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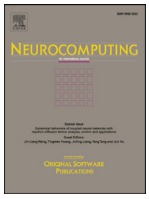

Editorial: Neural learning in life system and energy system

As well recognized, neural learning is one of the most powerful and popular techniques. The last decade has also witnessed the rapid advancements of neural learning techniques, which consists of various neural learning approaches such as neural networks, deep learning, evolutionary learning, etc. In recent years, to understand the interaction between components (i.e., cells, tissues and organisms) of life system and predict system behaviors, people have started using neural learning techniques to model and simulate life systems. Although significant progress has been made in the research of life systems, the recently developed neural learning methods still cannot match the demands of exploiting life systems due to the complexity of a life system. Meanwhile, neural learning techniques have been employed to model and control energy systems. However, with the widely use of information and communications techniques in energy system, the new problems such as cyber security pose huge challenges to energy system. Therefore, it has become critical to explore neural learning techniques for life system and energy system. This special issue collected nine papers reporting the recent developments of neural learning in life system and energy system.

The paper entitled “An Adaptive Immune Algorithm for Service-Oriented Agricultural Internet of Things”, built the optimization model of minimum service cost between service providers and multiple requests in the agricultural IoT scenarios. And an adaptive immune algorithm based on endocrine regulation is proposed to optimize this service model. AIE is inspired by biological immune system mechanism to minimize service cost for multiple requests. Simulation results demonstrate the effectiveness of AIE in the optimization of agricultural IoT service.

In the contribution “Neural-network-based learning algorithms for cooperative games of discrete-time multi-player systems with control constraints via adaptive dynamic programming”, investigated the cooperative game issue for DT multi-player systems with control constraints via ADP technique. NNs have been utilized to implement the proposed PI algorithm. By applying NNs, an online learning algorithm and an iterative offline algorithm have been developed through gradient descent method and least-square scheme, respectively. The critic-only structure has been utilized in the offline learning algorithm, which reduces much computation burden. Simulation results have demonstrated the optimality and effectiveness of our proposed scheme.

Incremental attribute reduction is very important in dynamic data analysis with rough set theory. In the paper “Compressed Binary Discernibility Matrix Based Incremental Attribute Reduction Algorithm for Group Dynamic Data”, developed an incremental attribute reduction algorithm based on compressed binary discernibility matrix to update the attribute reduction results efficiently for group dynamic data, which could calculate the attribute reduction efficiently whether the increasing dynamic data is a single object or a group of objects. The theoretical analysis and experimental results show that the proposed incremental algorithm can obtain a comparable attribute reduction in a much shorter time comparing with a non-incremental algorithm and a traditional incremental algorithm.

The paper “Optimal Sensor Placement Based on Relaxation Sequential Algorithm”, proposed a novel relaxation sequential algorithm by introducing the idea of edge relaxation operation of Dijkstra’s algorithm into sequential algorithm. The proposed algorithm takes modal assurance criterion matrix as the objective fitness function. A truss structure and a rigid-framed arch bridge are applied as examples to verify the effectiveness of the new algorithm for optimal sensor placement, and it could also be applied to the other criterions of optimal sensor placement problems and discrete optimization problems.

In “Parameter Estimation of Hammerstein–Wiener Nonlinear System with Noise Using Special Test Signals”, presented the identification procedure of Hammerstein-Wiener nonlinear system with colored process noise. The designed test signals composed of separable signal and random multi-step signal could be applied to the Hammerstein-Wiener system, which can separate the identification issues of the linear part and output nonlinear part from that of the input nonlinear part. The identification procedure can be significantly simplified. Simulation results demonstrate that the proposed scheme can achieve good identification results to the disturbance of colored process noise.

The paper “Adaptive Deep Dynamic Programming for Integrated Frequency Control of Multi-area Multi-microgrid Systems”, designed the framework of integrated frequency control to reduce the frequency deviation of a multi-area multi microgrid system, which can replace load frequency control and generation command dispatch. The adaptive deep dynamic programming is proposed for the controller based on the integrated frequency control. Six case studies (i.e., basic case, plug-and-play, communication failure, all-day long disturbance, time-varying topology and parameters varying) are undertaken with a long configured simulation time of 158 algorithms. Simulation results verify the effectiveness and superiority of the adaptive deep dynamic programming for integrated frequency control of a multi-area multi-microgrid system.

In “Contract-Based Approach to Provide Electric Vehicles with Charging Service in Heterogeneous Networks”, presented the

contract-based approach to provide electric vehicle users with power supplied by mobile charging stations in the heterogeneous networks, and the optimal solution could be obtained based on the proposed iterative search algorithm. Through the theoretical analysis, the existence of optimal contract items is proved, which also ensure the feasibility of electric vehicle users. The optimal solutions can be achieved based on our proposed algorithm. Numerical and simulation results validate the effectiveness of our proposal.

The paper "A novel online detection method of data injection attack against dynamic state estimation in smart grid", proposed the novel online detection method for data injection cyber attacks against dynamic state estimation in smart grid. A search approach is designed to select these targeted state variables, and their values are then determined by solving an optimal model based on particle swarm optimization (PSO) algorithm. And the chi-square detection method associated with two kinds of state estimates is further presented. Numerical simulations confirm the feasibility and effectiveness of the proposed method.

In "Using Continuous Hopfield Neural Network for Solving A New Optimization Architecture Model of Probabilistic Self Organizing Map", the authors proposed the new optimization model of probabilistic self-organizing map architecture, which consists of a main objective function that describes the PRSOM functioning and 320 constraints on variables. Resolution phase is conducted in two phases: assignment and minimization phases. The first phase has been performed by continuous Hopfield neural network which has been adapted technically to the problem. Assignment phase is carried out by gradient method. Suggested Model has been efficiently accomplished to data clustering. Performance of the proposed model is demonstrated through the dataset clustering.

Finally, the guest editors wish to thank Professor Zidong Wang and Steven Hoi (Editor-in-Chief of Neurocomputing), for providing the opportunity to edit this special issue. We would like to thank the authors for submitting contributions, and all the reviewers for their most helpful and constructive comments. We also hope that the readers could get some benefits from this collection of papers.

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