Utility Analytics 301: *Machine Learning and Big Data Analytics for Power Systems & Smart Grid*

About this training

Description

This course provides background information, real-world development experience, and in-depth discussions of big data analytics and machine learning in power systems and smart grid. The value, velocity, volume, and variety of big data in smart grid will be discussed. The basics of machine learning algorithms such as unsupervised learning, supervised learning, and reinforcement learning algorithms will be covered. Important real-world applications of big data analytics and machine learning in transmission system, distribution system, and electricity market will be presented.

Audience

This training is intended for the following audiences:

1. Utility professionals who are interested in machine learning and big data analytics in power systems and smart grid
2. Utility Analytics 101 and 201 completers who want to continue advancing their in-depth knowledge of machine learning in power systems and smart grid

Prerequisites

College- or university-level statistics and algebra or equivalent experience.

Objectives

- Understand how to assess the business value of machine learning and big data analytics in smart grid
- Identify important machine learning and big data applications in smart grid
- Explain and selection of machine learning algorithms
- Learn about how to develop big data applications in smart grid
- Understand how to apply machine learning algorithms to solve problems in transmission system, distribution system, and electricity market

Course Outline continued next page…

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Course Outline (Virtual Classroom*)

Day 1 (4-hours)

Introduction

- **Self-Introduction**
- **Course Objectives**
- **Big Data in Power Systems & Smart Grid**
  - Volume, Variety, Velocity, and Value
- **Overview of Machine Learning Applications in Smart Grid**
  - Applications in Transmission System
  - Applications in Distribution System
  - Applications in Electricity Market
  - Applications for End-use Customers
- **Overview of Machine Learning Algorithms**
  - Unsupervised and Supervised Machine Learning
  - Deep Neural Networks (Feed-forward, Convolution, Recurrent, and Graph Neural Network)
  - Reinforcement and Imitation Learning
  - Generative Model

Day 2 (4-hours)

- **Applications of Machine Learning in Distribution System**
  - Topology Identification in Distribution Network
  - Electricity Theft Detection
  - Predictive Maintenance for Transformers
- **Applications of Machine Learning for End-use Customers**
  - Estimation of Behind-the-meter Solar Generation
- **Applications of Machine Learning in Electricity Market**
  - Algorithmic Trading with Virtual Bids

Day 3 (4-hours)

- **Applications of Machine Learning in Transmission System**
  - Abnormal Event Detection and Labeling
  - Power System Event Classification
- **Applications of Machine Learning in Distribution System**
  - Graph learning for distribution parameter estimation
  - Reinforcement learning based control in distribution system
- **Next Steps and Concluding Remarks**

**In-person class will be held over a two-day period (6-hours each day)*