

Modeling Neural Systems (MCB 417)

A combination lecture/lab course in using computers to model the nervous system

Each week students will learn to use a new modeling paradigm, and will learn the relevance of that paradigm for understanding real neural systems.

- Instructor:** Thomas J. Anastasio
Associate Professor of Molecular and Integrative Physiology
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- Teaching assistant** Shawn Kohler, email: sjkohler@uiuc.edu
Office hours by appointment
- Meeting times:** Monday 3-5pm (lecture) Wednesday 3-5pm (computer lab)
- Meeting places:** lectures in 170 Everitt, labs in 406B8 Engineering Hall
- Suggested text:** Neural Networks: A Comprehensive Foundation
Author: Simon Haykin, Publisher: Prentice Hall
- Work required:** Completion of weekly computer lab assignments
- Grading method:** Grades (plus/minus scale) based on scores on lab reports
- Class policy:** Lab reports must be turned in two weeks following assignment date, in class. No credit will be given for late assignments.
- Background:** Familiarity with computer programming is necessary
- Website:** <http://csn.beckman.uiuc.edu/mcb417>

Topics covered:

1. Overview of neural systems and computer modeling
2. Abstract neuron models and simple neural circuits
3. Feed-forward and recurrent lateral inhibition
4. Unsupervised learning and self-organizing maps
5. Covariance learning and Hopfield networks
6. Supervised learning and back-propagation
7. Reinforcement learning and associative conditioning
8. Informational capacity of neural networks
9. Estimation of probabilities by neural networks
10. Recurrent back-propagation and time series learning
11. Sequential decisions and temporal difference learning
12. Predictor-corrector networks and Kalman filters
13. Genetic algorithms and neural networks
14. Review and case studies