Pattern Recognition

CS-688

Instructor: Dr. Carlotta Domeniconi

carlotta@cs.gmu.edu

Fall 2010

General Information

➢ Instructor: Carlotta Domeniconi

  ➢ Office: ENG, Rm 4424

  ➢ Email: carlotta@cs.gmu.edu

  ➢ Phone: (703) 993-1697

➢ Office hours: TR 4:30-5:30pm, or by appointment, or stop by

  ➢ http://www.cs.gmu.edu/~carlotta/teaching//CS-688-f10/info.html

➢ Visit the class webpage often!

Objective of the course

- In depth study and critical analysis of most current methodologies and most challenging problems in pattern recognition

- Technical tools from... linear algebra, probability, statistics, multivariate calculus, optimization

Topics (tentative)

- Issues with learning, model selection, over-fitting, decision theory, curse-of-dimensionality
- Linear Models for Classification
- Prototype Methods and Nearest Neighbors
- Neural Networks: back-propagation
- Dimensionality reduction: PCA, LDA, kernelized versions

More topics

- Kernel methods
- Support Vector Machines
- Clustering
- Mixture Models, EM, HMMs
- Additional topics: Subspace clustering; Ensemble methods for classification/clustering; Semi-supervised learning;

Course Format

- Lectures by the instructor
- Homeworks (require programming)
- Project: proposal, presentation, paper
- Midterm
- Final

Important Dates

- **October 19**: Midterm
- **Nov 30**: Final
- **TBD:** Project proposal due
- **Dec 7/14**: Project presentations
- **Dec 14**: Paper on the project due

Visit the class webpage often for updates!!!

The final grade is based on…

➢Homeworks: **20%**

➢Midterm1: **20%**

➢Midterm2: **20%**

➢Project (proposal, presentation, paper): **40%**

Some useful books

- **Textbook**:

  – Christopher M Bishop,
    "Pattern Recognition and Machine Learning",
    Springer, 2006.

  Companion website:
  http://research.microsoft.com/~cmbishop/PRML/index.htm

- **On Pattern Classification**:

  – R. O. Duda, P. E. Hart, D. G. Stork,
    "Pattern Classification",
    Second Edition, Wiley, 2001.

- **On Kernel Methods**:

  – Bernhard Scholkopf and Alexander Smola,
    *Learning with Kernels. Support Vector Machines,
    Regularization, Optimization, and Beyond*,
    The MIT Press, 2002.

  – John Shawe-Taylor and Nello Cristianini,
    Kernel Methods for Pattern Analysis,
    Cambridge University Press, 2004.

- **On Statistical Learning**:

  - T. Hastie, R. Tibshirani, and J. Friedman, "*The Elements of Statistical Learning. Data Mining, Inference and Prediction*", Springer, 2001. (Last Print!)