격주 토요일 진행 <<1 회차 26.9.2020(완료)>>

week 1 **Yoonjung Choi**

<Introduction>

- **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 Choi**
  - 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** **Iilju 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 > **Iilju Kim**

- **Large Margin Classification**
  - Optimization Objective
  - Large Margin Intuition
  - Mathematics Behind Large Margin Classification
- **Kernels**
  - 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
- **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

<<6 회차 5.12.2020 끝>>

week 11

<Application Example: Photo OCR> **Sanggeon Park**

- **Photo OCR**
  - Problem Description and Pipeline
  - Sliding Windows
  - Getting Lots of Data and Artificial Data
  - Ceiling Analysis: What Part of the Pipeline to Work on Next