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GUEST EDITORIAL

Machine learning in nD signal processing

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In multidimensional (nD) signal analysis and processing area, machine learning based algorithms have received extensive attentions due to their convincing performance, including computer vision, image/video recognition and tracking, bioinformatics and medical data processing, array signal processing, and voice recognition, etc. The large amount of data size and multi-source heterogeneous data pose challenges in the generalization performance as well as processing speed to existing devices and algorithms.

In the light of these considerations, this special issue was launched. The aim is to present the recent developments and applications of machine learning algorithms in nD signal analysis and processing. In this special issue, 17 papers relevant to machine learning algorithms in nD signal processing are included, which can be broadly categorized into three groups, namely, machine learning algorithms in image recognition and segmentation, machine learning algorithms in multi-task learning and acoustic signal processing, and machine learning algorithms in tracking/system identification/biomedical engineering. A brief description of the papers in each of the three groups is given in the following.

1 Machine learning algorithms in image recognition and segmentation

In this group, we have 7 papers. Wang et al. study a novel classification framework for encrypted images without decryption using the artificial neural network based multilayer extreme learning machine (ELM). Fan et al. present a new image forensic method by using white balance from the EXchangeable Image File format (EXIF) header to resist multiple

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types of post-processing. Huang et al. propose a method called the extreme learning machine with multi-scale local receptive fields (ELM-MSLRF) to achieve feature learning and classification simultaneously for texture classification. Liang et al. develop a hybrid threshold optimization for melasma image segmentation where both local and global information around image pixels is employed for developing the optimal threshold. Xin et al. propose an unsupervised extreme learning machine algorithm combining with a spatial fuzzy C-means method for brain nuclear magnetic resonance (NMR) image segmentation. Yang et al. develop an improved extreme learning machine framework to tackle the covariance descriptor classification problem in remote sensing images by incorporating a collaborative coding approach. S. Liu et al. employ both robust within-class and between-class scatter matrices to enhance the discrimination capacity of ELM relevance feedback in image retrieval, which can effectively address the long computation time and non-discriminative model issues in conventional SVM based methods.

2 Machine learning algorithms in multi-task learning and acoustic processing

In this group, we have 5 papers. He et al. develop a pruning ensemble model of extreme learning machine with the $\ell_{1/2}$ regularizer to determine the optimal parameters between the hidden and output layer and select the suitable number of hidden nodes automatically. Cao et al. propose an improved spectrum dynamic feature extraction algorithm combining with the extreme learning machine classifier for acoustic signal recognition, which has been applied to real excavation device classification. Chang et al. develop an infant cry classification system to categorize the types of infant crying to help parents and nursing staffs attending to the needs of the infants. In the system, the sequential forward floating selection is to pick out high discriminative features in each crying frame and the directed acyclic graph support vector machine is finally used to perform classification. Jin et al. study a cross-modal feature learning based face descriptor to reduce the cross-modal differences and develop a multi-task learning algorithm integrated with ELM. Wei et al. propose an effective multi-modal deep extreme learning machine to achieve good robotic grasp recognition performance.

3 Machine learning algorithms in tracking/system identification/biomedical engineering

In this group, we have 5 papers. Zhang et al. propose a novel target tracking method based on online sequential extreme learning machine (OS-ELM), in which the enhanced tracking target is obtained by judging the position relationship between samples and the classification boundary, and the noisy samples which are far from the classification boundary are eliminated to enhance the tracking performance. Song and Zhang design a new lagged-Poincare-based feature extraction method (LPBF) to characterize the chaotic behavior of EEG signal and the extreme learning machine is trained with the LPBF features for automatic seizure detection. Dwiyasa et al. present several indoor location fingerprinting techniques and their translation into ELM-based technique and provide a systematic framework on how the equivalent ELM representation can be derived from a location fingerprinting technique. J. Liu et al. propose a single-hidden layer feedforward neural network approach to modeling fading channels, including large-scale attenuation and small-scale variation, in which the path loss (PL) pre-

diction and fading channel estimation are performed with a trained ELM. Das et al. present a random forest tree classifier combining with the entropy measures, fractal dimension and Hu's moments based representation approach for the oral squamous cell carcinoma (OSCC) diagnosis.

Finally, we would like to thank all the authors who have contributed their work to our special issue. We also would like to express our sincere appreciation to the reviewers for their valuable and insightful comments on the submitted manuscripts to our special issue, to the former Editor-in-Chief (EiC) while preparing the special issue, Dr. Zhiping Lin, and the now EiC Prof Eric Rogers, and other staffs of the journal, for their kind help and valuable support.

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