Computer Science and Information Systems 20(4): vii–x https://doi.org/10.2298/CSIS230400viiL

Guest Editorial: Soft/edge computing for imaging and remote sensing applications

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Recently, soft/edge computing paradigm has been developed and it is evolving as a new branch of computing and communication technologies. This new approach integrates the existing computing environment with the digital technologies by creating a new revolution in the emerging communication technologies like Internet of Things (IoT) and cyber–physical systems. Moreover, soft/edge based communication integrates the artificial intelligence technologies to intelligently investigate, collect, process and store the huge amount of data generated by IoT applications. Edge/soft computing plays a significant role to enhance the potential of data analytics and decision-making process with the reduced amount of delay.

Remote sensing and imaging, as one of the sources for big data, are generating earth-observation data and analysis results daily from the platforms of satellites, manned/unmanned aircrafts, and ground-based structures. These different kinds of remote-sensing data include SAR - synthetic aperture radar, multi-spectral optical data and hyper-spectral optical data. Those data sets comprise different spectral bandwidths (dimensionality), spatial resolutions, and radiometric resolutions. The increasing growth of remote sensing data and geoscience research pushes earth sciences strongly and poses great challenges to data science for remote sensing big data, including collection, storage, management, analysis and interpretation.

This Special Issue is expected to bring together experts from different research areas to discover and realize the values of soft/edge computing in various remote sensing areas. This Special Issue is intended to present the current theoretical and methodological research and state-of-the-art techniques and application of imaging and remote sensing big data in the area of soft/edge computing. The aim of this special Issue is to share the experiences in processing imaging and remote sensing with large volumes and variant modes, and intelligent interpretation with advance soft/edge computing algorithms. We expect that these research results will provide a necessary effort towards the incorporation of this soft/edge computing technology into the imaging and remote sensing field and also to help stakeholders and researchers in academia, governments, and industries to gain insights into the potential of using soft/edge computing techniques and concepts in imaging and remote-sensing applications.

This special issue received 36 submissions where the corresponding authors were majorly counted by the deadline for manuscript submission with an open call-for-paper period of 5 months. All these submissions are considered significant in the field, but however, only one-third of them passed the pre-screening procedure by guest editors. The qualified papers then went through double-blinded peer review based on a strict and rigorous review policy. After a totally three-round reviews, 8 papers were accepted for publication. A quick overview to the papers in this issue can be revealed below, and we expect

the content may draw attentions from public readers, and furthermore, prompt the society development.

The first paper entitled "Generative Adversarial Network Based on LSTM and Convolutional Block Attention Module for Industrial Smoke Image Recognition" by Dahai Li et al. In this paper, a low-cost data enhancement method is used to effectively reduce the difference in the pixel field of the image. The smoke image is input into the LSTM in generator and encoded as a hidden layer vector. This hidden layer vector is then entered into the discriminator. Meanwhile, a convolutional block attention module is integrated into the discriminator to improve the feature self-extraction ability of the discriminator model, so as to improve the performance of the whole smoke image recognition network. Experiments are carried out on real diversified industrial smoke scene data, and the results show that the proposed method achieves better image classification and recognition effect. In particular, the F scores are all above 89%, which is the best among all the results.

The second paper entitled "A Novel Feature Fusion Model Based on Non-subsampled Shear-wave Transform for Retinal Blood Vessel Segmentation" by Fan Zhang et al. proposes a new feature fusion model based on non-subsampled shear-wave transform for retinal blood vessel segmentation. The contrast between blood vessels and background is enhanced by pre-processing. The vascular contour features and detailed features are extracted under the multi-scale framework, and then the image is postprocessed. The fundus images are decomposed into low frequency sub-band and high frequency sub-band by non-subsampled shear-wave transform. The two feature images are fused by regional definition weighting and guided filtering respectively, and the vascular detection image is obtained by calculating the maximum value of the corresponding pixels at each scale. Finally, the Otsu method is used for segmentation. Results: The experimental results on DRIVE data set show that the proposed method can accurately segment the vascular contour while retaining a large number of small vascular branches with high accuracy. The main conclusion is that the proposed method has a high accuracy and can perform vascular segmentation well on the premise of ensuring sensitivity.

The third paper entitled "LUN-BiSeNetV2: A Lightweight Unstructured Network Based on BiSeNetV2 for Road Scene Segmentation" by Yachao Zhang et al. proposes a road scene segmentation method based on a lightweight unstructured network based on BiSeNetV2. The network contains backbone segmentation network and BiSeNetV2 network. The Mobilenetv2 network is used in the backbone network to replace the Xception feature extraction network in the decoder. In addition, grouping convolution is used to replace common convolution in Mobilenetv2 network. And it selects the batch specification layer to reduce the number of parameters, without affecting the accuracy and improving the efficiency of segmentation.

The fourth paper entitled "A Novel Multilevel Stacked SqueezeNet Model for Handwritten Chinese Character Recognition" by Yuankun Du et al. proposes a novel multilevel stacked SqueezeNet model for handwritten Chinese characters recognition.

"Deep Adversarial Neural Network Model Based on Information Fusion for Music Sentiment Analysis" by Wenwen Chen et al. proposes a new model that combines deep adversarial neural network model based on information fusion for music sentiment analysis. Firstly, the information of music text sequence is captured by the bidirectional short and long time memory network. Then the sequence information is updated according to the tree structure of dependency syntactic tree. Further, the relative distance and syntac-

tic distance position information are embedded into the music text sequence. Thirdly, the adversarial training is used to expand the alignment boundary of the field distribution and effectively alleviate the problem of fuzzy features leading to misclassification.

The sixth paper entitled "A Novel Single Shot-multibox Detector Based on Multiple Gaussian Mixture Model for Urban Fire Smoke Detection" by Hao Han et al. proposes a novel single shot-multibox detector based on a multiple Gaussian mixture model for urban fire smoke detection. Multiple Gaussian models are used to represent the features of each pixel in the moving object image. The Gaussian mixture model is updated based on the principle that each pixel in the image is regarded as a background point if it matches the Gaussian mixture model. Otherwise, if it matches the Gaussian mixture model, it is regarded as the foreground point. By updating the foreground model and calculating the short-term stability index, the detection effect of moving objects is improved. By determining the relationship between Gaussian distribution and pixel, a new parameter is set to construct the background model to eliminate the influence caused by illumination mutation. Aiming at the problems of smoke detection efficiency and network over-fitting, authors presented an InceptionV3-feature fusion single shot-multibox detector.

The seventh paper "Anti-aliasing Filter Based on Whale Parameter Optimization Method for Feature Extraction and Recognition of Dance Motor Imagery EEG" by Tianliang Huang et al. proposes a new model for the feature extraction and recognition of dance motor imagery EEG, which makes full use of the advantage of anti-aliasing filter based on whale parameter optimization method. The anti-aliasing filter is used for preprocessing, and the filtered signal is extracted by two-dimensional empirical wavelet transform. The extracted feature is input to the robust support matrix machine to complete pattern recognition. In pattern recognition process, an improved whale algorithm is used to dynamically adjust the optimal parameters of individual subjects. Experiments are carried out on two public data sets to verify that anti-aliasing filter-based preprocessing can improve signal feature discrimination. The improved whale algorithm can find the optimal parameters of robust support matrix machine classification for individuals. This presented method can improve the recognition rate of dance motion image.

The last paper is "Heterogenous-view Occluded Expression Data Recognition Based on Cycle-Consistent Adversarial Network and K-SVD Dictionary Learning Under Intelligent Cooperative Robot Environment" by Yu Jiang et al. and it proposes a cycle-consistent adversarial network and K-SVD dictionary learning method for occluded expression recognition in education management under robot environment. Firstly, the new method uses the cyclic-consistent generation adversarial network as the skeleton model, which can generate the un-occluded expression image without the need of paired data sets. Meanwhile, in order to improve the discriminant ability and image generation ability of the network, a multi-scale discriminator is used to construct the discriminant network. Then, the least squares and cyclic sensing loss are used to strengthen the constraints on the network model and improve the image quality. By subtracting the error matrix from the test sample, a clear image of the expression classification stage can be recovered. The clear image samples are decomposed into identity features and expression features by using the collaborative representation of two dictionaries.

The first guest editor would like to thank Prof. Mirjana Ivanović, the editor-in chief of ComSIS, for her support during the preparation of this special section in the journal.

Finally, we gratefully acknowledge all the hard work and enthusiasm of authors and reviewers, without whom the special section would not have been possible.