Guide to Research and the Senior Thesis Process in the Cognitive Science Program

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Table of Contents

Introduction

This document is intended for Yale Cognitive Science Majors as they begin to find research opportunities and then complete the senior thesis process.

Additional information can be found on the Cognitive Science website, at this link:
https://cogsci.yale.edu/undergraduate/research-opportunities

The purpose of this document in more limited than the large amount of advice (and links to additional resources) at the above link. The goal of this document is to provide a high-level overview of the senior thesis process, and very targeted advice for getting it started (e.g., contacting professors).

Suggestions for improving the document can be addressed to the senior colloquium instructor (for 2019-2020, that is natalia.cordova@yale.edu).

Courses for the Senior Thesis

The Required Junior Colloquium in the Fall

This is a required course for all Cognitive Science Juniors*. The course consists mostly of guest lectures by current Cognitive Science faculty at Yale. The purposes include (a) learning about a cross-section of cognitive science research directly from professors engaged in the research, (b) having the opportunity to engage in a "lab meeting" setting with the professors and your peers, and (c) solidifying plans for your senior thesis. At the end of the semester, students submit a short (2-3 page) summary of current senior thesis plans and next steps.

*Rarely, a student will take this course a year early or a year late, for example to accommodate a semester spent studying abroad. Taking this course early or late can only be done with the approval of the DUS.

The Optional Junior Seminar in the Spring

This is an optional course, and about half of the Cognitive Science Juniors choose to take it each year. It provides an overview of recent advances in cognitive science, as well as some classic foundational papers. The goal is to provide an overview of both content and methods in cognitive science, with an eye towards informing the selection of a senior thesis topic. Given the breadth of cognitive science, the course does not address all potential topics (and then the interesting intersections between topics!), and so the final list of readings will be determined based on student interests. This is true for all weeks, but especially the later weeks in the semester, when topics for the weeks are voted on by the students.

The Required Senior Colloquium

This is a required course for all Cognitive Science Seniors*. The course consists mostly of seniors presenting their in-progress senior thesis work to each other (typically a 20-minute PowerPoint presentation with time for Q&A afterwards) and submitting drafts to each other for peer review (each student peer reviews for three other seniors, and receives three peer reviews). The purposes include (a) helping students write the thesis by providing piecemeal due dates, (b) learning about and engaging in the peer review process, and (c) learning about other students' research through presentations and peer review.

*For students graduating in December, the course is taken the during the penultimate semester (e.g., a student graduating December 2020 takes the course with students graduating May 2020), but some work is not due until the final semester, and an initial grade of Incomplete in the Spring semester is replaced after completion of work in the Fall semester.

Empirical vs. Theoretical Theses

Each senior thesis is categorized as either empirical or theoretical. If you are doing an empirical thesis, then you have the option to get a B.S. (assuming you fulfill the other requirements of a B.S.). If you are doing a theoretical thesis, then you will receive a B.A.

In general, if the focus of your paper is reporting new results (e.g., a series of mturk studies you conducted, or an experiment you conducted with 150 children at a museum), then you are doing an empirical thesis. If the focus of your paper is making a novel argument without reporting new data, then you are doing a theoretical thesis.

There are some gray areas (e.g., conducting a meta-analysis), in which case your senior thesis adviser can confer with either the DUS or the senior colloquium instructor to help make the determination about your specific thesis (and the ultimate categorization is up to the thesis adviser).

Most seniors pursue an empirical thesis, including students intending to receive a B.A. There are many factors that can enter into the decision about what sort of thesis to pursue, and you should feel free to discuss options with the DUS, the senior colloquium instructor, and potential thesis advisers.

A particularly common point is worth noting here. Sometimes students assume a theoretical thesis will be "easier" because it does not require all of the time involved to design, conduct, and analyze the results of new data collection. However, it is worth considering the reverse of this intuition: a theoretical thesis might be substantially "harder" because it requires making a novel contribution to the literature *without* the benefit of new data. Reframing the issue away from "easy" and "hard," it is worth noting that empirical senior theses often have more straightforward success criteria (e.g., "I spent the time to collect the data my adviser agreed was worth collecting, analyzed the data as planned, and then reported what happened in a paper) than theoretical senior theses (e.g., "I tried to make an argument that was important and true and new—referring only to facts that have already been discussed by many other people—and I *think* I succeeded!").

How to Contact a Professor or Lab

A common barrier to getting started on research (for a senior thesis or otherwise) is making initial contact with a professor or lab. Students have sometimes procrastinated for a semester or more due to this barrier. Sometimes, students delay because of an impression that the e-mail to a professor should include a fully developed idea. To the contrary, most students start research with a professor or lab based on a general interest in a topic, and then discover the specific thesis project together. Indeed, in the case of many labs, it is often a requirement that a student start working on current lab projects before potentially starting to discuss introducing a new study that could serve as the student's thesis project.

After identifying a potential professor/lab that you think you might want to work with, you should take the following steps:

1. Read multiple recent publications from the professor or lab to see how interested you are in the topic and methods used in them.
2. Look at the professor's website and lab website (if applicable) and see if there are any instructions about how to join the lab as an undergraduate (e.g., "send the following information to my lab manager").
3. If there are other undergrads working in the lab, then you might try to talk to them about their experiences, especially to determine if the lab is a good fit for your research and thesis goals.
4. Once you are ready to e-mail, you should keep any correspondence short, but also tailor the content so it is specific to the person you are contacting. It should be clear you have spent the time ("costly signal") to become familiar with the professor's research and that you are particularly interested in doing this sort of research. Two examples are below, and you should feel free to contact the senior colloquium adviser (even if you are not a senior! especially if you are not a senior!) with a draft of your e-mail.

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Dear Professor Summers,

I took your class, XXX, last semester. I am now beginning to plan my Senior Thesis in Cognitive Science (due in 3 semesters) on a topic related to XXX. You can find some details below my signature.

I am e-mailing to ask whether there is any chance that you would be available to supervise me on a thesis about XXX. I became interested in your work when I read *[title of article by Summers]*, and I know several other of your works [*two more Summers refs*] also relate to how I am thinking about this topic (again, more info below my signature).

Please let me know whether there is any chance you might be available, or whether it might be worth chatting more to see if this would be a good fit. If it's not possible, but another professor who could be an adviser comes to mind, that would also be great to know--any advice would be incredibly appreciated at this stage!

Best,
Mark

A bit more information about my thoughts on a thesis for this topic: [one paragraph here]
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Dear Professor Harris,

I am currently thinking through options for my Senior Thesis in Cognitive Science, and would love to chat at some point to discuss whether I might be able to pursue a project building off of my work in your lab for the past 3 semesters.

My presentation last month at lab meeting highlighted my work with Willow, but I could imagine also imagine building off or my work with another graduate student: Cordelia. In my side project helping Cordelia, I found additional papers for the lit review in the recent draft she sent to you, and have started learning how to run participants in the follow-up study to it.

Please let me know whether you think there might be a good fit for a senior thesis project this upcoming year in your lab, and whether you might be free to chat in the next week or so. Thanks!

-Mark

Funding Your Thesis Work

This content is copied directly from an FAQ on the cognitive science website. In addition to the information being directly useful here as a resource students commonly need, please note that it also serves as a reminder that there is a lot of useful information on the website, and that you should make sure to look at it.

Perhaps the most common source of research funding is your research supervisor herself/himself. Many (but not all) faculty members have grants and/or discretionary funding that can be used to support such projects – especially if those projects fall within their own primary research goals, and/or if you have already been assisting in their laboratory.

CGSC seniors are able to obtain up to $100 for their research on their senior project in conjunction with the Dept. of Psychology. Forms are available in K 109. The forms need to be signed by your senior research advisor in addition to the CGSC DUS.

Many students find that they can support their research through various funding sources that are managed by their residential colleges.

Yale College itself also has a number of funding opportunities, many of which are summarized at this link:

https://science.yalecollege.yale.edu/yale-science-engineering-research/fellowship-grants

Of these various funding sources at the above link, two are especially popular. First, the Yale College Dean's Research Fellowship in the Sciences and the Yale College Dean's Research Fellowship in the Humanities and Social Sciences each often fund cognitive science students to conduct research (often with Yale faculty) over the summers.

The Senior Thesis Timeline

As with nearly all aspects of the Senior Thesis process, there is a lot of variation in the timeline. Some students work in a lab for their entire time at Yale, starting with their first semester, and the senior thesis paper is a culmination of this work. Other students complete a senior thesis entirely within the time span of their senior year.

Note that doors start closing as you get closer to your senior thesis year: there are some labs where it is only an option to do a senior thesis if you have already been working in the lab for a year (e.g., you must start by the beginning of your Junior year), and others where it is possible to start during your Junior year but not during your Senior year. By the time your senior year has started (and especially once you are a good chunk of the way into your first semester) doors will be closing rapidly, severely limiting your options for finding a thesis advisor and project that fits your interest and goals.

Here is a "middle of the road" timeline:

Year 3, Semester 1
- Take the required Junior Colloquium (CGSC395) and start thinking about broad options
- Take a senior seminar (might include final paper that is developed into thesis collaboration)

Year 3, Semester 2
- Take optional Junior Seminar (CGSC390), discuss thesis ideas with one or more profs
- Have a thesis advisor secured by the end of the semester, with some work towards thesis

Year 4, Semester 1
- At start of semester, students fill out a "thesis progress" survey sent out by CGSC491 instructor
- Lots of work on thesis

Year 4, Semester 2
- Take the required Senior Colloquium (CGSC491)
- Finalize thesis work and complete write-up

Wisdom from Previous Cognitive Science Seniors

[this section may soon contain nuggets of wisdom from previous seniors]