
Editorial

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Biographical notes: Vijendra Singh is working as a Professor in the School of Computer Science at The University of Petroleum and Energy Studies, Dehradun, Uttarakhand, India. He received his PhD in Engineering and MTech in Computer Science and Engineering from Birla Institute of Technology, Mesra, India. He has 20 years of experience in research and teaching, including in the IT industry. His significant research has been in data mining, pattern recognition, image processing, big data, machine learning, and deep learning. He has published more than 80 scientific papers in this domain. He has served as Editor-in-Chief for numerous journal special issues, and is an editorial board member for several international journals. He received IBM Edu Leader Award, and is a member of ISTE, IEEE, and ACM. He has successfully organised the Elsevier and Springer international conferences, including ICCIDS2018, ICCIDS2019, ICCMDE2020, and ICCMDE2021, as a lead role/organising chair/general chair.

Vijayan K. Asari is the University of Dayton Ohio Research Scholars Endowed Chair in Wide Area Surveillance and a Professor with the Electrical and Computer Engineering department. He is also the Director of Vision Lab. He holds an advisory position as the Vice President at Deep Lens, Inc., Columbus, Ohio. He has received several awards for teaching, research, advising, and technical leadership. He has published more than 700 research articles, including edited books and 120 peer-reviewed journal papers. He has attended more than 200 research events that include 18 keynote talks, 92 invited talks, and several paper presentations in 30 countries.

This special issue focuses on the optimisation of computational theories and probabilistic and statistical models for data analytics, and novel techniques that apply effective computing tools and techniques for data analysis. A key motivation for this special issue is to explore the adoption of novel effective big data computing frameworks and IOT systems to go beyond a mere word-level analysis of data.

This special issue aims to provide a leading opportunity for researchers, academicians, professionals, and developers from different background areas to exchange the latest research ideas and synergic research and development on fundamental issues and applications about computational analysis and data science. Topics include: computational theories for big data analysis, probabilistic and statistical models and theories; computational intelligence for pattern recognition and medical imaging; incremental learning – theory, algorithms, and applications in big data; sparse data; feature selection and feature transformation; intelligent

information retrieval; knowledge discovery from heterogeneous, unstructured and multimedia data; high performance/parallel computing; semantic-based data mining; architecture, management and process for data science; decision making from insights; hidden patterns; optimisation for data analytics and their applications.

The paper by Sergei Bidenko et al., ‘Topologisation of the situation geographical image in the aspect of control of local transport and economic activity’, proposes a model for constructing anamorphosis of the terrain for topologising the geo-image of the real situation. An algorithm based on affine transformation, based on the distortion of the area’s boundaries relative to the centre of mass of the region, is also proposed. A comparison of the proposed algorithm with the applicable Gastner-Newman algorithm is given.

The paper entitled ‘Palm-print recognition based on quality estimation and feature dimension’, by Poonam Poonia and Pawan K. Ajmera, presents a palm-print recognition system based on quality estimation

and feature dimensions. Initially, the authors applied a quality assessment on the extracted region of interest images. Gabor filter is employed to extract the palm-print features having various scales and orientations. The kernel-based dimensionality reduction is applied in the entire space, which reduces the high dimensional Gabor features. The experiments are conducted on the PolyU, IIT-Delhi, and CASIA palm-print databases. The best recognition performance in terms of an equal error rate of 0.051% and recognition rate of 98.34% was achieved on the PolyU database. Experimental results prove the effectiveness of the proposed approach.

The paper by M. Sarith Divakar et al., 'Design and implementation of an efficient and cost effective deep feature learning model for rice yield mapping', proposes a deep feature learning model using convolutional LSTM cells for forecasting rice yield from remote sensing satellite imagery. Convolutional STM with convolutional input and recurrent transformations directly captures spatial and temporal features of the input data. Feature selection is performed using principal component analysis to reduce the dimension of input data without much loss in the performance. Results suggest that features learned are highly informative, and the proposed model performed better than other existing techniques.

The paper entitled 'Stock indices price prediction in real time data stream using deep learning with extra-tree ensemble optimisation', by Monika Arya and Hanumat G. Sastry, presents a novel Deep Learning network with extra-tree ensemble (DELETE) optimisation for predicting stock indices price trends in the real-time data stream. To construct the extra-tree (ET) forest from training data, each decision tree is provided with a random sample of k -features. Each decision tree in the forest selects the best feature to optimise the loss. The ET ensemble aggregates the decisions from multiple de-correlated decision trees, thus normalising the total reduction in optimisation parameters. Finally, k highly predictive stock technical indicators have been selected to supply tensor to the deep learning model.

The paper entitled 'A two-stage text detection approach using gradient point adjacency and deep network', by Tauseef Khan and Ayatullah Faruk Mollah, designs a simple, robust yet effective text detection method for both scene and scene computer-generated images under a multi-script environment in the Indian context. At first, a fine-scale edge map is generated from the original image, and subsequently, adaptive clustering is applied to form clusters of edge points based on their spatial density. Foreground objects are then extracted with the help of the appropriate cluster boundaries and considered as prospective text proposals. Subsequently, such text proposals are fed to a deep convolutional neural network for learning and prediction as text or non-text components. Finally, true-text components are properly aggregated as localised final texts of the original image. The proposed method is evaluated on two popular benchmark datasets,

viz. ICDAR 2017-MLT and ICDAR 2013 born-digital image, and obtained results are found to surpass some other state-of-the-art methods, which demonstrates its strength and pertinent usefulness in both scene and born-digital environments.

The paper entitled 'RNN-BD: an approach for fraud visualisation and detection using deep learning', by G. Madhukar Rao and K. Srinivas, presents deep learning and dimensionality reduction techniques to visualise and detect credit card fraud. The Real dataset was used to assess the effectiveness of the intended work. The results show that the proposed model is more efficient in identifying fraudulent transactions to reduce fraud and income loss. The proposed deep learning model can identify fraudulent transactions and reduce fraud losses to protect customer interests.

The paper by Khushboo Sukhija et al., 'Spatial and temporal trends reveal: hotspot identification of crimes using machine learning approach', develops a framework model for identifying criminal hotspots using a modified KNN (K nearest neighbour) algorithm by considering different crime characteristics such as the severity of the crime, the frequency of the crime and temporal data of the crime, by visualising hotspots using geographic information systems (GIS). The authors analyse the real dataset of crime for the recent five years collected from the Commissioner of Police of Gurgaon, Haryana. The data cleaning and pre-processing strategies have been applied to make data ready for further training of the model. The results demonstrate locations of the different hotspots based on the density of crime occurrences, and accurate visualisation of hotspots using GIS display is done by supervised learning and unsupervised classifiers. The claims have been validated through a proposed model, the modified KNN algorithm, with accuracy of around 99% by appropriately tuning and optimising the parameters.

The paper by Prashant Kumar et al., 'Statistical heart rate variability analysis under rest and post-exercise', presents a heart rate variability (HRV) analysis that follows the physical occurrence of variation of inter-beat interval and can be employed for regular monitoring of the health of the sportsperson. For this work, 62 datasets (two from each participant) have been incorporated from people who were actively engaged in some morning exercise or games to investigate chronic fatigue and underperformance due to overtraining. Data were acquired by using BIOPAC MP45, and pre-processed signals have been applied for R peak detection using maximum overlap discrete wavelet transform. Analysis of variance (ANOVA) and Wilcoxon signed-rank test have been evaluated to differentiate HRV parameters in resting and post-exercise conditions. The p -value based on ANOVA for each HRV index suggests that there is no statistically significant difference between the two sets of data, and it accedes to the null hypothesis. Still, significant differences have been attained for the standard deviation of heart rate and approximate entropy in the case of the Wilcoxon signed-rank test.

We want to express our gratitude and appreciation to the authors for their sincere efforts and involvement in the special issue publication. We are grateful to the promptness and commitment of the reviewers for their valuable evaluations to enhance the quality of the papers significantly. Additionally, we thank all the staff members

of Inderscience publications for their continuous effort and dedication to publishing this special issue. We particularly appreciate the grit and relentless support granted to us by Professor Kuan-Ching Li, Editor-in-Chief of the *International Journal of Computational Science and Engineering*.