13.1 Informal Course Overview

13.1.1 Unsupervised

Clustering

- K-Means

- Gaussian Mixture Model (GMM), learned with EM

- Spectral Clustering

Dimensionality Reduction

- PCA (and Probabilistic PCA)

13.1.2 Supervised

Binary Classification

- k-Nearest Neighbors, kernel k-NN

- Naïve Bayes

- Hyperplane Classifiers:

    - Perceptron (and Margin Perceptron)
    - Winnow
    - SVM:
        * Hard Margin and Soft Margin SVM
        * Kernel SVM: Polynomial and Gaussian Kernels, others

- Decision Tree (e.g. with Decision Stumps)

- Boosting:

  – AdaBoost (e.g. with Decision Stumps)

  – Bagging, Stacking

  – Random Forest

Multiclass Classification

- K-Nearest Neighbors

- Naïve Bayes

- Multiclass SVM: One vs. All, One vs. One

Regression

- K-Nearest Neighbors Regression

- Linear Regression

- Linear Regression with Regularization:

  – Ridge Regression
  – Lasso Regression

- Logistic Regression

13.1.3   Tools and Theory

Model Selection

- Train vs. Test, k-fold Cross Validation

- Penalty

Statistics

- Maximum Likelihood (ML) Estimators

- Maximum Aposteriori (MAP) Estimators

Optimization

- Gradient Descent (and Coordinate Gradient Descent)

- Linear Programming, Quadratic Programming

- Expectation-Maximization (EM)

Others

- PAC Framework

- Singular Value Decomposition (SVD)