papers) |
| 17:30 - 18:00 | Closing Ceremony + Awards + Next All 2024 Announcement | |

Notes



All times are in **UAE time (GMT+4)**

Day 01: Sunday, October 29, 2023

16:00 – 18:00 Welcome Session

16:00 – 18:00 Registration, conference kit collection, and welcome networking

Day 02: Monday, October 30, 2023

08:30 – 09:00 Conference Inauguration

08:30 – 08:35 Welcome speech from the All2023 conference chair (Dr Mufti Mahmud)

08:35 – 08:40 Welcome speech from the All2023 conference co-chair (Prof Hanene Benabdallah)

08:40 – 08:50 Speech from invited guest (TBC)

08:50 – 08:55 Overview of Conference Programme (Prof M Shamim Kaiser)

08:55 – 09:00 Vote of Thanks (Prof Eisa Al Matroushi)

09:10 – 10:50 Keynote Session I

Zoom Meeting ID: 831 0071 9716; Meeting Passcode: 102023

09:10 – 10:00 **Keynote 1:**
Speaker: **Prof El-Sayed M. El-Alfy**, King Fahd University of Petroleum and Minerals, Kingdom of Saudi Arabia
Chair: **TBC**

Title: **Applications of Deep Learning in Biometric Recognition**

10:00 – 10:50 **Keynote 2:**
Speaker: **Prof David J Brown**, Nottingham Trent University, UK
Chair: **TBC**

Title: **Some Use Cases of Applied AI to Support Students with Learning Disabilities and Autism.**

10:50 – 11:10 Coffee Break

11:10 – 12:50 Keynote Session II

Zoom Meeting ID: 831 0071 9716, Meeting Passcode: 102023

11:10 – 12:00 **Keynote 3:**
Speaker: **Prof Bing Xue**, Victoria University of Wellington, New Zealand
Chair: **TBC**

Title: **Evolutionary Deep Learning for Image Analysis**



12:00 – **Keynote 4:**
12:50 Speaker: **Prof Stefano Vassanelli**, University of Padova, Italy
Chair: **TBC**

Title: **Connecting Brain and Artificial Neurons: Where we are, Challenges and Opportunities**

12:50 – 14:30 Lunch Break

14:30 – 16:00 Invited Session I: Tutorial

14:30 – 16:00 Title: **Application of Artificial Intelligence in Alzheimer’s Disease Detection**
Speakers:
Dr Noushath Shaffi, University of Technology and Applied Sciences, Oman
Mr Vimbi Viswan, University of Technology and Applied Sciences, Oman

16:00 – 16:30 Coffee Break

16:30 – 18:00 Invited Session II: Panel Discussion

16:30 – 18:00 Title: **Application of Artificial Intelligence Towards Inclusiveness and Personalisation for Students with Learning Disabilities and Autism**
Panellists:
Prof David Brown, Nottingham Trent University, UK
Mr David Stewart, Nottingham Schools Trust, UK
Dr S Manikandan, Indian Institute of Technology Palakkad, India
Prof M Shamim Kaiser, Jahangirnagar University, Bangladesh
Moderator: **Dr Mufti Mahmud**, Nottingham Trent University, UK

19:00 – 20:00 Conference Banquet

Day 03: Tuesday, October 31, 2023

09:00 – 10:30 Technical Session I

Track 1: Emerging Applications of AI and Informatics

Session Chair: TBC

Paper ID: **10204** Paper title: **A Deep Learning-Based Neural Network Model for Autism Spectrum Disorder Prediction**
Authors: **Mohamad T Sultan, Hesham El Sayed, Mohammed Abduljabar**
Presenter: **Mohamad T Sultan, United Arab Emirates University, UAE**

Paper ID: **10217** Paper title: **Improving a Fuzzy Matching Engine**
Authors: **Callum Binns, John Kingston**
Presenter: **Callum Binns, InSiteTrack, Marlow, United Kingdom**

Paper ID: **10234** Paper title: **Speech Emotion Recognition: An Empirical Analysis of Machine Learning Algorithms Across Diverse Data Sets**
Authors: **Mostafiz Ahammed, Rubel Sheikh, Farah Hossain, Shahrima Mustak Liza, Muhammad Arifur Rahman, Mufti Mahmud, David J Brown**
Presenter: **Mostafiz Ahammed, Jahangirnagar University, Bangladesh**

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|---|---|
| Paper ID: 96149 | <p>Paper title: <i>A BERT-based Chatbot to Support Cancer Treatment Follow-Up</i> Authors: <i>Arup Dutta Bappy, Tanjim Mahmud, Mohammad Shahadat Hossain, Karl Andersson</i> Presenter: <i>Karl Andersson, Lulea University of Technology, Sweden</i></p> |
| Paper ID: 96155 | <p>Paper title: <i>Optimizing Medical Imaging Quality: An In-Depth Examination of Preprocessing Methods of Brain MRIs</i> Authors: <i>Vimbi Viswan, Noushath Shaffi, Faizal Hajamohideen, Karthikeyan Subramanian</i> Presenter: <i>Vimbi Viswan, University of Technology & Applied Sciences, Oman</i></p> |
| Paper ID: 96156 | <p>Paper title: <i>MindData for Enhanced Entertainment Building a Comprehensive EEG Dataset of Emotional Responses to Audio-Visual Stimuli</i> Authors: <i>Thejaswini M S, G.Hemantha Kumar, V.N. Manjunath Aradhya, Narendra R, Suresha M, D S Guru</i> Presenter: <i>Thejaswini MS, University of Mysore, India</i></p> |
| 10:30 – 11:00 Coffee Break | |
| 11:00 – 12:30 Technical Session II | |
| Track 2: Application of AI and Informatics in Healthcare | |
| Session Chair: TBC | |
| Paper ID: 10202 | <p>Paper title: <i>A Robust and Explainable Deep Learning Method for Cervical cancer Screening</i> Authors: <i>Marcello Di Giammarco, Francesco Mercaldo, Xiaoli Zhou, Pan Huang, Antonella Santone, Mario Cesarelli, Fabio Martinellin</i> Presenter: <i>Marcello Di Giammarco, Italian Institute of Technology, National Research Council of Italy, Italy</i></p> |
| Paper ID: 10207 | <p>Paper title: <i>Classifying Depressed and Healthy Individuals Using Wearable Sensor Data: A Comparative Analysis of Machine Learning Approaches</i> Authors: <i>Faiza Guerrache, David J Brown, Mufti Mahmud</i> Presenter: <i>Faiza Guerrache, Nottingham Trent University, United Kingdom</i></p> |
| Paper ID: 10211 | <p>Paper title: <i>Performance Analysis of a Single-Input Thermal Image Classifier with Patient Information for the Detection of Breast Cancer</i> Authors: <i>Anna Susan Cherian, Mathew Jose Mammoottil, Lloyd J Kulangara, Prabu Mohandas, Jerline S. Anni, Veena Raj, Murugathas Thanihaichelvan</i> Presenter: <i>Prabu Mohandas, National Institute of Technology Calicut, India</i></p> |
| Paper ID: 10232 | <p>Paper title: <i>Investigation of HR and QT Variability for Monitoring Sleep Apnea: An Interpretable Machine Learning Approach</i> Authors: <i>Partha Pratim Das Turja, Mohammad Abdul Motin, Sumaiya Kabir, Mufti Mahmud, Dinesh Kumar</i> Presenter: <i>Mohammad Abdul Motin, Rajshahi University of Engineering and Technology, Bangladesh</i></p> |
| Paper ID: 10236 | <p>Paper title: <i>Transfer Learning-Based Ensemble of Deep Neural Architectures for Alzheimer's and Parkinson's Disease Classification</i> Authors: <i>Vimbi Viswan, Noushath Shaffi, Mufti Mahmud, Faizal Hajamohideen, Karthikeyan Subramanian</i> Presenter: <i>Noushath Shaffi, University of Technology and Applied Sciences, Oman</i></p> |

Paper ID: **96151**
Paper title: *Classifying Emotions of Parkinsonian Patients from Electroencephalogram Signals using Efficient Attention Capsule Network*
Authors: *Sabbir Ahmed, Tatinee Sarker Sunom, M Shamim Kaiser, Mufti Mahmud, M Murugappan*
Presenter: *Sabbir Ahmed, Jahangirnagar University, Bangladesh*

Paper ID: **96152**
Paper title: *Early Prediction of Chronic Kidney Disease Using Machine Learning Algorithms with Feature Selection Techniques*
Authors: *Farzana Tasnim, Sultana Umme Habiba, Mohammad Saeed Hasan Chowdhury, Md. Khairul Islam, Lutfun Nahar, Md. Shahadat Hossain, M. Shamim Kaiser, Karl Andersson*
Presenter: *Sultana Umme Habiba, Bangladesh University of Engineering and Technology, Bangladesh*

12:30 – 14:00 Lunch Break

14:00 – 15:30 Technical Session III

Track 3: Application of AI and Informatics in Pattern Recognition

Session Chair: TBC

Paper ID: **10206**
Paper title: *A Media-pipe integrated deep learning model for ISL (Alphabet) recognition and converting Text to Speech with Video Input*
Authors: *Vishnu Mukundan, Aryan Gadhiya, Karthik Nadar, Rishita Gagrani, Niha Kamal Basha*
Presenter: *Niha Kamal Basha, Vellore Institute of Technology, Vellore, India*

Paper ID: **10216**
Paper title: *A Driver Fatigue Detection Framework with Convolutional Neural Network and Long Short-Term Memory Network*
Authors: *Ruyi Bao, Nazia Hameed, Adam Walker*
Presenter: *Ruyi Bao, University of Nottingham, UK*

Paper ID: **10219**
Paper title: *FallGuardian: Wear OS-Based Machine Learning Fall Detection Framework*
Authors: *Alexandros Michaelides, Nazia Hameed, Adam Walker*
Presenter: *Alexandros Michaelides, University of Nottingham, United Kingdom*

Paper ID: **10233**
Paper title: *Classification of Different Cancer Types Based on RNA HI-SEQ Data Using Dimensionality Reduction*
Authors: *Zannatul Ferdous Tunny, Md. Abir Hasan Munna, Md. Shahadat Hossain, M. Arifur Rahman, M. Shamim Kaiser, David Brown*
Presenter: *Zannatul Ferdous Tunny, BUP, Bangladesh*

Paper ID: **96150**
Paper title: *YOLO-V4 Based Detection of Varied Hand Gestures in Heterogeneous Settings*
Authors: *Nanziba Basnin, Atta Binti Aziz, Mohoshena Akter, Mohammad Farshid, M Shamim Kaiser, M Shahadat Hossain, Karl Andersson*
Presenter: *Nanziba Basnin, IIUC, Bangladesh*

Paper ID: **96153**
Paper title: *Comparative Analysis of Pre-Trained CNN Models for Neurobiological Disease Classification*
Authors: *Uwasila Binte Munir, Shamim Al Mamun*
Presenter: *Shamim Al Mamun, Jahangirnagar University, Bangladesh*

15:30 – 16:00 Coffee Break

16:00 – 17:30 Technical Session IV
Track 4: Application of AI and Informatics in Network, Security, and Analytics
Session Chair: TBC

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|---------------------------|---|
| Paper ID: 10205 | Paper title: <i>Optimizing Round-Robin Scheduling Algorithm Performance in Real-time Systems</i> Authors: <i>Tarek Helmy</i> Presenter: <i>Tarek Helmy, King Fahd University of Petroleum and Minerals, Kingdom of Saudi Arabia</i> |
| Paper ID: 10210 | Paper title: <i>Enhancing Outdoor Comfort: A Machine Learning Framework for Predicting Comfort Level</i> Authors: <i>Maher Alndiwee, Shamik Palit, Preetha V.K, Jimy Mathew, Natalie Joseph, Akshay Datar, Pablo Izquierdo Lopez, Waqar Ullah</i> Presenter: <i>Maher Alndiwee, University of Stirling, United Arab Emirates</i> |
| Paper ID: 10214 | Paper title: <i>Augmented Reality in the Fields of Management and Business: A Bibliometric Review of the Literature</i> Authors: <i>Thiago de Luca Santana Ribeiro, Anderson Antonio de Lima, Gustavo Goncalves</i> Presenter: <i>Thiago de Luca Santana Ribeiro, FATEC, Brazil</i> |
| Paper ID: 10218 | Paper title: <i>CDSER: Sentiment Analysis for Product Selection to Enhance E-commerce Review System</i> Authors: <i>Md. Mamun Or Rashid, Abu Sayed Md. Mostafizur Rahaman</i> Presenter: <i>Md. Mamun Or Rashid, Jahangirnagar University, Bangladesh</i> |
| Paper ID: 10220 | Paper title: <i>Screening of Enhanced Oil Recovery Methods Using Supervised Machine Learning Predicated on Range Data</i> Authors: <i>Gbubemi H. Harrison, Josephine A. Lamboi</i> Presenter: <i>Gbubemi H. Harrison, American University of Ras Al Khaimah, United Arab Emirates</i> |
| Paper ID: 10228 | Paper title: <i>Enhancing Internet of Things Security with Random Forest-Based Anomaly Detection</i> Authors: <i>Muhammad R Ahmed, Thirein Myo, Ahmed Al Shihimi, Badar Al Baroomi, M Shamim Kaiser</i> Presenter: <i>Muhammad R Ahmed, Military Institute of Technology, Oman</i> |

18:00 – 18:30 Closing Ceremony
Closing Ceremony, Awards, Next All 2024 Announcement
Session Chair: TBC

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|---------------|--------------------------------|
| 18:00 – 18:10 | All2023 Awards |
| 18:10 – 18:20 | Announcement of All2024 |
| 18:20 – 18:30 | Closing Remarks |

Notes



Day 02: Monday, October 30, 2023, 09:10 – 10:00 UAE time (GMT+4)**Keynote I (Zoom Meeting ID: 83100719716, Passcode: 102023)**

Speaker: Prof El-Sayed M. El-Alfy, *King Fahd University of Petroleum and Minerals, Kingdom of Saudi Arabia*

Chair: TBC

Website: <https://ics.kfupm.edu.sa/people/faculty/faculty-details/dr.-el-sayed-el-alfy>

Title: Applications of Deep Learning in Biometric Recognition

Abstract: Biometrics provide a more convenient and reliable mechanism for individual identification and authentication to control their access to restricted areas, devices and services. Nowadays, they have been widely deployed in automatic check points, border security, visa and immigration services, fraud and criminal detection, access to mobile devices, etc. Recently there has been rapid development of machine learning, specifically deep learning, in biometric applications. Among the advantages of deep learning paradigms are their capability to automate feature extraction and processing various types of data including speech, image, and natural language, eliminating the need for data preprocessing and dependency on hand-engineered features by human experts. Deep learning models have also achieved cutting-edge accuracy in some domains, e.g. BERT and GPT-4, exceeding human performance. However, deep learning is more computationally intensive and requires huge amount of data to train effective models. In this talk, we will review the state-of-the-art techniques, architectures, potential opportunities, and challenges of deep learning. Their applications and future directions in biometric recognition will be also discussed.

Biography: El-Sayed M. El-Alfy (Senior Member, IEEE) is currently a Professor at the Information and Computer Science Department, Fellow of the SDAIA-KFUPM Joint Research Center for Artificial Intelligence, and Affiliate of Interdisciplinary Research Center on Intelligent Secure Systems, King Fahd University of Petroleum and Minerals (KFUPM), Saudi Arabia. He has over 25 years of experience in industry and academia, involving research, teaching, supervision, curriculum design, program assessment, and quality assurance in higher education. He is an approved ABET/CSAB Program Evaluator (PEV), and a Reviewer and a Consultant for NCAAA and several universities and research agents in various countries. He is an active researcher with interests in fields related to Artificial Intelligence and Nature-inspired Computing, Multimodal Machine Learning, Computer Vision and Biometrics, Cybersecurity, and Data Analytics and Intelligent Systems Applications. He has published numerous in peer-reviewed international journals and conferences, edited a number of books published by reputable international publishers, attended and contributed to the organization of many world-class international conferences, and supervised master and Ph.D. students. He was also a member of ACM, the IEEE Computational Intelligence Society, the IEEE Computer Society, the IEEE Communication Society, and the IEEE Vehicular Technology Society. His work has been internationally recognized and received a number of

awards. He has served as a Guest Editor for a number of special issues in international journals and been on the editorial board of a number of premium international journals, including IEEE/CAA Journal of Automatica Sinica, IEEE Transactions on Neural Networks and Learning Systems, International Journal of Trust Management in Computing and Communications, and Journal of Emerging Technologies in Web Intelligence (JETWI). His research interest includes Artificial Intelligence and Nature-inspired Computing, Multimodal Machine Learning, Computer Vision and Biometrics, Cybersecurity and Data Analytics and Intelligent Systems Applications.

Day 02: Monday, October 30, 2023, 10:00 – 10:50 UAE time (GMT+4)

Keynote II (Zoom Meeting ID: 83100719716, Passcode: 102023)



Speaker: Prof David J Brown, Nottingham Trent University, United Kingdom

Chair: TBC

Website: <https://www.ntu.ac.uk/staff-profiles/science-technology/david-brown>

Title: Some Use Cases of Applied Intelligence to Support Students with Learning Disabilities and Autism

Abstract: This presentation will cover the case for applying Artificial Intelligence Tools for Education (AIEd) with students with Intellectual Disability and Autism, where schools are receiving more diverse students in their classrooms requiring diverse teaching. Approaches that address the real issue of teachers not having enough capacity to attend to each child's individual learning needs, or to support their best behavioural outcomes in class are called for, to ensure that all students are supported to develop their full academic and social potential. Approaches to using eXplainable AI (XAI) will be covered, as are the reasons for pursuing such methods in light of the vulnerabilities of such students.

Biography: David is a highly experienced project manager (€4M as Principal Investigator), and over 100 high quality journal and conference publications. He is Chair of the International Conference on Disability, Virtual Reality and Associated Technology. He is Co-Investigator on the EPSRC The Internet of Soft Things Project; PI on the EU H2020 MaTHiSiS and No One Left Behind projects; and PI on the Erasmus DiversAsia and AI-TOP projects. His research focusses on the development and evaluation of enabling technologies for the cognitive and physical rehabilitation of users within the real world, and promotion of their mental wellbeing. He is Associate Editor for Frontiers: Virtual Reality in Medicine.

Day 02: Monday, October 30, 2023, 11:10 – 12:00 UAE time (GMT+4)

Keynote III (Zoom Meeting ID: 83100719716, Passcode: 102023)



Speaker: Prof Bing Xue, *Victoria University of Wellington, New Zealand*

Chair: TBC

Website: <https://people.wgtn.ac.nz/bing.xue>

Title: Evolutionary Deep Learning for Image Analysis

Abstract: Image analysis is an important task in computer vision, with a wide range of real-world applications. Deep learning, particularly deep neural networks (DNNs), have been a successful approach to image analysis, but it is challenging to design an effective DNNs, requiring extensive experience and expertise in both DNNs and the problem domain as well as a huge computational cost. To address these limitations, evolutionary computation techniques start playing a significant role for automatically determining deep structures to tackle image classification tasks, and have great potential to advance the developments of deep structures and the overall algorithms. This talk will provide an extended view of deep learning, overview the state-of-the-art work in evolutionary deep learning. Furthermore, we will discuss some recent developments using Genetic Programming (GP) to automatically evolving deep structures and feature learning for image analysis with a highlight of the interpretation capability and visualisation of the constructed features.

Biography: Bing Xue is currently Professor of Artificial Intelligence, Deputy Head of School for Engineering and Computer Science, Deputy Director of Centre for Data Science and Artificial Intelligence, at Victoria University of Wellington (VUW). Her research focuses mainly on evolutionary computation and machine learning, such as evolutionary deep learning, feature selection, and image analysis, and their real-world applications in biology, healthcare, aquaculture, forest, and others. She has about 400 fully refereed publications and leading several prestigious research grants. Professor Xue is currently the Editor of IEEE CIS Newsletter, Chair of IEEE CIS Evolutionary Computation Technical Committee. She also chairs many international conferences, such as General Chair of PRICAI 2025, Conference chair of IEEE CEC 2024, Chair of Women+@GECCO2024, Proceedings chair of ACM GECCO 2023, and Panel chair of CEC 2023. She has also served as an Associate Editor of several international journals, such as IEEE TEVC, TAI, CIM, TETCI, and ACM TELO. She is also a Fellow of Engineering New Zealand.

Day 02: Monday, October 30, 2023, 12:00 – 12:50 UAE time (GMT+4)

Keynote VI (Zoom Meeting ID: 83100719716, Passcode: 102023)



Speaker: Prof Stefano Vassanelli, *University of Padova, Italy*

Chair: TBC

Website: <https://pnc.unipd.it/vassanelli-stefano/>

Title: Connecting Brain and Artificial Neurons: Where We Are, Challenges and Opportunities

Abstract: The availability of brain-inspired devices, including spiking neuronal networks and memristive synapses, is offering an intriguing opportunity for the creation of novel neuroelectronic links and brain-computer interfaces. Brain-artificial neurons connections can be established at different scales, from single neurons to networks, and through emulation of various biological processing schemes such as synaptic plasticity or spiking neural networks computation. However, important limiting factors remain, such as the constraints imposed by neural interfaces when 'reading-out' or 'writing-in' information from artificial neurons to the brain. We will report our experience on connecting biological neurons in culture or in the brain somatosensory cortex of the living animal with artificial neurons on-chip, commenting on major challenges and opportunities in particular for neuroprosthetic applications.

Biography: Stefano Vassanelli (M.D., Ph.D.) is head of the NeuroChip laboratory and Professor of Physiology at the Department of Biomedical Sciences and Padua Neuroscience Center, University of Padova, Padova, Italy. He obtained his PhD in molecular biology and pathology at the University of Padova and worked as postdoctoral research scientist at the Oregon Graduate Institute of Science & Technology, Portland, Oregon and at the Max-Planck Institute for Biochemistry, Department Membrane and Neurophysics, Martinsried, Germany. His research activity at the crossroad of neuroscience, materials science and electronics focuses on neuroelectronic interfaces, brain-inspired devices, neurophysiology of brain microcircuits and neural computation.

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Day 02: Monday, October 30, 2023, 14:30 – 16:00 UAE time (GMT+4)**Invited Session I (Zoom Meeting ID: 83100719716, Passcode: 102023)****Title: Application of Artificial Intelligence in Alzheimer's Disease Detection****Speakers:****Dr Noushath Shaffi, *University of Technology and Applied Sciences, Oman*****Mr Vimbi Viswan, *University of Technology and Applied Sciences, Oman*****Description:**

The number of people who have Alzheimer's Disease (AD), a debilitating neurological condition, is rising, increasing concerns about world health. The proposed workshop aims to thoroughly examine the use of Artificial Intelligence (AI) methods and tools in AD early detection, diagnosis, and treatment. Attendees will receive a thorough understanding of the relationship between AI and healthcare in this workshop, with a particular emphasis on AD and the topics listed below.

- Participants will be introduced to the foundational concepts of Artificial Intelligence, including machine learning, deep learning, and their relevance to healthcare applications.
- Discussion on the critical role of data in AI-based AD detection, encompassing data sources, data quality, and the preprocessing steps required to prepare data for AI models.
- An exploration of the key features and biomarkers that are indicative of AD, and how to extract and engineer these features from healthcare data.
- In-depth coverage of the AI algorithms and models used for AD detection, including support vector machines, neural networks, and their variations, and the application of these models to real-world AD datasets.
- A specific focus will be on the preprocessing of neuroimaging MRI data and how AI can be leveraged to analyse and interpret these MRI scans for early AD detection.
- Practical demonstrations and hands-on exercises will be included to help participants gain hands-on experience in developing AI models for AD detection.
- An exploration of the current challenges and limitations in the field, and a discussion on potential future directions, including the integration of AI in clinical settings and the development of innovative tools and technologies for AD management.
- Opportunities for participants to network, share insights, and explore potential collaborations in the domain of AI and AD detection.

The tutorial is designed for a broad group of people interested in using AI to improve the detection and diagnosis of Alzheimer's disease, including researchers, physicians, data scientists, and healthcare professionals. It will provide participants with the information and abilities needed to support continuing initiatives to fight this crippling illness and enhance the quality of life for those afflicted and their families.

Biography:

Dr Noushath Shaffi is an Assistant Professor at the University of Technology and Applied Sciences (UTAS) in Oman. With a PhD in image processing from the University of Mysore, India and expertise in biometrics, he has made notable contributions to computer vision. With prior experience as a research consultant at Hewlett Packard Laboratories, India, he brings industry insights to academia. Recognized for his research excellence, he has received grants from the Research Council of Oman and the National Research Award for his mentorship of the best ICT project. Currently, he leads UTAS's Research department and Technology Transfer Office. He can be contacted at noushath.mys@gmail.com.



Mr Viswan Vimbi is an experienced Lecturer at the University of Technology and Applied Sciences (UTAS), Oman, since 2008. With a background in computer applications and a strong focus on data mining and deep learning, he has made significant contributions to the field. He has also been involved in international projects, including the United Nations Education Project in Ethiopia. He holds a Master's and B. Sc. degrees from the University of Kerala, India. Currently, he serves as a Lecturer in the Department of Information Technology at UTAS. He is also engaged in research supported by grants from the Research Council of Oman and the University. He can be contacted at vismaya97@gmail.com.

Day 02: Monday, October 30, 2023, 16:30 – 18:00 UAE time (GMT+4)**Invited Session II (Zoom Meeting ID: 83100719716, Passcode: 102023)****Title: Application of Artificial Intelligence Towards Inclusiveness and Personalisation for Students with Learning Disabilities and Autism****Panellists:****Prof David Brown, Nottingham Trent University, UK****Mr David Stewart, Nottingham Schools Trust, UK****Dr S Manikandan, Indian Institute of Technology Palakkad, India****Prof M Shamim Kaiser, Jahangirnagar University, Bangladesh****Moderator:****Dr Mufti Mahmud, Nottingham Trent University, UK****Description:**

This panel aims to discuss the opportunities and challenges presented by the use of artificial intelligence (AI) to provide personalised support to students with learning disabilities and Autism. The recent European Commission Erasmus+ funded projects “An AI Tool to Predict Engagement and ‘Meltdown’ Events in Students with Autism (AI-TOP)” seeks to understand how AI can be used to predict when “Rumble” moments might occur for students with Autism so that evidence-based calming interventions can be introduced in a timely fashion to decrease the frequency and intensity of the meltdown events. Another project funded under the same programme titled “Embracing diversity in Asia through the adoption of Inclusive Open Practices (DIVERSASIA)” aims to make accessible Open Education Resources and Massive Open Online Courses and their personalisation using AI that will enable better provision of open distance learning for those with disabilities. The panel comprises experts from special education, and Autism research teamed together with experts in AI. We predict a lively discussion which we intend to analyse in greater depth after the workshop and provide a blueprint for the future use of AI in special education.

Indicative Panel Questions:

- Use of AI in Supporting Students with Autism: Challenges and Opportunities
- What do you see as the ethical issues of using AI in the education of students with Autism?
- Do you foresee any security issues?
- How could AI be successfully used in the classroom (e.g., personalised pathway, challenging behaviour)?

Notes





The 3rd International Conference on Applied Intelligence and Informatics (AII2023)

Abstracts of Accepted Papers

October 29-31, 2023

Dubai, United Arab Emirates

<https://aii2023.org/>

Notes



Track 1: Emerging Applications of AI and Informatics

List of Accepted Papers

| | |
|---------------------------|---|
| Paper ID: 10204 | Paper title: <i>A Deep Learning-Based Neural Network Model for Autism Spectrum Disorder Prediction</i> Authors: <i>Mohamad T Sultan, Hesham El Sayed, Mohammed Abduljabar</i> |
| Paper ID: 10217 | Paper title: <i>Improving a Fuzzy Matching Engine</i> Authors: <i>Callum Binns, John Kingston</i> |
| Paper ID: 10234 | Paper title: <i>Speech Emotion Recognition: An Empirical Analysis of Machine Learning Algorithms Across Diverse Data Sets</i> Authors: <i>Mostafiz Ahammed, Rubel Sheikh, Farah Hossain, Shahrina Mustak Liza, Muhammad Arifur Rahman, Mufti Mahmud, David J Brown</i> |
| Paper ID: 96149 | Paper title: <i>A BERT-based Chatbot to Support Cancer Treatment Follow-Up</i> Authors: <i>Arup Dutta Bappy, Tanjim Mahmud, Mohammad Shahadat Hossain, Karl Andersson</i> |
| Paper ID: 96155 | Paper title: <i>Optimizing Medical Imaging Quality: An In-Depth Examination of Preprocessing Methods of Brain MRIs</i> Authors: <i>Vimbi Viswan, Noushath Shaffi, Faizal Hajamohideen, Karthikeyan Subramanian</i> |
| Paper ID: 96156 | Paper title: <i>MindData for Enhanced Entertainment Building a Comprehensive EEG Dataset of Emotional Responses to Audio-Visual Stimuli</i> Authors: <i>Thejaswini M S, G.Hemantha Kumar, V.N. Manjunath Aradhya, Narendra R, Suresha M, D S Guru</i> |

Notes



Paper ID 10204

A Deep Learning-Based Neural Network Model for Autism Spectrum Disorder Prediction

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Abstract

The autism spectrum disorder (ASD) is a neuro-disorder that tremendously impacts peoples lives and today ASD is gaining its prevalence globally faster than ever. ASD affects the mental, social, and physical state of a person due to its unknown aetiology, and medical professionals believe that identifying autism traits and provide accurate analyses and early ASD detection is a relatively challenging and time-consuming task. However, diagnostic pre-dictions for autism features could be improved using multiple methods owing to the rise and development of artificial intelligence (AI) and machine learning (ML) techniques. Therefore, this research attempts to explore the possibility of using AI deep learning techniques to assist in ASD diagnosis and prediction by proposing an effective prediction models based on deep learning Artificial Neural Networks (ANNs) and Convolutional Neural Network (CNNs). This will aid medical, healthcare professionals and recent research studies in diagnoses of autism using a publicly available dataset. We employed extensive exploratory data analysis and oversampling techniques on the dataset to avoid overfitting problems. We enhanced our deep learning neural network models by selecting the best parameter values and using validation approach. Our proposed ANN model was able to achieve 92.6% in terms of precision and 88.2% in terms of accuracy and using CNN, our model was able to achieve 86.4% in terms of precision and 90.6% in terms of accuracy. Our obtained results are compared and benchmarked against the existing state-of-the-art literature that addresses the same problem.

Keywords: Machine learning, Autism prediction, Deep learning, ANN, CNN

Paper ID 10217

Improving a Fuzzy Matching Engine

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Abstract

InSiteTrack requires that individual client products are matched to competitor products in order to provide pricing intelligence on their market. To increase the speed of the product matching process, string matching suggestions are put forward. The previous solution utilized the Levenshtein algorithm, but this was found to be computationally inefficient and also omitted numerous possible matches. After analysing a number of possible solutions, an algorithm that utilized Term Frequency Inverse Document Frequency (TF-IDF) with n-grams and a cosine similarity calculation seemed the most promising. The key benefits of this solution were the fact that it uses basic arithmetic when comparing two names and that it weighted the rarity of terms across a collection. A prototype system was quickly developed that was specific to a use case; with the success of the test program, a database connected version was created that has since been deployed. The resulting system is significantly faster, more accurate and more adaptable to specific datasets than the solution that it is now replacing.

Keywords: Fuzzy matching; product matching; Levenshtein algorithm; TF-IDF

Paper ID 10234

Speech Emotion Recognition: An Empirical Analysis of Machine Learning Algorithms Across Diverse Data Sets

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Abstract

Communication is the way of expressing ones feelings, ideas, and thoughts, and speech is the potential medium for communication. While people communicate with each other in several human interactive applications, like a call center, entertainment, E-learning between teachers and students, medicine, and communication between doctors and patients, especially psychiatric patients, it is crucial to identify peoples emotions for better performance in a specific field. Automated systems are constructed to recognize emotions from speech or voice using Artificial Intelligence (AI) or Machine Learning (ML) approaches, gaining momentum in recent research. This research aims to recognize different emotional states like happy, sad, calm, angry, fear, disgust, surprise, or neutral from input speech signals more accurately by feature extraction methodology using machine learning algorithms. In this work, we have used the Support Vector Machine (SVM) classification algorithm and formed a feature vector by exploring some features from the speech signals used for the emotion recognition task. We have explored different speech features like Mel Frequency Cepstral Coefficient (MFCC), Chroma, Mel-spectrogram, Spectral Centroid, Spectral Bandwidth, Spectral Roll-off, Root Mean Squared Energy (RMSE), and Zero Crossing Rate (ZCR). The system is tested on the Ryerson Audio-Visual Database of Emotional Speech, and Song dataset (RAVD ESS), the Toronto Emotional Speech Set (TESS), and the Surrey Audio-Visual Expressed Emotion Database (SAVEE) datasets. The performance evaluation matrix indicated that our approach has achieved an overall accuracy of 99.59% on the RAVDESS dataset, 99.82% on the TESS dataset, and 98.95% on the SAVEE dataset for the SVM classifier. A mixed dataset is created from the three speech emotion datasets, which achieved significantly high classification accuracy. This model performs well on a large dataset, is ready to be tested with a vast dataset, and can be used in education and diverse applications. Project Website: <https://github.com/Mostafiz24/Speech-Emotion-Recognition>.

Keywords: Emotion Recognition, AI, ML, Feature Extraction, SVM, MFCC, RMSE, ZCR, RAVDESS, TESS, SAVEE

Paper ID 96149

A BERT-based Chatbot to Support Cancer Treatment Follow-Up

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Abstract

The aftermath of primary cancer treatment presents a multitude of challenges for patients, necessitating prolonged recovery periods that can span months or even years. Survivors contend with a range of debilitating side effects, including fatigue, constant pain, lymphedema, weight fluctuations, swallowing difficulties, and menopause symptoms. These adversities often demand consistent counseling, compelling patients to visit hospitals regularly. However, the advent of advanced Artificial Intelligence (AI) offers a transformative solution. AI-powered chatbots, also known as conversational agents, emerge as potent allies capable of providing mental support, answering queries, diagnosing issues based on texted symptoms, and more. This paper explores the potential of AI-driven conversational agents to address the unique needs of cancer patients during their recovery phase. Drawing inspiration from successful applications in other chronic diseases, the proposed model capitalizes on the capabilities of the Bert-large-cased-whole-word-masking model. Demonstrating an impressive F1 score of 93.46%, this model signifies its efficacy in serving as an intelligent ally for cancer survivors. By facilitating mental support and information dissemination, the proposed conversational agent system aligns with the evolving landscape of AI-driven healthcare, forging a path toward enhanced patient care and improved quality of life during the recovery journey.

Keywords: Cancer follow-up, Chatbot, Conversational agent, Question and Answering, Extractive Question-and-Answering, BERT

Paper ID **96155**

Optimizing Medical Imaging Quality: An In-Depth Examination of Preprocessing Methods for Brain MRIs

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Abstract

Neurodegenerative diseases arise from the gradual deterioration of neuronal structure or function and spans different levels of neuronal circuitry in the brain, ranging from molecular to systemic. This progression can lead to eventual cell death and lack of a known means to arrest the ongoing degeneration of neurons renders these diseases incurable. Magnetic Resonance Imaging (MRI) plays a crucial role in both diagnosing and categorizing AD. In recent years, substantial research efforts have been dedicated to developing Artificial Intelligence (AI)-based methods for the automated diagnosis of brain disease. However, the efficacy of AI algorithms in this context is contingent upon the quality of preprocessing applied to input images. This article comprehensively reviews various preprocessing techniques aimed at enhancing MRI image quality and extracting pertinent features for AI-driven disease classification. Techniques such as reorientation, registration, skull stripping, and slicing are examined in detail, exploring their impact on both image quality and classification performance. The discussion also delves into the challenges and potential pitfalls associated with preprocessing MRI images for AI-based disease classification, while highlighting emerging trends and advanced techniques in the field. Emphasis is placed on the significance of standardized preprocessing pipelines and the necessity for further research to optimize preprocessing methods, ultimately enhancing the accuracy and reliability of AI-based classification enabling early and accurate diagnoses of brain diseases and contributing to the development of effective treatment strategies.

Keywords: Neurodegenerative disorder, MRI, Preprocessing, FMRIB, Software Library, Artificial Intelligence, Skull Stripping

Paper ID 96156

MindData for Enhanced Entertainment Building a Comprehensive EEG Dataset of Emotional Responses to Audio-Visual Stimuli

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Abstract

We present data from Electroencephalograph signals that can be used to analyse audio-visual stimuli for emotion recognition. A successful attempt towards recording of EEG signals of 46 subjects is made using portable Biopic 2 channel EEG device and a self-rating scale. Two different kinds of experiments were exposed to subjects, included with commercial advertisements and musical clips from South-Indian – Kannada language, that recorded a range of emotional reactions (Relaxed, Sad, Scary, Funny, Enjoyment). In our data repository, Labeled preprocessed EEG data is stored in CSV format. The purpose of this work is to create an entertainment-based emotion dataset, which is an effective method for collecting brain signals. Finally, in order to evaluate the suitability of our dataset, we ran statistical analyses on the data that had been recorded. Using this analysis, we also divided the EEG signals into those associated with positive and negative emotions from the two experiments. Since the data will be made publicly accessible, interested can use it for research/educative purpose with suitable acknowledgements.

Keywords: Emotional Awareness, BCI (Brain Computer Interfacing), Social Entertainment, Electroencephalography

Track 2: Application of AI and Informatics in Healthcare

List of Accepted Papers

| | |
|---------------------------|--|
| Paper ID: 10202 | Paper title: <i>A Robust and Explainable Deep Learning Method for Cervical cancer Screening</i> Authors: <i>Marcello Di Giammarco, Francesco Mercaldo, Xiaoli Zhou, Pan Huang, Antonella Santone, Mario Cesarelli, Fabio Martinellin</i> |
| Paper ID: 10207 | Paper title: <i>Classifying Depressed and Healthy Individuals Using Wearable Sensor Data: A Comparative Analysis of Machine Learning Approaches</i> Authors: <i>Faiza Guerrache, David J Brown, Mufti Mahmud</i> |
| Paper ID: 10211 | Paper title: <i>Performance Analysis of a Single-Input Thermal Image Classifier with Patient Information for the Detection of Breast Cancer</i> Authors: <i>Anna Susan Cherian, Mathew Jose Mammoottil, Lloyd J Kulangara, Prabu Mohandas, Jerline S. Anni, Veena Raj, Murugathas Thanihaichelvan</i> |
| Paper ID: 10232 | Paper title: <i>Investigation of HR and QT Variability for Monitoring Sleep Apnea: An Interpretable Machine Learning Approach</i> Authors: <i>Partha Pratim Das Turja, Mohammad Abdul Motin, Sumaiya Kabir, Mufti Mahmud, Dinesh Kumar</i> |
| Paper ID: 10236 | Paper title: <i>Transfer Learning-Based Ensemble of Deep Neural Architectures for Alzheimer's and Parkinson's Disease Classification</i> Authors: <i>Vimbi Viswan, Noushath Shaffi, Mufti Mahmud, Faizal Hajamohideen, Karthikeyan Subramanian</i> |
| Paper ID: 96151 | Paper title: <i>Classifying Emotions of Parkinsonian Patients from Electroencephalogram Signals using Efficient Attention Capsule Network</i> Authors: <i>Sabbir Ahmed, Tatinee Sarker Sunom, M Shamim Kaiser, Mufti Mahmud, M Murugappan</i> |
| Paper ID: 96152 | Paper title: <i>Early Prediction of Chronic Kidney Disease Using Machine Learning Algorithms with Feature Selection Techniques</i> Authors: <i>Farzana Tasnim, Sultana Umme Habiba, Mohammad Saeed Hasan Chowdhury, Md. Khairul Islam, Lutfun Nahar, Md. Shahadat Hossain, M. Shamim Kaiser, Karl Andersson</i> |

Notes



Paper ID 10202

A Robust and Explainable Deep Learning Method for Cervical cancer Screening

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Abstract

The cervix forms the lower part of the uterus and marks the passage between the uterine body and the vagina. The cervix is crossed by a fusiform canal which is called the cervical canal. Cervical cancer is a disease caused by the uncontrolled multiplication of some cells located at the level of the squamous-columnar junction which transform into malignant cells. It represents the leading cause of death from gynecological cancer in the world and almost half of the cases are recorded among women aged between 35 and 55 years. Early diagnosis is important to treat the disease in its early stage when the chances of recovery are highest. In this paper, we propose a method aimed to detect the presence of cancerous cells in cervix histological images for screening purposes. The distinct features of the proposed method rely on the explainability, thanks to the adoption of the activation map to provide a localization behind a certain prediction, and in the robustness, of using different activation maps to visually confirm the location of cancer cells. In this way the pathologist and the medical doctor can trust the prediction, considering that the localization of the cancerous cells is confirmed by two different activation map algorithms. Five different deep learning models are evaluated (i.e., Inception, ResNet20, DenseNet, MobileNet, and a Convolutional Neural Network developed by authors), obtaining an accuracy ranging from 0.78 to 0.83. We discuss the model effectiveness for the screening of cervical cancer cells not only based on quantitative results (i.e. how many pathological images they can correctly classify) but also based on qualitative results, i.e. by considering the quality of explainability and on the robustness of predictions.

Keywords: Deep learning model, Classification, Explainability, Robustness.

Paper ID 10207

Classifying Depressed and Healthy Individuals Using Wearable Sensor Data: A Comparative Analysis of Machine Learning Approaches

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Abstract

This paper presents a comprehensive study on classifying depressed and healthy individuals using the Depresjon dataset, which contains motor activity data collected from wearable devices. We prepared six different datasets, including raw data, normalised raw data, PCAtransformed data, and statistical features extracted from the raw data. We trained and evaluated six popular machine learning algorithms and their combinations using a 5-fold cross-validation technique. Our results demonstrate that most models achieved the highest accuracy with the normalised statistical feature dataset. Furthermore, we fine-tuned these algorithms using GridSearchCV and selected the best threshold using the ROC curve. Our findings provide valuable insights into the potential of wearable sensor data for detecting and predicting depressive episodes.

Keywords: Machine Learning, Stress Prediction, motor activity, depression, depressive episodes, Logistic Regression

Paper ID 10211

Performance Analysis of a Single-Input Thermal Image Classifier with Patient Information for the Detection of Breast Cancer

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Abstract

Breast cancer is counted among one of the most invasive cancers with a high mortality rate among women. Early detection is essential as this nature of cancer can be life-threatening. Mammography is one of the leading diagnosis techniques. However, there has been increasing research into other methods due to the high cost and painful procedure involved with mammography. Thermography is one such method that has garnered attention in recent years due to its lower cost and non-invasive approach. This work focuses on building and optimizing a single-input CNN model for the diagnosis of breast cancer using thermal images when working with a limited dataset. The images were resized from 640 x 480 to 640 x 640 using the Pytorch library. The images of 5 different views are passed to a single CNN model whose output would be a two-element tuple indicating the probability that the patient is diagnosed healthy or sick. Stochastic Gradient Descent with a learning rate of 0.001 has been used as the optimizer. The model can classify 98% of the dataset with a sensitivity and specificity of 1.00 and 0.97, respectively. Hence, for the detection of breast cancer using thermal images, the use of multiple views of a breast along with clinical data is a viable option.

Keywords: Breast Cancer, Convolutional Neural Network, Multi-View Classification, Single-input CNN, Thermography

Paper ID 10232

Investigation of HR and QT Variability for Monitoring Sleep Apnea: An Interpretable Machine Learning Approach

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Abstract

Polysomnography, the gold standard technique for monitoring sleep apnea, is a costly, cumbersome, and time-consuming process that often causes disturbance to sleep and, therefore, is unsuitable for long-term monitoring. This paper investigates the single-channel electrocardiogram (ECG) derived heart rate variability (HRV) and QT variability (QTV) features, which are low-cost and suitable for long-term monitoring for automated sleep apnea monitoring. Using HRV alone and HRV combined with QTV features, different classifiers were trained to distinguish apneic events from healthy sleep events. The proposed model is trained and tested using 70 full-night ECG recordings acquired from the PhysioNet apnea ECG database. The extreme gradient boosting classifier outperformed a series of classifiers with sensitivity, specificity, and accuracy of 82.70%, 76.34%, and 79.38%, respectively, for HRV features. Adding QT features improved the sensitivity, specificity, and accuracy to 84.18%, 82.15%, and 83.16%, respectively. The performance suggests that HRV and QTV features have the potential to detect sleep apnea. Moreover, its non-invasive nature and cost-efficiency make it more suitable for wearable-based sleep apnea monitoring.

Keywords: Electrocardiogram signal, Extreme gradient boosting, Heart rate variability, Sleep apnea, Support vector machine

Paper ID 10236

Transfer Learning-Based Ensemble of Deep Neural Architectures for Alzheimer's and Parkinson's Disease Classification

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Abstract

The use of transfer learning in medical imaging has shown promising results in various applications, including disease classification and segmentation. Early detection of neurological diseases like Alzheimer's (AD) and Parkinson's (PD) is the need of the hour. This research experiments MRI datasets pertaining to AD and PD using transfer architecture of neural networks for disease classification. We used three popular datasets, namely ADNI, OASIS, and NTUA, and evaluated seven state-of-the-art transfer learning algorithms for classification. The experiments demonstrates the effectiveness of transfer learning in Alzheimer's and Parkinson's disease classification by achieving high accuracy and AUC scores. While the study highlights the top performing neural network models like InceptionV3 and InceptionResNetV2 for both OASIS and ADNI, it also showcase the high performances of transfer architectures like ResNet50 and EfficientNetB0 from the NTUA dataset. Additionally, we presented an ensemble of these algorithms. Relevant codes can be found at <https://github.com/snoushath/AD-PD-TransferLearning.git>.

Keywords: Transfer Learning, Deep Learning, Alzheimer's Disease, Parkinson Disease, Ensemble

Paper ID 96151

Classifying Emotions of Parkinsonian Patients from Electroencephalogram Signals using Efficient Attention Capsule Network

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Abstract

Detecting Parkinson's disease (PD) and other neurodegenerative disorders holds significant importance for early and automated intervention using non-invasive modalities like EEG. Although PD detection using the Electroencephalogram (EEG) signal has been done previously, identifying subtle differences in a wider spectrum of EEG signals from persons with PD and neurotypical (HC) individuals remains an open and challenging problem. PD patients often exhibit emotional dysregulation; identifying this is vital for their appropriate treatment. Though complex neural networks, such as Capsule Networks (CapsNet) and graph convolutional neural networks, have been applied to do this task, they are constrained by available computational resources. To address this issue, we proposed an efficient Capsule Network that leverages dynamic convolutional feature extraction and self-attention to mitigate CapsNet complexity in PD classification. By incorporating parallel fully connected neurons with CapsNet, regularisation and normalisation performance both in terms of types of predictions and on testing set is increased in the model. In this paper, binary classification of PD vs HC and categorical classification of emotions using machine learning techniques are explored. The proposed model archives 98.71% test accuracy in PD vs HC classification and 92.35% test accuracy in PD emotion classification. This method can serve the purpose of easy identification of emotions in persons with PD for better management of their day-to-day lives.

Keywords: Parkinson's disease, neurodegenerative disorder, deep learning, machine learning, affective computing

Paper ID 96152

Early Prediction of Chronic Kidney Disease Using Machine Learning Algorithms with Feature Selection Techniques

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Abstract

Chronic Kidney Disease is one most chronic diseases causing severe health hazards among the world population, especially for the elderly and middle-aged people. This creates gradual damage to the kidney affecting the Glomerular Filtration Rate (GFR) which lessens renal function at the end stage. CKD has become a major concern in health the issue leading the affected people to a condition of poor morbidity and high mortality rate. Degradation in renal function leads a man to death as the kidney is a vital part of the human body. Without analyzing the clinical data of a patient, doctors find it too difficult to diagnose this disease at an early stage. An automated prediction system that predicts CKD with good accuracy analyzing the co-factors behind CKD will be a great addition to the healthcare system. Machine learning algorithms can be applied to analyze the required physiological variables to predict CKD. This research presents a technique to apply feature selection techniques with machine learning models to predict CKD using the most prominent attributes indicating the stage of CKD. Different machine learning models like Naive Bayes, K Nearest Neighbor, Support Vector Machine, Decision Tree, Random Forest, and Xgboost are used to predict CKD using clinical data. Random Forest Classifier and Xgboost showed the highest accuracy of 100% with the help of 25 associated physiological attributes. We have achieved a good performance (98.48%) using Chi-Square Test and Principal Component Analysis feature selection techniques using only six attributes among the 25 attributes of the dataset. Blood glucose random, serum creatinine, hypertension, etc. are found as dominant features in this prediction task. This research will help us to predict CKD efficiently using minimal clinical data about a patient.

Keywords: Chronic kidney disease, random forest classifier, chi-square test, principal component analysis, feature selection

Notes



Track 3: Application of AI and Informatics in Pattern Recognition

List of Accepted Papers:

| | |
|---------------------------|--|
| Paper ID: 10206 | Paper title: <i>A Media-pipe integrated deep learning model for ISL (Alphabet) recognition and converting Text to Speech with Video Input</i> Authors: <i>Vishnu Mukundan, Aryan Gadhiya, Karthik Nadar, Rishita Gagrani, Niha Kamal Basha</i> |
| Paper ID: 10216 | Paper title: <i>A Driver Fatigue Detection Framework with Convolutional Neural Network and Long Short-Term Memory Network</i> Authors: <i>Ruyi Bao, Nazia Hameed, Adam Walker</i> |
| Paper ID: 10219 | Paper title: <i>FallGuardian: Wear OS-Based Machine Learning Fall Detection Framework</i> Authors: <i>Alexandros Michaelides, Nazia Hameed, Adam Walker</i> |
| Paper ID: 10233 | Paper title: <i>Classification of Different Cancer Types Based on RNA HI-SEQ Data Using Dimensionality Reduction</i> Authors: <i>Zannatul Ferdous Tunny, Md. Abir Hasan Munna, Md. Shahadat Hossain, M. Arifur Rahman, M. Shamim Kaiser, David J. Brown</i> |
| Paper ID: 96150 | Paper title: <i>YOLO-V4 Based Detection of Varied Hand Gestures in Heterogeneous Settings</i> Authors: <i>Nanziba Basnin, Atta Binti Aziz, Mohoshena Akter, Mohammad Farshid, M Shamim Kaiser, M Shahadat Hossain, Karl Andersson</i> |
| Paper ID: 96153 | Paper title: <i>Comparative Analysis of Pre-Trained CNN Models for Neurobiological Disease Classification</i> Authors: <i>Uwasila Binte Munir, Shamim Al Mamun</i> |

Notes



Paper ID 10206

A Media-pipe integrated deep learning model for ISL (Alphabet) recognition and converting Text to Speech with Video Input

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Abstract

The present study showcases a novel deep learning-based vision application tasked with reducing the communication gap between sign language and non-sign language users. Speech and hearing impairments are a type of disability that restricts an individual's ability to communicate with others properly. Modern-day automation tools can be used to address this communication gap and allow people to communicate ubiquitously and in a variety of situations. The method defined in the paper involves loading a video file, extracting each frame, and detecting the hand landmarks in each frame using the Media-Pipe library. Then the frame is cropped, and the region of interest is pre-processed and stored in a new data directory for training purposes. The pre-processing involves the use of Gaussian blur, edge detection, morphological transformations, and signal processing functions. Data augmentation is then performed, and images are saved in a new directory. The images are then used to train a custom CNN model, which contains four convolutional layers along with two fully connected layers. The model is compiled using the categorical cross-entropy loss function, optimized using the RMSprop optimizer, and then evaluated using the evaluation metric, accuracy. The predicted sign language alphabet is displayed on the screen and is converted to speech using the Google Text-to-Speech library. The model achieves an overall accuracy of 89.60%. The findings indicate that the proposed approach can serve as a road map to develop a real-time system capable of sign language recognition and Direct future investigations in this domain.

Keywords: Augmentation, Sign Language to Text conversion, Image Processing, Gesture recognition, Deep Learning, Text to Audio conversion

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Paper ID 10216

A Driver Fatigue Detection Framework with Convolutional Neural Network and Long Short-Term Memory Network

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Abstract

Fatigue driving is a significant cause of traffic accidents and injuries. To reduce this risk, we propose a compact and effective method for detecting driver fatigue using deep learning techniques. Our method combines 2D-Convolutional Neural Network (CNN) and Long Short-Term Memory network (LSTM), which allows us to effectively capture the spacial and temporal dynamics of driver behaviour. To improve the robustness and generalization ability of our model, we also apply several types of data augmentation. We evaluate our proposed method on the publicly available YawDD dataset and achieve an accuracy of 95% in distinguishing between fatigued and alert driving behaviour. Our results demonstrate the effectiveness of using 2D-CNN-LSTM networks for driver fatigue detection and highlight the potential for practical applications in the automotive industry. Our analysis of the results reveals that our proposed method outperforms some existing methods in the literature, but there is still room for improvement. We discuss the strengths and weaknesses of our method and suggest possible directions for future research.

Keywords: Machine Learning, Deep Learning, Convolutional Neural Network, Long Short-Term Memory, Driver Fatigue Detection

Paper ID 10219

FallGuardian: Wear OS-Based Machine Learning Fall Detection Framework

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Abstract

Falls among elderly individuals pose a significant health risk, and fast detection is crucial to prevent injuries. This paper presents FallGuardian, a fall detection system using machine learning and an IoT smartwatch powered by Googles Wear OS, which works by communicating with a server hosting the fall detection machine learning model. This work explores the different methodologies of currently available solutions to fall detection using IoT devices. Publicly available datasets are evaluated using machine learning models which power fall detection system behind FallGuardian. A range of machine learning models are evaluated, including k-Nearest Neighbors, Support Vector Machines (SVM) with both linear and Radial Basis Function kernels, Random Forest, Nave Bayes, and a deep learning approach employing a Convolutional Neural Network (CNN). The experiments produced models with high evaluation metrics. Notably, a CNN achieves an outstanding 0.99 accuracy on test data. However, it is observed that these models face challenges in maintaining high performance levels when tested in real-time. Our research highlights the need for ongoing refinement and adaptation of fall detection systems to bridge this gap between testing performance and practical application. Our work advances the development of robust IoT-based fall detection systems, aiming to enhance safety in practical scenarios.

Keywords: Fall Detection, Machine Learning, IoT, Smartwatch, Healthcare, Deep Learning, Real-Time Fall Detection, Wear OS

Paper ID 10233

Classification of Different Cancer Types Based on RNA HI-SEQ Data Using Dimensionality Reduction

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Abstract

The number of genome sequences has increased a lot compared to previous years as the use of genome sequencing has grown a lot compared to previous years. These genome sequencing have huge size of datasets, which is very difficult to use effectively and efficiently. Researchers have been working on genome sequencing to find correlations and connections among them. But there is still a lack of any specific model which can identify and classify the cancer cells and specify where they belong. John N Weinstein states the questionable practicality of using characterization based on genetic changes to complement pathological analysis for cancer categorization across tumor types. Since computer-assisted processes and algorithms are far more powerful, Machine learning and Data mining came to seek the attention of bioinformaticians because they can handle the datasets very efficiently. Many researchers have used machine learning algorithms to classify the gene sequence dataset found from the cancer cells of different patients. Keeping this research gap in mind, we have selected the Pancan Hi-sequence dataset which included 801 cases and 20531 genes for each case. We have used dimensionality reduction to reduce the feature number to make the dataset effective to use. Principal Component Analysis (PCA) resulted in 10 principle components where we used 10 N components. Similarly, t-Distributed Stochastic Neighbor Embedding (t-SNE) and Uniform Manifold Approximation and Projection (UMAP) resulted in 2 and 5 principle components where we used 2 and 5 N components. Then we examined two types of Support Vector Machines to classify tumors using the gene expression cancer RNA-Seq data set.

Keywords: Dimensionality Reduction, PCA, t-SNE, UMAP, RNASeq, NSVM, LSV

Paper ID 96150

YOLO-V4 Based Detection of Varied Hand Gestures in Heterogeneous Settings

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Abstract

Hand gestures refer to a form of non-verbal communication that include specific movements of the hands and fingers to convey information, commands, or emotions. With a better understanding of machine learning techniques, researchers are using machine learning to interpret and understand hand gestures. In this work, Yolo-V4 model-based hand gesture detection has been proposed. The study addresses the challenge of optimizing model efficiency using a small dataset, in contrast to extensive data which prolongs training duration and compromises accuracy. The study centers on a succinct yet significant dataset featuring prominent Indian subcontinental hand gestures. Encompassing both singular and bilateral hand motions, this dataset aims to enrich human-machine interaction. Through rigorous annotation, ten distinct datasets are meticulously curated, subsequently subjected to training, validation, and testing using the YOLO-V4 Model. The performance of the resultant model is benchmarked against existing methodologies, underscoring its potential for superior accuracy and efficacy.

Keywords: Deep Learning, PCA, CNN, Gesture Detection, Artificial Intelligence

Paper ID 96153

Comparative Analysis of Pre-Trained CNN Models for Neurobiological Disease Classification

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Abstract

Machine learning has gained enormous popularity in the diagnosis of neurobiological diseases due to its pattern recognition and diagnostic prediction ability. Numerous studies have explored machine learning with neuroimaging data to separate schizophrenic patients from healthy controls but only a small number of them have included bipolar patients, allowing the most clinically pertinent discrimination between two psychotic groups. Also, it has been proven by previous studies that machine learning-based methods are not that effective in drawing out complex patterns from neuroimaging data. In order to address these issues, we have implemented three different pre-trained CNN models (VGG-16, MobileNet, and Xception) to classify schizophrenia (SZ), bipolar disorder (BD), and healthy controls (HC) automatically based on the gray matter volume images. In our study, 66 bipolar patients, 66 schizophrenia patients, and 66 healthy controls were taken into account. Experimental findings show that among the three classifiers, Xception shows the best performance with an accuracy of 90.21%.

Keywords: Deep learning, Prediction model, Feature extraction, CNN, Structural MRI

Track 4: Application of AI and Informatics in Network, Security, and Analytics

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| Paper ID: 10205 | Paper title: <i>Optimizing Round-Robin Scheduling Algorithm Performance in Real-time Systems</i> Authors: <i>Tarek Helmy</i> |
| Paper ID: 10210 | Paper title: <i>Enhancing Outdoor Comfort: A Machine Learning Framework for Predicting Comfort Level</i> Authors: <i>Maher Alndiwee, Shamik Palit, Preetha V.K, Jimy Mathew, Natalie Joseph, Akshay Datar, Pablo Izquierdo Lopez, Waqar Ullah</i> |
| Paper ID: 10214 | Paper title: <i>Augmented Reality in the Fields of Management and Business: A Bibliometric Review of the Literature</i> Authors: <i>Thiago de Luca Santana Ribeiro, Anderson Antonio de Lima, Gustavo Goncalves</i> |
| Paper ID: 10218 | Paper title: <i>CDSER: Sentiment Analysis for Product Selection to Enhance E-commerce Review System</i> Authors: <i>Md. Mamun Or Rashid, Abu Sayed Md. Mostafizur Rahaman</i> |
| Paper ID: 10220 | Paper title: <i>Screening of Enhanced Oil Recovery Methods Using Supervised Machine Learning Predicated on Range Data</i> Authors: <i>Gbubemi H. Harrison, Josephine A. Lamboi</i> |
| Paper ID: 10228 | Paper title: <i>Enhancing Internet of Things Security with Random Forest-Based Anomaly Detection</i> Authors: <i>Muhammad R Ahmed, Thirein Myo, Ahmed Al Shihimi, Badar Al Baroomi, M Shamim Kaiser</i> |

Notes



Paper ID 10205

Optimizing Round-Robin Scheduling Algorithm Performance in Real-time Systems

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Abstract

Process scheduling is one of the most important tasks that a successful operating system must perform. Over decades operating system designers came up with multiple ways of achieving this task where each is tackling different perspectives to gain a fast response to processes, be fair to processes, mini-mize the average waiting & turnaround times and hence improve the system productivity. Round Robin is the widely used scheduling algorithm in re-source allocation in a real-time environment. But, its performance degrades concerning context switching and waiting time. To enhance the performance, the context switching, waiting time and turnaround time need to be reduced which depends on the choice of an optimal time quantum. The objective of this paper is to optimize the Round Robin scheduling algorithm to be fair to processes that are interrupted during their quantum time in the CPU, especially I/O bound processes. A variation of the RR algorithm is implemented such that a sort first will be executed based on the total used quantum time whereas processes with the lowest total used quantum time will be first. This was implemented using C# on three processors each running a variation of the RR algorithm which generated data to validate the proposed implementation's benefits. The implemented algorithm showed a slight improvement in milliseconds and was even smaller than this scale but in the CPU scale, it is considered significant especially when we have huge clusters. This improvement was attributed to most individual processes including I/O bound processes that are naturally not favored with the pure RR scheduling algorithm. Overall, the overhead of sorting a limited number of processes was comparable to RR with two queues. However, when it comes to individual processes the proposed implementation in this paper shows better fairness to processes than the pure RR with one queue and the RR with two queues.

Keywords: Round-Robin Scheduling, Performance Evaluation



Paper ID 10210

Enhancing Outdoor Comfort: A Machine Learning Framework for Predicting Comfort Level

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Abstract

This paper presents a comprehensive study on predicting the performance of outdoor comfort systems using machine learning models. The study is based on a dataset collected from various projects in Ras Al Khaimah, UAE and focuses on the prediction of temperature and humidity values. The evaluated models include Random Forest Learner, Neural Network, and SVM, with performance assessed using key metrics. The findings of the study provide valuable insights into both the data analysis process and the performance of machine learning models. Among the models evaluated, the Random Forest Learner demonstrated superior performance in capturing the variability in the data and generating accurate predictions. This highlights its potential as a reliable tool for predicting outdoor comfort system performance. Furthermore, the study proposes the integration of machine learning models into decision-making processes for planning outdoor comfort projects. By leveraging the predictive capabilities of these models, stakeholders can make informed decisions regarding system design and optimization.

Keywords: Outdoor comfort system, temperature and humidity prediction, Random Forest, Neural Network, SVM, data analysis

Paper ID 10214

Augmented Reality in the Fields of Management and Business: A Bibliometric Review of the Literature

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Abstract

Despite the importance of augmented reality technologies for business, revisional research still restricts its focus to specific contexts, such as, for example, education. In relation to business in a broad way, to our best knowledge, only two works spent some effort to consolidate knowledge, but they did not bring together themes and theories in clusters. In this context, the objective of this bibliometric article is to identify and develop the theoretical clusters that represent the bases and frontiers of knowledge in augmented reality in the fields of management and business. Through the techniques of co-citation analysis and bibliographic coupling analysis, we worked with a sample of 260 articles to cluster the bases and frontiers of knowledge. In the co-citation analysis (theoretical bases), we identified 4 clusters, namely: 1) Main Characteristics of Augmented Reality Systems, 2) The Effects of Augmented Reality on the Customer/User Experience, 3) The relationship between Augmented Reality and E-commerce, the improvements in Retail Shopping Experiences and 4) The Role of Mobile Augmented Reality Devices in the Retail Purchase Decision Making Process. In the bibliographic coupling analysis (knowledge frontiers), we identified 5 clusters, namely: 1) Augmented Reality in Marketing, 2) Technological Experience with Augmented Reality, 3) Virtual Reality as an AR Umbrella, 4) Relationship between Brand and Augmented Reality, and 5) Augmented Reality Specifically in Retail. Thus, we present two contributions in this work. First, we identified and developed the foundations of knowledge in augmented reality in business. Second, we identify and develop the frontiers of knowledge.

Keywords: Augmented reality, Virtual reality, Bibliometrics

Paper ID 10218

CDSER: Sentiment Analysis for Product Selection to Enhance E-commerce Review System

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Abstract

Opinion mining is a widely booming genre where reasoning test using machine learning or lexicon-based. The basic goal of review generation is to keep the features of the text while shortening it without affecting the meaning of the content. The requirement for effective automatic review sparked significant interest in Opinion Mining and the Natural Language Processing areas. This research focuses on developing an extractive review method called CDSER is a candid sentiment analysis based on rule which generates grammatically combined words frequency. At first, we manage dictionary which contains words, phrase and associated polarity. Adjective detection method pick up most relevant words and combining method combines words grammatically and third method makes score on grammatically extracted words. We compare its effectiveness with two existing methods including VADER and TextBlob. The suggested technique has the advantages of increased computing efficiency, improved inferences from social media, data interpretation, resilience, and managing sparse data. Experiments on various datasets also surpass earlier research, and the accuracy is great, demonstrating the efficiency and innovation of the study report.

Keywords: Sentiment Analysis, Summary Making, TextBlob, VADER

Paper ID 10220

Screening of Enhanced Oil Recovery Methods Using Supervised Machine Learning Predicated on Range Data

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Abstract

Enhanced oil recovery (EOR) is the tertiary stage of subsurface hydrocarbon extraction from an oilfield. It involves the use of chemical and thermal procedures to manipulate the properties of the in situ rock and/or fluids to mobilize a good fraction of the residual oil left over from prior primary and secondary stages. EOR screening is the first step in the procedure of selecting the best EOR technology that could be applied to a specific reservoir, before the economic analysis step. EOR screening is a challenging multi-criteria decision-making process, considering that there are about twenty possible methods to choose from. The conventional pre-defined screening criteria are based on hundreds of successful EOR projects undertaken worldwide, aggregated into fifteen EOR methods (classes) each defined by nine reservoir properties (features). However, the features data are given in the form of acceptable ranges of values (minimum, mean and maximum). In this study, we adopted a supervised machine learning (ML) technique capable of creating models for making classifications and predictions. We introduce a novel triangular distribution approach to generate a semi-synthetic dataset of 500 data rows (instances) for each EOR method, resulting in a total of 7500 rows. This was used to train and test two multiclass classification algorithms: Logistic Regression and Random Forest. The Random Forest model gave an overall classification accuracy of 97% compared to 91% for the Logistic Regression. The ML models created herein are one-step solutions for recommending the most technically applicable EOR method for a new project.

Keywords: Enhanced oil recovery, EOR screening, Supervised machine learning, Multiclass classification, Synthetic data

Paper ID 10228

Enhancing Internet of Things Security with Random Forest-Based Anomaly Detection

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Abstract

The Internet of Things (IoT) has revolutionized communication and device operation, but it has also brought significant security challenges. IoT networks are structured into four levels: devices, networks, applications, and services, each with specific security considerations. Personal Area Networks (PANs), Local Area Networks (LANs), and Wide Area Networks (WANs) are the three types of IoT networks, each with unique security requirements. Communication protocols such as Wi-Fi and Bluetooth, commonly used in IoT networks, are susceptible to vulnerabilities and require additional security measures. Apart from physical security, authentication, encryption, software vulnerabilities, DoS attacks, data privacy, and supply chain security pose significant challenges. Ensuring the security of IoT devices and the data they exchange is crucial. This paper utilizes the Random Forest Algorithm from machine learning to detect anomalous data in IoT devices. The dataset consists of environmental data (temperature and humidity) collected from IoT sensors in Oman. The Random Forest Algorithm is implemented and trained using Python, and the accuracy and results of the model are discussed, demonstrating the effectiveness of Random Forest for detecting IoT device data anomalies.

Keywords: Internet of Things, Challenges, Security, Random Forest, Security

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