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E. S. Gopi • P Maheswaran
Editors

Proceedings of the International Conference on Machine Learning, Deep Learning and Computational Intelligence for Wireless Communication

MDCWC 2023

International Conference on Machine Learning, Deep Learning and Computational Intelligence for Wireless Communication

Springer

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Dedicated to Past, Present and Future Students

Preface

Due to the availability of high-speed computing systems, there is a huge scope to still raise the standard of wireless communication in terms of massive connectivity, capacity enhancement, ultra-high reliability, and low latency using machine learning (ML), deep learning (DL) and computational intelligence (CI) algorithms. There is a requirement in bringing out the wireless research community and machine learning research community to submit their findings integrating ML, DL and CI for wireless communication. With this as an objective, the First International Conference on Machine Learning, Deep Learning and Computational Intelligence for Wireless Communication (MDCWC2020) was launched during 22nd to 24th October 2020 as a virtual event at NIT, Tiruchirappalli. The proceedings of MDCWC2020 were published as the Lecture Notes in Electrical Engineering by Springer (https://link.springer.com/book/10.1007/978-981-16-0289-4). Later MDCWC2021 was launched as the special session during IEEE International conference on Information and Automation for Sustainability (ICIAfS) during 11th August to 13th August 2021. Later MDCWC2022 was launched as the long virtual workshop during 30th May to 24th June 2022.

As the sequel, Second International Conference MDCWC2023 was conducted as the Hybrid event during 22nd to 24th June 2023. This book consists of the reviewed papers of MDCWC2023 grouped under the following topics: (a) Machine Learning, Deep Learning and Computational Intelligence Algorithms; (b) Wireless Communication Systems; (c) Mobile Data Applications. We thank those directly and indirectly involved in executing the hybrid event MDCWC2023 successfully. Thanks

Convener and Programme Chair — Dr. E. S. Gopi
MDCWC2023
NITT
June, 2023

About the Book

The Second International Conference on Machine Learning, Deep Learning and Computational Intelligence for Wireless Communication 2023 (MDCWC2023) has attracted 158 papers from across India and the globe. Out of this, 53 papers are selected for presentation and publication. The aim of the conference is to showcase the state-of-the-art research in the areas where machine learning, deep learning, computational intelligence, and wireless communications intersect. The accepted papers cover the topics which are divided into three parts, viz. Part I Machine Learning, Deep Learning, and Computational Intelligence, Part II Wireless Communications, and Part III Mobile Data Application. Brief summary of the papers in the aforementioned parts is given below:

Part I Machine Learning, Deep Learning, and Computational Intelligence:

This part covers the application of machine learning algorithms to various applications such as protection from privacy threats, speech recognition, usage of artificial intelligence in controlling pests in agriculture, etc. Further, an integrated optimization technique with support vector machine for feature selection is proposed using binary particle swarm optimization along with binary successive approximation. A finite impulse response predictor system based on artificial intelligence is also proposed. A work in this part uses predictive models on text data for human personality prediction. A dehazing algorithm named Channel-Pixel-Spatial Feature Fusion Network (CPSNet) is also proposed. Moreover, topics like sensor data fusion, adaptive learning in neural network architecture, improvement of energy efficiency by employing ant colony algorithm and cat swarm optimization algorithm are covered in this part.

Part II Wireless Communications:

In this part, different machine learning techniques are applied to address different aspects of wireless communications. Intrusion detection in 5G technologies by integrating long-short term memory and particle swarm optimization is carried out. The performance of polar decoding using linear code mapping with feedback-based ANN is analysed in one of the works. Improved random forest algorithm is used to classify the packets in software-defined networks in another work. Further, this part also covers topics such as optimal data transmission path in wireless sensor

networks using machine learning, blockchain-based solution for KYC, bit error rate performance of OFDM index modulation under various channel models, non-orthogonal multiple access for IoT, improved wireless indoor localization with deep learning algorithms, design of antenna parameters using machine learning, and dual mode OFDM index modulation for wireless communications.

Part III Mobile Data Application:

This part covers state-of-the-art research on the application of image processing and signal processing with machine learning in health care and other areas. Topics such as surface water-body extraction from satellite image, macular degeneration detection in retina, lung disease classification from CT images, machine learning-based women safety solutions with alert system, smart agriculture using IoT, breast cancer detection with deep learning and bio-inspired optimization algorithm, malaria parasite detection and COVID-19 detection based on deep learning, automatic license plate reading on vehicles, sentiment classification and analysis based on YouTube comments, application of machine learning for prediction of diabetes and heart disease, etc. are also covered in this part.

Overall, the scientific findings of the authors and the applications of various algorithms to address problems in real-life applications in different domains have given a complete coverage to the wide range of topics that come under the gamut of machine learning, deep learning, and computational intelligence and their application in wireless communications.

Thanks

Coordinator Dr. P Maheswaran
MDCWC2023
National Institute of Technology, Tiruchirappalli, India
June, 2023

Organization

Machine Learning, Deep Learning and Computational Intelligence for Wireless Communication (MDCWC 2023) is the second international online workshop organized by the Pattern Recognition and the Computational Intelligent Division, Department of Electronics and Communication Engineering, National Institute of Technology Tiruchirappalli. It was conducted completely in the Hybrid mode from 22nd to 24th June 2023

The keynote speakers include the following: (a) Prof. Arumugam Nallanathan, Professor of Wireless Communications, FIEEE, FIET, CEng, Web of Science Highly Cited Researcher, Founding Head of Communication Systems Research (CSR) Group, School of Electronic Engineering and Computer Science, Queen Mary University of London, on "Federated Learning for Energy Limited Wireless Networks" (b) Dr. Jithin Jagganathan, Chief Scientist of Technology, ANDRO Computational Solutions, LLC, Founding Director of Marconi-Rosenblatt AI/ML Innovation Lab Adjunct Assistant Professor, Department of Electrical Engineering at the University at Buffalo IEEE Senior Member, IEEE Region 1 Technological Innovation Awardee AFCEA International Meritorious Rising Star Awardee, AFCEA 40 Under 40, on "Radio Frequency Models Machine Learning for Edge Deployment: How to Design AI/ML Models for NextG Wireless Applications".

The invited talk includes the following: (a) Dr. Prabhat Kumar Sharma, Department of Electronics and Communication Engineering, Visvesvaraya National Institute of Technology, Nagpur, India, on "Biological and Molecular Communications: Fundamentals, Evolution and Role in 6G and Beyond Communication". (b) Dr. G. Swaminathan, Department of Electronics and Communication Engineering, Indian Institute of Technology Indore, on "Automatic Code and Interleaver Classification Using Conventional and ML Techniques". (c) Dr. Rahul Meshram, Department of Electrical Engineering, Indian Institute of Technology Madras, on "Reinforcement learning algorithms for restless Multi-armed Bandit Problem". (d) Dr. Narayanan C Krishnan, Head, Department of Data Science, Indian Institute of Technology Palakkad, on "GAN – Characterizing Its Convergence and Its Application to Zero-Shot Learning". Workshop was conducted by Chandhar Research Labs, Chennai.

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DNN-ILD: A Transfer Learning-Based Deep Neural Network for Automated Classification of Interstitial Lung Disease from CT Images

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(MDCWC 2023)

Sanjib Saha & Debashis Nandi

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Abstract

Interstitial lung disease (ILD) is a term commonly used to refer to several types of lung disorders that are harmful to humans. ILD is challenging to categorize. Analyzing the type of ILD from computed tomography (CT) images by radiologists is very time-consuming. Computer-aided diagnostic (CAD) technology has been constructed to excite detection. This work introduces one such method that relies on convolutional neural networks (CNN) to detect ILD from chest CT images. We examined domain-specific neural networks and pre-trained neural networks for problem-solving. We introduced various approaches to enhance a CNN's capability in categorizing ILD. We have proposed a new deep neural network (DNN) based on the modified DenseNet121 with hyper-parameter tuning and fivefold cross-validation. The performance of the proposed model is measured using accuracy and confusion matrix. The test accuracy of four types of detection (pulmonary fibrosis, hypersensitivity pneumonitis, tuberculosis, and healthy lung) on ResNet50, VGG16, and modified DenseNet121 models are 62%, 86.2%, and 89.6%, respectively. The proposed method has achieved better training, validation, and test accuracy on the MedGIFT ILD dataset and outperforms the state-of-the-art models.

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