


AI Empowered Big Data Analytics for Industrial Applications

J.UCS Special Issue


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We proposed the idea of editing a special issue that would compile the fruitful research that resulted from the stimulating discussions that occurred during the workshop that was held during the 5th International Conference on Intelligent Computing, Chennai on 25th & 26th March 2022. The objective of this special issue is to call for high-quality papers covering the latest data analytic concepts and technologies of big data and artificial intelligence. This special issue serves as a forum for researchers across the globe to discuss their work and recent advances in this field. The best papers from Artificial intelligence and Big Data Analytics (BAM) in the domains of Product, Finance, Health, and Environment were invited, peer-reviewed. The best high-quality papers were selected based on the innovativeness and relevance of the theme. The amount of data being generated and stored in various fields such as education, energy, environment, healthcare, fraud detection, and traffic is increasing exponentially in the modern era of Big Data. Simultaneously, there is a significant paradigm shift in business and society worldwide due to rapid advancements in fields such as artificial intelligence, machine learning, deep learning, and data analytics. This creates significant challenges for decision-making and the potential for transformation in areas such as the economy, government, and industry. Artificial Intelligence tools,

techniques, and technologies, in conjunction with Big Data, improve the predictive power of the systems created and allow the government, public, and private sectors to discover new patterns and trends, as well as improve public values such as accountability, safety, security, and transparency to enable better decision-making, policies, and governance. They also have a wide range of capabilities to perform complex tasks that humans cannot. They could be used to collect, organize, and analyze large, diverse data sets to discover patterns and trends that address a variety of problems related to the development of the economy, such as identifying new sources of revenue, expanding the customer base for business, product reviews, and promotion, disease prediction and prevention, climatic variation prediction, and the provision of energy solutions. The wide variety of subject areas discussed at the 5th International Conference on Intelligent Computing is reflected in the seven accepted papers presented in the following section.

The paper “Color Ultrasound Image Watermarking Scheme Using FRT and Hessenberg Decomposition for Telemedicine Applications” by Lalan Kumar and Kamred Udham Singh presents a watermarking scheme in medical images based on the Finite Ridgelet Transform (FRT)-Hessenberg. The proposed paradigm is split into two stages. The FRT is applied to medical images prior to watermark insertion. The coefficients are combined into 4×4 blocks, which are then decomposed using Hessenberg decomposition. The additive quantization technique is used to insert a watermark in the second column of the Q matrix. The results of the experiment show that the watermarked image has good visual quality. The scheme is performing better, as evidenced by the high PSNR value of 53.6121 and the NC value of 1.0. In addition, the scheme’s performance is resistant to a variety of attacks. The results indicate that the anticipated scheme is effective for medical image watermarking.

In the paper “English Teaching in Artificial Intelligence-Based Higher Vocational Education Using Machine Learning Techniques for Students’ Feedback Analysis and Course Selection Recommendation” by Xin Ma, proposes novel techniques in English teaching based on artificial intelligence for course selection based on students’ feedback on courses for Higher Vocational Education. The processed data features have been dimensionality reduction integrated with K-means neural network. And the extracted features have been classified with higher accuracy using recursive elimination-based convolutional neural network. Based on this feedback data classification, recommendations for courses in Higher Vocational Education in English teaching were suggested.

The paper “X-Ray Image Authentication Scheme using SLT and Contourlet Transform for Modern Healthcare System” by Vijay Krishna Pallaw and Kamred Udham Singh presents a nonblind digital watermarking method for X-ray medical images using the Contourlet transform (C.T.) and Slantlet Transform (SLT). Because contourlet transforms can represent two-dimensional signals in a flexible manner, contour plots can be used to efficiently represent curves and smooth contours. Simultaneously, the SLT has better time-localization and smoothness properties. If SLT transforms are used, the maximum energy of an image is conceived in the LL band. As a result, the LL band is used to secure the watermark. To embed the watermark, the additive quantization method was used. The scheme’s efficiency is evaluated using various quality parameters and compared with several existing schemes. The

experimental results show that the proposed scheme outperforms and can withstand multiple attacks.

The paper “Automatic Detection and Recognition of Citrus Fruit & Leaves Diseases for Precision Agriculture” by Ashok Kumar Saini, Roheet Bhatnagar, and Devesh Kumar Srivastava creates and tests computer vision and machine learning algorithms for classifying Huanglongbing (HLB)-infected and healthy citrus plant leaves and fruits. A normalised graph cut was used to segment the images, and texture information was extracted using a co-occurrence matrix. The attributes gathered were used for classification, using support vector machine (SVM) and deep learning methods. The classification accuracy and the number of false positives and false negatives were considered when rating the classification outcomes. The results show that Deep Learning can classify up to 90% of HLB infected leaves. Despite a wide range of intensities in leaves collected in North India, this method suggests that it may be useful in diagnosing HLB.

The paper “Customized Curriculum and Learning Approach Recommendation Techniques for Medical Education Using Virtual Reality” by Abhishek Kumar, Abdul Khader Jilani Saudagar, Badr Alsamani, Muhammad Badruddin Khan, Mohammed AlKhathami, Mozaherul Hoque Abul Hasanat, and Ankit Kumar proposes, based on deep learning techniques, a novel technique customized curriculum for medical students as well as recommendations for their learning process. Here, data has been collected based on the student's prehistoric performance and current requirements, and these data have been created as a dataset. The data was then processed for analysis using a CAD system combined with deep learning techniques to create a customized curriculum. This data was initially processed and analyzed to remove missing and invalid data. The data was then classified for curriculum development using a gradient decision tree integrated with naive Bayes. The learning approach recommendation was carried out using a fuzzy rule integrated knowledge-based recommendation system based on this customized curriculum. The proposed technique yielded experimental results in terms of accuracy of 98%, specificity of 82%, F-1 score of 79%, information overload of 75%, and precision of 81%.

In the paper “A Novel Image Super-Resolution Reconstruction Framework Using the AI Technique of Dual Generator Generative Adversarial Network (GAN)” by Loveleen Kumar and Manish Jain, a three-phase framework is proposed for generating superresolution images while preserving low-resolution image features and reducing image blurring and artefacts. Image enlargement is performed in the first phase, which enlarges the low-resolution image to the 2x/4x scale using two standard algorithms. The image is enhanced in the second phase using an AI-powered Generative Adversarial Network (GAN). The authors have used the DIV2K dataset to train the GAN and further tested the results on the images of Set5, Set14, B100, Urban100, Manga109 datasets with ground truth of size 224x224x3. The obtained results were compared with state-of-the-art superresolution approaches based on important image quality parameters such as peak signal-to-noise ratio (PSNR), Structural similarity index (SSIM), and Visual information fidelity (VIF). The results show that the proposed framework for generating super-resolution images from 2x/4x resolution downgraded images significantly improves the image quality parameters mentioned above.

The paper “Natural Language Enhancement in English Teaching Using Character-Level Recurrent Neural Network with Back Propagation Neural Network-Based

Classification by Deep Learning Architectures" by Zhiling Yang, investigates the efficacy of using AI apps for teaching English based on deep learning methodologies, measuring both the level of effectiveness and the level of efficacy. This natural language processing (NLP) approach to language enhancement used character-level recurrent neural network with back propagation neural network (Cha RNN, BPNN) based categorization. It is possible to use this DL (deep learning) technique to assist teachers in analyzing and diagnosing students' English learning behavior, replacing teachers in part to answer students' questions in a timely manner, and automatically grading assignments while teaching English. Experimental analysis demonstrates word perplexity, Flesch-Kincaid (F-K) grade level for readability, cosine similarity for semantic coherence, gradient change of NN, validation accuracy, and training accuracy of the proposed technique.

We thank all authors of the journal articles in this issue for their contributions to this excellent collection of AI empowered research. We would like to express our heartfelt gratitude to all reviewers who spent a significant amount of time reading the articles and making substantive suggestions for improvement, resulting in the high quality. We would also like to thank the JUCS evaluation committee for the opportunity to publish this collection of research articles as a special issue of the Journal of Universal Computer Science, as well as specially thank Johanna Zeisberg and the Publishing team for their invaluable assistance throughout the process. We would also like to thank the organizing committee of the 5th International Conference on Intelligent Computing for their support.

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