COMPUTER SCIENCE

The School of Computer Science offers MSc and PhD programs in Computer Science.

The MSc in Computer Science program emphasizes both academic and applied research that can contribute to further research, academic studies, industry partnerships, and government programs. The MSc degree encompasses professors at the cutting edge of their fields, course offerings covering a wide range of computer science areas, and competitive financial incentives to eligible students.

The PhD in Computer Science program prepares candidates for careers in computer science teaching, research, or consulting. The program is designed to provide a deep knowledge of computer science and training in advanced research. Doctoral research carries the expectation of making an original contribution to the body of existing knowledge or technology. It is also expected that the responsibility of problem definition and solution is that of the student, and that the student's advisor(s) acts truly in an advisory capacity. Therefore, graduates are expected to have acquired autonomy in defining and analysing problems, conducting research, and preparing scholarly publications. These objectives are achieved through a combination of course work, independent research, public seminars, a qualifying examination, and the production and defense of a research dissertation.

The School of Computer Science also offers an Interdisciplinary PhD degree in Computational Sciences. More information on can be found at: Computational Sciences (calendar.uoguelph.ca/graduate-calendar/graduate-programs/computational-sciences/)

Administrative Staff

Director
Minglun Gong (1117 Reynolds, Ext. 52824)
director@socs.uoguelph.ca
Associate Graduate Director
Joe Sawada (2226 Reynolds, Ext. 53277)
graddir@socs.uoguelph.ca
Graduate Program Assistant
Jennifer Hughes (1116 Reynolds, Ext. 56402)
csgradassist@uoguelph.ca

Graduate Faculty

This list may include Regular Graduate Faculty, Associated Graduate Faculty and/or Graduate Faculty from other universities.

Luiza Antoine
B.Sc. Politehnica Bucharest (Romania), M.Sc., PhD Alberta - Associate Professor
Graduate Faculty

Neil Bruce
B.Sc. Guelph, M.A.Sc., Waterloo, PhD York - Associate Professor
Graduate Faculty

David A. Calvert
BA, M.Sc. Guelph, PhD Waterloo - Associate Professor
Graduate Faculty

Ritu Chaturvedi
PhD Windsor - Assistant Professor

Rozita Dara
B.Sc. Shahid Teheshti, M.Sc. Guelph, PhD Waterloo - Associate Professor
Graduate Faculty

Ali Dehghantanha
BSE Azad, M.Sc., PhD Putra Malaysia - Associate Professor
Graduate Faculty

David Flata
B.Sc., M.Sc., PhD Saskatchewan - Associate Professor
Graduate Faculty

Dan Gillis
B.Sc., M.Sc., PhD Guelph - Associate Professor
Graduate Faculty

Minglun Gong
B.Eng. Harbin Engineering, M.Sc. Tsinghua, PhD Alberta - Professor and Director
Graduate Faculty

Gary Gréwal
B.Sc. Brock, M.Sc., PhD Guelph - Associate Professor
Graduate Faculty

Hassan Khan
B.Sc. NUST, M.Sc. Southern California, PhD Waterloo - Assistant Professor
Graduate Faculty

Stefan C. Kremer
B.Sc. Guelph, PhD Alberta - Professor
Graduate Faculty

Xiaodong Lin
B.A.Sc. Nanjing, M.Sc. East China Normal, PhD Beijing, PhD Waterloo - Professor
Graduate Faculty

Pascal Matsakis
B.Sc., M.Sc., PhD Paul Sabatier (France) - Professor
Graduate Faculty

Judi R. McCuaig
B.Ed., B.Sc., MS, PhD Saskatchewan - Associate Professor
Graduate Faculty

Denis Nikitenko
B.Sc. Ryerson, M.Sc., PhD Guelph - Associate Professor
Graduate Faculty

Charlie F. Obimbo
M.Sc. Kiev, PhD New Brunswick - Professor
Graduate Faculty

Joseph Sawada
B.Sc., PhD Victoria (British Columbia) - Professor
Graduate Faculty

Stacey Scott
B.Sc. Dalhousie, PhD Calgary - Professor
Graduate Faculty

Fei Song

B.Sc. Jilin (China), M.Sc. Academia Sinica (China), PhD Waterloo -
Associate Professor
Graduate Faculty

Deborah A. Stacey
B.Sc. Guelph, MASc, PhD Waterloo - Associate Professor
Graduate Faculty

Fangju Wang
BE Changsha, M.Sc. Peking, PhD Waterloo - Professor
Graduate Faculty

Mark Wineberg
B.Sc. Toronto, M.Sc., PhD Carleton - Associate Professor
Graduate Faculty

Michael A. Wirth
B.Sc. New England (Aust.), M.Sc. Manitoba, PhD RMIT Melbourne -
Associate Professor
Graduate Faculty

Yang Xiang
B.Ss., M.Sc. BUAA (Beijing), PhD British Columbia - Professor
Graduate Faculty

MSc Program
Admission Requirements

Most spaces are filled in March for entry the following September,
and in October for entry the following January. Prospective students
should check the School of Computer Science website http://
www.socs.uoguelph.ca/ for admission procedures and deadlines.

General Requirements
To be considered for admission, applicants must have a four-year
honours degree in computer science, or a four-year honours degree in
another discipline with at least 10 courses related to computer science.
Applicants must meet the minimum admission requirements of both the
university and the School of Computer Science, including at least a 75%
average during the previous two years of full-time university study for a
degree.

In addition to the university and School of Computer Science
requirements, applicants must also submit:

  i. a current CV and
 ii. a statement of research that would normally include the following
      sections:
      • Specific research interest with justification.
      • Academic and/or practical research experience.

English Proficiency
A test of English proficiency is required of all applicants whose first
language is not English. Please refer to the University of Guelph
Admission Requirements (calendar.uoguelph.ca/graduate-calendar/
general-regulations/admission/admission-requirements/)

Program Requirements
Once a student has been admitted to the MSc program, the following
components are required for the successful completion of the MSc
degree:

  • Completion of CIS*6890 Technical Communication and Research
    Methodology and at least four other graduate courses

  • Completion of the seminar requirement.
  • An accepted thesis.

Duration of the Program
The MSc degree is a two-year program during which students complete
five courses, give a public seminar and complete and successfully defend
a thesis. Heavy emphasis is placed on the thesis, which usually requires
at least two semesters. Students should plan on spending at least four
full-time semesters (16 months) in the program assuming adequate
preparation for graduate work.

Course Requirement
An MSc student is required to take CIS*6890 Technical Communication
and Research Methodology and at least four other CIS graduate courses.
Of these four courses, at least two should be outside of the student's
thesis topic area. This area and the courses which fall outside of this area
are identified by the student's advisor. With approval from the Graduate
Program Committee, a CIS graduate course requirement may also be
met by a non-CIS graduate course or by a 4000-level course. At most one
reading course (CIS*6660 Topics in Computer Science II) and at most one
4000-level course can count towards the course requirement.

Seminar Requirement
An MSc student must give one publicly announced research seminar
on their MSc thesis research. The student will be allocated times and
dates for the seminar. It must be attended by the student's advisor
and at least one other member of the student's Advisory Committee.
The quality of the presentation is graded on a pass/fail basis. The MSc
seminar requirement is intended for students to practice presentation
and communication skills and to participate in the process of knowledge
dissemination as part of the academic life.

Thesis Defence
Arrangements for the MSc thesis defence should be made at least four
weeks prior to the anticipated date of the defence, and the student
must submit their MSc thesis to the Examination Committee at least
two weeks prior to the defence. The examination consists of an oral
presentation by the student followed by questions from the Examination
Committee.

PhD Program
Admission Requirements

The minimum academic requirement for admission to the PhD program
is completion of a recognized master's degree in Computer Science, or
related discipline, that included a thesis or major independent project,
with a minimum grade average of B. Normally, successful applicants have
obtained high academic standing in their master's degree program. In
addition to the Office of Graduate and Postdoctoral Studies admission
requirements, applicants must submit: (i) a current CV including research
publications; and (ii) a statement of research (maximum of 1500 words).

In exceptional circumstances, a student who has completed an honours
undergraduate Computer Science degree (or an equivalent 4-year
undergraduate degree) may apply for direct admission to the PhD
program. The successful applicant must have an outstanding academic
record, breadth of knowledge in Computer Science, demonstrated
research accomplishments, and strong letters of recommendation.

Prospective students should check the School of Computer Science
(SoCS) website (http://www.socs.uoguelph.ca/) for further details,
procedures and deadlines.

Program Requirements

The prescribed program of study consists of CIS*6890: Technical and Communication Research Methodology, plus two additional 0.50 courses at the graduate level. The additional courses should be prescribed in consultation with the advisory committee, which may specify more than two courses, including undergraduate make-up courses, depending on the student's background, and will ensure appropriate breadth of knowledge in traditional core topics of Computer Science.

To further satisfy breadth, students must have completed a total of 8 graduate courses (including CIS*6890), where at least four (not including CIS*6890) have content related to computer science. This requirement includes courses from previous degrees, where a master's thesis counts for one course. Each course must have a grade of at least 70% and at most, one reading course can be used to satisfy this requirement. A student must satisfy the breadth requirement no later than the 4th semester after entering the program. It is the responsibility of the student's advisory committee to assess this breadth requirement.

Students are expected to present two public seminars, successfully complete the Qualifying Examination (QE), and present and defend a thesis.

Collaborative Specializations
Artificial Intelligence

The School of Computer Science participates in the collaborative specialization in Artificial Intelligence. MSc students wishing to undertake thesis research with an emphasis on artificial intelligence are eligible to apply to register concurrently in Computer Science and the collaborative specialization. Students should consult the Artificial Intelligence (calendar.uoguelph.ca/graduate-calendar/collaborative-specializations/artificial-intelligence/) listing for more information.

One Health

The School of Computer Science participates in the collaborative specialization in One Health. Master's and Doctoral students wishing to undertake thesis research or their major research paper/project with an emphasis on one health are eligible to apply to register concurrently in Computer Science and the collaborative specialization. Students should consult the One Health (calendar.uoguelph.ca/graduate-calendar/collaborative-specializations/one-health/) listing for more information.

Courses

The core graduate courses are designed to be accessible to any student with an appropriate background in Computer Science and will provide enough introduction for those unfamiliar with the specific area to allow them to keep up with the advanced material.

The advanced graduate courses are taught with the assumption that the student has sufficient background in the research area to understand the advanced concepts and research ideas. Students who intend to take a course for which they have insufficient background should consult with the instructor prior to enrollment in the course.

CIS*6020 Artificial Intelligence Unspecified [0.50]

An examination of Artificial Intelligence principles and techniques such as: logic and rule based systems; forward and backward chaining; frames, scripts, semantic nets and the object-oriented approach; the evaluation of intelligent systems and knowledge acquisition. A sizeable project is required and applications in other areas are encouraged.
Department(s): School of Computer Science
Location(s): Guelph

CIS*6030 Information Systems Unspecified [0.50]

Relational and other database systems, web information concurrency protocols, data integrity, transaction management, distributed databases, remote access, data warehousing, data mining.
Offering(s): Odd-numbered years
Department(s): School of Computer Science
Location(s): Guelph

CIS*6050 Neural Networks Unspecified [0.50]

Artificial neural networks, dynamical recurrent networks, dynamic input/output sequences, communications signal identification, syntactic pattern recognition.
Offering(s): Odd-numbered years
Department(s): School of Computer Science
Location(s): Guelph

CIS*6060 Bioinformatics Unspecified [0.50]

Data mining and bioinformatics, molecular biology databases, taxonomic groupings, sequences, feature extraction, Bayesian inference, cluster analysis, information theory, machine learning, feature selection.
Offering(s): Odd-numbered years
Department(s): School of Computer Science
Location(s): Guelph

CIS*6070 Discrete Optimization Unspecified [0.50]

This course will discuss problems where optimization is required and describes the most common techniques for discrete optimization such as the use of linear programming, constraint satisfaction methods, and genetic algorithms.
Offering(s): Odd-numbered years
Department(s): School of Computer Science
Location(s): Guelph

CIS*6080 Genetic Algorithms Unspecified [0.50]

This course introduces the student to basic genetic algorithms, which are based on the process of natural evolution. It is explored in terms of its mathematical foundation and applications to optimization in various domains.
Offering(s): Odd-numbered years
Department(s): School of Computer Science
Location(s): Guelph

CIS*6120 Uncertainty Reasoning in Knowledge Representation Unspecified [0.50]

Representation of uncertainty, Dempster-Schafer theory, fuzzy logic, Bayesian belief networks, decision networks, dynamic networks, probabilistic models, utility theory.
Offering(s): Odd-numbered years
Department(s): School of Computer Science
Location(s): Guelph

CIS*6130 Object-Oriented Modeling, Design and Programming Unspecified [0.50]
Objects, modeling, program design, object-oriented methodology, UML, CORBA, database.
Offering(s): Odd-numbered years
Department(s): School of Computer Science
Location(s): Guelph

CIS*6160 Multiagent Systems Unspecified [0.50]
Intelligent systems consisting of multiple autonomous and interacting subsystems with emphasis on distributed reasoning and decision making. Deductive reasoning agents, practical reasoning agents, probabilistic reasoning agents, reactive and hybrid agents, negotiation and agreement, cooperation and coordination, multiagent search, distributed MDP, game theory, and modal logics.
Offering(s): Odd-numbered years
Department(s): School of Computer Science
Location(s): Guelph

CIS*6170 Human-Computer Interaction Unspecified [0.50]
This course concentrates on the theoretical and practical issues related to the design and study of interactive technologies for human use. Topics include: general principles of design, qualitative and quantitative research methods, prototyping techniques, theoretical issues underlying designing to individuals and groups, and ethical issues related to conducting research involving humans.
Offering(s): Odd-numbered years
Department(s): School of Computer Science
Location(s): Guelph

CIS*6180 Analysis of Big Data Unspecified [0.50]
This course introduces software tools and data science techniques for analyzing big data. It covers big data principles, state-of-the-art methodologies for large data management and analysis, and their applications to real-world problems. Modern and traditional machine learning techniques and data mining methods are discussed and ethical implications of big data analysis are examined. May be offered in conjunction with DATA*6300.
Offering(s): Odd-numbered years
Restriction(s): Credit may be obtained for only one of CIS*6180 or DATA*6300
Department(s): School of Computer Science
Location(s): Guelph

CIS*6190 Machine Learning for Sequential Data Processing Unspecified [0.50]
This course emphasizes machine learning for sequential data processing. It covers common challenges and pre-processing techniques for sequential data such as text, biological sequences, and time series data. Students are exposed to machine learning techniques, including classical methods and more recent deep learning models, so that they obtain the background and skills needed to confront real-world applications of sequential data processing. May be offered in conjunction with DATA*6400.
Offering(s): Odd- numbered years
Restriction(s): Credit may be obtained for only one of CIS*6190 or DATA*6400
Department(s): School of Computer Science
Location(s): Guelph

CIS*6320 Image Processing Algorithms and Applications Unspecified [0.50]
Brightness transformation, image smoothing, image enhancement, thresholding, segmentation, morphology, texture analysis, shape analysis, applications in medicine and biology.
Offering(s): Odd-numbered years
Department(s): School of Computer Science
Location(s): Guelph

CIS*6420 Soft Computing Unspecified [0.50]
Neural networks, artificial intelligence, connectionist model, back propagation, resonance theory, sequence processing, software engineering concepts.
Offering(s): Odd-numbered years
Department(s): School of Computer Science
Location(s): Guelph

CIS*6510 Cybersecurity and Defense in Depth Fall Only [0.50]
This course provides an overview of concepts and technical measures that are employed to enforce security policies and protect networks and systems from malicious activities. Students will learn how to engineer a secure system and how to secure networks in an ethical manner.
Restriction(s): Restricted to Master of Cybersecurity and Threat Intelligence students.
Department(s): School of Computer Science
Location(s): Guelph

CIS*6520 Advanced Digital Forensics and Incident Response Fall Only [0.50]
This course provides an in-depth understanding of theoretical concepts and practical issues in the field of digital forensics and incident response. Students will develop necessary skills, methodologies, and processes to detect cyber incidents and conduct in-depth computer and network investigation.
Restriction(s): Restricted to Master of Cybersecurity and Threat Intelligence students.
Department(s): School of Computer Science
Location(s): Guelph

CIS*6530 Cyber Threat Intelligence and Adversarial Risk Analysis Winter Only [0.50]
This course provides an in-depth understanding of techniques for detecting, responding to, and defeating Advanced Persistent Threats (APT) and malware campaigns using artificial intelligence and data mining techniques. Students will identify, extract, and leverage intelligence from different types of cyber threat actors.
Restriction(s): Restricted to Master of Cybersecurity and Threat Intelligence students.
Department(s): School of Computer Science
Location(s): Guelph

CIS*6540 Advanced Penetration Testing and Exploit Development Winter Only [0.50]
This course provides an in-depth understanding of techniques for detecting, responding to, and defeating Advanced Persistent Threats (APT) and malware campaigns using artificial intelligence and data mining techniques. Students will identify, extract, and leverage intelligence from different types of cyber threat actors.
Restriction(s): Restricted to Master of Cybersecurity and Threat Intelligence students.
Department(s): School of Computer Science
Location(s): Guelph

CIS*6550 Privacy, Compliance, and Human Aspects of Cybersecurity Unspecified [0.50]
This course provides an in-depth view of the privacy, regulatory, and ethical issues surrounding cybersecurity. It covers methods of mitigating/treating privacy risks associated with emerging technologies that collect, manage, and analyse data. This course also examines data protection regulations and compliance strategies.
Department(s): School of Computer Science
Location(s): Guelph

CIS*6560 Cybersecurity and Threat Intelligence Project Winter and Summer Reg Required [1.00]
Students plan, develop, and write an industry- or faculty-led report and produce required tools, services, and software. Projects should advance knowledge or practice, and address an emerging challenge in cybersecurity, cyber threat intelligence, digital forensics and incident response, cyber threat hunting, or a closely related field.
Restriction(s): Restricted to Master of Cybersecurity and Threat Intelligence students.
Department(s): School of Computer Science
Location(s): Guelph

CIS*6570 Advanced Cryptography and Cryptanalysis Unspecified [0.50]
This course provides an in-depth understanding of modern cryptography, with emphasis on practical applications. Topics covered include classical systems, information theory, symmetrical cryptosystems, block ciphers, stream ciphers, DES, AES, asymmetric cryptosystems, ECC, provable security, keyexchange and management, and authentication and digital signatures, among others.
Department(s): School of Computer Science
Location(s): Guelph

CIS*6580 Security Monitoring and Cyber Threat Hunting Unspecified [0.50]
This course provides a comprehensive review of tools, techniques, and procedures for monitoring network events and assets to build a secure network architecture. It trains students in methods for hunting attackers that could bypass designed network defense mechanisms in an enterprise.
Restriction(s): Restricted to Master of Cybersecurity and Threat Intelligence students.
Department(s): School of Computer Science
Location(s): Guelph

CIS*6590 Professional Seminar in Cybersecurity Fall and Winter Reg Required [0.50]
This two-semester course offers a multidisciplinary forum for discussion of topics related to cybersecurity. The seminar fosters professional skills development (academic and industry), promotes collaboration between industry experts and graduate students, facilitates mentoring and project development, and contributes to the transfer of knowledge between industry and academia.
Department(s): School of Computer Science
Location(s): Guelph

CIS*6650 Topics in Computer Science I Unspecified [0.50]
This special topics course examines selected, advanced topics in computer science that are not covered by existing courses. The topic(s) will vary depending on the need and the instructor.
Offering(s): Odd-numbered years
Department(s): School of Computer Science
Location(s): Guelph

CIS*6660 Topics in Computer Science II Unspecified [0.50]
This is a reading course. Its aim is to provide background knowledge to students who need to get a head-start in their thesis research fields early during their program while no suitable regular graduate courses are offered. Admission is under the discretion of the instructor.
Restriction(s): Instructor consent required.
Department(s): School of Computer Science
Location(s): Guelph

CIS*6670 Special Topics in Cybersecurity Unspecified [0.50]
This course provides an in-depth view of a variety of advanced topics within cybersecurity. Subject areas discussed in any particular semester will depend upon the interests of both the students and the instructor. Students should check with the School of Computer Science to determine what topics will be offered during specific semesters.
Department(s): School of Computer Science
Location(s): Guelph

CIS*6890 Technical Communication and Research Methodology Unspecified [0.50]
This course aims to develop students' ability in technical communication and general research methodology. Each student is expected to present a short talk, give a mini lecture, review a conference paper, write a literature survey and critique fellow students' talks and lectures.
Department(s): School of Computer Science
Location(s): Guelph