



WHY GO TO GRADUATE SCHOOL IN CS?

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CRA-E

Computing Research Association
Education

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Overview

- What is graduate school all about?
- How to prepare for graduate school
- Choosing where to apply
- Fellowships
- The application process and procedures



What is graduate school all about?

- Increasing breadth and depth of knowledge
- Pursuing your intellectual and professional interests
- Transitioning from foundations of CS to current state-of-the-art
- Engaging in research and learning to work on open problems



Master's Degree (M.S.)

- Typically 1.5-2 years
- Coursework including “the next level” of CS foundations + advanced electives
- Research M.S. (includes master's thesis) versus Professional M.S. (entirely coursework)
- Typically charges tuition
 - some employers pay for their employees to attend a M.S. program part-time while working full-time

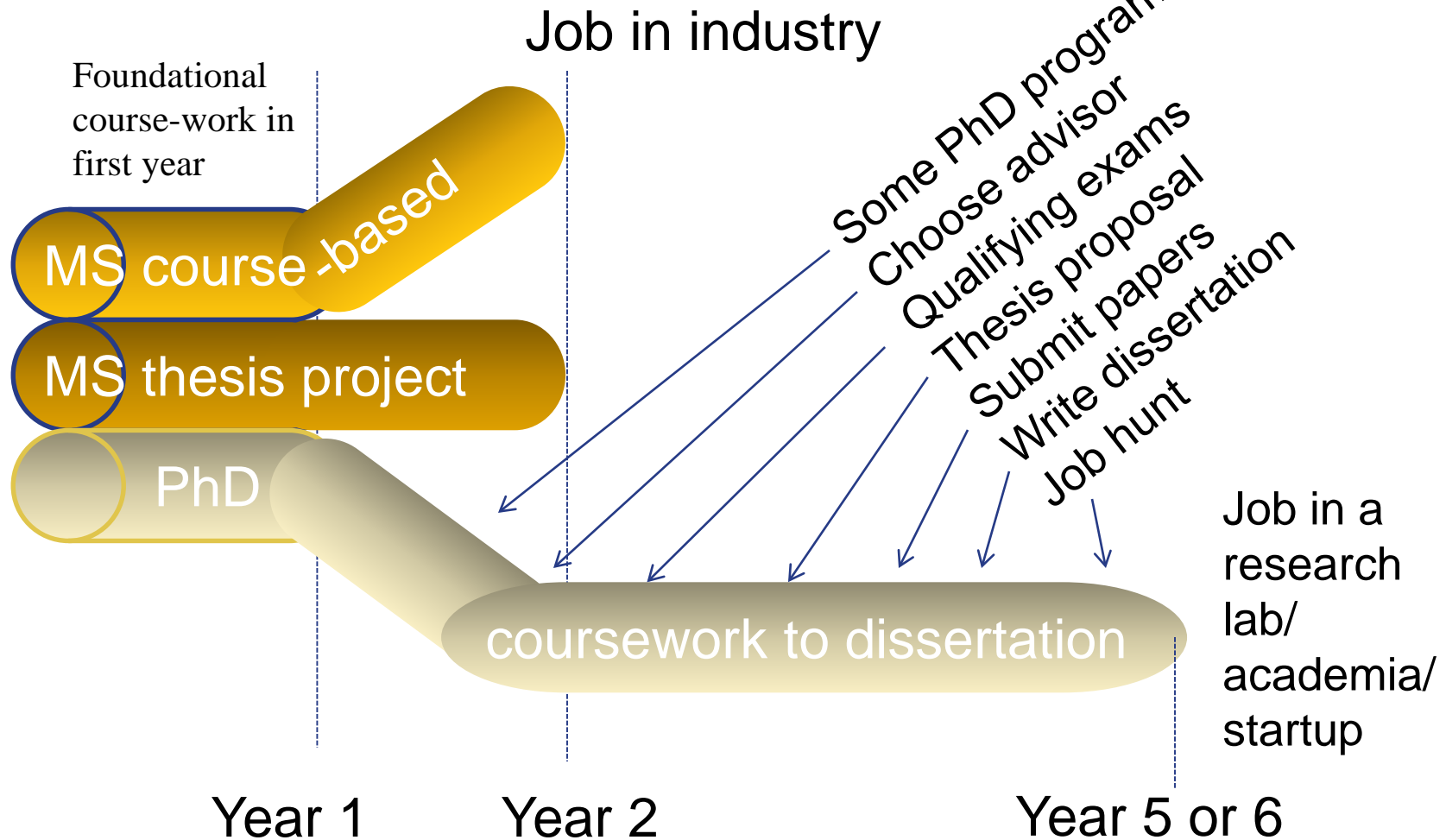
Doctorate (Ph.D.)

- Typically 5-6 years from the B.S. degree (3-4 from the Master's degree)
- Coursework like Master's + some additional courses (varies by school)
- Master's often given along the way
- Dissertation (aka "doctoral thesis")
- Some oral and/or written exams (e.g., qualifying exams, research proposal, dissertation defense)
- Generally, tuition is waived and stipend (enough to live on) in the form of a teaching assistantship, research assistantship, or fellowship

Career Path: MS versus PhD

- **Career paths for MS degrees**
 - Technical and/or managerial positions in industry
 - Teaching at community college or lecturer at some colleges/universities
 - Test the waters for continuing on for a Ph.D.
- **Career paths for PhD degrees**
 - Academia
 - Industrial, government, or other research labs
 - Entrepreneur

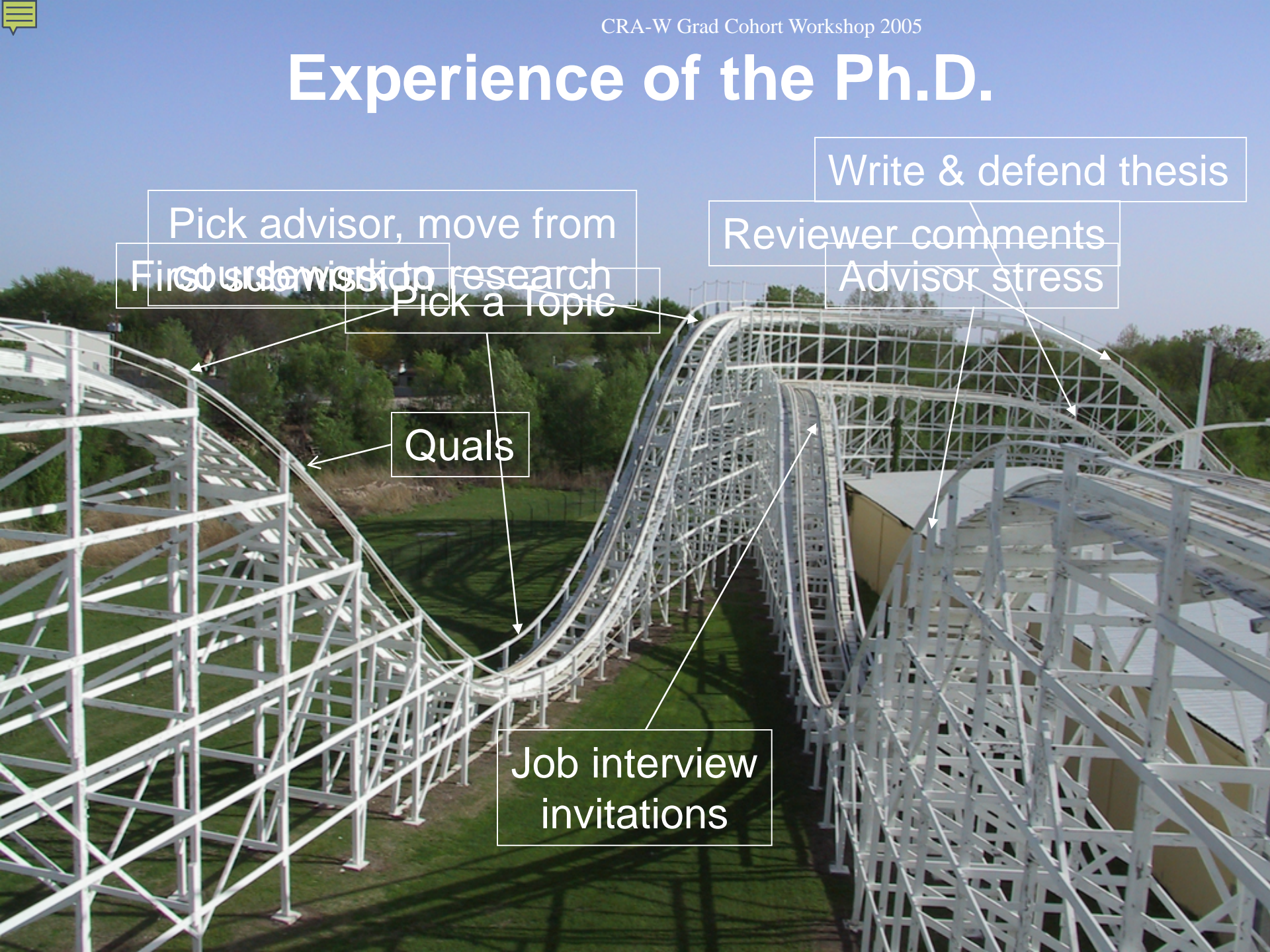
Graduate School Paths



What is the Grad School “Experience” like?

- Professional Master’s Program
 - 3-4 courses per semester for 1.5 to 2 years
- Research Master’s Program
 - 3-4 courses/semester (no other responsibilities)
 - 2-3 courses/semester (with other responsibilities; i.e., TA, RA)
- Ph.D.
 - Similar to Research Master’s in first two years
 - Primarily research and seminar courses in remaining 3-5 years
 - Typically a teaching or research assistant

Experience of the Ph.D.



Pick advisor, move from

First course to research

Pick a topic

Quals

Job interview
invitations

Write & defend thesis

Reviewer comments

Advisor stress

What about going to work first?

- **Advantages**

- Work may give you a clearer sense of what kind of research you want to do
- Graduate schools tend to value work experience
 - it's generally not harder to get accepted after a few years of work
 - work experience can make up for a less-than-stellar academic record
- Some employers pay or provide time off for a professional Master's degree

- **Disadvantages**

- Once you have financial and/or family responsibilities, going back to graduate school can be more challenging

What about going to grad school part-time?

- More common for Master's degrees
 - Some employers will cover tuition costs for their employees for part-time studies while working full-time.
 - Typically, full-time Master's will take two years while part-time will take around four years.
- Part-time Ph.D. is uncommon
 - probably not very feasible
- Both Master's and Ph.D. students often spend their summers working at internships.
 - These often pay well and provide good learning experiences.

About starting salaries

- Salaries vary considerably! The following may give you some general sense of the “delta” for B.S., M.S., and Ph.D.:
- UIUC 2012-13 average starting salary data (cs.illinois.edu/about-us/cs-statistics):
 - B.S. \$84K
 - M.S. \$102K
 - Ph.D. \$131K
- National Association of Colleges and Employers (2012)
 - B.S. \$60K
 - M.S. \$80K
- Ph.D. salaries in academia are somewhat lower than in industry (about \$95K for 9 months) (CRA Taulbee Report 2012)

How to prepare for graduate school

- Take challenging courses and get broad foundations
 - Theory and systems count the most
- Do well in your classes (performance in advanced courses is particularly important)
- Participate in research in your junior year (or earlier)
- Participate in a summer research experience
- Try to get to know some of your professors (they are likely writers for letters of recommendation) through:
 - Research
 - Independent study
 - Undergraduate teaching assistant



What are graduate schools looking for?

- Your prior research experience
- Your potential for being creative, hardworking, and productive
- Your potential for becoming a leader in a field
- Your grades
- Your test scores



Where should I apply?

- The “top few” schools (e.g. MIT, Stanford, Berkeley, CMU) have **extremely** competitive admission standards for Ph.D. programs
 - More competitive than for undergraduate admission
 - Self-selected application pool for grad school
- There are many schools you might not have considered for undergraduate study that have very strong Ph.D. programs
- Reputation of the department matters (not the institution)
- Many highly rated research departments do not accept students for a research Masters

Where should I apply?

- Look at rankings (e.g., U.S. News), but with a grain of salt!
- Look at departmental websites to learn about research areas and faculty
- Talk to faculty and the graduate admissions chair about where to apply
- Some schools are very strong in certain sub-disciplines of CS and less so in others.
 - If you're interested in subfield X (e.g., AI, robotics, graphics, theory) and a school is particularly strong in that field, don't worry about the overall ranking too much

Recent Rankings

US News and World Report



#1	Carnegie Mellon University Pittsburgh, PA	5.0
#1	Massachusetts Institute of Technology Cambridge, MA	5.0
#1	Stanford University Stanford, CA	5.0
#1	University of California—Berkeley Berkeley, CA	5.0
#5	University of Illinois—Urbana-Champaign Urbana, IL	4.6
#6	Cornell University Ithaca, NY	4.5
#6	University of Washington Seattle, WA	4.5
#8	Princeton University Princeton, NJ	4.4
#9	Georgia Institute of Technology Atlanta, GA	4.3

+ more than 100 other Ph.D. granting departments!

How many applications?

- Apply to a range of schools
- 2 safe schools, 2 good matches, 2 slight stretches is a minimum!
- Most students are advised to apply to 8-10 schools,
- “Top few” should be considered as stretches in almost every case
- Talk to your faculty and advisors about your choices



A Typical Timeline

Almost all departments admit students for the fall semester only.

If you want to start graduate school in fall of year X

- Start your application in September of $X-1$
 - Your senior year if you are applying as an undergrad
- Take GREs in October or December of $X-1$
- Deadlines vary from November to January
- Apply for fellowships awarded to you in fall $X-1$

What are typical acceptance rates?

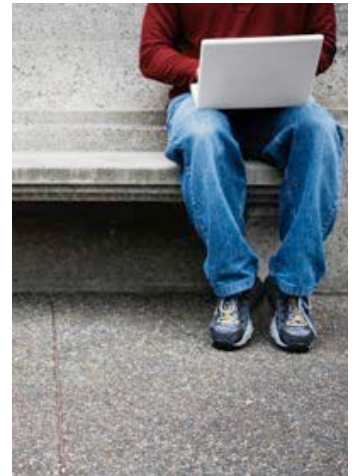
- Acceptance rates for domestic students (U.S. citizens and permanent residents) are higher than for international students
- Acceptance rates for domestic students to Ph.D. programs
 - “Top 4”: 5-10%
 - “Top 5-10”: 15-20%
 - “Top 11-25”: 30-45%
- Acceptance rates to professional master’s programs are much higher (and tuition is, commensurately, quite high)

Fellowships

- Prestigious, more money (\$30K), fewer strings attached
 - NSF (Early November deadline)
 - Hertz (late October deadline)
 - NDSEG (Early January deadline)
 - Homeland Security Fellowships (Early January deadline)
 - Targeted fellowships (e.g., GEM Fellowship for students from under-represented groups)
- Majority of fellowships students apply before grad schools require US citizenship/permanent resident status
- Many schools have their own fellowships for top applicants

Applying

- Personal statement
- Letters of recommendation
- GRE
- Transcripts



Personal Statement: DOs

- Describe your prior research experiences
- Demonstrate that you know what research is
- Describe your future research interests – the more specific the better
- Demonstrate that you have some ideas for interesting and important problems to study
- Personalize each statement with at least one paragraph about why the particular department is of interest to you
- Have at least one person (ideally a professor) read your drafts and give you feedback

Personal Statement: DON'Ts

- Write that you've been interested in CS since you were in the second grade
 - too many essays start this way
- Write that you want to do research but don't have any ideas for which subfield

Letters of Recommendation

- Three or four letters are required.
 - Ideally, have at least one letter from a faculty member with whom you have done research.
- A letter from a professor who can only say “*This student did well in class*” is not very useful
 - The transcript already reflects this
- It is often hard to find 3-4 CS professors who know you well.
 - A few letters from faculty in related fields (e.g., EE, ECE, Math, or other sciences) are useful too.
- A letter from a supervisor in a summer internship is fine
 - Most useful if the letter can speak to your research potential and the writer has a Ph.D.

How to ask for a letter of recommendation ...

- Give your prospective recommenders a way to say “no” easily, because a neutral letter is not helpful.
- How?
 - *“I’m applying to graduate school and I’m wondering if you’d feel comfortable writing letters for me? If so, I’d be very grateful. If you’re not able to do this for any reason, I’ll certainly understand.”*
- If they answer “yes”, ask what materials they would like (e.g., statement of purpose, transcripts, etc.) and when they would like to receive them.
- Ask early!

The GRE

- General exam (computer-based)
 - Verbal reasoning (similar to SAT verbal)
 - Quantitative reasoning (similar to SAT math)
 - Analytical Writing
 - Write an essay defending an argument
 - Evaluate an argument for good logic and construction



The GRE

- Computer Science Subject Exam (paper-based)
 - 40% Software Systems and Methodology
 - 15% Computer organization and architecture
 - 40% Theory and Mathematical Background
 - 5% Other topics
- Register in the summer before senior year and take the early fall exam



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CANCELLED

The CS subject exam no longer exists!

Want more info? Check out Conquer!

Conquer: A website specifically for undergraduate research and graduate school advice in CS:

<http://conquer.cra.org/>



Questions?

