Graduate Studies in Computer Science

Questions, Answers, Things to Think About

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What is Graduate Studies?

◆ Academic studies after you've graduated with a bachelor's degree
◆ Training in RESEARCH in your field
  • moving from studying what others have done to creating work that other people will study
◆ Two levels in most programs: master's and doctoral
  • masters: shows mastery in your field of choice
  • doctoral: significant original research contributions
◆ Both normally involve coursework (fewer, more intense courses) and a thesis (a research project stretching over a long period of time)
◆ Normal entry is from B.Sc. → M.Sc.
Overview

- Why? Why Not?
- Tradeoffs: Choosing a School
- Tradeoffs: Choosing an Application Area
- Tradeoffs: Choosing a Supervisor
- Tradeoffs: Finding Money
- Applying for Scholarships
- Applying to Graduate Schools

Note the major theme to the above: it's all about tradeoffs; every choice you make brings you some opportunities and limits others.

Being Realistic

- You have to balance what would be perfect with what you can likely expect and what you can afford.
- There are always dream schools, but whether you can get into them or afford them is likely another question.
- That DOESN’T mean you should aim low – just that you should have a realistic assessment of your abilities and where they can take you.
Standards (for example)

- It's currently not possible to get into our programs if you do not have **at least** a 3.0 gpa **cumulative on your last 60 credit hours**
  - *and* somebody in the dept who is willing to supervise your research (but you should have this anywhere!)
- Scholarship expectations range from 3.75 - 4+
  - No surprise: it's harder to get free money
- Most of this is typical for a major Canadian university
- Things other than GPA matter too – documented skills in chosen area, letters of recommendation, etc.

Having Said That

- Grad studies is not (just) for the superhuman among us
- If you choose to go to graduate studies you will meet many people smarter than you and many people that aren't
- Grad studies can sound very intimidating…
- …but so did grade 3 when you were in grade 2
- If you're considering it the first thing you need to ask yourself is:
Why?

Some of the reasons people go into grad studies at the Master's level:

- To do more interesting work than they might with a B.Sc., or to be a better candidate for the fewer more interesting jobs out there.
- To advance their prospects in their place of employment; to "get ahead in the game".
- To advance your own knowledge, work at higher things.
- As a stepping stone to a Ph.D. (a few enter thinking this, many decide after they've done an M.Sc.)
  - I get to be a Doctor! Fame, prestige, paparazzi 😊
- To make more money.
- Similar reasons for going to University in the first place!

Why not?

Cons:

- Time taken takes time out of the workforce
  - i.e. you're starting another couple of years later.
- Time taken away from other things (building a family, living a larger life).
- Taking a chance your chosen field will be as marketable in a couple of years.

- These concerns need to be overridden by the pros
  - They usually can be – grad students get married, have children, live lives – but they do make sacrifices.
  - They also spend a couple of years around some interesting people doing interesting work.
Choosing Programs

- Assuming you are becoming an M.Sc. student, we have two choices here (common in many places)
- The thesis M.Sc. is solidly about mastery through research
- The coursework M.Sc. shows mastery through additional coursework
- The latter is restrictive – no significant research experience = very limited entry into Ph.D. programs, less specialization in one area

Co-Op Option

- The coursework-only M.Sc. also has a new co-op option, similar to the undergrad coop
  - Take 0-credit hour courses to record work terms on your transcript
  - Not available through thesis M.Sc., because again, there you are doing research, and this usually can't practically be done with large gaps for work terms
OK, So I’m leaning toward this...

- Now what?
- Many decisions:
  - Where?
  - With who?
  - Doing what?
  - How will I pay for this?
  - The issues surrounding these questions are highly intertwined

Where?

- There are a few "universally" good schools
  - Everybody's heard of the Stanfords, the MITs
  - But you've also got to be able to get into them and afford them
- There are good all-around schools in every country
- Likely more useful to be at schools that are considered good for the particular area you intend to work in
- How do I find this?
- Grad Studies is about research! Put in a bit of effort and look at professors, groups, labs...this is a high-impact, costly decision on your life, why would you NOT research this?
Other Issues

- There are factors other than interest and goodness that go into choosing a school
  - Location? Livability of the area? Connections?
  - Expense considerations - how expensive is it to live there, as well as go to school?
  - Income considerations – how much income can you expect there? Can you work as well (both legally and in terms of your academic workload)?
  - Family considerations
  - Other opportunities – research partnerships with industry? Teaching?
  - And much more – the other things we'll talk about also enter into it

Application Area

- Affects your choice of pretty much everything else
- Not everybody knows about their chosen area perfectly ahead of time (you usually do have a good idea though, it's part of what motivates you in the first place)
- It generally starts with what you're really interested in, combined with what's economically feasible (to the degree that is a factor to you)
  - Also affected by available funding, advisor
Active Research Areas at the UofM

- AI and Robotics (*Blatant Self Promotion*)
- Parallel and Distributed Systems
- Networks
- Human-Computer Interaction
- Software Engineering
- Computational Finance
- Bioinformatics
- Theoretical Computer Science
- Databases/Data Mining…and many others!
- Talk to people in these areas for advice on the area (and schools, people in the area!)

Who Will I Work With?

- For a thesis M.Sc., you need a potential advisor, the earlier the better
- Sometimes as an M.Sc. student you arrive advisor-less, but that is not usual
- One thing that may make you think of going to a particular place is the opportunity to work with a particular person
  - There are generally a few really good people anyplace
    - again, research this!
  - Keep in mind just looking at a picture from a distance isn't often accurate – contact them in a non-form-letter like manner!
Judging Who's Active

- Look at publications and where they appear (recognized international publications, not just the “Winnipeg Journal of CS”, small workshops, or other local things, and look at recent ones first!)
- Look at who talks about them and what they are involved with (are they well known? do they have research funding?)
- If people don't publicize these things it may be because they don't feel they need to; or because they don't actually have them
  - you have to critically explore to judge

Factors in Choosing an Advisor

- Doing something you're interested in?
- More importantly, are his/her other grad students doing something interesting?
  - TALK to their grad students, find out what working in that group is like (people here might know them too!)
- Money? Connections?
  - An influential and well-connected advisor can mean a lot in terms of recognition of good work if you go on to a Ph.D. or from there out into academia
- Freedom?
  - How much room for choosing your own thesis topic? Do you even want that freedom? Remember tradeoffs— you need to decide what's important to YOU
Factors in Choosing an Advisor

- How many other grad students are there in the group? How much time will there be for you?
  - This is an issue in choosing schools too
  - If you're one of a dozen for your advisor or one in a couple of hundred in your school, things will be different (not necessarily bad, just different)
    - Big family vs. only child
    - Again, balance with your considerations – YOU know best about your style, likes and dislikes, potential pitfalls. If you don't, this is where to start: do some self-analysis and make a list of important points

How Will I Live?

- Clearly money is not all-encompassing, you still need to eat and live indoors

- A number of sources:
  - National Scholarship Programs
  - Provincial/Local Scholarship Programs
  - Specialty scholarship Programs (look deep and long, these can add up!)
  - Advisor?
  - TA work? Teaching? Research Assistantships?
  - Your own wherewithal (i.e. external work, savings, relatives to sponge off of)
National Scholarship Programs

- NSERC PGS
  - Natural Sciences and Engineering Research Council (federal granting agency for Sci/Eng)
  - $17k+ for a PGS-M, portable in Canada
  - Getting one of these is an easy admission to almost any Canadian university
    - Many universities guarantee additional funding ("top ups") to those that hold these
    - this is possible to do here

NSERC Applications

- …Are done online (NSERC.ca; still need to submit paper transcripts)
- **Spend some time filling this out** – includes a statement of what you think you'll be doing. consult your intended supervisor if possible
- Dept. of Comp. Sci. Awards committee will provide feedback for any applications submitted before October 3
- Online applications must be complete before Oct.10; Transcripts must be sent to the Faculty of Graduate Studies by Oct. 3.
Other Scholarships

- Here, UM Fellowships ($12k Master's, $16k Ph.D.), Manitoba Graduate Fellowships ($15k Master's) – deadline in Jan
  - they expect you to have *tried* to get an NSERC – so *you must put in the NSERC application by the deadline*
  - Min 3.75 GPA in the last 2 years of study
- Look into provincial/local funding in your province of interest
- Many small specialty scholarships – everything from ethnic groups, religious affiliations, charities, service organizations
  - Usually you have to hunt for these – *but so does everybody else*

Other Money

- TA/RA
  - TA's are normally dealt with by the department and usually involve a job application process
  - RA's are affiliated with a particular individual or group and are paid from research grants
Money

◆ Advisor
  - Your advisor may have money that may or may not come with strings attached
    - extra work or a thesis on a particular project that the money exists for
  - Be aware this is hard to come by if the advisor doesn’t "know" you, unless they are extremely well off
    - Hard to take a chance with money when they don’t have guarantees of your abilities

Guaranteed Funding Packages

◆ Our department has a limited number of guaranteed funding packages, with a combination of funds from the supervisor and from the department (some of which will be TA money, i.e. money you are expected to work for)
Applying to Graduate Schools

- Watch deadlines (June 1 for Canadians for the University of Manitoba, often earlier elsewhere)
- Generally applications are viewed by a committee from people in different areas
- There are always hard-and-fast rules in any grad program - e.g. Minimum GPA 3.0 in the last 60 credit hrs along with faculty advocacy for ours
- But it's also about convincing a committee that you're a good applicant. They look for:
  - Good grades; previous research experience; industry experience; initiative (not MS certification and the like)
  - Present yourself well – convince them you have what it takes! (written communications skills)

Applying for Scholarships

- Much more fixated on GPA (especially at the M.Sc. level – research counts more at the Ph.D. level and you generally have more evidence of that)
- Usually components to ranking that include scores for research & Industrial experience
  - get some – projects, work at places that do R&D
  - e.g. NSERC PGS-MSc: 50% Academic Excellence; 30% Research ability/potential, 20% communication/interpersonal/leadership
- Most ask for references – get someone who actually has something significant to say
  - e.g. will a professor remember that you did a great project for their course, or just that you're a generally good student? Do they know you in particular?
Applying for Scholarships

- A description of proposed research is often part of an application (e.g. to NSERC)
- Many people don't know precisely what they want to do when they start, but if you do it is a sign of initiative and planning, and this bodes well
- **Get some help** working on such an item so that you have something reasonable – and if you can, **do** some pre-research in this area
- A big part of all this is presenting yourself well
  - Written communication skills again – I'm bringing this up again so that those of you with some time left before you get to the point of applying can get some!

Getting Research Experience

- ...And experience in the skills that make a good researcher
- Do an honours project, or an industrial project (4520, 4560)
- Especially for people still in 3rd year (or earlier), apply for an **Undergrad Research Award** (NSERC/Faculty of Science) – lets you work in a lab for a work term (can count as coop too, but generally doesn't pay as well)
  - Deadline is December 15
- These both give you research skills **AND** connections to a supervisor or a reviewer who can talk honestly about your good qualities
Finally

- Remember that an application for a scholarship or a graduate school is an indication of how skilled you are and **how badly you want this**

- Make yourself stand out – find ways of showing a committee that you are a better choice than the other people that are applying
  - Be genuine
  - They are not trying to keep you out, they are **trying to let the most promising, dedicated people in**
  - Be one of those people! Give them reasons to give you an opportunity!