

Open Invited Track

Applications of Advanced Deep Neural Networks to Forecasting Problems in Smart Grid

Proposed by

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Abstract

This Open Invited Track presents new Deep Neural Networks (DNNs) for forecasting problems in Smart Grid. It is aimed at understanding different DNN models from a standpoint of theoretical background and the applications in Smart Grid. It has important components like Renewable Energy, Power Markets, EVs, DR (Demand Response), Energy Storage Systems (ESSs), Virtual Power Plants (VPPs), etc. As a result, Smart Grid operation and planning become much more complicated and highly nonlinear. Turning our attention to Artificial Intelligence (AI), it is now the third AI boom since the development of Deep Learning in 2006. The use of DNNs has been rapidly spread in the fields of engineering fields due to better performance than the conventional Artificial Neural Networks (ANNs) in terms of model accuracy. On the surface, DNNs might look similar to ANNs, but in practice, DNNs are often different from conventional ANNs. DNNs have been originally developed in the field of image processing, which means that it is not necessarily straightforward to apply DNNs to smart grid operation and planning. Namely, we need to think out new applications by having enough knowledge about DNNs in different case studies. In this invited open track, we focus on forecasting problems in Smart Grid.

Detailed description

This Open Invited Track focuses on applications of DNNs to forecasting of a lot of variables in Smart Grid that allows decision makers to solve highly nonlinear complicated systems. As DNN models, the following models are widely spread in engineering fields: CNNs (Convolutional Neural Networks), Pre-learning methods with Restricted Boltzmann Machine and Autoencoders, LSTM (Long Short Term Memory) and its variants such as GRU (Gated Recurrent Unit) , Residual Networks, GAN (General Adversarial Network), etc. However, DNNs still have potential problems as follows:

- 1) How to tune up parameters efficiently
- 2) In conjunction with item1), how to make DNNs more robust for unknown data
- 3) How to improve model accuracy, etc.
- 4) How to speed up learning time

It is challenging to handle DNN models with some insights in Smart Grid really well. Therefore, this track is calling for papers with the following topics:

- PV generation output forecasting with Advanced Deep Neural Networks
- Wind power generation output forecasting with Advanced Deep Neural Networks
- Electricity Price forecasting in Power Markets with Advanced Deep Neural Networks
- Load Forecasting Price forecasting with Advanced Deep Neural Networks
- Applications of DNNs to Control of EV Charging/Discharging
- Applications of DNNs to DR (Demand Response)
- Applications of DNNs to Control of Energy Storage Systems (ESSs)
- DNN-based Model Predictive Control for Smart Grid, etc.

Link to a web page

<https://hmori2911.wixsite.com/tc6-3-oit>