636 Midterm Review

- **When and Where**: 3/4/2008 (Tuesday), 12:45pm-2:00pm in HRBB 126: If everyone arrives early, we can begin early.
- **Material**: Haykin chapters 1 through 5 (with focus on the material discussed in the lecture only).
- **Things to bring**:
  - 1 sheet of notes on US letter paper (you may fill both sides). No limit on font size.
  - Scientific calculator (may not be necessary).
  - Your ID (TAMU ID or Texas driver's license).

Chapter 1: Introduction

- Benefits of neural networks
- Neural networks and brain organization
- Model neurons
- Neural network definition
- Similarity measures

Chapter 2: Learning

- Learning in general
- Five learning rules: err correction, Hebbian, memory-based, competetive, and Boltzman
- Learning paradigms: credit assignment problem, supervised and unsupervised learning.
- Memory: associative memory, correl. matrix memory, autoassociation
- Statistical nature of leanrning: bias/variance dilemma, VC dimension, PAC learning.

Chapter 3: Perceptrons and Linear Adaptive Filters

- Steepest descent
- Gauss-Newton method and linear least square fit (pseudoinverse)
- Perceptron: geometric interpretations (two ways)
- Perceptron: the role of the bias
- Linear separability and limitations of perceptron
- Perceptron learning rule
- Perceptron convergence theorem: geometric insight

Chapter 4: Multilayer Perceptrons

- Hidden unit representation, combination hidden units
- Error gradient and backpropagation
- Momentum
- Batch vs. sequential mode
- Representational power
- Training recurrent networks with backprop
- Function approximation with backprop
- Generalization and overfitting
- Curse of dimensionality
- Virtues and limitations of backprop

Chapter 4: Multilayer Perceptrons (supplemental)

- Heuristics for better backprop
- Weight normalization
- Backprop as optimization
- Conjugate direction method
- Conjugate gradient method

Chapter 5: Radial-Basis Function Networks

- Cover's theorem
- ϕ-separability
- Exact interpolation
- Regularization theory
- Generalized RBF
- Two phases in RBF learning
- Learning RBF centers