



# **Have You Considered Graduate School?**

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- Why do an MSc or a PhD?
- More control over your professional life, comfortable financial lifestyle, personal satisfaction, socially meaningful work.
- Often MSc/PhD is the person in charge.
- At UWO Computer Science graduate students are fully supported:

MSc	\$19,975/year
PhD	\$21,875/year

- Most North American and European universities offer similar support.
- At UWO, this money comes from the university, your supervisor and a TA position.
- At UWO, an MSc takes about 1.5 years to complete while a PhD takes 4 years beyond the MSc. on average.

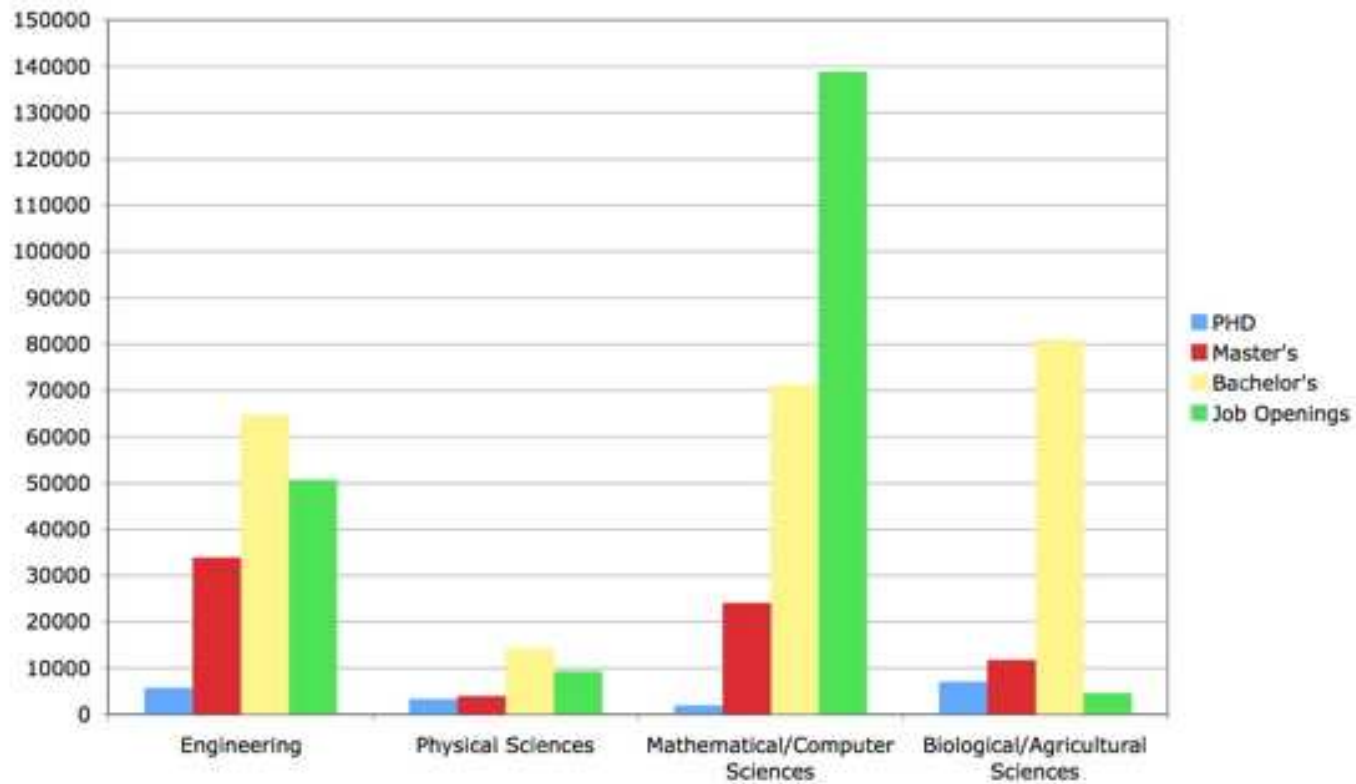
## Why do an MSc or PhD?

- If you want to do research, you need an advanced degree, at least an MSc but preferably a PhD.
- An MSc will improve your marketable skills (at only a small cost in time and money).
- If you want to lead research projects or do advanced research, you need an advanced degree, usually a PhD.
- You get to work on things that interest you (your own project?). You get to specialize in a particular area  $\Rightarrow$  Intellectual Satisfaction.

# Is There a Demand for Computer Science MSc's and PhD's?

- The graph shown on the next slide was produced by Computer Research Associates in 2007, showing the US Bureau of Labor projected job openings in various science, technology, engineering and mathematics fields versus the number of graduates in these fields (this data was initially based on data collected by the US National Science Foundation).
- The demand for CS graduates far exceeds the supply, the demand for Engineering graduates and the supply are more in balance while for the Biological Sciences the supply is much greater than the demand.
- While statistics are for the US there is no reason not to expect they roughly hold in Canada as well.

**Annual Degrees (2004) and Average Job Openings in Broad S&E Fields (2004-2014)**



# **What is the Demand by Specific Areas of Computer Science**

- The US Bureau of Labor also collected data in various computer related fields. Total employment is about 10% more than at the height of the dot-com boom, even in the face of increased off-shoring (basic programming jobs).
- Demand for basic programmers has been significantly reduced but demand for other specialized areas has increased (sometimes, quite significantly).

<b>Category</b>	<b>2000</b>	<b>May 2006</b>	<b>% Change From 2000</b>
Computer and Information Scientists, Research	25,800	27,650	7.2%
Computer Programmers	530,730	396,020	-25.4%
Computer Software Engineers, Applications	374,640	472,420	26.1%
Computer Software Engineers, Systems Software	264,610	329,060	24.4%
Computer Support Specialists	522,570	514,460	-1.6%
Computer Systems Analysts	463,300	446,460	-3.6%
Database Administrators	108,000	109,840	1.7%
Network and Computer Systems Administrators	234,040	289,520	23.7%
Network Systems and Data Communications Analysts	119,220	203,710	70.9%
Computer and Information Systems Managers	283,480	251,210	-11.4%
Computer Specialists, All Other		180,270	n/a
<b>Total</b>	<b>2,928,390</b>	<b>3,220,620</b>	<b>10.0%</b>

Table 1: Demand for Various Areas of Computer Science.

# How does Computer Science Fare Relative to Other Fields?

- According to data for the years 2004/2005/2006, released 03/25/2008 in CRA Bulletin, SOURCE: NSF (National Science Foundation) 2006:
  1. 91% CS graduates at the bachelor's level had full times jobs
  2. 93% CS graduates at the master's level had full times jobs
- The table below gives the ERI (Economic Research Institute) median 2006 salary information for a number of fields.



Field	BSc	MSc
Accounting	\$44,630	\$49,217
Art General	\$33,605	\$42,043
Biochemistry	\$37,556	\$45,758
Chemistry General	\$44,136	\$55,213
Computer Science	<u>\$49,582</u>	<u>\$70,717</u>
Economics General	\$46,024	\$61,857
Elementary Teacher	\$32,327	\$42,906
Engineering	<u>\$52,690</u>	<u>\$68,022</u>
Finance General	\$40,306	\$49,217
Foreign Languages/Literature	\$36,092	\$42,043
History General	\$36,313	\$42,043
Human Resources Management	\$36,831	\$54,704
Management Science	\$47,899	\$68,916
Mathematics	\$49,190	\$56,046
Philosophy	\$33,316	\$42,043
Physical Sciences	\$30,483	\$68,111
Psychology	\$34,119	\$36,598
Sociology	\$35,890	\$37,428

Table 2: BSc and MSc salaries for various fields.

## **The Financial Case for MSc versus BSc**

- Assumptions: BSc salary: \$49,582.00, MSc salary: \$70,717.00, no inflation, and 5% salary increase each year (these assumptions are conservative).
- Lets look at the cumulative salaries and their differences assuming a 2 year MSc (no salary) for a BSc and an MSc graduate.
- With an MSc, you will make more than \$1 million dollars over your working life than with a BSc!!!

Year	BSc Salary	Cum BSc Salary	MSc Salary	Cum MSc Salary	Cum Diff
1	\$49,582.00	\$49,582.00	\$70,717.00	\$0.00	\$-49,582.00
2	\$52,061.10	\$101,643.10	\$74,252.85	\$0.00	\$-101,643.10
3	\$54,664.16	\$156,307.25	\$77,965.49	\$77,965.49	\$-78,341.76
4	\$57,397.36	\$213,704.61	\$81,863.77	\$159,829.25	\$-53,875.36
5	\$60,267.23	\$273,971.84	\$85,956.95	\$245,786.20	\$-28,185.64
<u>6</u>	\$63,280.59	<u>\$337,252.44</u>	\$90,254.80	<u>\$336,041.00</u>	<u>\$-1,211.44</u>
7	\$66,444.62	\$403,697.06	\$94,767.55	\$430,808.56	\$27,111.50
8	\$69,766.86	\$473,463.94	\$99,505.92	\$530,314.50	\$56,850.56
9	\$73,255.20	\$546,719.12	\$104,481.22	\$634,795.75	\$88,076.62
10	\$76,917.96	\$623,637.06	\$109,705.28	\$744,501.00	\$120,863.94
15	\$98,168.98	\$1,069,908.38	\$140,014.84	\$1,381,001.62	\$311,093.25
20	\$125,291.25	\$1,639,476.12	\$178,698.38	\$2,193,355.50	\$553,879.38
25	\$159,906.92	\$2,366,405.25	\$228,069.45	\$3,230,148.00	\$863,742.75
<u>30</u>	\$204,086.25	<u>\$3,294,171.25</u>	\$291,080.84	<u>\$4,553,387.50</u>	<u>\$1,259,216.25</u>
35	\$260,471.52	\$4,478,261.50	\$371,501.12	\$6,242,213.00	\$1,763,951.50
40	\$332,435.00	\$5,989,495.00	\$474,140.03	\$8,397,630.00	\$2,408,135.00
45	\$424,280.66	\$7,918,254.00	\$605,136.19	\$11,148,548.00	\$3,230,294.00
50	\$541,501.62	\$10,379,894.00	\$772,324.12	\$14,659,496.00	\$4,279,602.00

Table 3: Cumulative BSc and MSc salaries and their differences.

# Why do a PhD?

- A necessary qualification for a professorship or a research scientist with industry/government.
- Often, this is the person in charge!
- Do research, expand the frontiers of knowledge, leave a mark behind.
- Do multidisciplinary research - For example: robot control for surgery, detect/predict earthquakes and severe weather events, financial control systems, etc.
- On average, a PhD can provide greater lifelong freedom of movement (your credentials are good anywhere) and more independence. Typically, less involved in corporate hierarchies.
- More emphasis on individual creativity.
- Of course, fewer jobs required such advanced credentials.

- More self-starting and internally motivated.
- More focused on ideas and less on process, politics, or economics.
- Working on leading edge ideas and future products.
- Very comfortable financially.
- Use a wide range of skills (design, analysis, synthesis, working with others, etc.).
- Provide tremendous satisfaction in helping others (for example: helping students develop their skills).
- 2007 starting salaries range from \$80,000 to \$150,000.

## Specifically for University Professors

- Immediate means to leverage ideas through graduate students.
- Variety: teach, research, write, give talks, raise funds (apply for grants), travel, etc.
- Some amount of pressure, especially prior to tenure.
- Freedom to pursue your ideas (especially after tenure).
- Satisfaction in invention, publications and impact of work.
- Relatively high job security and stability.
- Comfortable to very good salaries.
- Consulting is possible (for extra income).

# Salaries for Professors

- Statistics from 2005-2006 Taulbee Survey.

**Table 33. Twelve-month Salaries, 19 Responses of 28 Canadian Computer Science Departments (Canadian Dollars)**

Faculty Rank	Number of Faculty	Reported Salary Minimum			Overall Mean	Overall Median	Reported Salary Maximum		
		Minimum	Mean	Maximum			Minimum	Mean	Maximum
Full Professor	265	\$56,727	\$107,270	\$139,154	\$129,342	\$126,698	\$86,443	\$156,692	\$224,259
Associate Professor	221	\$49,368	\$86,498	\$119,517	\$102,615	\$102,732	\$94,308	\$115,695	\$149,281
Assistant Professor	173	\$59,559	\$80,881	\$110,200	\$90,873	\$91,081	\$67,474	\$101,321	\$134,988
<b>Non-Tenure-Track</b>									
Teaching Faculty	73	\$24,600	\$61,161	\$80,383	\$73,535	\$73,740	\$47,355	\$85,613	\$125,630
Research Faculty	9	*	*	*	*	*	*	*	*
Postdoctorates	19	\$22,800	\$33,260	\$48,000	\$38,694	\$40,000	\$35,000	\$46,600	\$65,000

\*Numbers not reported due to low number of respondents

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