Mid-Term Review

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Overview

• Midterm: 10 questions (Basic questions 80% + tricky questions 20%)

• Time: 75 mins (use your time wisely)

• You can expect to receive >80 points in exam if you well understand all contents in this slides

• Tricky questions are still covered by this slides, but require deeper understanding on all algorithms
Probability

- Joint Probability
- Conditional Probability
- Marginal Probability
- Bayes Rule
- Independence
- Conditional Independence
Probability

• Basically, given the joint probability, you should know how to compute the conditional probability, marginal probability, and know how to verify the independence and conditional independence

• Understand Bayes rule and know how to use Bayes rule to compute the probability you desire
Naive Bayes

- Key assumption: Conditional independence
- How to predict the label?
Naive Bayes

- Given the training samples, know how to use the Naive Bayes rule to predict the labels. Basically, you know the procedure of Naive Bayes classifier.
- Understand the key assumption of Naive Bayes and its limitation.
K-Means

• Algorithm procedure (given you the data points, know how to use this algorithm to generate the clustering result)

• Distortion function (understand the geometric meaning of this distortion function)
Hierarchical Clustering

• Algorithm procedure (given you the data points, know how to use this algorithm to generate the clustering result)

• Cluster distance (understand several commonly used cluster distance and know which one to use in different scenarios)
KNN

- Algorithm procedure (given you the data points, know how to use this algorithm to generate the clustering result)
- Decision boundary
- Accuracy evaluation (know how to evaluate accuracy given the testing points)
SVM

- Understand how to obtain the SVM formulation (understand the meanings of each component: $w^Tw$, $C$, constraint, slack variable, optimization variables)

- Slack variables (Why do we need slack variables? What does it mean if slack variable $>0$ or $=0$?)
SVM

- Kernel approach (know why do we use kernel approach)
- Linear separable / non-separable (understand the definition)
- Prediction (know how to use \( w \) and \( b \) to predict the label for testing sample)
- Accuracy evaluation (know how to evaluate the accuracy on given a data set)
Decision Tree

- Entropy (given a distribution, how to compute the entropy; what does entropy standard for?)
- How to construct a decision tree? (Given you a set of training samples, know how to construct a decision tree)
- Accuracy evaluation (given you a data set, know how to use the decision tree to evaluate the prediction accuracy)
- How to prune a decision tree? (Know how to prune an internal node (change a internal node to a leaf node); know how to evaluate the accuracy on the tuning data set on the pruned decision tree.)