

# 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.

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## 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

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## 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

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## 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.

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## 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:

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## 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!

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## 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

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## Choosing Programs

- ◆ Assuming you are becoming an M.Sc. student, we have two choices here (common in many places)
- ◆ Thesis and non-Thesis M.Sc.
- ◆ 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

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## 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

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## 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

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## 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?

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## 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

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## 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

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## 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!)

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## 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!

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## 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

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## 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

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## 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

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## 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)

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# 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

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# 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.

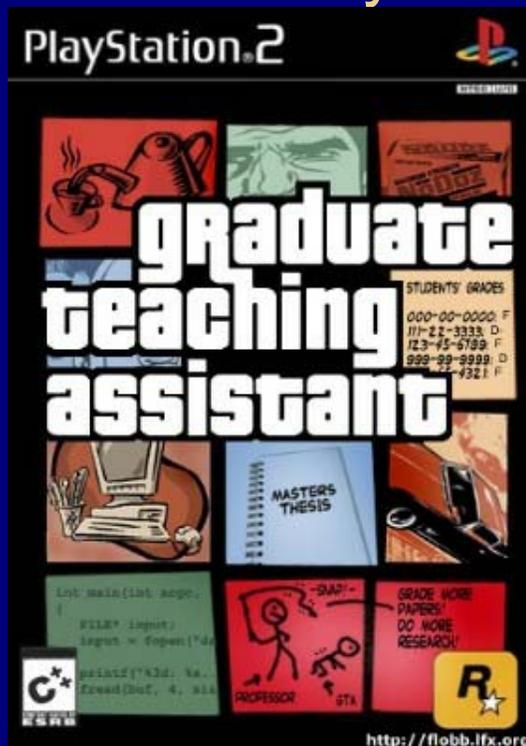
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## Other Scholarships

- ◆ 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*

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## 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

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# 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*

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# 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)

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## 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)

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## 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?

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## 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!

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## 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 3<sup>rd</sup> 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

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# 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!