



# Editorial: Special Issue on Recent Advances in Cognitive Learning and Data Analysis

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With the rapid development of artificial intelligence (AI)-related techniques and the continuous explosion of multimodal data, there is a new trend in combining AI machine learning with multimodal big data analytics. This has enabled emerging new techniques and applications in a wide range of fields. Accordingly, these have brought in both challenges in effective big data analysis and opportunities in innovative applications. To this end, cognitive modeling and cognitive systems have attracted increasing attention under the framework of big data enabled machine learning, especially the sparse representation and sparse learning, deep learning, and reinforcement learning.

To address these challenges and opportunities, we have successfully organized the Brain Inspired Cognitive System (BICS) Conference series, including the 9<sup>th</sup> in Xi'an, China in July 2018 [1] and 10<sup>th</sup> in Guangzhou, China in July 2019 [2]. Selected papers are extended and included in this special issue. The special issue has solicited the state-of-the-art

contributions in cognitive learning and data analysis, which has also provided a premier forum for both the academic and industrial research community to report progress, exchange findings, and facilitate future multidisciplinary research directions as detailed below.

In total, there are seven papers included in this special issue. The selected papers have covered a wide range of relevant topics, showing both theoretical and applicable values. Therefore, these can be categorized into various groups under different criteria, where detailed introduction of the included papers is given as follows.

## From Conventional Machine Learning to Deep Learning

In the seven contributed papers, three of them papers are deep learning based, including Style Neutralization Generative Adversarial Network (SN-GAN) upgraded U-Net [3], Semi-Supervised Convolutional Neural Network [4], and recurrent neural network (RNN) [5]. On the other hand, conventional machine learning approaches are also adopted in the other four papers, which include multi-scale mahalanobis kernel-based support vector machine [6], graph model based salient superpixel visual tracking [7], an evolutionary safelevel synthetic minority over-sampling technique (ESLSMOTE) for balanced learning [8], and Laplacian-regularized correlative sparse ranking enabled matching [9]. The transition from conventional approaches to deep learning has shown a changing trend in AI and cognitive computing.

## Various Tasks

The seven contributed papers in the special issue cover several typical tasks of cognitive computation. These include classification/recognition [3, 4, 6, 9], image captioning [5], and object segmentation for visual tracking [7]. The work in [8] is also tested on three classifiers, where the work in [9] for

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vehicle re-identification can also be regarded as classification or recognition. Majority of the papers focus on pattern classification and recognition, which has indicated this as the mainstream of cognitive computation.

## Diverse Application Areas

The application areas of the seven contributed papers are quite diverse. These cover from data classification [3], including seminal quality assessment [8], to synthetic aperture radar image recognition [4], image captioning [5], high-resolution remote sensing image classification [6], visual tracking [7], and vehicle re-identification [9]. These have demonstrated the growing wider application areas of cognitive computation.

In addition, the SN-GAN model [3] and the ESLSMOTE approach [8] can actually be applied in more generic applications, as these address mainly on theoretical side of machine learning, an important topic in cognitive computation. The remaining approaches focus on application sides, where improved models and methods are adapted to particular problems and show promising results.

In summary, this special issue has covered several challenging topics within cognitive computation. All these have been valuable and useful in AI and cognitive analysis of data and patterns from various application areas. Herein we in particular thank the great contributions from all authors, the efforts from anonymous reviewers, and the management and Editorial team of the Cognitive Computation Journal.

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