## **Introduction**

What is Machine Learning?

Supervised Learning

Unsupervised Learning

## **Linear Regression with One Variable**

[Model Representation](https://www.coursera.org/lecture/machine-learning/model-representation-db3jS" \t "https://www.coursera.org/learn/_blank)

Cost Function

Cost Function - Intuition I

Cost Function - Intuition II

Gradient Descent

Gradient Descent Intuition

Gradient Descent For Linear Regression

## **Linear Regression with Multiple Variables**

[Multiple Features](https://www.coursera.org/lecture/machine-learning/multiple-features-6Nj1q" \t "https://www.coursera.org/learn/_blank)

Gradient Descent for Multiple Variables

Gradient Descent in Practice I - Feature Scaling

Gradient Descent in Practice II - Learning Rate

Features and Polynomial Regression

Normal Equation

Normal Equation Noninvertibility

## **Logistic Regression**

[Classification](https://www.coursera.org/lecture/machine-learning/classification-wlPeP" \t "https://www.coursera.org/learn/_blank)

Hypothesis Representation

Decision Boundary

Cost Function

Simplified Cost Function and Gradient Descent

Advanced Optimization

Multiclass Classification: One-vs-all

## **Regularization**

[The Problem of Overfitting](https://www.coursera.org/lecture/machine-learning/the-problem-of-overfitting-ACpTQ" \t "https://www.coursera.org/learn/_blank)

Cost Function

Regularized Linear Regression

Regularized Logistic Regression

## **Neural Networks: Representation**

[Non-linear Hypotheses](https://www.coursera.org/lecture/machine-learning/non-linear-hypotheses-OAOhO" \t "https://www.coursera.org/learn/_blank)

Neurons and the Brain

Model Representation I

Model Representation II

Examples and Intuitions I

Examples and Intuitions II

Multiclass Classification

## **Neural Networks: Learning**

[Cost Function](https://www.coursera.org/lecture/machine-learning/cost-function-na28E" \t "https://www.coursera.org/learn/_blank)

Backpropagation Algorithm

Backpropagation Intuition

Implementation Note: Unrolling Parameters

Gradient Checking

Random Initialization

Putting It Together

Autonomous Driving

## **Advice for Applying Machine Learning**

[Deciding What to Try Next](https://www.coursera.org/lecture/machine-learning/deciding-what-to-try-next-OVM4M" \t "https://www.coursera.org/learn/_blank)

Evaluating a Hypothesis

Model Selection and Train/Validation/Test Sets

Diagnosing Bias vs. Variance

Regularization and Bias/Variance

Learning Curves

Deciding What to Do Next Revisited

## **Machine Learning System Design**

[Prioritizing What to Work On](https://www.coursera.org/lecture/machine-learning/prioritizing-what-to-work-on-4h5X4" \t "https://www.coursera.org/learn/_blank)

Error Analysis

Error Metrics for Skewed Classes

Trading Off Precision and Recall

Data For Machine Learning

## **Support Vector Machines**

[Optimization Objective](https://www.coursera.org/lecture/machine-learning/optimization-objective-sHfVT" \t "https://www.coursera.org/learn/_blank)

Large Margin Intuition

Mathematics Behind Large Margin Classification

Kernels I

Kernels II

Using An SVM

## **Unsupervised Learning**

[Unsupervised Learning: Introduction](https://www.coursera.org/lecture/machine-learning/unsupervised-learning-introduction-czmip" \t "https://www.coursera.org/learn/_blank)

K-Means Algorithm

Optimization Objective

Random Initialization

Choosing the Number of Clusters

## **Dimensionality Reduction**

[Motivation I: Data Compression](https://www.coursera.org/lecture/machine-learning/motivation-i-data-compression-0EJ6A" \t "https://www.coursera.org/learn/_blank)

Motivation II: Visualization

Principal Component Analysis Problem Formulation

Principal Component Analysis Algorithm

Reconstruction from Compressed Representation

Choosing the Number of Principal Components

Advice for Applying PCA

## **Anomaly Detection**

[Problem Motivation](https://www.coursera.org/lecture/machine-learning/problem-motivation-V9MNG" \t "https://www.coursera.org/learn/_blank)

Gaussian Distribution

Algorithm

Developing and Evaluating an Anomaly Detection System

Anomaly Detection vs. Supervised Learning

Choosing What Features to Use

Multivariate Gaussian Distribution

Anomaly Detection using the Multivariate Gaussian Distribution

## **Recommender Systems**

[Problem Formulation](https://www.coursera.org/lecture/machine-learning/problem-formulation-Rhg6r" \t "https://www.coursera.org/learn/_blank)

Content Based Recommendations

Collaborative Filtering

Collaborative Filtering Algorithm

Vectorization: Low Rank Matrix Factorization

Implementational Detail: Mean Normalization

## **Large Scale Machine Learning**

[Learning With Large Datasets](https://www.coursera.org/lecture/machine-learning/learning-with-large-datasets-CipHf" \t "https://www.coursera.org/learn/_blank)

Stochastic Gradient Descent

Mini-Batch Gradient Descent

Stochastic Gradient Descent Convergence

Online Learning

Map Reduce and Data Parallelism

## **Application Example: Photo OCR**

[Problem Description and Pipeline](https://www.coursera.org/lecture/machine-learning/problem-description-and-pipeline-iDBMm" \t "https://www.coursera.org/learn/_blank)

Sliding Windows

Getting Lots of Data and Artificial Data

Ceiling Analysis: What Part of the Pipeline to Work on Next

Summary and Thank You