CS4375: Recap

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Supervised Learning

• Regression & classification

• Discriminative methods
  • k-NN
  • Decision trees
  • Perceptron
  • SVMs & kernel methods
  • Logistic regression
  • Neural networks

• Parameter learning
  • Maximum likelihood estimation
  • Expectation maximization
Bayesian Approaches

• MAP estimation
• Prior/posterior probabilities
• Bayesian networks
  • Naive Bayes
Unsupervised Learning

- Clustering
  - \(k\)-means
- Spectral clustering
- Hierarchical clustering
- Expectation maximization
  - Soft clustering
  - Mixtures of Gaussians
Learning Theory

- PAC learning
- VC dimension
- Bias/variance tradeoff
- Chernoff bounds
- Sample complexity
Optimization Methods

- Gradient descent
  - Stochastic gradient descent
  - Subgradient methods
- Coordinate descent
- Lagrange multipliers and duality
Matrix Based Methods

- Dimensionality Reduction
  - PCA
  - Matrix Factorizations
Ensemble Methods

- Bootstrap sampling
- Bagging
- Boosting
Other Learning Topics

• Evaluation metrics
• Reinforcement learning
Questions about the course content?
For the final...

- You should understand the basic concepts and theory of all of the algorithms and techniques that we have discussed in the course.

- There is no need to memorize complicated formulas, etc.
  - For example, if I ask for the sample complexity of a scheme, I will give you the generic formula.

- However, you should be able to derive the algorithms and updates.
  - E.g., Lagrange multipliers and SVMs, the EM algorithm, etc.
For the final...

• No calculators, books, notes, etc. will be permitted
  • As before, if you need a calculator, you have done something terribly wrong

• The exam will be in roughly the same format
  • Expect true/false questions, short answers, and two-three long answer questions

• Exam will emphasize the new material, but ALL material will be tested

• Take a look at the practice exams!
Final Exam

Monday, 12/9/2019
11:00AM - 1:45PM
ECSS 2.203
Related Courses at UTD

- Human Language Technologies (CS 4395)
- Introduction to Computer Vision (CS 4391)
- Artificial Intelligence (CS 4364)
- Computational Methods for Data Scientists (CS 4371)
- Intelligent Systems Design (CS 4315)
ML Related People

- Vincent Ng (NLP)
- Vibhav Gogate (MLNs, Sampling, Graphical Models)
- Sriraam Natarajan (Graphical Models & Reinforcement Learning)
- Sanda Harabagiu (NLP & Health)
- Dan Moldovan (NLP)
- Nicholas Ruozzi (Graphical Models & Approx. Inference)
- Rishabh Iyer (Submodular Functions)
- Jessica Ouyang (NLP)
Please evaluate the course!

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