Computational [Principles of] Psychology*

Shimon Edelman
Department of Psychology
Cornell University
Ithaca, NY 14853
http://shimon-edelman.github.io

Contents

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1 Overview

This course states, motivates, and offers detailed support for the observation that cognition is fundamentally a computational process [28]. Students are introduced to a number of conceptual tools for thinking about natural behavior and the cognitive information processing that underlies it, including statistical learning from experience and the use of patterns distilled from past experience in guiding future actions. The application of these tools to the understanding of natural minds and to advancing the goals of artificial intelligence is illustrated on selected examples drawn from the domains of perception, memory, motor control, action planning, problem solving, decision making, reasoning, and creativity.

The material is conceptually advanced and moderately to highly technical. It is aimed at advanced undergraduate students, as well as graduate students from psychology, neurobiology, computer science, and other cognitive sciences. Prior exposure to statistical concepts and the scientific method is essential.

How to use this syllabus

- For each week, there's a list of readings with references. Some of the readings are required, others are optional. The references are also listed at the end of the syllabus, alphabetically by first author.
- For an alphabetical roster of select key ideas and topics, see section B.

Readings

The recommended textbook is *Computing the Mind: How the Mind Really Works* (Oxford University Press, 2008). Additional readings (a zipped collection of PDFs) are available on the course Canvas site.

There are over 100 references listed at the end of this syllabus. Please do not be alarmed: this does not mean that you are required to read all the papers on that list. Many of the references are there to provide entry points into the technical literature on cognition for those of you who are interested in learning more about it than what this course covers.

2 Notes for participants

This section contains essential information for participants: the inclusion statement,[1] learning goals and practices, and credit requirements.

2.1 Diversity and inclusion

Computational Psychology is more diverse than many other courses at Cornell, in at least two respects. First, it purposely ignores the traditional disciplinary boundaries, as cognitive science has done since its inception (see the illustration on the next page). Accordingly, my plan is for us to freely mix concepts and topics from psychology, mathematics, computer science, and neurobiology. Second, this course does not respect college and program boundaries: historically, it has been attended and successfully completed by students from different colleges and a variety of majors, among them psychology, neurobiology, engineering, information science, computer science, and English, as well as by graduate and professional masters students.

[1] The remarks in section 2.1, which are specific to this course, are intended to supplement the official Cornell statement on diversity and inclusion, which covers dimensions such as gender, race, socio-economic background, etc., and which can be found here: `http://diversity.cornell.edu/`.