The Interdisciplinary Ph.D Program in Cognitive Science

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Why you should care about Cognitive Science

• You are all carrying around the lowest-power, lightest weight, general purpose computer in Known Space - your necktop.
• How the brain works is one of the biggest remaining mysteries to science.
• Unlike the human genome, we can’t put it in a dish and cut it up (except for non-human species) and still expect it to do anything.
• Hence, building computational models (that we can cut up and still expect them to work) is one of the best ways to study the brain.

What is Cognitive Science?

• The discipline of understanding how the mind works
• A discipline in its own right, but fundamentally, an Interdiscipline: Includes at least Psychology, AI, Neuroscience, Linguistics, Philosophy.

The Axioms of Cognitive Science

1. The Mind is what the Brain does.
2. Thinking is a kind of Computation.
3. UCSD addition (from my perspective): Probability theory in some form (e.g., neural networks, Bayesian networks, etc.) are a good model of the kind of computation the brain does.

Hence, we study *brain-style* computation.
A Brief History of Cognitive Science at UCSD

- 1979: The first Cognitive Science Society Meeting is held at UCSD
- 1986: The first Ph.D. in the new Interdisciplinary PhD Program in Cognitive Science is awarded to Michael Jordan.
- 1987: The Cognitive Science Department is formed.

Hence, the a priori chance of a UCSD-related Cognitive Science person winning the Rumelhart prize is 5/12 (Expected Value of $46,667).

- So you should join the IDP!

The Interdisciplinary PhD Program

- So, there are now TWO Ph.D. Programs in Cognitive Science at UCSD:
  - The Department of Cognitive Science PhD program
  - The Interdisciplinary Ph.D. Program in Cognitive Science. (IDP for short)

A Brief History of Cognitive Science at UCSD

- 2000: The David E. Rumelhart Prize in Cognitive Science (the Nobel Prize of Cognitive Science) is established. It comes with $100,000 and a medal.
- UCSD-related awardees:
  - 2001: First Rumelhart Prize to Geoff Hinton (formerly a postdoc at UCSD).
  - 2005: Another former UCSD postdoc, Paul Smolensky
  - 2007: UCSD Cognitive Science Faculty Jeff Elman
  - 2010: Former UCSD faculty member Jay McClelland
  - 2012: Former Sejnowski postdoc Peter Dayan
The Interdisciplinary PhD Program

Structure of the Program

Eight participating departments:
   Anthropology, Communication, Computer Science and Engineering, Linguistics, Neurosciences, Philosophy, Psychology, and Sociology

Faculty from even more departments:

This program lets you explore beyond the boundaries of your discipline:
You are expected to gain significant expertise in an area of study outside your home department.

Added value: secondary specialty
Your PhD would then read:
“Neuroscience and Cognitive Science”

0. You apply for admittance (usually in your 2nd or 3rd year) proposing a program of study in a participating department or in the Cognitive Science Department. Your PhD topic should be interdisciplinary in nature.

1. You fulfill all of the requirements for a PhD in Neuroscience up through the University Qualifying Exam.

2. You also propose a "secondary specialty."
   This could be:
   • in a recognized discipline (e.g., Psychology) or,
   • covering a substantive issue in Cognitive Science that spans departmental boundaries (e.g., "How and where are emotional facial expressions processed in cortex?")
   • This requirement is fulfilled by
      • taking on the order of six courses that don’t start with “Neuro”
      • or (and this is more fun!) you spend about a year in someone’s lab outside the department.

The Interdisciplinary Ph.D. Program in Cognitive Science
Structure of the Program

3. For breadth, you participate in six quarters of "Cognitive Science 200"


Note: There are a lot of postdocs advertised in Cognitive Neuroscience!

An example: Brian Keeley

Home department: Philosophy
Advisors in Philosophy: Sandra Mitchell and Pat Churchland
Secondary Specialty: Behavior of weakly electric fish (work performed in Walter Heiligenberg’s lab at the Scripps Institution of Oceanography)
Current project: The role of neurobiology in differentiating the senses

Another example: Honghao Shan...
Efficient Encoding of the world leads to magno and parvo-cellular response properties...

Trained on video
This suggests that these cell types exist because they are useful for efficiently encoding the temporal dynamics of the world.
Relevant local happening:

- We have a $33.5M grant from NSF for a “Science of Learning Center” titled:
- The Temporal Dynamics of Learning Center
- We are composed of four research networks studying:
  - Interacting Memory Systems (Andrea Chiba, UCSD Cog Sci & Neurosciences)
  - Social Interaction (Javier Movellan, UCSD, Inst. for Neural Comp.)
  - Sensorimotor learning (Howard Poizner, UCSD, INC)
  - Perceptual Expertise (Isabel Gauthier & Tom Palmeri, Vanderbilt)
- We are studying the role of time and timing in learning, from spike-time dependent plasticity to the timing of social interactions.

Links

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  - (or just google Gary Cottrell)
- Also see:
  - Cog Sci home page: idp.ucsd.edu (follow "for graduates" menu to "Interdisciplinary PhD program"
- TDLC home page: tdlc.ucsd.edu