

# How to Get a Ph.D. [Advice from Dr. Arbib]



- 1. Why get a Ph.D.?
- 2. Finding an Advisor
- 3. Screening
- 4. Breadth and Depth
- 5. What Advisors Want
- 6. Quals
- 7. Between Quals and Thesis Completion
- 8. Thesis
- 9. Defense

# 1. Why get a Ph.D.?



Because you're not ready for the real world?

To prepare for industry?  
& Research or Management?

To prepare for a university career?  
& Teaching?  
& Research?  
& Administration?

What else? You may be working for the next 40 years!

Issue: Should you choose a thesis topic designed to meet your career objectives, or should you enjoy the chance to explore some basic issues that you may not be able to work on in your later career?

# The Questions Posed to You



- What do you want to get out of the PhD?
  - a meal-ticket
  - stepping-stone to industry
  - a milestone in an intellectual quest
  - something else?
- To what extent do you expect your thesis topic to result
  - from your motivation or
  - your supervisor's direction?
- How do you get information to inform yourself
  - in your research area
  - in computer science generally
  - in broader intellectual topics
  - in the arts and current events?
- ***What are you doing to educate yourself as as a citizen of the world, not just as a computer scientist?***

## 2. Finding an Advisor



Two different strategies:

& Go where you can learn the most about what interests you most

& Go where the money is

## 3. Screening



- 1. Course work
  - Core courses
  - Research courses
  - Intellectual development
    - Find the balance as you hit that 3.5 GPA
    - Study what you need for your Ph.D.
- 2. Find a *potential* advisor and convince him/her that you can make real progress in their research area.

## 4. Breadth and Depth



At the time of screening, you may only know your *general* research area: e.g., “networking” or “intelligent agents”.

You must “chart the territory” for a definite subarea

-- what are the key issues, the best books, journals and conferences, who are the top researchers?

then you must define (or accept - see Item 5) your own **more focused subarea** in which ***you will be the world’s leading expert.***

***Choosing a sufficiently focused area and defining a 3-year (more or less) research project can be time consuming and frustrating!***

The right advisor should know more about the overall territory than you do so that s/he can be your guide.

***But to be a successful student, you should eventually know more than your adviser about your narrow subarea!!***

## 5. What Advisors Want



- All advisors want to advance their careers, and thus hope that your thesis will yield conference papers and journal publications that will help their reputation and help them get their grants renewed.
- *Three styles:*
- “Directed”: The advisor has already specified step-by-step what an RA has to do on one of their grants and if you follow these steps you will get a Ph.D.
- “Laissez-faire”: “Come and see me at quals and defense time.”
- “Negotiator”: Convince the advisor that you have your own goals but then negotiate a thesis topic that advances your goals but also allows you to learn from what the advisor and his/her group are doing and contribute to the group’s progress.

## 6. Quals



1. **Form a 5-person Quals committee:** Usually 4 from the department and one Outside Member who represents the Graduate School.

2. **Write a Quals Document**

- & Review the relevant literature
- & Define the open problems *you* will work on
- & Report on a completed piece of the research (similar to a conference paper or half a chapter).
- & Present a preliminary outline for your Ph.D. thesis with a tentative timeline

3. **Defend your Proposal orally in front of the committee**

- & The aim is *not* to convince the committee you should pass ***but to maximize their feedback to focus and refine your work on your dissertation.***

4. **Form a Ph.D. committee:** Usually 3 to 5 members of your Quals committee -- but you must include the Outside Member.

## 7. Between Qualls and Thesis Completion



- The thesis might take as little as one year or as many as four -- when doing original research you cannot predict what will happen:
  - Your "predictions" in the quals timeline may be just right, but
  - Some problems may turn out to be much harder than predicted, while
  - Others may get solved by someone else while you are still working on them.
- Thus the Qualls Document is a general guideline, but may undergo constant reshaping in response both to your own discoveries and developments in the literature.
- As your work progresses see your advisor frequently and other committee members more or less occasionally to report your progress and get helpful feedback.

## Skills You May Acquire Along the Way



- Presenting papers at conferences
- Preparing articles for journal publication
- Writing a patent
- Helping your advisor prepare a research proposal

## 8. Thesis



- The thesis is a sandwich:
  - Introduction and Literature Review
    - 2 to 4 Research Chapters each similar in Scope to a Publication
  - Prospects for Future Research
- Key advice:
  - Scope out the hot places to publish in your subarea.
  - Then maintain 2 versions of the “meat” chapters as you write them: one for the thesis and one for publication.
    - a) You will thus continually calibrate your work against the state of the art
    - b) You will avoid the disaster of getting so busy in your first job after the Ph.D. that you do not publish for a year or two, if at all.
- In general your advisor will let you proceed to the Defense only when s/he feels that you have a critical mass of original research

## 9. Defense



- 1. Two weeks before the defense, submit a complete draft of the thesis to your committee
- 2. The defense will usually have 2 parts:
  - A 1-hour public lecture on the main points of your thesis
  - followed by a closed door session in which you will be closely questioned by the committee about any and all aspects of the thesis.
- 3. In general, you will require a few weeks work to polish the thesis in a way that addresses the questions raised by your defense.
- 4. Both in preparing for the exam and in submitting the thesis, you will be responsible to complete all Grad School paperwork and follow all the guidelines.
- 5. Get a robe and mortar board and go to Commencement for proud photographs with your family, Dr. X!!

# Your Ph.D. at USC [additional notes from Dr. Itti]



- The goal of a Ph.D.
- What it takes to achieve a great Ph.D.
- Courses
- Advisor
  
- How to read papers?
- How to keep up-to-date with research?
- How to determine novelty of an idea?

# The goal of a Ph.D.



*Make a significant impact onto a specific research issue, such that nobody working on this issue can afford to ignore your work.*

- Several components:
  - Need to become an expert in the field
  - Develop novel ideas
  - Implement them
  - Thoroughly test and validate them
  - Make your results known through conferences, informal meetings, and journal publications

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- Your Ph.D. will not necessarily succeed – be very careful to keep it under control
- Your Ph.D. is **your** most important, largest-scale achievement – not anybody else's

# Courses



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- During my Ph.D. I adopted the "fire-and-forget" strategy:
  - Learn as much as possible
  - Exploit the university and its resources to the maximum
  - Spend a minimum amount of time on the homeworks – be focused, efficient, do not drag it along forever, **do not polish it**

# Your advisor



- Can help you with **any** issue – don't be shy to ask!
- Generally speaking, is understanding – don't hesitate to criticize or complain (nicely)
- Is knowledgeable – please do listen and implement his/her advice
- Is interested only in motivated, hard-working students – unless you are one of these, you will not get much attention from her/him

# Your advisor



... is extra-busy!

- many deadlines every day
- many ongoing projects
- teaching takes a lot of time
- need to write proposals, papers, reports, organize committees, organize conferences, organize the lab, manage the lab, render various services to the university, do research, disseminate research, help many students (not only from their lab), etc...

## Interacting with your advisor



- Cut on non-work-related stuff
- When meeting, be sure to provide short reminder of context – you have one Ph.D. project but your advisor is working on 10+ just like yours in parallel
- When meeting, be prepared – your advisor has no time to waste
- If your advisor seems too busy – that's probably because your progress has not generated enough excitement yet. Work harder, implement what s/he suggested, go beyond that, show lots of results, ... **demonstrate that you are dedicating your life to your project.**

## Beyond your advisor



- A secondary goal throughout my studies was to maximally benefit from the incredible resources provides by the university.
- Identify key people and meet with them (you need to be prepared and have things to show them)
- Identify key labs and hang around them
- Identify key facilities and exploit them

## Beyond your advisor



- Show your work to other professors and students – get feedback!
- In difficult situations, most professors will open their door to you – but you need to do the first step.

## A typical weak paper



- **Short and naïve introduction** – demonstrates lack of background research and of expertise from the authors
- **Methods / algorithms not very original** – demonstrates lack of understanding of the state-of-the-art in the field
- **Results show operation of system on one example case** – lack of systematic study demonstrates laziness and greatly reduces belief that research described is generally applicable
- **Short discussion limited to own research rather than putting work into perspective by comparing to previous studies** – shows lack of knowledge of others' work and reduces credibility

## A typical weak paper: summary



A weak paper is one where the authors describe work that is not very new, is not thoroughly validated, and is not properly placed in perspective with respect to previous work.

Mostly, it is weak because... the **authors have been lazy** and have not done proper background research.

## A typical strong paper



- **Comprehensive expert introduction** – demonstrates extensive background research, mastery of the whole field, understanding of the important issues, and clear positioning of the research as new
- **Methods / algorithms are original** – demonstrates good understanding of the state-of-the-art in the field, and expertise
- **Results include thorough quantitative validation** – the authors seriously stand behind their research and make efforts to prove how it is new / different / better
- **Discussion puts work into perspective by comparing to previous studies** – shows expertise and credibility by not being shy about comparing to other research

## A typical strong paper: summary



A strong paper is one where the authors demonstrate that they have complete expert understanding of the major open research issues in the field, and where they provide a convincing argument that they just professionally cleaned up one of those issues.

Mostly, it is strong because **the authors know what they are doing!**  
**And because they worked extremely hard on their research.**

# How to read papers



- Be focused
- Use google and books extensively
- Start with reviews and book chapters, then go on with topical research as you are already more familiar with the field
- Be critical – learn to identify weak papers

Read as much as you can. You want to become *the world expert* in your research domain.

# How to keep up-to-date with research



- Check online journals regularly
  - Check online search engines regularly
  - Go to conferences
  - Go to USC/UCLA/Caltech/other research seminars
  - Talk with people – identify key researchers in your topic, then meet with them when they come over to USC for a talk
  - Check conference web sites
  - Check lab web sites
- 
- You may want to ask your advisor to consider the JournalTracker service of ISI: sends you an email with the table of content for each new issue of a set of monitored journals.

see <http://iLab.usc.edu/jtrack/>

## How to determine the novelty of an idea



- Be an expert in the field
- Check with your advisor and other researchers
- Check at conferences
- Send it to a conference and gather reviews & reactions