



GRADUATE OVERVIEW 2016-2017

... that can handle uncertainty in the world, provide compact solutions, and are able to provide guarantees with respect to their behaviour.

Existing solutions to Probabilistic Planning problems:

- Offline planners cannot handle large problems
- Online planners:
 - no guarantees of optimality
 - poor mechanism to avoid deadends
 - large solutions

Approach: Exploit (our) state-of-the-art techniques for Fully Observable Non-Deterministic (FOND) planning.

- better scalability
- compact solutions

solutions to probabilistic problems.

Exploring most likely plans

- Likelihood of a plan π : $L(\pi) = \prod_{i=0}^{n-1} P(s_i, a_i, s_{i+1})$
- GENERATEWEAKPLAN modified to give preference to exploring the most likely plans

Maximizing Reachability

- Best quality policy P found so far is selected
- All states reachable by P are fully explored

Prob-PRP finds high-quality solutions that outperform the state of the art.

MAXPROB Prob-PRP is **guaranteed** to find optimal MAXPROB solutions when deadends are avoidable.

Compact Policy Prob-PRP inherits the **compact representation** of the policies from PRP, leading to **small policies**.

Short Plans Prob-PRP solutions do **not rely** on highly improbable events to reach the goal.

Example

- Init: set of n keys
- Goal: door open
- Actions:
 - unstackKey
 - testKeyAtRandom

generate weak plan

```

graph LR
  Init --> s1
  s1 --> s2
  s1 --> s3
  s2 --> Goal
  s3 --> s4
  s3 --> s7
  s4 --> s5
  s4 --> s8
  s5 --> s6
  s7 --> s8
  
```

of the initial state of the world, ... and a goal or objective ... mapping from states to actions ... can execute to achieve the goal. ... π , is called a plan ... stochastic action outcomes ... action outcomes

Solution

... of the plan ... (PROB)

	%	L	S	T	%	L	S	T
blocksworld-p01	100	23	18	0.02	100	19	17	0.00
blocksworld-p03	100	23	18	0.02	100	19	17	0.00
blocksworld-p05	100	65	61	0.72	100	47	43	0.16
blocksworld-p07	100	64	61	0.69	100	47	43	0.16
blocksworld-p09	100	41	38	0.67	100	65	61	0.46
blocksworld-p11	100	42	39	0.66	100	65	61	0.46
blocksworld-p13	0	0	117	17	100	115	107	1.38
blocksworld-p15	0	0	117	17	100	115	107	1.38
boxworld-p01	100	29	50	0.43	100	32	57	0.06
boxworld-p03	100	29	48	0.38	100	32	57	0.06
boxworld-p05	100	39	81	1.77	100	39	105	0.24
boxworld-p07	100	65	160	13.0	100	69	266	2.32
boxworld-p09	100	65	132	7.56	100	63	207	1.84
boxworld-p11	100	73	183	22.2	100	102	415	17.9
boxworld-p13	0	0	344	36	100	178	906	130
boxworld-p15	0	0	347	35	100	178	906	160
ex-blocksworld-p02	28	12	37	0.11	54	10	15	0.02
ex-blocksworld-p04	52	14	49	0.09	59	21	18	0.06
ex-blocksworld-p06	90	13	62	0.10	96	27	28	0.34
ex-blocksworld-p08	7	24	69	0.64	36	18	32	0.36
ex-blocksworld-p10	2	36	77	0.97	3.1	26	105	14.3
ex-blocksworld-p12	1	38	97	2.15	2.1	17	78	6.28
schedule-p02	100	59	5	0.01	100	48	7	0.04
schedule-p03	100	100	5	0.01	100	87	7	0.12
schedule-p04	96	58	14	0.02	100	46	21	0.14
schedule-p05	89	116	14	0.03	100	95	16	0.18
schedule-p06	45	364	141	1.42	-	-	-	-
triangle-tire-p02	100	13	81	0.17	100	12	23	0.00
triangle-tire-p04	100	30	248	1.76	100	25	55	0.06
triangle-tire-p06	100	46	490	7.98	100	39	95	0.22
triangle-tire-p08	100	62	958	36.5	100	52	143	0.72
triangle-tire-p10	100	78	1595	111	100	65	199	2.38

Table: Successful runs (!), expected plan length (L), policy size (S), and computation time (T) for previous state-of-the-art MAXPROB planner, RobustFF (Teichteil Königsbuch 2010), and Prob-PRP. Bold numbers indicate superior performance. Dash (-) indicates the planner exceeded the 2GB memory limit during computation.

Potential App...

Auton...

Robo...

Inter...

ary

- Introduced ... other capab...
- high-quality ... ons of ...
- Identified ...
- Prob-PRP ...
- of the ...

[1] From FOND sidestep avoid mission under re and Search for D [2] Improved No Mause, C., McIlva Conference on Auton

Preface

The purpose of this handbook is to describe the degree requirements, financial support, and other matters that concern graduate students in the Department of Computer Science. This handbook is developed over the summer and updated online as needed. Please check this DCS website regularly. Students will be notified by email of significant changes and upcoming deadlines as necessary.

Information about the Department of Computer Science at the University of Toronto, its graduate program admissions, course descriptions and current timetable is available from the Departmental website at www.cs.toronto.edu.

NOTE: The Graduate Program in the Department of Computer Science is a unit within the School of Graduate Studies. The mission of the School of Graduate Studies is to promote university-wide excellence in graduate education and research and to ensure consistency and high standards across the divisions. Sharing responsibility for graduate studies with graduate units and divisions, and operating through a system of collegial governance, consultation, and decanal leadership, SGS defines and administers university-wide regulations for graduate education.

School of Graduate Studies regulations and procedures, some of which are briefly mentioned in this handbook, are available in the SGS Calendar at www.sgs.utoronto.ca.

Graduate Office Contact Information:

Graduate Program Office Location:

Bahen Centre for Information Technology
40 St. George Street, Room BA4242
Toronto, Ontario Canada M5S 2E4

Departmental Mailing Address:

Graduate Office
Department of Computer Science,
University of Toronto
Sandford Fleming Building
10 King's College Road, Room 3302
Toronto, Ontario M5S 3G4
Fax: 416-946-7132

Graduate Program Office Hours

9:00 am - 4:30 pm

Contact

gradinq@cs.toronto.edu

Administrative Staff:

Professor **Angela Demke Brown**
Associate Chair, Graduate Studies

Celeste Francis Esteves, M.Ed.
Graduate Program Administrator

Lynda Barnes
Graduate Program Assistant

Claire Mosses
Graduate Administrative Assistant

Susan Lee
Graduate Office Assistant

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SESSIONAL DATES 2016-2017

Fall Session 2016

M September 12	Start of classes
F August 28	Last date for payment of tuition fees to register for the fall session.
W September 14	Summer Grades are available for viewing by students on the Student Web Service
TH September 15	<ul style="list-style-type: none"> Final date to submit final doctoral theses to SGS to avoid fee charges for 2016–2017 (Refer to Note 2) Students who are required to complete modifications to final thesis must register for the fall session in order to do so. A pro-rated fee structure will apply.
F September 16	Registration for Fall session ends – after this date a late registration fee will be assessed.
M September 26	Final date to add full-year and fall session courses
F September 30	<ul style="list-style-type: none"> Final date to submit PhD thesis for Fall convocation Final Date to submit MSc convocation request for Fall convocation and Dual Registration
F September 30	NSERC PGS/CGS Doctoral Scholarship student submission to Grad Office deadline
F September 30	MICROSOFT Scholarship student submission to Grad Office deadline
M October 10	Thanksgiving Day (University Closed)
W October 12	Departmental Awards student submission to Grad Office deadline
F October 7	Deadline to submit Breadth Evaluation & Plan of study forms for students who started September 2016
M October 24	OGS UofT Online application opens to students
M October 24	SSHRC Doctoral Scholarship student submission to Grad Office deadline
M October 31	Final date to drop fall session full- or half courses without academic penalty (Refer to Note 6)
M November 1	Deadline for students to change immigration status or claim exemption from international student fees for the Fall session.
F November 18	GOOGLE Scholarship student submission to Grad Office deadline
R December 1	NSERC CGSM student submission directly to NSERC (online) deadline
W December 14	Sumner Fellowship student submission to Grad Office deadline
W December 21	Winter break begins (Wednesday, December 21 to Friday December 30 (inclusive))

Winter Session 2017

M January 2	University re-opens
M January 9	Start of classes
F January 13	Registration for Winter session ends – after this date a late registration fee will be assessed.
F January 13	<ul style="list-style-type: none"> • Coursework must be completed and grades submitted for Fall session courses (Refer to Note 3) • Final date for receipt of degree recommendations and submission of any required theses for March or June graduation for master's students without fees being charged for the winter session (Refer to Note 4) • Fall dual registrants must be recommended for the master's degree by this date to maintain their PhD registration (Refer to Note 4)
M January 16	Final date to submit doctoral theses without fee payment for winter session. (Refer to Note 2)
W January 18	Fall Grades are available for viewing by students on the Student Web Service
F January 20	Final date for all students to request that their degrees be conferred in absentia in March/June
M January 23	Final date to add winter session courses
T January 31	Master's Tuition Fee Bursary for Fall session deadline to submit to SGS
M February 20	Family Day (University Closed)
M February 27	Deadline to submit Breadth Evaluation & Plan of Study forms for students who started January 2017
M February 27	Final date to drop full-year and winter session courses without academic penalty (Refer to Note 6)
W March 1	OGS VISA Student Submission to the Grad Office deadline
M April 3	OGS Student Submissions to the Grad Office deadline
R April 13	<ul style="list-style-type: none"> • For students obtaining degrees at June Convocation, coursework must be completed and submitted for full-year and Winter session courses (Refer to Note 3) • Final Date for submission of degree recommendations and submission of any required thesis for degrees for June convocation (Refer to Note 4) • Final date for submission of final doctoral thesis for students whose degrees are to be conferred at the June convocation (Refer to Note 4)
F April 14	Good Friday (University closed)
F April 21	Final date for degree recommendations of Winter dual registrants for the master's degree to their PhD registration
F April 28	Master's Tuition Fee Bursary for Winter session deadline to submit to SGS

F May 5	Final date for registration for May session
M May 8	Final date to enroll in May–June or May–August session courses
F May 12	Coursework must be completed and grades submitted for full-year and winter session courses (except for extended courses) (Refer to Note 3)
W May 17	Winter Grades are available for viewing by students on the Student Web Service
M May 22	Victoria Day (University Closed)
F May 26	Final date to drop May–June F section courses without academic penalty (Refer to Note 6)
M June 19	Final date to drop May–August session Y section courses without academic penalty (Refer to Note 6)
M July 3	Final date to enroll in July–August courses (Refer to Note 7)
F July 1	Canada Day (University Closed)
M July 3	Final date to enroll in July-August courses
F July 14	Coursework must be completed and grades submitted for May–June F section courses (Refer to Note 3)
M July 17	Final date to drop July-August S section courses without academic penalty (Refer to Note 6)
F July 19	Grades for May–June F section courses available for viewing by students on the Student Web Service

Notes:

1. Graduate students may only enroll in undergraduate courses with the approval of their supervisor or graduate unit. Students are responsible for meeting the requirements of the undergraduate course as presented in class and in the undergraduate division's calendar. IMPORTANT! Graduate students will be graded under the graduate grading scale, anything less than a B- is considered a fail. Students must adhere to the SGS course ADD and DROP dates.
2. A final thesis is the corrected, approved version of thesis which is submitted to SGS following the Final Oral Examination.
3. Course instructors will establish earlier deadlines for completion of course work and may prescribe penalties for late completion of work and for failure to complete work, provided that these penalties are announced at the time the instructor makes known to the class the methods by which student performance shall be evaluated.
4. These submission deadlines are set one week earlier than the SGS calendar date.
5. Reading week dates are the dates which have been established for undergraduate students in the Faculty of Arts and Science. Instructors in CS graduate courses have some flexibility in scheduling classes during Reading Week or the November Pause. To find out if your instructor observes Reading Week or November Pause, please contact them directly.
6. Please note that the last date to cancel a course or registration with no academic penalty is not the same as the last date to be eligible for a refund.
7. Students starting their program in the summer are required to register by this date by paying the minimum tuition amount stated in their invoice.

The Department

Overview

The Department of Computer Science at the University of Toronto has been a leading international research department for over forty years; it was the first computer science department established in Canada. It is characterized by a breadth of research and teaching interests, and the high quality of its faculty and graduate students. The department currently consists of over 100 faculty members including a broad array of regular faculty, cross appointed and adjunct faculty, several post-docs, research associates and visitors, almost 300 graduate students, and around 750 undergraduate majors and specialists.

The department is not only responsible for a large number of the computer science PhD's in Canada, but our graduates are on the faculties of CS departments around the world. In fact, many of our graduates have gone on to serve as chairs of the top CS departments, including those at MIT, University of Washington, and the University of Waterloo. Our graduate students also go on to exciting and successful careers in industry. One is the former vice-president, Development and Marketing of Microsoft and now runs a venture capital company. One has won an Academy Award for his work in animation. One received the ACM Doctoral Dissertation Award for the best computer science PhD thesis in the world. Several others have gone on to run successful start-ups. For example, the idea for BumpTop arose out of the founder's MSc work when he was a student here.

Our faculty and graduate students are engaged in cutting-edge investigations at the forefront of the dramatic changes in the development and uses of information and communications technology. We also place great emphasis on exposure to, and direct engagement in, research projects among our undergraduates, integrating inquiry-based learning deeply into our curriculum. Our department covers a broad spectrum of research areas – from the theoretical to the more practical – and our students have the unique opportunity to explore a variety of exciting topics with world-renowned researchers.

We are proud of our deep interdisciplinary connections. Our department has strong ties with other departments and institutes within the University of Toronto and beyond. We collaborate with areas such as Electrical and Computer Engineering (ECE), Psychology, Sociology, Philosophy, Mathematics, Occupational Therapy, and we have adjunct faculty from companies, institutes and universities around the world.

A key focus of teaching and research is currently digital media, a highly interdisciplinary field that calls us to draw from areas as diverse as networking, mobile computing, speech and natural language processing, vision, machine learning, visualization, HCI, knowledge media design and information systems. The Department of Computer Science is a leader in this effort, having been awarded a significant grant by the Canadian Foundation for Innovation for the construction of a Centre for Collaborative Interactive Digital Media.

Being in the heart of Toronto provides our students and faculty with a unique opportunity – we are in one of the most diverse cities in the world, and home to the third-largest ICT sectors in North America.

Administration

The Department of Computer Science is administered by the Chair: Professor Ravin Balakrishnan and the Graduate Program is administered by the Associate Chair for Graduate Studies, Professor Angela Demke Brown. The Graduate Administrator, Celeste Francis Esteves is assisted in the Graduate Office by the Graduate Program Assistants Lynda Barnes, Susan Lee, and Claire Mosses. Graduate policies are under the advisement of the Graduate Affairs Committee, consisting of several faculty members and graduate students.

Overview of Graduate Programs

We currently offer two separate streams in our graduate programs, the research stream and the professional master's stream. The research stream leads to MSc and PhD degrees, while the professional stream leads to the Masters of Science in Applied Computing (MScA.C) degree. The choice here is whether the student is seeking to be trained as a researcher, capable of creating original, internationally recognized, research in Computer Science, or is seeking an understanding of current research and the opportunity to apply it in real-world situations.

Applicants to the research stream are assessed, in part, on their potential to make substantial contributions to research in Computer Science. Students are offered some of the most attractive funding packages in the country, with strong funding guarantees for up to five years that rise with tuition and fee increases, competitive Admissions Awards for incoming students, and significant financial top ups for scholarship holders. In addition, about 15% of graduate students in our research stream choose to take one or more leaves to do separate industrial internships. While these internships are not part of the requirements for the MSc or PhD degrees, they can provide valuable industrial experience and contacts.

Alternatively, the professional masters stream is oriented towards training the next generation of industrial leaders, innovators, and entrepreneurs. Students spend eight months studying with our world class faculty, and then eight months applying their knowledge in an internship. Unlike the research stream, the internship is required for this professional stream. During their internship, the student works together with an industrial partner and a faculty supervisor on applying current research to industrially relevant problems. Our MScA.C. students have interned with a wide range of companies, including: Chango, eHealth Innovation, FixMo, Google, Guardly, IBM, MDA Space Missions, Medical Technologix, RIM, SecureKey Technologies, Side Effects Software, and Uken Games.

DCS Graduate Courses

DCS graduate courses must be approved by both the Graduate Affairs Committee and by SGS. The list of all our current graduate courses is provided in Appendices A and B. However, please note that in any given year we offer only a subset of all these courses. Generally, courses are mainly offered in the Fall and Winter terms, with a handful of courses (if any) offered in the Summer term. The 2016-17 course schedule is available at uoft.me/DCSGradCourses.

Breadth and Course Requirements

Each program has a **course requirement**, which specifies the minimum number of half-courses that are required for the degree. For the MSc and PhD programs there are also specific **breadth requirements** which limit the selection of courses. Breadth requirements are designed to ensure the graduate has a broad and well-balanced knowledge of the field of Computer Science, at the level of graduate study here at the University of Toronto. This reflects the fact that these degrees are masters and doctorates of Computer Science as a whole.

The breadth requirements for our degree programs ensure that students complete courses from a wide range of topics within Computer Science. These requirements are specified in terms of a categorization of courses into different categories of methodology and research area.

The methodological and research area categorizations for the current list of graduate courses can be found in Appendixes A and B. For continuing students who have taken courses that are no longer offered, these course categorizations can be found in Appendix C.

There is no breadth requirement for the MScAC program.

Degree Programs

Master of Science (MSc)

The MSc degree program consists of four computer science graduate half-courses, which satisfy the MSc breadth requirement, and a major research paper. The major research paper should demonstrate the student's ability to do independent work in organizing existing concepts and in suggesting and developing new approaches to solving problems in a research area.

Master of Science in Applied Computing (MScAC)

The MScAC program is a sixteen-month professional master's program comprising two terms of coursework (September to December & January to April), and an eight-month industrial internship. The program is intended for students with an undergraduate degree in Computer Science or a related discipline who want to expand their academic competence but do not intend to pursue careers in pure research.

Doctor of Philosophy (PhD)

The most important part of doctoral work is original research conducted under the direction of a faculty member. This research will constitute a significant and original contribution to computer science. The results will be presented in a thesis and defended at departmental and graduate school oral examinations. The PhD thesis may build upon the student's MSc research. The PhD degree program also requires four computer science graduate half-courses and satisfaction of the PhD breadth requirement. Courses taken during a student's Master's degree can count towards the breadth requirement. Students who enter into the graduate program from another university may request transfer credit for courses which were not used toward the requirements of another degree, diploma, certificate, or any other qualifications. Students admitted to the PhD program directly from a Bachelor's degree will have to complete eight courses, and the selection of these courses must satisfy both the MSc and PhD breadth requirements.

Details of the program requirements for each of these programs are provided in the program-specific documents for each program (MScAC, MSc, and PhD).

Different Admission Categories

There are four categories of students:

- 1. MSc** Students who have completed a B.Sc. (in the Department of Computer Science or elsewhere) and are enrolled in the MSc program (potentially as a precursor to entering the PhD program).
- 2. PhD** Students who entered the PhD program after having completed their MSc program in our department.
- 3. PhD with MSc from elsewhere.** Students who have completed the MSc degree elsewhere and have entered the PhD program.
- 4. PhD Direct Entry.** Students who have completed a BSc (in the Department of Computer Science or elsewhere) and have entered directly into the PhD program.

MSc and PhD Student Supervision

Every MSc and PhD graduate student will be assigned a supervisor or group prior to registration. The supervisor(s) advises on course selection, research topic selection, and provides continuing help during the conduct of research. All MSc and PhD students are required to consult frequently (annually, at minimum), with their supervisors throughout their graduate studies, to report on their progress and direction and to obtain advice.

Occasionally the student-supervisor match is not productive. The student should discuss difficulties or concerns with the current supervisor. In many cases the reason for wanting the change is an issue which might be resolved by talking it out. If no resolution can be found, students who feel a need to change supervisor are welcome to seek advice from the Associate Chair, Graduate Studies.

Guaranteed Funding

The Department of Computer Science will ensure that all full-time research degree graduate students receive financial support to at least the basic departmental level, provided that they are making satisfactory progress in their graduate program. MScAC Students do not qualify for guaranteed departmental funding.

MSc Students: 17 months of guaranteed funding.

PhD Students: 43 months of guaranteed funding.

PhD with MSc from elsewhere: 48 months of guaranteed funding.

PhD -Direct Students: 60 months of guaranteed funding.

Students and prospective students wishing to obtain financial support must apply for all scholarships, fellowships, and bursaries for which they are eligible. Canadian and permanent resident students should apply to the Canadian and Ontario Government scholarships, e.g. NSERC and OGS. Foreign students are expected to apply to their own government and national agencies, and for Government of Canada Scholarships available through the Canadian Embassy in their country. The Ontario Student Aid Program (OSAP) provides interest-free loans. For details on awards available to domestic and foreign students, visit the SGS awards website at uoft.me/Govfunding.

Students who win a major scholarship are no longer eligible for basic departmental support, since that support will now be provided by their scholarship. To ensure scholarship winners obtain a significant financial reward from their scholarship, the department will pay a top-up for scholarship holders who are within their guaranteed funding period.

Deadlines and procedures for application to all award competitions will be announced by email to all registered students as that information becomes available each year.

Departmental Awards

In addition to external award sponsors, students can apply for internal awards.

Acres Productive Technologies Inc. -- Joseph Yonan Memorial Fellowship

This scholarship is to be awarded to graduate students with academic excellence and financial need. Eligible students will be drawn from the DCS.

C.C. Gottlieb (Kelly) Graduate Fellowship in the Department of Computer Science

To be awarded on the basis of academic merit (research and course work) to an outstanding graduate student in any sub-discipline of Computer Science. Financial need may also be considered.

Robert E. Lansdale/Okino Computer Graphics Graduate Fellowship in DGP for the Department of Computer Science

To be awarded to a graduate student in the Department of Computer Science's Dynamic Graphics Project on the basis of academic merit. Financial need may also be considered.

Platform Computing Graduate Fellowship in Computer Science

To be awarded to a graduate student in the Department of Computer Science on the basis of academic merit. Financial need may also be considered.

Ray Reiter Graduate Award in Computer Science

To be awarded on the basis of financial need to a graduate student in the area of Artificial Intelligence.

Monica Ryckman Bursary

The funds will be used for graduate students who are otherwise without support. Value is variable.

Alfred B. Lehman Graduate Scholarship in Computer Science

To be awarded to a graduate student in the Department of Computer Science on the basis of academic merit with preference given to students studying in the area of discrete mathematics, with a special emphasis on combinatorics, graph theory, matroid theory and the theoretical foundations of mathematical programming. Financial need will also be considered.

Wolfond Scholarship Program in Wireless Information Technology

To be awarded to graduate students in the Department of computer Science who are pursuing research in areas related to systems, wireless, networks, HCI and digital media. Awards to be given based on academic merit. The recipients of this scholarship will be known as "Wolfond Fellows".

Financial Support

Doctoral Thesis Completion Award (DCA)

This award is intended to help support PhD students who are in their first year beyond the period of guaranteed funding and whose program cannot be completed within the funded years because of special features of the research program or because of unforeseen events such as loss of data, obstruction of access to research materials, etc. The DCA is available to both domestic and international students. Information is available at www.sgs.utoronto.ca.

Conference Travel Grants

Opportunities to actively present research at regional, national or international conferences throughout your program are an important component of graduate study. Students should discuss the development of any paper for consideration to a conference in the field with their supervisor.

SGS Conference Grant

Registered full-time MSc and PhD students in good academic standing who are presenting a paper (e.g. speaker or poster presenter) that has been approved by their supervisor and is relevant to their academic program, may apply for this grant. For details please visit: uoft.me/SGSConferenceGrant

DCS PhD Conference Travel Grant

Registered full-time PhD students in good academic standing who are presenting a paper (e.g. speaker or poster presenter) that has been approved by their supervisor and is relevant to their academic program, may apply for this grant. Travel expenses typically form the bulk of the cost of conference attendance. The Travel Grant is intended to contribute towards reimbursing students for reasonable travel expenses.

Master's Tuition Fee Bursary (MTFB)

SGS can offer a limited number of bursaries for master's students for whom the minimum period of registration (i.e., program length) will have ended by or before either August or December and who have a small amount of work outstanding for the degree. The value of the bursary is equal to the difference between one session full-time fee and one session part-time fee. This tuition assistance is provided for only one session during the academic year. The form is available on the [SGS website](#), under Student Forms.

Financial Counseling

Students in financial difficulty may wish to visit a Financial Counselor at the School of Graduate Studies, 63 St. George Street. A counselor can help with budgeting and may have access to various bursaries, grants, loans, etc. that would be sufficient to get a student through a rough financial situation.

Departmental and University Facilities

Computer Facilities

The Computer Science Laboratory (CS Lab) is the department's research computing facility. Workstations, servers, and printers for research computing are in abundance throughout the department. Every graduate student is equipped with a research computing desktop, inter-connected via a high-speed network to departmental servers, the university backbone, and the internet. Wired and wireless network access for notebook computers is also available. In addition, there are multiple special-purpose research computing laboratories focusing on specific research areas, such as graphics, databases, computer vision, machine learning, computational linguistics, robotics and distributed systems.

Teaching computing on both the graduate and undergraduate level is supported by the Computing Science Teaching Labs, which operates a number of departmental teaching laboratories at different locations on campus.

Additional computing facilities on campus are also available. A list of central university IT resources is available online at www.its.utoronto.ca/.

Library Facilities

The University of Toronto library system is the largest in Canada. It consists of four central libraries and many departmental libraries. Pamphlets describing the library services are available at these locations. The Reader Registration Office is on the main floor of the Robarts Library. Visit the libraries website at www.library.utoronto.ca/home/. The central libraries are:

Gerstein Science Information Centre

7 King's College Circle

Sigmund Samuel Library

9 King's College Circle

Robarts Research Library

(Humanities & Social Science Library)

130 St. George Street

Sandford Fleming Library

(Engineering & Computer Science Library)

10 King's College Circle

English Language and Writing Support

English Language and Writing Support, at the School of Graduate Studies, offers individual consultations, single-session workshops, and free non-credit courses for both native and non-native speakers of English. Information and registration: <http://www.sgs.utoronto.ca/informationfor/students/english>.

The Graduate Professional Skills (GPS) program

The Graduate Professional Skills (GPS) program is an initiative from the School of Graduate Studies to help research stream (MSc, PhD) graduate students become fully prepared for their future.

GPS focuses on skills beyond those conventionally learned within a disciplinary program, skills that may be critical to success in the wide range of careers that graduates enter, both within and outside academe. GPS can help you to communicate effectively, plan and manage your time, be entrepreneurial, understand and apply ethical practices, and work effectively in teams and as leaders.

The GPS consists of a range of optional “offerings” with a time commitment roughly equivalent to 60 hours of work over the course of a degree. Its successful completion will be recognized by a notation on the student’s university transcript.

Graduate Skills Seminar Series

The department offers Graduate Skills Seminars intended to help students develop essential research skills needed to succeed in conducting research, publishing research, and becoming part of the research community. In Fall, these seminars are offered on Tuesdays 11am-1pm at the DCSIL, Room 2360, in the Gerstein Library. These seminars are considered mandatory for first year students.

2016 – 2017 Graduate Skills Seminar Schedule

FALL 2016		Winter 2017	
Oct. 20	Introduction to grad studies	Jan. 12	Reflections
Nov. 1	Research - the vision, the joys & challenges	Jan. 19	How to present your work
Nov. 8	SGS: Setting Goals and Time Management	Jan. 26	SGS+CS: Career Planning and networking
Nov. 15	SGS: Conflict Resolution	Feb. 2	SGS+CS: Interaction with advisor
Nov. 17	SGS: Career Paths (time and location to be announced)	Feb. 9	The Impact of your Research
Nov. 22	SGS: Raphael Slawinski – How to Climb a Tall Mountain		

Department Chair Lunches

Graduate Student lunches with the Chair are meant to increase communication between the Chair's office and graduate students. It does so by creating an informal dialogue forum where students are able to voice their concerns regarding their graduate program and receive feedback on how to make progress in their research and overcome difficulties encountered in the program.

These lunches are held bi-monthly (October, December, February, April from 12-1pm).

Department Mentorship Program

The Mentorship program matches graduate students with faculty members who are not their supervisors and may work outside of their research areas. The program aims to give graduate students the opportunity to obtain a second opinion on matters of concern and a broader perspective on graduate studies and career planning. It is hoped that the interactions with graduate students outside of their research groups will also be rewarding to the faculty mentors.

The mentor and mentee are expected to meet 1-3 times over the academic year. Discussion between the mentor and mentee are confidential.

- Possible topics for conversation include:
- Program progress
- Career planning
- Dealing with challenges of research
- Changing supervisors
- What to consider if offered a job before program completion

Mentors are not able to advocate for individual students, or to sign forms in lieu of their supervisor or associate chair. They cannot circumvent university or department policies, (e.g., grant extensions or assign TAs).

University of Toronto Policies

This is not an exhaustive list of U of T policy. For more information, visit the School of Graduate Studies Website: uoft.me/Policies

Intellectual Property Guidelines: Inventions and Patents

Ownership of IP

As a graduate student in the Department of Computer Science, the ownership of any intellectual property generated by you during the course of your studies is governed by the University of Toronto's Inventions Policy. Further information is also provided by the School of Graduate Studies. It is also important to note that your graduate student funding can come from a variety of funding sources. It is possible that some of these funding sources will impose additional constraints, beyond that outlined in the University of Toronto's Inventions Policy, on ownership of intellectual property generated by those who are paid from those sources. You are advised to consult with your faculty advisor if you have any questions or concerns regarding these issues.

For information, refer to The University of Toronto Policy on Intellectual Property at: uoft.me/IntellectualProperty.

Code of Behaviour on Academic Matters

Students in graduate studies are expected to commit to the highest standards of integrity and to understand the importance of protecting and acknowledging intellectual property. For example, it is assumed that they bring to their graduate studies a clear understanding of how to cite references appropriately, thereby avoiding plagiarism. The student's thinking must be understood as distinct from the sources upon which the student is referring. Two excellent documents entitled How Not to Plagiarize and Deterring Plagiarism (of interest to students and faculty respectively) are available for reference through the SGS website: uoft.me/CodeofBehaviouronAcademicMatters

Safety Abroad

The Safety Abroad Office works with students, staff and faculty to minimize risk by:

- Providing Safety Abroad Workshops
- Monitoring international security situations
- Assisting students with emergencies abroad
- Offering a 24-hour emergency line

Visit: www.studentlife.utoronto.ca/cie/safety-abroad.

U of T Code of Student Conduct

uoft.me/CodeofStudentConduct

No person shall cause another person or persons to fear for their safety or the safety of another person known to them while on the premises of the University of Toronto or in the course of activities sponsored by the University of Toronto or by any of its divisions, or cause another person or persons to be impeded in exercising the freedom to participate reasonably in the programs of the University and in activities in or on the University's premises, knowing that their conduct will cause such fear, or recklessly as to whether their conduct causes such fear. This protection is extended to all graduate and undergraduate students, all administrative and support staff, all faculty members and all instructors and TA's.

U of T Policy on Sexual Harassment

See: uoft.me/UofTPolicyonSexualHarassment

Preamble to the Policy

Sexual harassment in any situation is reprehensible. In particular, within the University community it fosters a hostile or unfair environment which counteracts the spirit of cooperation and education.

Responsibility shared

All members of the University community share responsibility for bringing about and maintaining an environment free of sexual harassment, but a particular burden is placed on those in positions of academic and administrative authority to attempt to ensure that allegations of sexual harassment which are brought to their attention are dealt with in the appropriate fashion as laid out in this Policy and Procedures.

Appendix A: COURSE CLASSIFICATION BASED ON METHODOLOGIES

Methodology 1: Analysis and Computation in Discrete Models

CSC2104 Software Design=
CSC2125 Topics in Software Engineering
CSC2221 Introduction to Theory of Distributed Computing
CSC2226 Topics in Verification
CSC2401 Introduction to Computational Complexity
CSC2404 (438) Computability and Logic
CSC2405 (448) Automata Theory: Formal Languages and Automata
CSC2410 Introduction to Graph Theory
CSC2413 Combinatorial Methods and Designs
CSC2414 Topics in Applied Discrete Mathematics
CSC2415 Advanced Topics in Distributed Computing: Impossibility Results for Distributed Computing
CSC2419 Topics in Cryptography
CSC2420 Algorithm Design, Analysis and Theory
CSC2426 Fundamentals of Cryptography
CSC2427 Topics in Graph Theory
CSC2429 Circuit Complexity
CSC2502 (484) Knowledge Representation and Reasoning
CSC2506 (412) Uncertainty and Learning
CSC2512 Constraint Satisfaction Problems
CSC2517 Discrete Math Models of Sentence Structure
CSC2519 Natural Language Semantics
CSC2523 Object Modeling and Recognition
CSC2534 Decision Making Under Uncertainty
CSC2542 Topics in Knowledge Representation and Reasoning: Algorithms for Sequential Decision Making
CSC2601 Topics in Analysis and Computation in Discrete Models

Methodology 2: Analysis and Computation in Continuous Models

CSC2206 System Modeling and Analysis
CSC2302 Numerical Solution of Initial Value Problems for Ordinary Differential Equations
CSC2305 Numerical Methods for Optimization Problems
CSC2306 (456) High-Performance Scientific Computing
CSC2307 Numerical Software
CSC2310 (446) Computer Methods for PDE
CSC2321 Matrix Calculations
CSC2322 Boundary Value Problems for Ordinary Differential Equations
CSC2429 Proof Complexity, Semi-Definite Hierarchies and Extended Formulations
CSC2503 (487) Foundations of Computational Vision
CSC2504 (418) Computer Graphics
CSC2511 (401) Natural Language Computing
CSC2515 (411) Machine Learning

CSC2521 Topics in Computer Graphics: Computational Design and Fabrication
CSC2521 Topics in Computer Graphics: Geometry Processing
CSC2522 Advanced Image Synthesis
CSC2529 Computer Animation
CSC2530 Computer Vision for Advanced Digital Photography
CSC2535 Advanced Machine Learning
CSC2539 Topics in Computer Vision: Visual Recognition with Text
CSC2541 Inference and Generative Models
CSC2545 Kernel Methods and Support Vector Machines
CSC2602 Topics in Analysis and Computation in Continuous Models

Methodology 3: Building Software and Hardware Artifacts

CSC2107 Compilers and Interpreters
CSC2203 Packet Switch and Network Architectures
CSC2208 (469) Advanced Operating Systems: Operating Systems Design and Implementation
CSC2209 (458) Computer Networks
CSC2227 Topics in the Design & Implementation of Operating Systems
CSC2228 Topics in Mobile and Pervasive Computing
CSC2229 Software-Defined Networking
CSC2231 Advanced Topics in Mobile and Cloud Computing
CSC2232 Topics in Computer System Performance and Reliability
CSC2233 Topics in Storage Systems
CSC2508 Advanced Data Management Systems
CSC2525 Evaluating Data Curation
CSC2531 Advanced Topics in Data Management Systems
CSC2603 Topics in Building Software and Hardware Artifacts

Methodology 4: Human-Centered and Interdisciplinary Computing

CSC2130 Empirical Research Methods in Software Engineering
CSC2417 Algorithms and Genome Analysis
CSC2431 Topics in computational Molecular Biology
CSC2501 (485) Computational Linguistics
CSC2514 (428) Human-Computer Interaction
CSC2518 Spoken Language Processing
CSC2524 Topics in Interactive Computing: Information Visualization
CSC2526 HCI: Topics in Ubiquitous Computing
CSC2527 (454) The Business of Software
CSC2541 Topics in Machine Learning: Sports Analytics
CSC2546 Topics in Machine Learning: Computational Neuroscience
CSC2604 Topics in Human-Centred and Interdisciplinary Computing
CSC2720 Systems Thinking for Global Problems

No breadth:

CSC2699 Special Reading Course in Computer Science

Appendix B: COURSE CLASSIFICATION BASED ON RESEARCH AREAS

Research Area 1: Algorithms and Discrete Math

CSC2410 Introduction to Graph Theory
CSC2414 Topics in Applied Discrete Mathematics
CSC2419 Algorithms and Complexity in Private Data Analysis
CSC2420 Algorithm Design, Analysis and Theory
CSC2427 Topics in Graph Theory

Research Area 2: Complexity and Cryptography

CSC2401 Introduction to Computational Complexity
CSC2404 (438) Computability and Logic
CSC2405 (448) Automata Theory: Formal Languages and Automata
CSC2426 Fundamentals of Cryptography
CSC2429 Circuit Complexity
CSC2429 Proof Complexity, Semi-Definite Hierarchies and Extended Formulations

Research Area 3: Computational Biology

CSC2417 Algorithms and Genome Analysis
CSC2431 Topics in Computational Molecular Biology

Research Area 4: Computational Linguistics

CSC2501 (485) Computational Linguistics
CSC2511 (401) Natural Language Computing
CSC2517 Discrete Math Models of Sentence Structure
CSC2518 Spoken Language Processing
CSC2519 Natural Language Semantics

Research Area 5: Computer Graphics

CSC2504 (418) Computer Graphics
CSC2521 Topics in Computer Graphics: Computational Design and Fabrication
CSC2521 Topics in Computer Graphics: Geometry Processing
CSC2522 Advanced Image Synthesis
CSC2529 Computer Animation
CSC2530 Computer Vision for Advanced Digital Photography

Research Area 6: Computer Systems and Networks

CSC2203 Packet Switch and Network Architectures
CSC2206 System Modeling and Analysis
CSC2208 (469) Advanced Operating Systems: Operating Systems Design and Implementation

CSC2209 (458) Computer Networks
CSC2227 Topics in the Design & Implementation of Operating Systems
CSC2228 Topics in Mobile and Pervasive Computing
CSC2229 Software-Defined Networking
CSC2231 Advanced Topics in Mobile and Cloud Computability
CSC2232 Topics in Computer System Performance and Reliability
CSC2233: Topics in Storage Systems

Research Area 7: Computer Vision

CSC2503 (487) Foundations of Computational Vision
CSC2523 Object Modeling and Recognition
CSC2539 Topics in Computer Vision: Visual Recognition with Text

Research Area 8: Database Systems

CSC2508 Advanced Data Management Systems
CSC2525 Evaluating Data Curation
CSC2531 Advanced Topics in Data Management Systems

Research Area 9: Distributed Computing

CSC2221 Introduction to Theory of Distributed Computing
CSC2415 Advanced Topics in Distributed Computing: Impossibility Results for Distributed Computing

Research Area 10: Human-Computer Interaction

CSC2514 (428) Human-Computer Interaction
CSC2524 Topics in Interactive Computing: Information Visualization
CSC2526 HCI: Topics in Ubiquitous Computing
CSC2527 (454) The Business of Software

Research Area 11: Knowledge Representation

CSC2502 (484) Knowledge Representation and Reasoning
CSC2512 Constraint Satisfaction Problems
CSC2542 Topics in Knowledge Representation and Reasoning: Algorithms for Sequential Decision Making

Research Area 12: Machine Learning

CSC2506 (412) Uncertainty and Learning
CSC2515 (411) Machine Learning
CSC2535 Advanced Machine Learning
CSC2541 Topics in Machine Learning: Sports Analytics
CSC2545 Kernel Methods and Support Vector Machines

Research Area 13: Scientific Computation and Numerical Analysis

CSC2302 Numerical Solution of Initial Value Problems for Ordinary Differential Equations
CSC2305 Numerical Methods for Optimization Problems
CSC2306 (456) High-Performance Scientific Computing
CSC2310 (446) Computer Methods for PDE
CSC2321 Matrix Calculations
CSC2322 Boundary Value Problems for Ordinary Differential Equations

Research Area 14: Software Engineering

CSC2104 Software Design
CSC2107 (488) Compilers and Interpreters
CSC2125 Topics in Software Engineering
CSC2130 Empirical Research Methods in Software Engineering
CSC2226 Topics in Verification

Research Area 15: Interdisciplinary Computer Science

CSC2534 Decision Making Under Uncertainty
CSC2546 Computational Neuroscience
CSC2602 Topics in Analysis and Computation in Continuous Models
CSC2604 (Winter 2014 version only) Topics in Human-Centred and Interdisciplinary Computing: Systems Thinking for Global Problems
CSC2720: Systems Thinking for Global Problems

No breadth:

CSC2699 Special Reading Course in Computer Science

Appendix C: COURSES NO LONGER OFFERED AS OF 2011-2012

CSC2402 Methodology Re: Interactability
CSC2406 Triple Systems
CSC2408
CSC2409
CSC2412 Computer Algebra
CSC2422 Reasoning about Knowledge
CSC2423 Finite Model Theory and Descriptive Complexity
CSC2428 Logic and Automata
CSC2103 Software Arch & Design
CSC2105 Software Engineering
CSC2122 Language and Compiler Design
CSC2123 Managing the Software Organization
CSC2124 Topics in Programming Languages
CSC2199 Special Reading Course in Programming
CSC2204 Advanced Operating Systems
CSC2205 Performance in Distributed Operating Systems
CSC2207 Topics in Computer Organization
CSC2211 No current course title found
CSC2225 Structure and Correctness in Operating Systems
CSC2299 Special Reading Course in Computer Systems
CSC2499 Special Reading Course in Theoretical Aspects of Computer Science
CSC2500 Artificial Intelligence
CSC2507 Conceptual Modeling
CSC2509 Data Management Systems
CSC2537 Hypermedia
CSC2538 Topics in Foundations of Databases
CSC2599 Special Reading Course in Computer Applications
CSC3111 Software Application
CSC3110 Topics in Cryptography
CSC2304
CSC2308 Numerical Methods for Nonlinear Equations
CSC2309
CSC2311
CSC2312 The Design and Assessment of Numerical Algorithms
CSC2324 Advanced Methods for Partial Differential Equations
CSC2399 Special Reading Course in Numerical Computation