

# Machine Learning Foundation: Working with Statistics, Algorithms and Neural Networks - TTML5504

Explore the Math Behind the Magic | Deep Dive Popular Algorithms, Supervised vs Unsupervised Learning, Neural Networks & More

**Duration:** 3 Days

**Skill Level:** Introductory

**Available Format:** Instructor-Led Online; Instructor-Led, Onsite In Person ; Blended; On Public Schedule

**Machine Learning Foundation** is a hands-on introduction to the mathematics and algorithms used in Data Science, as well as creating the foundation and building the intuition necessary for solving complex machine learning problems. The course provides a good kick start in several core areas with the intent on continued, deeper learning as a follow on.

## What You'll Learn

### Overview

**Machine Learning Foundation** is a hands-on introduction to the mathematics and algorithms used in Data Science, as well as creating the foundation and building the intuition necessary for solving complex machine learning problems. The course provides a good kick start in several core areas with the intent on continued, deeper learning as a follow on.

Although this course is highly technical in nature, it is a foundation-level machine learning class for Intermediate skilled team members who are relatively new to AI and machine learning. This course as-is is not for advanced participants.

## Objectives

This “skills-centric” course is about **50% hands-on lab and 50% lecture**, with extensive practical exercises designed to reinforce fundamental skills, concepts and best practices taught throughout the course. Throughout the course students will learn about and explore popular machine learning algorithms, their applicability and limitations and practical application of these methods in a machine learning environment.

This course reviews key foundational mathematics and introduces students to the algorithms of Data Science. Working in a hands-on learning environment, students will explore:

- Popular machine learning algorithms, their applicability and limitations
- Practical application of these methods in a machine learning environment
- Practical use cases and limitations of algorithms
- Core machine learning mathematics and statistics
- Supervised Learning vs. Unsupervised Learning
- Classification Algorithms
- Regression Algorithms
- Neural Networks
- How to choose an algorithm for a given problem
- How to choose parameters and activation functions
- Ensemble methods

**Need different skills or topics?** If your team requires different topics or tools, additional skills or custom approach, this course may be further adjusted to accommodate. We offer additional AI, machine learning, data science, programming, Python/R and other related topics that may be blended with this course for a track that best suits your needs.

## Audience

Students attending this course should be familiar with Enterprise IT, have a general (high-level) understanding of systems architecture, as well as some knowledge of the business drivers that might be able to take advantage of applying AI.

This course is ideally suited for a wide variety of technical learners who need an introduction to the core skills, concepts and technologies related to AI programming and machine learning. Attendees might include:

- Developers aspiring to be a 'Data Scientist' or Machine Learning engineers
- Analytics Managers who are leading a team of analysts
- Business Analysts who want to understand data science techniques
- Information Architects who want to gain expertise in Machine Learning algorithms
- Analytics professionals who want to work in machine learning or artificial intelligence
- Graduates looking to build a career in Data Science and machine learning
- Experienced professionals who would like to harness machine learning in their fields to get more insight about customers

## Pre-Requisites

Although this course is highly technical in nature, it is a foundation-level machine learning class for Intermediate skilled team members who are relatively new to AI and machine learning. This course as-is is not for advanced participants.

This course is geared for Data Analysts, Programmers, Administrators, Architects, and Managers interested in a deeper exploration of common algorithms and best practices in machine learning. Attending students should have

- Strong foundational mathematics skills in Linear Algebra and Probability, to start learning about and using basic machine learning algorithms and concepts
- Basic Python Skills. Attendees without Python background may view labs as follow along exercises or team with others to complete them. (NOTE: This course is also offered in R or Scala – please inquire for details)

- Basic Linux skills, including familiarity with command-line options such as ls, cd, cp, and su

**Take Before:** Attending students should have incoming skills equivalent to those in the course(s) below, or should have attended these as a pre-requisite:

- **TTPS4800** Introduction to Python (3 days)

TTPS4800                      Introduction to Python Programming Basics

## Agenda

*Please note that this list of topics is based on our standard course offering, evolved from typical industry uses and trends. We will work with you to tune this course and level of coverage to target the skills you need most. Course agenda, topics and labs are subject to adjust during live delivery in response to student skill level, interests and participation.*

### Fundamental Concepts

- What is deep learning?
- Supervised Learning
- Unsupervised Learning
- Parametric / nonparametric Learning
- Statistics and Probability Overview

### Neural Predictions (Forward Propagations)

- Simple Neural Network Predictions
- What is a Neural Network?
- Make predictions with multiple inputs
- Predict with multiple inputs and outputs
- Predict on predictions
- NumPy (Numerical Python Primer)

## **Gradient Descent**

- Measuring Error
- Crude Learning
- Characteristics of crude learning
- Calculate direction and error
- Single iteration of gradient descent
- Divergence
- Alpha
- Learning

## **Neural Network Generalization**

- Gradient Descent with multiple inputs
- Freezing weights
- Gradient Descent with multiple outputs and inputs
- What do weights learn
- Linear Algebra and the Dot Product (how does it help us learn)

## **Backpropagation and Building your First E2E Neural Network**

- Build a Neural Network
- Learn the whole dataset
- Full, Batch, Stochastic Gradient Descent
- Overfitting
- Correlations
- Backpropagation
- Putting it all together

## **Machine Learning Regression**

- What is Classification
- Binary Classification for Machine Learning
- Multi-Class Classification
- Multi-Label Classification for Machine Learning
- Imbalanced Classification for Machine Learning
- Hands-on

- Assessment

## **Machine Learning Classification**

- What is Classification
- Binary Classification for Machine Learning
- Multi-Class Classification
- Multi-Label Classification for Machine Learning
- Imbalanced Classification for Machine Learning
- Hands-on
- Assessment
- Program Assessment
- Assessment Solutions

## **Machine Learning Resampling and Tuning**

- Resampling
- Evaluation Metrics
- Evaluation Metrics for Regression
- Evaluation Metrics for Classification
- Hyperparameter Tuning
- Grid Search
- Random Search
- Hands-on
- Assessment

## **Ensemble Methods**

- Ensemble Theory and Methods
- Ensemble Classifiers
- Bucket of Models
- Boosting
- Stacking

## Related Courses

TTML5502	Exploring AI & Machine Learning for the Enterprise Overview (Light Hands-on)
TTML5503	Introduction to AI & Machine Learning JumpStart
TTML5506-P	Machine Learning Essentials with Python
TTML5504	Machine Learning Foundation: Working with Statistics, Algorithms and Neural Networks

## For More Information

Please [contact us](#) or call 844-475-4559 toll free for more information about our training services (instructor-led, self-paced or blended), coaching and mentoring services, public course enrollment or questions, partner programs, courseware licensing options and more.