# Introduction to Machine Learning with TensorFlow Syllabus

## Contact Info

While going through the program, if you have questions about anything, you can reach us at enterprise-support@udacity.com. For help from Udacity Mentors and your peers visit the Udacity Classroom.

## Nanodegree Program Info

Learn foundational machine learning techniques — from data manipulation to unsupervised and supervised algorithms.

### Prerequisite Skills

A well-prepared learner is able to:

- Python

**Version**: 1.0.0

**Length of Program**: 74 Days*

** This is a self-paced program and the length is an estimation of total hours the average student may take to complete all required coursework, including lecture and project time. Actual hours may vary.*

## Part 1: Introduction to Machine Learning

## Part 2: Supervised Learning

### Project: Finding Donors for CharityML

You've covered a wide variety of methods for performing supervised learning -- now it's time to put those into action!

**Supporting Lessons**

| Lesson | Summary |
|---|---|
| **Machine Learning Bird's Eye View** | Before diving into the many algorithms of machine learning, it is important to take a step back and understand the big picture associated with the entire field. |
| **Linear Regression** | Linear regression is one of the most fundamental algorithms in machine learning. In this lesson, learn how linear regression works! |
| **Perceptron Algorithm** | The perceptron algorithm is an algorithm for classifying data. It is the building block of neural networks. |
| **Decision Trees** | Decision trees are a structure for decision-making where each decision leads to a set of consequences or additional decisions. |
| **Naive Bayes** | Naive Bayesian Algorithms are powerful tools for creating classifiers for incoming labeled data. Specifically Naive Bayes is frequently used with text data and classification problems. |
| **Support Vector Machines** | Support vector machines are a common method used for classification problems. They have been proven effective using what is known as the 'kernel' trick! |
| **Ensemble Methods** | Bagging and boosting are two common ensemble methods for combining simple algorithms to make more advanced models that work better than the simple algorithms would on their own. |
| **Model Evaluation Metrics** | Learn the main metrics to evaluate models, such as accuracy, precision, recall, and more! |
| **Training and Tuning** | Learn the main types of errors that can occur during training, and several methods to deal with them and optimize your machine learning models. |

# Part 3: Deep Learning

### Project: Create Your Own Image Classifier - TensorFlow

In this project, you'll build a Python application that can train an image classifier on a dataset, then predict new images using the trained model.

**Supporting Lessons**

| Lesson | Summary |
| --- | --- |
| **Introduction to Neural Networks** | In this lesson, Luis will give you solid foundations on deep learning and neural networks. You'll also implement gradient descent and backpropagation in python right here in the classroom. |
| **Implementing Gradient Descent** | Mat will introduce you to a different error function and guide you through implementing gradient descent using NumPy matrix multiplication. |
| **Training Neural Networks** | Now that you know what neural networks are, in this lesson you will learn several techniques to improve their training. |
| **Deep Learning with TensorFlow** | Learn how to use TensorFlow for building deep learning models. |

# Part 4: Unsupervised Learning

## Project: Creating Customer Segments with Arvato

In this project, you'll apply your unsupervised learning skills to two demographics datasets, to identify segments and clusters in the population, and see how customers of a company map to them.

### Supporting Lessons

| Lesson | Summary |
| --- | --- |
| **Clustering** | Clustering is one of the most common methods of unsupervised learning. Here, we'll discuss the K-means clustering algorithm. |
| **Hierarchical and Density Based Clustering** | We continue to look at clustering methods. Here, we'll discuss hierarchical clustering and density-based clustering (DBSCAN). |
| **Gaussian Mixture Models and Cluster Validation** | In this lesson, we discuss Gaussian mixture model clustering. We then talk about the cluster analysis process and how to validate clustering results. |
| **Dimensionality Reduction and PCA** | Often we need to reduce a large number of features in our data to a smaller, more relevant set. Principal Component Analysis, or PCA, is a method of feature extraction and dimensionality reduction. |
| **Random Projection and ICA** | In this lesson, we will look at two other methods for feature extraction and dimensionality reduction: Random Projection and Independent Component Analysis (ICA). |

# Part 5: Congratulations!

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Generated Wed Oct 14 06:17:32 PDT 2020