Grad School Essentials

CPS 701: Introduction to Graduate Study
Kamesh Munagala
August 27, 2014

[Credits: Doug Comer, Mihir Bellare, Jun Yang]
Announcements

- Mentoring
  - Faculty mentor assignments finalized
  - PhD students: connect with your student mentors

- Course website
What is a Ph.D.?

- To earn a Ph.D., one must accomplish two things:
  
  - First, one must master a specific subject completely.
  
  - Second, one must extend the body of knowledge about that subject.

Source: http://www.cs.purdue.edu/homes/dec/essay.phd.html
Mastering a Subject

- Pass the Qual Exams

- Search the published literature to find and read everything that has been written about the subject
  - Textbooks, papers, internet, ...

- Prelim exam evaluates the above aspect
Extending Knowledge: Research!

- To extend knowledge, one must explore, investigate, and contemplate.

- Research is more than mere experiments -- it means interpretation and deep understanding
  - Conceptualizing, finding issues and directions, solving problems, definitions, exposition, and critical insight

- Theory, experiments, system building, software, ...

- Present results from their research to the faculty in a dissertation, and defend it in an oral exam
What does it take?

- Intelligence
- Time
- *Creativity*
- *Intense curiosity*
- Adaptability and resourcefulness
- *Self-motivation*
- Maturity
Why do a Ph.D.?

- Enjoy research
- Pursue an academic research career
- Pursue a teaching career
- Work in an industry research lab

You can discover things that no human has ever discovered!
Why not to do a Ph.D.?

- **Professional reasons:**
  - Higher salary than M.S. or B.S.
  - Easier to get a job later
  - Better than being in the industry for 5 years!

- **Personal reasons:**
  - Prestige of having a “doctor” attached to name
  - Impressing family and friends
  - Easiest route to leave home country
  - 5 years in grad school enough time to find spouse
Don’t kid yourself!

- You will only be happy with research if you enjoy the *process*, the day-to-day nuts and bolts of it.

- If to you it is only a means to some end, you are unlikely to enjoy yourself.
What can you gain from a Ph.D.?

- Confidence and inclination to question everything and seek out new ways of doing it or seeing it.
- Confidence to jump into a new area, pick it up quickly, have something interesting to say about it.
- More willing to contradict conventional wisdom and be constructively critical.

Source: http://cseweb.ucsd.edu/~mihir/phd.html
Graduate School Tips

CPS 701: Introduction to Graduate Study
Kamesh Munagala
August 27, 2014
On picking advisors

- Most important: work on things that you love
  - Choose an advisor and topic that inspires you
  - You are investing the 5 best years of your life!

- Flexibility vs. concrete projects
- Large vs. small groups
- Hands-off vs. hand-on
- Practical impact vs. intellectual challenge
- Junior vs. senior
- Funding prospects
- Non-CS advisor is fine; just beware some procedural steps
On approaching professors

- **Start early**; they want to see you “in action” before committing
- Show you have the required **background/skills**, or can acquire them quickly
  - Past projects, current course projects, RIP/MS ideas, ...
  - Communicating, thinking, coding, writing, ...
- Show you have the right **attitude/habits**
  - Initiative, punctuality, genuineness, independence, meticulousness, tenacity, flexibility, ...
What if...

• You got completely lost in this first meeting?

• You were just given a paper to read?

• Nothing concrete came out of the meeting?
When to meet with advisors

When to meet with your advisor

Is there ever a good time?

Beginning of the week

**Pro:** Get it over with quickly

**Con:** You have a guaranteed date with work on Sundays

End of the week

**Pro:** You might actually have something to show by then.

**Con:** You might not (!)

Mid-week

**Pro:** Good balance. Gives you time to work on feedback

**Con:** Your advisor will probably not show up (actually, this might be a pro)

Saturday/Sunday

**Pro:** There is no "pro."

**Con:** Your advisor is a workaholic maniac. Good luck with that.

The guilt game

- Often, advisors make advisees pressed, guilty, and scared
- But it should be the other way around
  - Make advisors feel (happily) pressured, guilty, and even scared!

Take initiative!

- Propose weekly goals, meeting agendas, new problems
  - “Propose” ≠ “set”; you need your advisor’s guidance
- Learn related work yourself and fill your advisor in
  - It’s your thesis area—you ought to know it better than your advisor
- Keep churning out high-quality write-ups until advisor cannot keep up
  - Good strategy for getting time from busy advisors
Make meetings more effective

- Be organized
  - Start with a summary of last meeting and an agenda for this one
  - End with concrete goals for next week
- Short productive meetings > long monologs
- Write-ups must show enough polish
  - Faculty have little time, and get tired of correcting simple mistakes

What if you get stuck?
- Try alternative approaches yourself
- Log all things you tried, and why they failed
- Ask senior students for help with low-level stuff
- If all else failed, don’t wait until the next meeting to tell your advisor
Communication is important

- Want your advisor to be your best advocate?
- Always keep him/her in the loop!

On finding related work

REFERENCES

MAKING SURE NO ONE HAS ALREADY WRITTEN YOUR THESIS

PAPERS FOUND ON ONLINE DATABASE

PAPERS FOUND FROM OTHER PAPERS’ REFERENCE LISTS

PAPER YOUR ADVISOR WROTE TEN YEARS AGO

PAPERS YOUR ADVISOR HAD FORGOTTEN TO TELL YOU ABOUT

TOTAL PRINTED OR PHOTOCOPIED: 248
PAPERS ACTUALLY READ: 107
PAPERS ACTUALLY UNDERSTOOD: 5
PAPERS ACTUALLY RELEVANT TO THESIS: 2
PAPERS INCLUDED IN THESIS REFERENCE LIST: 246

On finding related work (really!)

- Ask your advisor, who can offer good starting points and see not-so-obvious connections
- Follow citations (forward & backward)
- Google (Scholar) + online databases (e.g., ACM DL, DBLP)
  - Need to build up a list of useful keywords
- Rank using citations/venue prestige
- Routinely check top venues
- Share with fellow students (reading groups, journal clubs)
- Talk to people at seminars, conferences, ...
- Talk to those outside your field
  - Start with your fellow grad students!
Deciphering academese

The text appears to be a comic or cartoon strip titled "Deciphering Academese" from the website http://www.phdcomics.com. The comic humorously translates common academic phrases into more understandable language. The text is as follows:

"To the best of the author's knowledge..." = "We were too lazy to do a real literature search."

"Results were found through direct experimentation." = "We played around with it until it worked."

"The data agreed quite well with the predicted model." = "If you turn the page upside down and squint, it doesn't look too different."

"It should be noted that..." = "OK, so my experiments weren't perfect. Are you happy now??"

"These results suggest that..." = "If we take a huge leap in reasoning, we can get more mileage out of our data..."

"Future work will focus on..." = "Yes, we know there is a big flaw, but we promise we'll get to it someday."

"...remains an open question." = "We have no clue either."

The comic is a light-hearted commentary on the language used in academic research. The website mentioned is the source of the comic strip.
How to read a paper

*Above all, question authority*

- Identify the problem being solved
- Attack the problem yourself, without looking at solutions
  - At least come up with their “strawman” solution
  - Might even get a better solution!
- Read their solution and compare it with yours
  - Are you convinced which one is better?
- Write a short, poignant summary; record in your bib db
  - Don’t just copy their abstract
  - Keep additional notes in your bib db when you revisit the paper or discuss it with others
On reading motivation

- Is the problem new?
- Is the problem important?
- Is the problem interesting?
- Is the problem contrived?

Learn how people make good/bad pitches
- Some papers overstate/understate their applicability
- Can you do better?

Come back after finishing reading: did they solve the same problem motivated earlier?

On reading evaluation

- Do the experiments tell you anything new?
  - Many simply confirm the obvious!
    - E.g., # of ops counted analytically vs. measured
  - How do you make it more interesting?
- Is the paper trying to hide something?
  - Unexplained “magic sauce”
    - E.g., how to tune a parameter
  - Choices of workloads and parameter ranges
    - E.g., synthetic datasets, unreal uses of real datasets, or $x$-axis covering a small range
  - Choices of performance metrics
    - E.g., an index costs $1/10$ of the I/Os incurred by a full scan—great?

Other reading tips

• Read related work carefully
  • A glimpse at the bigger picture and pointers to follow to learn more about the problem/area
  • Think beyond their related work discussion
    • Congrats if you uncover non-obvious connections to other areas!

• After you finish reading
  • What is the “take-away” message?
  • Think about future work
    • What assumptions can be relaxed or introduced?
  • Learn to appreciate their contributions

• Don’t judge what a paper is about by its abstract
  • Corollary: if you cite it, better read beyond the first page!
General Advice

- Start with the goal of producing papers
  - Don’t start with the goal of finding a hard thesis topic

- Don't look down on *simplicity*
  - Good research is often simple
  - Simplicity often comes from deep insights!

- Don’t work on something because it is hard/complex
  - Work on it because you think it is *useful* to solve
  - Researchers can have different notions of utility
On Self-confidence

- If you are afraid of failure you will have a hard time succeeding
  - Risk-averse researcher = Incremental researcher

- If you find the process of research fun, failure to solve a problem is not as daunting
  - Can be emotionally exhausting though, so be prepared!

- When you are feeling down, remember:
  - Even the top people don't succeed all the time!
  - No one needs to ever know that you failed!
Assignment 1

Due in 3 weeks, on September 17

- Talk to your advisor or potential advisor or a senior student
  - Get recommendation of a recent and/or important paper in an area/project that interests you
  - Get a sense of the important publication venues in this field
  - Get recommendation on document editing, reference management, and literature search tools
- Read the suggested paper
- Find a few (between 2 and 5) related papers; skim them
- Prepare a BibTeX file of all above papers
- Prepare a short document (· 2 pages)
  - Summarize (in your own words) the paper you read
  - Write a few sentences about each related paper
Due in 4 weeks, on September 24:

- Read one of the “high impact” papers on the course website (or any other paper you liked)

- Think about why you like this paper and why it has high impact

- Write a paragraph or two summarizing these thoughts
  - Do this on your own

- Do a 10 minute presentation on a paper you read.
Assignment 3

- Due September 24
  - Set up a website for yourself, if not already
    - ~/public_html/
  - At the minimum, put your resume/CV there
    - .pdf or .html
  - Send me a note when I can go check it out!

- Scheduling meetings:
  - Check out http://doodle.com
ON BEING A SCIENTIST

Discussion on September 10.

- “The Selection of Data” (p. 5)
- “Is It Plagiarism?” (p. 18)
- “Publication Practices” (p. 15)