Area of Interest: Advanced Technology

Artificial Intelligence Software Development (Co-op and Non Co-op Version)

Ontario College Graduate Certificate Program Code: 1535X03FWO

1 Year

Ottawa Campus

Our Program

Connect reasoning and machine learning for an innovative career developing artificial intelligence solutions.

The Artificial Intelligence Software Development Ontario College Graduate Certificate program is designed to prepare you to meet the increasing market demand for artificial intelligence software development expertise. Through this program, you will enhance your existing software development skills to become an AI software developer, with an in-depth understanding of the major AI technologies and how to leverage AI to solve problems.

The program explores AI using a top-down and a bottom-up approach simultaneously. You begin a deep dive into the detailed mechanisms of machine learning to acquire the skills to troubleshoot, debug and optimize machine learning and deep learning architectures. You investigate various techniques of AI and survey which types of problems are best solved using each AI technique.

Through a combination of theory-based learning and industry-based applied research AI projects, graduates possess the theoretical knowledge and hands-on skills to assess, recommend, design, implement and troubleshoot various advanced AI solutions. Graduates enter the workforce with an in-depth understanding of deep learning, reinforcement learning and knowledge representation. Together these three branches form a comprehensive view of the AI landscape, giving the AI developer the knowledge and skills required to implement solutions such as speech recognition and natural language understanding, planning, diagnosis, smart agents, machine vision, intelligent manufacturing processes and intelligent control.

AI Developers need a thorough understanding of the ethical issues surrounding the deployment of AI technology. Graduates of the program have the knowledge to advise their organization on ethical considerations surrounding AI systems and development.

Students also have the option to gain real-world experience through a paid co-operative education (co-op) work term (see Additional Information for more details). Please note that places in the co-op work term are subject to availability and academic eligibility. **Please note that admission to the co-op program does not guarantee a co-op placement.**

Graduates may find employment in a variety of computer-software related domains in the private, corporate, industrial, governmental or service sectors. Employment opportunities may be available in:

- private software firms
- software consulting firms
- software vendors and their value-added resellers
- information technology consulting firms
- communications carriers
- information service providers
- government

- business and public organizations in multiple fields outside IT/IS requiring software practitioners

SUCCESS FACTORS

This program is well-suited for students who:

- Have a strong aptitude for computer science and mathematics.
- Enjoy working individually and as a team member.
- Possess strong critical thinking, analytical and problem-solving skills.
- Have a strong work ethic and attention to detail.
- Are interested in leveraging technology in support of social responsibility.

Employment

Graduates of this Artificial Intelligence Software Development Ontario College Graduate Certificate program may find employment as a computational linguist, intelligence algorithms engineer AI resident, artificial intelligence research analyst, artificial intelligence consultant, artificial intelligence software developer, deep learning and computer vision engineer as well as a data engineer in machine learning.

Learning Outcomes

The graduate has reliably demonstrated the ability to:

- Analyze, design, and implement secure Artificial Intelligence (AI) software systems through the application of systematic approaches and methodologies to meet organizational needs.
- Develop artificial intelligence models to identify patterns, provide insights, recommend actions, or perform tasks autonomously on behalf of stakeholders.
- Prepare and communicate analysis, reports, and recommendations, in a variety of formats, for various audiences, stakeholders and purposes.
- Conduct software development and deployment in an ethical manner that ensures data integrity, privacy, confidentiality, impartiality, transparency, equal access and no data bias.
- Complete all work in compliance with laws, regulations, data governance, professional ethics and industry standards.
- Evaluate and deploy custom-made and commercial AI software components for the purpose of integration into software solutions.
- Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.

Program of Study

Level: 01	Courses	Hours
CST8502	Machine Learning	70.0
CST8503	Knowledge Representation and Reasoning	70.0
CST8504	Applying Artificial Intelligence Techniques	70.0
CST8505	Artificial Intelligence Project 1	56.0
GEP1001	Cooperative Education and Job Readiness	21.0

PHI4005	Ethics for Artificial Intelligence	56.0
Level: 02	**Courses**	**Hours**
CST8506	Advanced Machine Learning	70.0
CST8507	Natural Language Processing	70.0
CST8508	Machine VIsion	70.0
CST8509	Reinforcement Learning	70.0
CST8510	Artificial Intelligence Project 2	56.0
Co-op: 01	**Courses**	**Hours**
WKT8006	Co-Op I	

Fees for the 2024/2025 Academic Year

Tuition and related ancillary fees for this program can be viewed by using the Tuition and Fees Estimator tool at https://www.algonquincollege.com/fee-estimator .

Further information on fees can be found by visiting the Registrar`s Office website at https://www.algonquincollege.com/ro .

Fees are subject to change.

Additional program related expenses include:

- Books are approximately $500.
- Robot Kit is approximately $1,000.
- Google Colab subscription is approximately $14/mo for 5-6 months.
- In addition, this is a BYOD program with a published specification for minimum laptop requirements.

Admission Requirements for the 2025/2026 Academic Year

Program Eligibility

- Ontario College Diploma, Ontario College Advanced Diploma, Degree or equivalent in Computer Science or a related field with software development education.
- Applicants must have successfully completed at least one introductory Calculus course from a recognized university or college.
- Applicants with international transcripts must provide proof of the subject-specific requirements noted above and may be required to provide proof of language proficiency. Domestic applicants with international transcripts must be evaluated through the International Credential Assessment Service of Canada (ICAS) or World Education Services (WES).
- IELTS-International English Language Testing Service (Academic) Overall band of 6.5 with a minimum of 6.0 in each band; OR TOEFL-Internet-based (iBT)-overall 88, with a minimum of 22 in each component: Reading 22; Listening 22; Speaking 22: Writing 22; OR Duolingo English Test (DET) Overall 120, minimum of 120 in Literacy and no score below 105.

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Application Information

ARTIFICIAL INTELLIGENCE SOFTWARE DEVELOPMENT (CO-OP AND NON CO-OP VERSION)
Program Code 1535X03FWO

Applications to full-time day programs must be submitted with official transcripts showing completion of the academic admission requirements through:

ontariocolleges.ca
60 Corporate Court
Guelph, Ontario N1G 5J3
1-888-892-2228

Applications are available online at https://www.ontariocolleges.ca/ .

Applications for Fall Term and Winter Term admission received by February 1 will be given equal consideration. Applications received after February 1 will be processed on a first-come, first-served basis as long as places are available.

International applicants applying from out-of-country can obtain the International Student Application Form at https://algonquincollege.forc.com/myACint/ or by contacting the Registrar`s Office.

For further information on the admissions process, contact:

Registrar`s Office
Algonquin College
1385 Woodroffe Ave
Ottawa, ON K2G 1V8
Telephone: 613-727-0002
Toll-free: 1-800-565-4723
TTY: 613-727-7766
Fax: 613-727-7632
Contact: https://www.algonquincollege.com/ro

Additional Information

CO-OP INFORMATION:
All applicants apply directly to the co-op version of this program through OntarioColleges.ca or our International Application Portal. Applicants not wishing to pursue the co-op version will have the opportunity to opt-out after being admitted to the program but prior to the first co-op work term.

Co-operative education (Co-op) allows students to integrate their classroom learning with a real-world experience through paid work terms. Two academic terms prior to the cooperative education work term, students are required to actively participate in and successfully complete the self-directed co-op course, readiness activities and workshops.

Students must actively conduct a guided, self-directed job search and are responsible for securing approved program-related paid co-op employment. Students compete for co-op positions alongside students from Algonquin College and other Canadian and international colleges and universities. Algonquin College`s Co-op Department provides assistance in developing co-op job

opportunities and guides the overall process, but does not guarantee that a student will obtain employment in a co-op work term. Co-op students may be required to relocate to take part in the co-op employment opportunities available in their industry and must cover all associated expenses; e.g., travel, work permits, visa applications, accommodation and all other incurred expenses.

Co-op work terms are typically 14 weeks in duration and are completed during a term when students are not taking courses. For more information on your program`s co-op level(s), visit the courses tab on your program`s webpage.

International students enrolled in a co-op program are required by Immigration, Refugees and Citizenship Canada (IRCC) to have a valid Co-op/Internship Work Permit prior to commencing their work term. Without this document International students are not legally eligible to engage in work in Canada that is part of an academic program. The Co-op/Internship Work Permit does not authorize international students to work outside the requirements of their academic program.

For more information on co-op programs, the co-op work/study schedule, as well as general and program-specific co-op eligibility criteria, please visit https://www.algonquincollege.com/coop .

Contact Information

Program Coordinator(s)

- Todd Kelley, mailto:kelleyt@algonquincollege.com , 613-727-4723, ext. 7474

Course Descriptions

CST8502 Machine Learning

One of the primary artificial intelligence techniques is machine learning, which involves developing datasets to train models forming the basis of decision-making facilities. Students develop machine learning representations and build datasets to train the corresponding algorithms used to design, develop and implement intelligent systems.

Prerequisite(s): none
Corerequisite(s):none

CST8503 Knowledge Representation and Reasoning

Knowledge representation and reasoning plays an important role in Symbolic AI, forming the foundation of various results in planning, diagnosis, and automated agent reasoning. Students differentiate between symbolic AI and machine learning, and specifically examine the nature of problems that use symbolic AI appropriate solution. Students write declarative programs in a logic programming language following a first order logic approach to knowledge representation and reasoning. Students describe a solution by formulating logical sentences, and automating the solution using a theorem prover.

Prerequisite(s): none
Corerequisite(s):none

CST8504 Applying Artificial Intelligence Techniques

An effective AI practitioner needs familiarity with the various techniques in the AI landscape in order to match appropriate techniques to the problem at hand. Students explore a range of examples of the different types of AI techniques that can be applied. Students deploy a selection of the current popular implementations on sample problems.

Prerequisite(s): none
Corerequisite(s):none

CST8505 Artificial Intelligence Project 1

Teamwork is a highly sought-after skill in AI development. Students participate on a team working with an industry partner addressing a substantial real-world problem and its solution. This work requires detailed design subject to requirements, validation of project deliverables and efficient

communication with clients. Students engage in the initial phase of the practical design and build of a year-long project. Using software development principles, students develop testing frameworks to validate that project deliverables meet requirements. Students work collaboratively on projects choosing topics from applied industrial and innovative applications.

Prerequisite(s): none
Corerequisite(s):none

CST8506 Advanced Machine Learning

Much of today's AI progress results from the broad body of techniques in machine learning. Students develop their core machine learning skills in depth, covering supervised and unsupervised learning. Students also apply specific algorithms such as K-means, and support vector machines to assist in solving corresponding problems.

Prerequisite(s): CST8502
Corerequisite(s):none

CST8507 Natural Language Processing

AI systems are dependant on interaction with and input from humans. Natural language processing is the field of AI concerned with processing the information of spoken and written human languages such as English and French. Students implement applications with capabilities including speech recognition, natural language understanding and natural language generation. Examples of these applications are automated help-desk assistants and other question-and-answer systems, as well as systems that process natural language for content and sentiment analysis. Students follows the modern approach to natural language processing, with word embeddings and deep learning.

Prerequisite(s): CST8502
Corerequisite(s):none

CST8508 Machine VIsion

Often AI systems depend on visual inputs. Machine vision is the branch of AI that deals with detecting and recognizing concepts in visual images. Applications of machine vision are pervasive, with prominent examples being self-driving cars, facial recognition systems and medical diagnosis. Students apply machine learning and deep learning techniques to solve vision problems. Students design, implement, train, and debug convolutional neural networks to perform image detection and classification functions.

Prerequisite(s): CST8502
Corerequisite(s):none

CST8509 Reinforcement Learning

A large class of real-world problems lend themselves to AI solutions based on reinforcement learning. These include customer relationship management, recommender systems, smart assistants, as well as industrial control and manufacturing processes. Students apply reinforcement learning techniques when implementing solutions to problems. Practical work includes implementing a complete reinforcement learning system to make automated decisions in a smart-agent domain.

Prerequisite(s): CST8504
Corerequisite(s):none

CST8510 Artificial Intelligence Project 2

Applying AI skills in a practical setting allows students to see theory in action, with real-world outcomes. Students develop skills and abilities to create solutions for substantial realistic problems in the domain of AI. Working with an industry partner, students experience applied research in industry by leveraging AI to solve problems. Building on previous knowledge, students choose appropriate AI technologies and approaches to effectively meet stakeholder requirements and specific challenges. Student work culminates in a software solution that exhibits intelligent

behaviors.

Prerequisite(s): CST8502 and CST8503 and CST8504 and CST8505 and PHI4005
Corerequisite(s):none

GEP1001 Cooperative Education and Job Readiness

Students are guided through a series of activities that prepare them to conduct a professional job search and succeed in the workplace. Through a detailed orientation students learn the cooperative education program policies and procedures related to searching and securing a work term opportunity. Students identify their strengths and transferable skills and participate in workshop-style sessions that focus on cover letter and resume development, interview techniques and job search strategies. Students learn how to navigate a web-based resource centre, which is used to post employment and cooperative education job opportunities. Students reflect on workplace success, ethics and responsibilities.

Prerequisite(s): none
Corerequisite(s):none

PHI4005 Ethics for Artificial Intelligence

AI, in its various forms, presents a risk to society from a moral and legal standpoint, threatening traditional views of topics such as accountability, fairness and privacy. Students examine ethical concepts and principles, compare a variety of ethical decision-making models and utilize these principles and models to make ethically sound decisions in a variety of contexts. Students examine the ethical perspectives of AI and develop the ability to access the type and degree of ethical risks posed by various types of AI.

Prerequisite(s): none
Corerequisite(s):none

WKT8006 Co-Op I

This co-op placement provides students with experiential opportunities within the field. Students attain entry-level positions that involve a variety of activities allowing application of principles and concepts developed during previous study. Although centred in public and private institutions located in Eastern Ontario, co-op employment opportunities may be sought throughout Canada and abroad. Pre-requisite: Completion of all Level 1 and Level 2 courses

Prerequisite(s): none
Corerequisite(s):none