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GUEST EDITORIAL

Special Section Guest Editorial: Frontiers in Image and Signal Processing for Remote Sensing

Chi Lin[a] and Chang Wu Yu[b]

[a]Dalian University of Technology, School of Software, Institute of Intelligent System, Dalian, China
[b]Chung Hua University, Department of Computer Science and Information Engineering, Hsinchu, Taiwan

Remote sensing is a method of acquiring information about an area or object without physical contact, relying on the detection and analysis of emitted energy or radiation. Satellite data, often in image form, undergo signal processing to extract specific information such as waveforms or time series data. Image processing manipulates images to enhance them or extract valuable information. Key phases in image processing include pre-processing, transformation, classification, enhancement, and analysis. Moreover, signal processing involves transforming information-bearing signals into other forms for various applications. Its applications include consumer electronics, transportation, medical services, the military, and remote sensing. In remote sensing, it aids in tasks like astronomy, climate monitoring, and weather forecasting. On the other hand, hyperspectral remote sensing is an emerging technology that scientists and researchers are exploring for detecting man-made materials, terrestrial vegetation, and mineral identification. It draws contributions from various fields like signal processing, image processing, optimization, AI, and ML. By organizing a special section on this topic, we aim to advance the state of the art in image- and signal-processing techniques for remote sensing, contributing to more accurate, timely and impactful remote-sensing applications across various domains. After rigorous peer-review procedures, four papers were accepted for publication in this special section.

Dahiya, Gupta and Singh present a simple framework-based artificial neural network (ANN) and post-classification comparison (PCC), named ANN-based PCC (ANPC) has been proposed to detect the multitemporal changes over agricultural land using hyperspectral. Experimental outcomes confirmed the effectiveness of ANPC (with an accuracy of more than 90%) in the extraction of multitemporal changes as compared to RFPC and SVMPC (with an accuracy of less than 90%). This study enhances the utilization of the hyperspectral dataset (due to narrow spectral bands) in the extraction of critical information about the Earth's surface parameters.

Beccaro et al. use SBAS multi-temporal InSAR technique to study ground motion on the entire island of Pico, aiming at investigating possible active ground displacements and at a better characterization of its source. Our results did not show any relevant ongoing deformation in the timeframe of our observations. Also, oceanic islands are challenging study areas because atmospheric and phase coherence disturbances affect the InSAR signal.

Krishnamoorthy and Sivanandan propose a deep feature-splitting approach that enhances a localized hashing (DFS-LHash) model for RSIR. The DFS strategy splits the fully connected layer features into equally sized blocks for a split-based localized hash learning, keeping VGG-16 as the baseline network. The proposed model provides effective search with better retrieval time and achieves state-of-the-art performance with mAP values of 97.42%, 96.06%, and 93.47% for the UCM, PatternNet and AID datasets, respectively.

Damalla et al. explore a new word embedding to describe the classes of remote sensing scenes to improve the classification accuracy of unseen categories. The proposed method uses a data2vec embedding based on self-supervised learning to obtain a continuous and contextualized latent representation. This representation leverages the advantages of standard transformer architecture twofold. The proposed approach demonstrates its efficacy over the existing GZSL approaches.

As editors, we are immensely grateful for the dedication and passion of our contributors, whose work serves as a testament to the boundless potential of image and signal processing in remote sensing. We hope this special section sparks new ideas and inspires collaboration for further exploration of the frontiers that lie ahead.