Ottawa-Carleton Institute for Computer Science

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The Institute

Director of the Institute:
S.P. Dandamudi
Associate Director of the Institute:
L.G. Birta

Students who wish to pursue studies in computer science leading to an M.C.S. or a Ph.D. degree can do so in a joint program offered by the Department of Computer Science at the University of Ottawa and the School of Computer Science at Carleton University under the auspices of the Ottawa-Carleton Institute for Computer Science. The Institute is responsible for supervising the program and for providing a framework for interaction between the two departments at the research level. In addition to the faculty members from the two computer science departments the Institute also has members with computer science expertise from other departments.

Requests for information, and completed applications, should be sent to the director or associate director of the Institute. A joint admissions committee examines all applications and assigns students to the most appropriate campus and supervisor.

Members of the Institute

The "home" department of each member is indicated by (CSI) for the Department of Computer Science, University of Ottawa, (ELG) for the Department of Electrical Engineering, University of Ottawa, (ADM) for Faculty of Administration, University of Ottawa, (SCS) for the School of Computer Science, Carleton University, (MAT) for the Department of Mathematics and Statistics, Carleton University, (SCE) for the Department of Systems and Computer Engineering, Carleton University, (C) for the Department of Civil Engineering, Carleton University, (BUS) for the School of Business, Carleton Univeristy.

M.D. Atkinson, (SCS), *Complexity, Algorithms, Computational Algebra*
L.G. Birta, (CSI), *Simulation, Optimization, Numerical Algorithms*
Sylvia Boyd, (CSI), *Optimization, Combinatorics*
R.J. Buhr, (SCE), *Software Engineering, Protocols, CAD of Computer Systems*
T.-Y. Cheung, (CSI), *Distributed Computing, Optimization, Databases*
J.W. Chinneck, (SCE), *Operations Research, Modelling and Simulation Methodology*
J.-P. Corriveau, (SCS), *Cognitive Science, Natural Language Understanding, CASE Tools*
S.P. Dandamudi, (SCS), *Parallel and Distributed Systems, Database Systems, Performance Evaluation, Computer Architecture, Operating Systems*
N.W. Dawes, (SCE), *Communication Networks, Optimization*
Frank Dehne, (SCS), *Computational Geometry, VLSI Algorithms*
J.D. Dixon, (MAT), *Algorithms, Algebra, Number Theory*
Frantisek Fiala, (SCS), *Optimization, Combinatorics*
N.D. Georganas, (ELG), *Computer Communications, Mobile Radio*
Morris Goldberg, (ELG), *Image Processing, Pattern Recognition*
R.C. Holte, (CSI) *Artificial Intelligence, Machine Learning, Knowledge Compilation*
N.M. Holtz, (C) *Computer-aided Structural Engineering*
G.M. Karam, (SCE), *Logic Programming, Office Automation*
A.R. Kaye, (SCE), *Expert Systems, Office Automation*
G.F. Kersten, (BUS), *Knowledge-based Systems, Intelligent Decision Support, Problem Structuring and Representation*
Evangelos Kranakis, (SCS), *Cryptography, Computational Number Theory, Combinatorial Analysis, Computational Geometry, Distributed Computing, Mathematical Logic*
Moshe Krieger, (ELG), *Computer Architecture*
Danny Krizanc, (SCS), *Parallel and Distributed Computing, Analysis of Algorithms and Use of Randomization in Computation*
W.R. LaLonde, (SCS), *Programming Languages,* Artificial Intelligence
Luigi Logrippo, (CSI), *Software Methodology, Communications Protocols*
S.A. Mahmoud, (SCE), *Local Area Networks, Communication Protocols*
S.J. Matwin, (CSI), *Programming Languages, Expert Systems*
A. Mili, (CSI), *Formal Specification, Program Transformation*
L.R. Morris, (SCE), *Signal Processing, Speech Analysis, Graphics*
B.C. Mortimer, (MAT), *Combinatorics, Algorithms, Groups Theory*
J. E. Neilson, (SCS), *Computer Architecture, Distributed Computing*

L.D. Nel, (SCS), *Network Reliability and Performance, Digital Signal Processing, Computer Music*
J.B. Oommen, (SCS), *Automata, Pattern Recognition, Image Processing*
Franz Oppacher, (SCS), *Natural Language Processing, Expert Systems*
T.I. Oren, (CSI), *Simulation, Modelling*
R.B. Osborne, (SCS), *Speculative Computation, Parallel Processing, Programming Languages*
E.J. Otoo, (SCS), *Databases, Algorithms*
Bernard Pagurek, (SCE), *Queuing, Databases*
R.L. Probert, (CSI), *Communications, Expert Systems*
John Pugh, (SCS), *Artificial Intelligence, Graphics, Programming Languages*
Jacques Raymond, (CSI), *Computer Architecture, Graphics*
Irwin Reichstein, (SCS), *Numerical Applications, Microcomputers*
Ivan Rival, (CSI), *Combinatorics, Optimization, Algorithms*
J.-R. Sack, (SCS), *Algorithms, Computational Geometry, Graphics*
Nicola Santoro, (SCS), *Algorithms, Distributed And Parallel Computing*
Philip Scott, (CSI), *Logic, Theoretical Computer Science, Category Theory*
J.B. Sidney, (ADM), *Combinatorics, Complexity, Computational Geometry*
D.R. Skuce, (CSI), *Artificial Intelligence, Logic Programming*
Ivan Stojmenovic, (CSI), *Computational Geometry, Multiple-valued Logics, Parallel Computing*
Stan Szpakowicz, (CSI), *Logic Programming, Computational Linguistics*
D.A. Thomas, (SCS), *Artificial Intelligence, Fifth Generation Machines*
Hasan Ural, (CSI), *Software Reliability and Testing, Data Communication Protocols, Applications of Logic Programming*
Jorge Urrutia, (CSI), *Algorithms, Combinatorics, Geometry And Algorithms*
Rémi Vaillancourt, (CSI), *Numerical Methods*
G.M. White, (CSI), *Networking, Office Automation*
C.M. Woodside, (SCE), *Performance Modelling, Distributed Systems, Queuing*
Negib Zaguia, (CSI), *Optimization, Theory of Algorithms, Theory of Ordered Sets*

Master of Computer Science

Admission Requirements

Applicants should have an honours bachelor's degree in computer science or equivalent, with at least high honours standing. By *equivalent* is meant an honours degree in a program which includes at least twelve computer science half courses, two of which must be at the fourth-year level, as well as eight half courses in mathematics, one of which must be at the third- or fourth-year level. These courses must include the topics indicated below:

Computer Science
Data structures/file management, operating systems, computer architecture, algorithm design and analysis, assembly language and two high-level languages

Mathematics
Calculus, linear algebra, algebraic structures or discrete mathematics, probability and statistics, numerical analysis. Applicants who have a general (pass) bachelor's degree, or who otherwise lack the required undergraduate preparation, may be admitted to a qualifying-year program. Refer to the general section of this calendar for regulations governing the qualifying year.

Program Requirements

The program includes graduate study and research in four broad areas identified as follows:

- *Programming Systems and Languages*

Database systems, operating systems, software methodology, software translators, language design

- *Theory of Computing*

Analysis of algorithms, automata theory, formal languages, complexity, computability, logic and program schemata

- *Computer Applications*

Artifical intelligence, graphics, picture and signal processing, modelling and simulation, numerical analysis, optimization

- *Computer Systems*

Computer architecture, networks and distributed processing, computer communications, mini- and microcomputers

Within these areas, the program emphasizes problems of current practical significance and has close links to the scientific and industrial communities.

Normally, students in the program will be expected to complete a thesis; however, students who have substantial relevant work experience may be permitted to take the non-thesis option, which must include a graduate research project course. Each candidate submitting a thesis will be required to undertake an oral defence of the thesis.

Students in the thesis option must take five half courses or equivalent, fulfil the graduate seminar requirement, and complete a thesis. Students in the non-thesis option must take ten half courses, and fulfil the graduate seminar requirement. The course selections must be approved by the student's academic adviser, and must include at least:

- One half course in programming systems and languages
- One half course in the theory of computing
- One half course in either computer applications or computer systems

The graduate seminar requirement includes a seminar presentation and participation in at least thirteen seminars in the Joint Graduate Student Seminar Series.

Both course and thesis work may be completed either by full-time or part-time study.

A candidate may be permitted to carry out thesis work off campus provided that suitable arrangements are made for supervision and experimental work, and prior approval is given by the Institute.

Doctor of Philosophy

Admission Requirements

A Master's degree in Computer Science (or equivalent) with high second-class standing is normally required for admission into the Ph.D. program. Students who are currently registered in the M.C.S. program may, in exceptional cases, be permitted to transfer into the Ph.D. program if they have completed all course requirements with at least high second-class standing and demonstrate significant promise for advanced research.

Program Requirements

- A minimum of six half courses, or equivalent, at the graduate level with at least one half course from each of the four areas
- Presentation of at least two seminars in the Computer Science Institute seminar series
- A comprehensive examination involving breadth and depth components
- A written thesis proposal defended at an oral examination
- A research thesis, defended at an oral examination

Residence Requirement

Students must fulfil a residence requirement of at least four terms of full-time study.

Graduate Courses

The courses in the following list are offered by various departments indicated by the prefix of the course code as follows:

Carleton University

70 Department of Mathematics and Statistics
94 Department of Systems and Computer Engineering
95 School of Computer Science

University of Ottawa

CSI Department of Computer Science
ELG Department of Electrical Engineering
MAT Department of Mathematics

Programming Systems and Languages

94.480		Software Engineering
95.404		Systems Software
95.490		Advanced Topics in Computer Science
94.531	(ELG6131)	System Design with Ada
94.571	(CSI5117)	Mini/Microcomputer Operating System Design
94.573	(CSI5115)	Integrated Database Systems
94.579	(CSI5112)	Advanced Topics in Software Engineering
95.501	(CSI5113)	Foundations of Programming Languages
95.502	(CSI5119)	User-Interface Facilities
95.514	(CSI5314)	Object-oriented Systems
95.516	(CSI5123)	Languages for Parallel Computing
CSI5111	(95.551)	Software Testing: Theory and Practice
CSI5118	(95.578)	Design of Compilers and Translators
CSI5184	(95.584)	Logic Programming
CSI5518	(95.578)	Conception des compilateurs et traducteurs
CSI5584	(95.584)	Programmation logique

Theory of Computing

70.482		Introduction to Mathematical Logic
70/95.483		Topics in Applied Logic
70/95.484		Design and Analysis of Algorithms
70/95.485		Theory of Automata
70/95.486		Numerical Linear Analysis
70.565	(MAT5165)	Theory of Automata
70.585	(MAT5308)	Topics of Algorithm Design
95.409		Introduction to Parallel and Systolic Computing
95.504	(CSI5305)	Topics in Arithmetic Complexity
95.505	(CSI5390)	Automata Models of Learning Systems
95.508	(CSI5164)	Computational Geometry
95.522	(CSI5172)	Network Reliability
95.528	(CSI5167)	Complexity of Boolean Functions
95.573	(CSI5163)	Algorithm Analysis and Design

95/70.587	(CSI5104)	Formal Language and Syntax Analysis
CSI5101	(95.561)	Formal Models of Computational Systems
CSI5107	(95.569)	Program Construction and Fault Tolerance
CSI5108	(95.570)	Software Specification and Verification
CSI5109	(95.571)	Algebraic Specification Methods for Distributed Systems
CSI5110	(95.577)	Principles of Formal Software Development
CSI5162	(95.572)	Topics in the Theory of Computing
CSI5165	(95.579)	Combinatorial Algorithms
CSI5166	(95.585)	Applications of Combinatorial Optimization
CSI5174T	(95.564)	Specification and Validation of Communication Software
CSI5507	(95.569)	La Construction et la Tolérance aux Fautes de Programmes
CSI5508	(95.570)	Spécification et Vérification de Logiciels
CSI5509	(95.571)	Méthodes Algébriques pour la Spécification de Systemes Répartis
CSI5510	(95.577)	Principes de développement formel de logiciels
CSI5565	(95.579)	Algorithmes Combinatoires

Computer Applications

70/95.486		Numerical Linear Algebra
94.405		Discrete Simulation and Its Applications
95.402		Computer Graphics
95.403		Transaction Processing Systems
95.405		First Course in Robotics and Computer Vision
95.407		Applied Artifical Intelligence
70.569	(MAT5301)	Topics in Combinatorial Mathematics
70.581	(MAT5303/ADM6385)	Linear Optimization
70.583	(MAT5304/ADM6386)	Nonlinear Optimization
70.584	(MAT5307/ADM6387)	Topics in Operations Research
70.586	(MAT5180)	Numerical Analysis
70.588	(MAT5305)	Combinatorial Optimization I
70.589	(MAT5306)	Combinatorial Optimization II
94.501	(CSI5120)	Simulation and Modelling
94.504	(ADM6371)	Mathematical Programming for Engineering Applications
94.505	(CSI5150)	Optimization Theory and Methods
94.534	(ELG6134)	Mini-Micro Applications
94.535	(ELG6135)	Representations and Methods in Design Tools for Concurrent Systems
94.542	(ELG6142)	Advanced Dynamics with Applications to Robots
94.553	(ELG6153)	Stochastic Processes
95.506	(CSI5306)	Natural Language Understanding
95/94.507	(CSI5307)	Expert Systems
95.510	(CSI5180)	Topics in Artificial Intelligence
95.513	(CSI5313)	Cryptography
95.520	(CSI5182)	Cerebral Computations
95.524	(CSI5124)	Computational Aspects of Geographic Information Systems
95.526	(CSI5183)	Genetic Algorithms and Artificial Life
CSI5161	(95.566)	Topics in System Simulation and Optimization
CSI5181	(95.575)	Artificial Intelligence Applications in Software Development
CSI5304	(95.562)	Knowledge Engineering
CSI5386	(95.555)	Natural Language Processing
CSI5387	(95.576)	Concept Learning Systems
CSI5388	(95.581)	Topics in Machine Learning
CSI5580	(95.510)	Sujet en intelligence artificielle
CSI5581	(95.575)	Applications de l'intelligence artificielle dans le développement des systèmes
CSI5787	(95.576)	Apprentissage Symbolique Automatique
ELG5119	(92.519)	Stochastic Processes

Computer Systems

94.457	

		Introduction to the Architecture of Computer Systems
94.470		Introduction to Telecommunications
94.511	(ELG6111)	Computer System Design for Performance
94.519	(ELG6119)	Teletraffic Engineering
94.521	(ELG6121)	Computer Communications
94.527	(ELG6127)	Distributed Processing Systems
94.538	(ELG6138)	Computer Architecture and Parallel Processing
94.558	(ELG6158)	Digital Systems Architecture
94.576	(ELG6176)	Analytical Performance Models of Computer Systems
94.577	(ELG6177)	Teleprocessing Software Design
94.581	(ELG6181)	Advanced Topics in Computer Communications
95.408		Performance Modelling
95.503	(CSI5308)	Principles of Distributed Computing
95.509	(CSI5141)	Associative Data Structures and Advanced Databases
95.511	(CSI5311)	Distributed Databases and Transaction Processing Systems
95.512	(CSI5312)	Distributed Operating Systems
95.515	(CSI5132)	Parallel Processing Systems
95.574	(CSI5131)	Parallel Algorithms and their VLSI Implementation
95.610	(CSI7131)	Advanced Parallel and Systolic Algorithms
97.587	(ELG6387)	Microprocessor Electronics
CSI5114	(95.554)	Automated Office Systems
CSI5133	(95.568)	Simulation and Testing of Logic Circuits
CSI5135	(95.565)	High Level Language Machines
CSI5170	(95.580)	Distributed Data Processing
CSI5171	(95.583)	Software for Communication Networks
CSI5514	(95.554)	Bureautique
CSI5535	(95.565)	Les machines de haut niveau
ELG5192	(92.577)	Microprocessor-based Systems
ELG5193	(92.578)	Multi-microprocessor Systems
ELG5374	(92.567)	Computer-Communication Networks
ELG5378TH	(92.559)	Image Processing Techniques and Image Communications

Theses, Projects and Topics

95.590	(CSI5140)	Selected Topics in Computer Science
95.591	(CSI5901)	Directed Studies (M.C.S.)
95.592	(CSI5900)	Graduate Project (M.C.S.)
95/70/94.595	(CSI7999)	M.C.S. Thesis
95.661	(CSI7160)	Advanced Topics in the Theory of Computing
95.662	(CSI7170)	Advanced Topics in Distributed Computing
95.663	(CSI7161)	Advanced Topics in Programming Systems and Languages
95.664	(CSI7162)	Advanced Topics in Computer Applications
95.665	(CSI7163)	Advanced Topics in Computer Systems
95.691	(CSI7901)	Directed Studies (Ph.D.)
95.692	(CSI7900)	Graduate Project (Ph.D)
95.699	(CSI9999)	Ph.D. Thesis
CSI9998		Examen général de doctorat/Ph.D. Comprehensive Examination