Machine Learning and Pattern Recognition

ECE 4950

Lecture 1

- Went over the intro slides.
- Types of machine learning
  - Supervised, Unsupervised, Reinforcement
- Spam vs Ham examples
- The ML pipeline
- Features, labels, training and test.

Lecture 2

- Introduced decision trees.
- What is a decision tree,
- Steps in designing a decision tree
- Select one attribute, divide samples recursively according to that.
- Started explaining how to choose ‘best’ attributes?
- Running example was of age, gender, height prediction

Lecture 3

- How to select the best attribute
- Main focus on information gain
- Tennis example
- Computed information gain for the four attributes
- Outlook has highest gain here

Lecture 4

- Issues with decision tree learning
- What is over-fitting (in general)
- Test vs Train errors
- Validation Set
- Ways to reduce over-fitting in decision trees
- Stop growing or prune the tree

Lecture 5

- Wrapped up DT learning
- Discriminative vs Generative classifiers
- Bayes' Rule for Classification
- Rule: $\max_i P(C_i) \cdot P(\bar{X}|C_i)$
- Finished with curse of dimensionality

Lecture 6

- Naïve Bayes Assumption
- Features independent given the class
- Examples with MNIST
- Additional assumption of Bag Of Words for text
- Simple estimation using count ratios!

Lecture 7

- Naïve Bayes Assumption
- Laplace, and Add-beta smoothing
- How to estimate probabilities

Lecture 8

- Naïve Bayes Assumption
- Gaussian Naïve Bayes,
- Mean variance estimation
- Tennis Example

Lecture 9 2/13

- Introduced Perceptron
- Linear classifiers
- Perceptron algorithm
  - Intuition behind perceptron

Lecture 6

- Linear classifiers
- Perceptron rule and guarantees
- Problems with perceptron