Comp Sci 182 / Cog Sci 110 / Ling 109

The Neural Basis of Thought and Language

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Syllabus

Introduction

This is a course on the current status of interdisciplinary studies that seek to answer the following questions:

1. How is it possible for the human brain, which is a highly structured network of neurons, to think and to learn, use, and understand language?
2. How are language and thought related to perception, motor control, and our other neural systems, including social cognition?
3. How do the computational properties of neural systems and the specific neural structures of the human brain shape the nature of thought and language?
4. What are the applications of neural computing?

Much of the course will focus on The Neural Theory of Language (NTL), which seeks to answer these questions in terms of architecture and mechanism, using models and simulations of language and learning phenomena. The focus is less on where such functions are located in the brain than on how neural systems can carry out the computations necessary to characterize specific concepts, such as spatial relations concepts, aspectual concepts (used in structuring events), abstract metaphorical concepts, and so on.

Here is the course description from the UCB catalog.

Prerequisites

Students in the course should have upper-division standing in one of the following departments: computer science, linguistics, biology, psychology, or cognitive science.

CompSci 61A is required for all students.
For students enrolled in CompSci 182, CompSci 61B is also required.

Course organization

The course meets three hours a week for lectures covering assigned readings and new material (Tue/Thu 12:30-2 in 247 Cory). Two one-hour discussion sections will be held each week (currently scheduled as Fridays, TBD).

The approach to teaching is hands-on to the extent possible. Students will use interactive software to learn in detail how neural models work. These include the connectionist exercises and on-line psychological experiments. In addition, we have adapted some existing programs for instructional use.

See the Computing Resources page for more information.

Assignments and exams

- **Weekly reading assignments** are aligned with the lectures. Students who come to class having read the assigned readings will be in a much better position to grasp the lecture material.
- **Weekly homework assignments** (9 total) are designed to give students practical experience applying ideas from the course. (see guidelines for submitting assignments)
- **Programming assigments:** Students enrolled in CompSci 182 and those from other majors wanting computational credit will be required to do 2-3 programming assignments in lieu of the non-programming assignments for students not enrolled in 182 or for those not wanting computational credit. The programming assignments are intended to provide a deeper understanding of the computational models and algorithms discussed in the course.
- A **final project** involves reading an article from the journal *Behavioral and Brain Sciences* and writing a commentary on it.
- An in-class **quiz**, **midterm**, and a **final quiz** will assess what students have learned.

Grading

- Weekly assignments and final paper: 60%
- Midterm: 15%
- Final exam: 15%
- Quiz: 5%
- ~~Class participation: 5%~~ -- the TA doesn't tend to favor class participation grades.

Because class participation is hard to judge, the TA's reserve the right to randomly take attendance in section to help guide the scoring of student participation.

The weekly assignment and final project percentage breakdown:

- Two of the weekly assignments (the two programming assignments or the two corresponding nonprogramming assignments) are relatively large and will be worth 10% each.
- The final paper will be worth 10%.
- The other 7 assignments are smaller and will be worth 5% each.
- The lowest grade out of the 7 smaller assignments will be dropped.
- THE SCORES ON THE PAPER AND THE LARGER ASSIGNMENTS CANNOT BE DROPPED.

There will be two curves. One for people that do the programming assignments and one for people that do not.

Late policy

Each student has a total of 4 free late days to use during the semester on the weekly homework assignments. Make sure to indicate clearly when you choose to use one or more of your free days. Other late assignments will generally not be accepted.

Cheating policy

- Individual assignments should be done independently. Students are encouraged to discuss the general techniques and methods required, but you must do your own work in solving the problems and writing up the solutions.
- *Plagiarism and cheating will not be excused* and will be referred to the Office of Student Conduct. (See also the Berkeley Code of Student Conduct.)