

### Description

Forecasting is an entry point to applying machine learning across many industries. Whether it's optimizing the supply chain through better product demand forecasts, allocating computing resources more effectively by predicting web server traffic, or saving lives by staffing hospitals to meet patient needs, there are few domains where accurate forecasts don't return their investments quickly.

This bootcamp is designed to provide you with the conceptual understanding and tools you need to apply forecasting in your own work.

### Intended Audience

This course is intended for:

- Developers and engineers
- Data scientists
- Machine learning practitioners

### Course Objectives

In this course, you will learn how to:

- Leverage Long Short-Term Memory (LSTM) neural networks for forecasting
- Apply forecasting to data through the Amazon SageMaker DeepAR algorithm
- Train a neural network-based model using MXNet and Gluon
- Build, train, and host a state-of-the-art time series forecasting model (LSTNet) in Amazon SageMaker

### Prerequisites

We recommend that attendees of this course have the following prerequisites:

- Familiarity with deep learning concepts (neural networks)
- Experience developing with Python and using Jupyter Notebooks
- Familiarity with AWS services (AWS IAM, Amazon S3, Amazon SageMaker)
- Background knowledge/experience with linear algebra and statistical concepts

### Delivery Method

This course is delivered through a mix of:

- Classroom training
- Hands-on labs

### Hands-On Activity

This course allows you to test new skills and apply knowledge to your working environment through a variety of hand-on labs that compliment and build off of presentation content.

### Duration

8 hours

### Course Outline

This course covers the following concepts:

- Module 1: Time Series Forecasting with Neural Networks

- Overview of Time Series Forecasting
- Long-Term Dependency Problem, Neural Networks, and Recurrent Neural Networks
- Vanishing Gradient and LSTM
- Lab: Forecasting with an LSTM Neural Network
- Module 2: Amazon SageMaker and DeepAR for Time Series Forecasting
  - Overview of Amazon SageMaker
  - Amazon SageMaker DeepAR (LSTM-parameterized Likelihood and Monte Carlo Simulation)
  - Lab: Using DeepAR to Forecast Time Series Data
- Module 3: Introduction to MXNet and Gluon
  - Overview of MXNet
  - Overview of Gluon
  - Lab: Building a Neural Network with Gluon
- Module 4: LSTNet
  - Background into LSTNet
  - LSTNet Architecture and Implementation
  - Lab: Building a Custom Forecasting Model with LSTNet

#### Important Course References and Documents

1. DeepAR: Probabilistic Forecasting with Autoregressive Recurrent Networks: <https://arxiv.org/abs/1704.04110>
2. Amazon SageMaker DeepAR Algorithm: <https://docs.aws.amazon.com/sagemaker/latest/dg/deepar.html>
3. Modeling Long- and Short-Term Temporal Patterns with Deep Neural Networks (LSTNet): <https://arxiv.org/abs/1703.07015>