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## Editorial

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The purpose of this special issue is to collect excellent articles on innovative computational intelligence for deep learning and knowledge acquisition. The papers in this issue are extended versions of selected papers presented at 2019 IEEE 11th International Workshop on Computational Intelligence and Applications (IEEE IWCIA2019), which was held in Hiroshima, Japan by the sponsorship of the IEEE Systems, Man and Cybernetics Society (SMC) Hiroshima Chapter. The IWCIA covers the broad spectrum of research fields ranging from computational intelligence

methodologies such as deep learning, neural networks, evolutionary computation, etc. to their practical applications like knowledge acquisition or data prediction from big data. High quality technical papers were presented at IEEE IWCIA2019, and the six papers were selected from among all the accepted papers for this special issue. To provide readers with a quick overview of the six papers, a brief summary for each of them is presented as below:

- 1 'Code completion for programming education based on deep learning' by K. Terada and Y. Watanobe

This paper proposes a method for code completion characterised by two principal elements: the prediction of the next within-vocabulary word and the prediction of the next referenceable identifier. For the prediction of within vocabulary words, a neural language model based on an LSTM network with an attention mechanism is proposed. Additionally, for the prediction of referenceable identifiers, a model based on a pointer network to a given incomplete program is proposed.

- 2 'Multi-objective optimisation of allocations and locations of incineration facilities with Voronoi diagram and genetic algorithm: case study of Hiroshima City and Aki County' by T. Kamikawa and T. Hasuike

This study focuses on the two objectives of maximising the amount of heat generated by incineration and minimising the waste collection distances divided by population densities, in determining allocations and locations of general waste incineration facilities as a case study of Hiroshima City and Aki County in Japan. For these objectives, we propose the version 2 of multi-objective optimisation with Voronoi diagram and genetic algorithm (MOVGA2).

- 3 'Efficient parameter-free adaptive penalty method with balancing the objective function value and the constraint violation' by T. Kawachi, J. Kushida, A. Hara and T. Takahama

This paper proposes a new parameter-free adaptive penalty method with balancing the objective function value and the constraint violation. L-SHADE is adopted as a base search algorithm, and the optimisation results of 28 benchmark functions provided by the CEC2017 and CEC2018 competitions on constrained single-objective numerical optimisations are compared with other methods.

- 4 'Detecting audio adversarial examples for protecting speech-to-text transcription neural networks' by K. Tamura, A. Omagari, H. Ito and S. Hashida

This study proposes a new protection method against audio adversarial examples. The proposed protection method is based on a sandbox approach, where an input voice sound is checked in the system to determine if it is an audio adversarial example. To evaluate the proposed protection method, this study uses actual audio adversarial examples created on deep speech, which is a typical speech-to-text transcription neural network. The experimental results show that our protection method can detect audio adversarial examples with high accuracy.

- 5 'Using term similarity measures for classifying short document data' by H. Seki and S. Toriyama

While the prior works on term expansion (a.k.a. document expansion), proposed by Carpineto et al., use a formal concept analysis (FCA)-based similarity measure defined between terms (or words), this paper studies the effectiveness of using two kinds of measures for term expansion: one is weighted similarity measures studied in FCA, and the other is some correlation measures, like cosine and all-conf, often employed in data mining. This paper presents some properties on the relationship between these term similarity/ correlation measures and the notion of relevancy in classification. This paper shows empirically that cosine correlation measure outperforms the prior methods in authors' two short document data. This paper also makes a comparison of our approach with a latent Dirichlet allocation (LDA)-based term expansion approach by Rogers et al.

- 6 'A video prediction method by using long short-term memory-based adaptive structural learning of deep belief network and its investigation of input sequence length for data structure' by S. Kamada and T. Ichimura

In this study, adaptive restricted Boltzmann machine (RBM) and adaptive deep belief network (DBN) have been developed as a deep learning model. The adaptive structural learning can find a suitable size of network structure for given input space during its training. This is the neuron generation and annihilation algorithms are implemented on RBM and layer generation algorithm is implemented on DBN. Moreover, the learning algorithms of adaptive RBM and adaptive DBN are extended to the time-series prediction by using the idea of long short-term memory (LSTM). The authors' previous research tackled the problems for supervised learning, this paper challenges to reveal the power of our proposed method in the video recognition research field by using moving MNIST for unsupervised learning, since video includes rich source of visual information.

We sincerely hope that the above six papers provide the readers with state-of-the-art information of their interest, and this issue will also bring their attention to the IEEE IWCIAs.

We wish to express our gratitude to the people who make this special issue possible. First, we would like to thank all the reviewers for their timely and thoughtful comments on the papers. Of course, we would like to thank all the authors for providing excellent papers and modifying them based on the reviewers' comments. Finally, we gratefully acknowledge the support of Professor George A. Tsihrantzis, the Editor-in-Chief of this journal, for giving us the opportunity to compile this special issue.