Graduate School Tips
CPS 300: Introduction to Graduate Study
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Assignment
Due in 4 weeks, until December 1
- Talk to your 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

Tools of the trade
My current choices

<table>
<thead>
<tr>
<th>Document editing</th>
<th>LaTeX + Emacs + make</th>
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<tbody>
<tr>
<td>Reference management</td>
<td>BibTeX + Emacs + make</td>
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<tr>
<td>Presentation software</td>
<td>PowerPoint 2010, or with TeXPoint</td>
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<td>Web authoring</td>
<td>Emacs + XML + scripts</td>
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<td>Wiki + XML + scripts</td>
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<tr>
<td>Graphing</td>
<td>Gnuplot, Matlab</td>
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<td>Drawing</td>
<td>Xfig with LaTeX</td>
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<td>PowerPoint 2010 + PDF/EPS export</td>
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Again, the “Resources” panel of the course website has many useful pointers

On finding related work

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

Deciphering academese


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!

Importance of planning

A fictional PhD student: Year 1
- Took many courses and aced them, like he always did
- Courses/TA took most of the time, but he was taking care of quals (and without exams!)—so no time was wasted?
- Met with a couple of professors, got papers to read, showed up in group meetings, but didn’t have time to “do” much
- Thought he could declare Prof. A as advisor at the end of Semester 2, but Prof. A wouldn’t commit
  - Got placed on departmental probation
  - Cursed the other student whom Prof. A did take
  - Couldn’t take advantage of the RIP initiative
  - So what? Got a well-paid programming job in the summer
A fictional PhD student: Year 2

- Thank God Prof. B took him!
- Late RIP proposal was rushed and half-baked; committee wanted an extra progress report!
- After the progress milestone, Prof. B didn’t think the defense would be ready until summer
  - Told by Prof. B to “prove himself” in the summer or else he would get no funding next year!
- Spent the summer finishing RIP while watching other 2nd-years getting cool internships at research labs or working on their prelim

A fictional MS student: Year 1

Semester 1
- Enjoyed life: 8+2 courses in 2 years = a piece of cake?

Semester 2
- So far, 4 regular courses: good progress?
- What? Declare an advisor?
  - Thank God Prof. C took him!

Summer 1

- Enjoyed life: travel + internship
- Prof. C was traveling too anyway!

A fictional MS student: Year 2

Semester 3
- What? Job hunting now?
- Still needed time to warm up to research
  - Why did Prof. C give another MS student RA support?

Semester 4
- Kept busy by courses and interviews, but really needed more time for research
- Prof. C thought the project wasn’t ready for defense!

Summer 2 and beyond
- Had to stay to wrap up MS project and defense
  - Continued to pay Duke $$$ while watching classmates graduating and moving on

Team discussion (20 min.)

- Knowing what went wrong for these fictional characters, how would you plan your own PhD/MS career?

Team assignment

- Team Young Scientists
  - Yunjia, Wuzhou, Marisabel, Xuan, Zihang
- Team Couch Potatoes
  - Fan, Jannie, Janardhan, Yu, Rohit
- Team Good Looking
  - Bing, Alan, Yezhou, Muzhi, Botong
- Team Amazing Five
  - Ke, Prateek, Muhammad, Tianqi, Xiao
- Team Enigma
  - Bala, Fei, Yasunori, Xiaoming, Dina
- Team Rawxs
  - Alex, You, Salman, Xixi, Rozemary
A reasonable PhD schedule

Year 1
- Talk to faculty, attend seminars and group meetings this fall
- Declare advisor early in spring
- Form committee and do RIP proposal before summer
- Earn 3 (or least 2) quals credits
- Focus on courses in your area (or related areas) and do projects that impress your potential advisors
- TA in spring

Summer 1
- Whatever you do, stay in touch with your advisor
- You may be offered an RA:
  - RIP initiative makes it easier for advisors to fund you
  - Take it—at this stage it’s often better than a higher-paid coding job

Year 2
- Full speed ahead with your research
  - Goal: a publishable piece of work for RIP
  - Pass the remaining quals
- Focus on courses useful to your research
  - Follow your advisor’s advice; no need to meet all course requirements yet
- TA in fall or spring, may even be deferred or waived
- Continue working with your advisor, to get a head start on prelim
- Or, find an internship relevant to your research
- Use your advisor’s connection

Year 3
- In fall, decide on your dissertation direction
  - Check with your advisor for classes to take before prelim
- Obtain initial results, and publish more on the way
- Get your committee together by early spring, and write/defend your prelim
  - Part of it is a dissertation proposal: not a contract, but a demonstration that you are “ready,” e.g., able to propose a research agenda suitable for PhD
  - Check with your committee for scope and expectation
- Extensions must be approval by the Graduate School
  - Extensions beyond Year 3.5 are rarely granted

Years 4 to n – 1
- Research, research, research...
- Wrap up course requirement; you can always take/audit more to expand your horizon and stay up-to-date

Year n
- Your last spring will be packed by interviews, writing, and defense
  - Job hunting starts earlier and takes more time than you think
  - For academic jobs, applications start in late fall
- Get bulk of your work done before last fall!

A reasonable MS schedule: Year 1

Year 1
- Finish >50% (i.e., ≥ 5) of the regular courses required
- Do projects that can impress your potential advisors
- Talk to faculty, attend seminars/group meetings this fall
- Declare advisor in spring
- If you don’t start your MS project in spring, at least develop a concrete idea and some steps to take in the summer
- Don’t miss any career fairs

Summer 1
- Whatever you do, stay in touch with your advisor, and continue/begin working on your MS project

Year 2
- Finish the rest of the course requirement
- Form your committee in fall and defend in spring
- Get bulk of your research work done before last fall, because your last spring will be packed by interviews, writing, and defense
- Job hunting starts early and takes a lot of time
- Don’t miss on-campus opportunities

MS schedule: Year 2