### What is Machine Learning?

Supervised vs. Unsupervised

### <Linear Regression with One Variable>

### Model and Cost Function

Model Representation

Cost Function

Cost Function - Intuition I

Cost Function - Intuition II

#### Parameter Learning

Gradient Descent

**Gradient Descent Intuition** 

Gradient Descent for Linear Regression

Linear Algebra Review (간단하게 정리)

week 2 Yoonjung Choi

## <Linear Regression with Multiple Variables>

## Multivariate Linear Regression

Multiple Features

Gradient Descent for Multiple Variables

Gradient Descent in Practice I - Feature Scaling

Gradient Descent in Practice II - Learning Rate

Features and Polynomial Regression

## Computing Parameters Analytically

Normal Equation

Normal Equation Non Invertibility

# <<2 회차 10.10.2020>>

## week 3

### <Logistic Regression>

## 1)Classification and Representation Yoonjung Cho

Classification

Hypothesis Representation

Decision Boundary

## 2)Logistic Regression Model Sanggeon Park

Cost Function

Simplified Cost Function and Gradient Descent

Advanced Optimization

## 3) Multiclass Classification (multi-level classification ) Sung Chul Noh

Multiclass Classification: One-vs-all

Quiz: Logistic Regression

## <Regularization>

### 4)Solving the Problem of Overfitting liliu Kim

Problem of Overfitting

Cost Function

Regularized Linear Regression

Regularized Logistic Regression

Assignment : logistic regression

Week4

## <supervised learning : Neural Networks: Representation>

### Motivations

Non-linear Hypotheses

Neurons and the Brain

### 5)Neural Networks Dae Bum Lee

Model Representation I

Model Representation II

# 6)Applications Jaeho Shin

Examples and Intuitions, I

Examples and Intuitions, II

Multiclass Classification

Assignment : multi-class classification and N

# <<3 회차 24.10.2020>>

### week 5

## <Neural Networks: Learning>

## Cost Function and Backpropagation Hyemi Kim

Cost Function

Backpropagation Algorithm

Backpropagation Intuition

Backpropagation in Practice Yoonjung Choi

Implementation Note: Unrolling Parameters

Gradient Checking

Random Initialization

Putting It Together

### Application of Neural Networks Sanggeon Park

Autonomous Driving

Assignment: NN Learning (learning only)

week 6

## <Advice for Applying Machine Learning> Minsung Kim

## Evaluating a Learning Algorithm

Deciding What to Try Next

Evaluating a Hypothesis

Model Selection and Train/Validation/Test Sets

#### Bias vs. Variance

Diagnosing Bias vs. Variance

Regularization and Bias/Variance

Learning Curves

Deciding What to Do Next Revisited

Assignment: regularized linear regression and bias /variance

### <Machine Learning System Design> Daebum Kim

### Building a Spam Classifier

Prioritizing What to Work On

Error Analysis

### Handling Skewed Data

Error Metrics for Skewed Classes Trading Off Precision and Recall

## Using Large Data Sets

Data for Machine Learning

# <<4 회차 7.11.2020>>

week 7

## <Support Vector Machine SVM > lilju Kim

## Large Margin Classification

Optimization Objective

Large Margin Intuition

Mathematics Behind Large Margin Classification

#### Kerne

Kernels I

Kernels II

### SVMs in Practice

Using An SVM

Assignment : SVM

## < Unsupervised Learning>>

week 8

### <Unsupervised Learning>

## Clustering Wooju Jeong

Unsupervised Learning: Introduction

K-Means Algorithm

Optimization Objective

Random Initialization

Choosing the Number of Clusters

## <Dimensionality Reduction> Jaeho Shin

### Motivation

Motivation I: Data Compression

Motivation II: Visualization

### Principal Component Analysis(PCA)

Principal Component Analysis Problem Formulation

Principal Component Analysis Algorithm

### Applying PCA(Principal Component Analysis)

Reconstruction from Compressed Representation

Choosing the Number of Principal Components

Advice for Applying PCA

Assignment: K-Means Clustering and PCA(Principal Component Analysis

# <<5 회차 21 11 2020>>

## week 9

<Anomaly Detection> Junwha Huh

### Density Estimation

Problem Motivation Gaussian Distribution Algorithm

## **Building an Anomaly Detection System**

Developing and Evaluating an Anomaly Detection System

Anomaly Detection vs. Supervised Learning

Choosing What Features to Use

### Multivariate Gaussian Distribution (Optional)

Multivariate Gaussian Distribution

Anomaly Detection using the Multivariate Gaussian Distribution

## < Recommender Systems > Yoonjung Choi

### Predicting Movie Ratings

Problem Formulation
Content Based Recommendations

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#### Collaborative Filtering

Collaborative Filtering

Collaborative Filtering Algorithm

## Low Rank Matrix Factorization

Vectorization: Low Rank Matrix Factorization

Implementational Detail: Mean Normalization

Assignment : anomaly detection and recommender systems

week 10

## < Large Scale Machine Learning > Hyemi Kim

## Gradient Descent with Large Datasets

Learning with Large Datasets

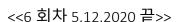
Stochastic Gradient Descent

Mini-Batch Gradient Descent Stochastic Gradient Descent Convergence

# Advanced Topics

Online Learning

Map Reduce and Data Parallelism



week 11

# <Application Example: Photo OCR> Sanggeon Park

## Photo OCR

Problem Description and Pipeline

Sliding Windows

Siluling Williaows

Getting Lots of Data and Artificial Data Ceiling Analysis: What Part of the Pipeline to Work on Next