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Section Artificial Intelligence

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Section Information

The Section Artificial Intelligence mainly covers topics of interest within unique hardware-based deep learning AI and algorithmic deep learning AI using machine learning. The purpose of this Section is to bring together researchers and engineers, from both academia and industry, to present novel ideas and solid research on the hardware and algorithmic aspects of advanced applications of deep-learning-based AI.

The primary focus of this Section is only unique hardware-based deep learning AI. This Section also focuses on the black box nature of deep neural networks and shallow NNs, transparency, interpretability and explainability of deep neural networks (DNNs), and algorithms and/or methods for the conversion of Gradient Boosting Decision Tree (GBDT) (e.g., XGBoost) and Decision Forest, e.g., Random Forest, into a single decision tree (DT).

Note that papers on hardware-based deep learning AI using FPGA, and other popular techniques, are handled by the Editor-in-Chief for the hardware related subsections. Papers on algorithmic deep learning are handled by the Editor-in-Chief for the Section Artificial Intelligence. Unique combinations of evolutionary computation, fuzzy logic, and deep learning are also of interest.

Section Editor-in-Chief

Prof. Dr. Xin Geng

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Selected Papers



User OCEAN Personality Model Construction Method Using a BP Neural Network

Authors: Xiaomei Qin, Zhixin Liu, Yuwei Liu, Shan Liu, Bo Yang, Lirong Yin, Mingzhe Liu and Wenfeng Zheng

Abstract: In the era of big data, the Internet is enmeshed in people's lives and brings conveniences to their production and lives. The analysis of user preferences and behavioral predictions of user data can provide references for optimizing information structure and improving service accuracy. According to the present research, user's behavior on social networking sites has a great correlation with their personality, and the five characteristics of the OCEAN (Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism) personality model can cover all aspects of a user's personality. It is important in identifying a user's OCEAN personality model to analyze their digital footprints left on social networking sites and to extract the rules of users' behavior, and then to make predictions about user behavior. In this paper, the Latent Dirichlet Allocation (LDA) topic model is first used to extract the user's text features. Second, the extracted features are used as sample input for a BP neural network. The results of the user's OCEAN personality model obtained by a questionnaire are used as sample output for a BP neural network. Finally, the neural network is trained. A mapping model between the probability of the user's text topic and their OCEAN personality model is established to predict the latter. The results show that the present approach improves the efficiency and accuracy of such a prediction.

<https://doi.org/10.3390/electronics11193022>



Hybrid CNN and XGBoost Model Tuned by Modified Arithmetic Optimization Algorithm for COVID-19 Early Diagnostics from X-ray Images

Authors: Miodrag Zivkovic, Nebojsa Bacanin, Milos Antonijevic, Bosko Nikolic, Goran Kvascev, Marina Marjanovic and Nikola Savanovic

Abstract: Developing countries have had numerous obstacles in diagnosing the COVID-19 worldwide pandemic since its emergence. One of the most important ways to control the spread of this disease begins with early detection, which allows that isolation and treatment could perhaps be started. According to recent results, chest X-ray scans provide important information about the onset of the infection, and this information may be evaluated so that diagnosis and treatment can begin sooner. This is where artificial intelligence collides with skilled clinicians' diagnostic abilities. The suggested study's goal is to make a contribution to battling the worldwide epidemic by using a simple convolutional neural network (CNN) model to construct an automated image analysis framework for recognizing COVID-19 afflicted chest X-ray data. To improve classification accuracy, fully connected layers of simple CNN were replaced by the efficient extreme gradient boosting (XGBoost) classifier, which is used

to categorize extracted features by the convolutional layers. Additionally, a hybrid version of the arithmetic optimization algorithm (AOA), which is also developed to facilitate proposed research, is used to tune XGBoost hyperparameters for COVID-19 chest X-ray images. Reported experimental data showed that this approach outperforms other state-of-the-art methods, including other cutting-edge metaheuristics algorithms, that were tested in the same framework. For validation purposes, a balanced X-ray images dataset with 12,000 observations, belonging to normal, COVID-19 and viral pneumonia classes, was used. The proposed method, where XGBoost was tuned by introduced hybrid AOA, showed superior performance, achieving a classification accuracy of approximately 99.39% and weighted average precision, recall and F1-score of 0.993889, 0.993887 and 0.993887, respectively.

<https://doi.org/10.3390/electronics11223798>



A Scenario-Generic Neural Machine Translation Data Augmentation Method

Authors: Xiner Liu, Jianshu He, Mingzhe Liu, Zhengtong Yin, Lirong Yin and Wenfeng Zheng

Abstract: Amid the rapid advancement of neural machine translation, the challenge of data sparsity has been a major obstacle. To address this issue, this study proposes a general data augmentation technique for various scenarios. It examines the predicament of parallel corpora diversity and high quality in both rich- and low-resource settings, and integrates the low-frequency word substitution method and reverse translation approach for complementary benefits. Additionally, this method improves the pseudo-parallel corpus generated by the reverse translation method by substituting low-frequency words and includes a grammar error correction module to reduce grammatical errors in low-resource scenarios. The experimental data are partitioned into rich- and low-resource scenarios at a 10:1 ratio. It verifies the necessity of grammatical error correction for pseudo-corpus in low-resource scenarios. Models and methods are chosen from the backbone network and related literature for comparative experiments. The experimental findings demonstrate that the data augmentation approach proposed in this study is suitable for both rich- and low-resource scenarios and is effective in enhancing the training corpus to improve the performance of translation tasks.

<https://doi.org/10.3390/electronics12102320>

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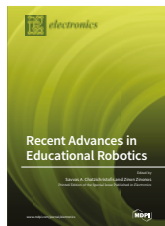
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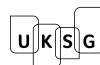
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