Editorial: The Ubiquitous Internet of Things in Electricity (IOTE): Computational-Intelligence-based Optimization, Security Control, and Fault Diagnosis

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The ubiquitous internet of things in electricity (IOTE) provides a new intelligent way to handle the different links of modern power grids, such as energy production, delivery, and consumption. The IOTE has deeply integrated several advanced technologies including Cloud Platform, Big Data, Internet of Things, Mobile Internet and Artificial Intelligence. Promoting the developments of IOTE will effectively improve the levels of security and energy management, and further benefit the renewable energy industry. Therefore, IOTE plays an important role in upgrading the energy industry and the construction of energy ecosystems.

Although IOTE brings a promising future of modern power grids, it also faces many technical and theoretical challenges in the optimization of energy management and the security of control. In order to address these crucial problems, it is necessary for IOTE to implement the computational-intelligence-based optimization algorithms, design advanced secure control strategies against the attacks from communication networks or sensors, and develop intelligent fault diagnosis schemes.

This special issue features Five selected papers with high quality.

The first paper, titled Multiple Faults Diagnosis of Distribution Network Lines Based on Convolution Neural Network with Fuzzy Optimization, proposes a multi-fault diagnosis model of a distribution network based on a fuzzy optimal convolutional neural network. First, the fault line and type judgment based on two soft maximum classifiers are analyzed. Membership functions of distribution network faults are established by using the fuzzy theory. Secondly, the influence of convolution kernel number and sample width on the accuracy of model diagnosis is studied and analyzed.

The second paper, titled Employing Best Input SVR Robust Lost Function with Nature-Inspired Metaheuristics in Wind Speed Energy Forecasting, presents a comparison of the

performance of various Support Vector Regression (SVR) applied to short-term wind power forecasting. The analogy with BORUTA and multivariate adaptive regression splines (MARS) as judge best input, and employ genetic algorithm and particle swarm optimization to find the best parameter in Support Vector Regression with robust lost function.

The third paper is a survey about Big Data for IoT in Cloud Computing. First, it introduces the concept of big data and cloud computing, and the main characteristics of big data are described in 6V mode. Then, it focuses on the main processes of big data, such as data acquisition, data organization and management, data analysis, and data presentation. After that, based on the architecture of could computing, big data frameworks and their characteristics are described.

The fourth paper, titled A novel prediction framework on sequence data flow with pre-trained node fusion, proposes a pre-trained node model with multiple fusion layers architecture SPP (Sequence Prediction via Node fusion). The model considers both connections of nodes and the time-variant status of nodes to predict the value of the next node. Multiple fusion layers can be exploited to capture spatial features and temporal dependencies from historical data.

The fifth paper discusses the Short-term Load Forecasting Model of the Integral Energy System Considering Demand Side Response. First, the topology and mathematical expression of the distributed energy system are summarized. Then, considering the comprehensive influencing factors of demand response, the radial neural network (RBF-NN) short-term load forecasting model is constructed. Third, the semi-trapezoidal membership function is employed to eliminate the user response fuzzy attribute, and the result of the demand response precision quantization is introduced into the RBF-NN model.