# CANADA'S AI ECOSYSTEM:

## A Brief Overview of In-Demand Skills and Trends

ICTC ⚜ CTIC

# PREFACE:

The Information and Communications Technology Council (ICTC) is a neutral, not-for-profit national center of expertise with the mission of strengthening Canada's digital advantage in the global economy. For over 30 years, ICTC has delivered forward-looking research, practical policy advice, and capacity-building solutions for individuals and businesses. The organization's goal is to ensure that technology is utilized to drive economic growth and innovation, and that Canada's workforce remains competitive on a global scale.

🌐 ictc-ctic.ca      ✉ info@ictc-ctic.ca

## TO CITE THIS REPORT:

## DISCLAIMER:

# TABLE OF CONTENTS

# FOREWORD

From May to October 2024, the Information and Communications Technology Council (ICTC) conducted primary research to identify the key roles and skill sets driving Canada's artificial intelligence (AI) industry, which "is projected to see annual growth of 33.9% from 2023 to 2028."[1]

This brief summarizes ICTC's research findings. It identifies the key roles propelling Canada's AI industry—AI engineers, AI researchers, computer vision engineers, data engineers, data scientists, machine learning engineers, and software developers—and outlines the essential skills and competencies that entry-level professionals require to succeed in these roles. It also offers students, post-secondary institutions, policymakers, and industry stakeholders insights into the skills and technologies shaping Canada's AI industry.

ICTC intends to use the findings from this research to develop an entry-level assessment framework for these key AI roles. The framework will be available through ICTC's eTalent Canada client portal in spring 2025.

---

[1]  Innovation, Science and Economic Development Canada, "Consultations on Artificial Intelligence (AI) Compute," Government of Canada, accessed 14 January 2025, https://ised-isde.canada.ca/site/ised/en/public-consultations/consultations-artificial-intelligence-ai-compute

# BACKGROUND

Artificial intelligence (AI) is transforming Canada's labour market. An increasing number of businesses are developing or adopting AI solutions due to AI's efficiency, innovative abilities, and scalability. This growing adoption is driving a steep rise in demand for AI-related skills, including machine learning (ML), deep learning (DL), AI ethics, and AI governance.[2] Roles such as ML engineer, computer vision engineer, and data scientist are becoming particularly sought after. Already, 46% of Canadian workers report using generative AI in some capacity in their roles, double the figure from the previous year.[3]

As demand for AI talent rises, Canadian companies face challenges securing skilled professionals.[4] IIn response to intense competition for experienced AI talent, some firms are adjusting their hiring strategies, focusing on eager, adaptable candidates who can develop and deploy AI technologies, even without direct industry experience. Others are adopting skills-based hiring approaches, prioritizing specific technical proficiencies over traditional job title credentials. Regardless of their strategies, organizations aiming to remain competitive must understand which occupations, skills, and competencies are at the forefront of the ever-evolving AI landscape.

For entry-level workers seeking careers in tech, a contextualized understanding of Canada's specific AI labour needs is crucial. As demand for AI-related skills increases, workers who do not keep up with new technologies and fail to integrate them into their workflows risk falling behind. Experts consulted in this study emphasized that AI tools can enhance the productivity of senior professionals, potentially reducing the number of junior or entry-level opportunities across various sectors. Therefore, it is even more important for emerging talent to have in-demand skills that align with industry needs.

To support Canadian businesses and entry-level professionals, this brief identifies the key roles driving Canada's AI industry—AI engineers, AI researchers, computer vision engineers, data engineers, data scientists, ML engineers, and software developers—and outlines the essential skill sets and competencies required for success in these roles. It also provides students, post-secondaries, policymakers, and industry stakeholders with insights into the skills and technologies shaping Canada's AI ecosystem.

**2**   Vector Institute, "Artificial Intelligence Talent in Canada," 30 October 2024, 9,15. https://vectorinstitute.ai/wp-content/uploads/2024/10/Final-From-CBoC-website_ai-talent-canada_oct2024.pdf

**3**   KPMG in Canada, "Generative AI Adoption Index," 28 November 2024, 2. https://assets.kpmg.com/content/dam/kpmg/ca/pdf/2024/11/generative-ai-adoption-index-report-en.pdf

**4**   Vector Institute, "Artificial Intelligence Talent in Canada," 30 October 2024, 13. https://vectorinstitute.ai/wp-content/uploads/2024/10/Final-From-CBoC-website_ai-talent-canada_oct2024.pdf

# KEY JOBS AND SKILLS DRIVING CANADA'S AI INDUSTRY

- Artificial Intelligence Engineer

- Artificial Intelligence Researcher

- Computer Vision Engineer

- Data Engineer

- Data Scientist

- Machine Learning Engineer

- Software Developer

# ARTIFICIAL INTELLIGENCE ENGINEER

**AI engineers are pivotal in developing and deploying cutting-edge AI solutions across a wide range of AI systems, including ML, deep learning, neural networks, computer vision, and natural language processing (NLP).** Ideal candidates demonstrate competency by building AI models using ML algorithms and deep neural networks to enable the application of AI in real-world scenarios and understand how code interacts with hardware. Employers place significant importance on having a disciplined approach to experimentation, valuing models based on performance, and demonstrating a desire to keep up with new tools and techniques.

## Education Requirements

› Master's degree in computer science, data science, NLP, mathematics, etc.

## Certifications

› Cloud certifications (AWS, Azure, GCP) are beneficial

## Technical Skills

› Ability to develop end-to-end pipelines that process data and integrate into a database

› Software engineering, MLOps, GitOps, DevOps and cloud proficiencies

› Displayed experience in implementing vector transformations and matrix mathematics

› Displayed experience working across cloud platforms

› Full-stack engineering experience beneficial for how code interacts with hardware

## Tools

› Data collection and processing tools (Apache Hadoop, Apache Spark, Pandas)

› ML frameworks and libraries (PyTorch, Scikit-learn, TensorFlow)

› Model deployment tools (Docker)

› Cloud platforms (AWS, Azure, GCP)

**Entry-Level Assessment Tip:** Showcase real-world applications of AI concepts and skills through previous project history. Provide reasoning for chosen logic, and challenges addressed.

**Career Advancement Tip:** Showcase autonomy and an ability to contribute to and lead technical teams. Display advanced expertise in programming AI models and systems.

# ARTIFICIAL INTELLIGENCE RESEARCHER

**AI engineers are pivotal in developing and deploying cutting-edge AI solutions AI researchers explore and advance ML and AI methodologies** to tackle complex problems by developing new models, refining existing ones, or applying innovative techniques tailored to specific organizational needs for optimal outcomes. In contrast to applied roles, such as AI engineers, AI researchers engage more deeply in hypothesis testing and experimentation and must keep up-to-date with the latest developments and trends in AI.

## Education Requirements

› Advanced degrees (master's/PhD) in computer science, statistics, mathematics, or other quantitative fields are preferred

## Certifications

› Hands-on skills and experience are prioritized over certifications

## Technical Skills

› Statistical modelling, hypothesis testing, and programming languages (Python, R, Java, C++, etc.)
› Proficiency with big data and deep learning frameworks
› Knowledge of research methods and hypothesis-driven frameworks is important

## Tools

› ML frameworks and libraries (TensorFlow, PyTorch, Scikit-learn)
› Data processing and visualization tools (Pandas, Matplotlib, Seaborn)
› Collaboration, version control, cloud computing and storage (Git, GitHub, GitLab, AWS, GCP, Azure)

**Entry-Level Assessment Tip:** Display experience in experimental research and academia. Demonstrate the ability to refine theoretical concepts and create or advance algorithms to advance global knowledge.

**Career Advancement Tip:** Exhibit ability to develop and define advancements in new AI methods through algorithms and experimentation. These are often displayed as reputable publications and/or having advanced industry collaborations.

# COMPUTER VISION ENGINEER

**Computer vision engineers specialize in designing and deploying systems that process and interpret visual data, including images and videos.** They develop ML models for applications such as image recognition, object detection, and autonomous systems like self-driving vehicles. Candidates generally need experience in applied ML and the capability to transition models from research to production.

## Education Requirements

› Bachelor's or master's degree in computer science, engineering, or related technical field

## Certifications

› Cloud certifications (AWS, Azure, GCP) are beneficial

## Technical Skills

› Strong programming skills (Python, Matlab, C++, or Java)
› Experience with ML and deep learning algorithms
› Ability to process large datasets repeatedly to find optimal solutions
› Ability to apply computer vision theory (convolutional neural networks, image processing, pattern recognition)

## Tools

› Image processing libraries (OpenCV)
› ML frameworks (TensorFlow, Keras, PyTorch)
› Collaboration and version control (Git, GitHub)
› Cloud platforms (AWS, Azure, GCP)

**Entry-Level Assessment Tip:** Build a portfolio of projects that show proficiency in building and implementing object detection models capable of detecting multiple objects. Discuss preprocessing steps, trade-offs between the various models, and rationale for model evaluation.

**Career Advancement Tip:** Display expertise in building, training, optimizing, deploying, and integrating models for hardware. Show an advanced understanding of cameras, deep learning, and neural networks, and skills to work in advanced areas of computer vision, such as 3D reconstruction and sensor fusion.

# DATA ENGINEER

**Data engineers are crucial for the success of data science and ML teams. They design, create, and maintain reliable data pipelines, which are the primary inputs for AI.** They also ensure that raw data is processed, cleaned, and organized into usable formats for downstream applications. Finally, they are responsible for establishing the infrastructure needed for scalable data storage, transformation, and analysis.

## Education Requirements
› Bachelor's or master's degree in computer science, information technology, software engineering, or other quantitative field

## Certifications
› Cloud certifications (AWS, Azure, GCP) are beneficial

## Technical Skills
› Experience with medallion design approach for preparing data, scaling data, and preserving the lineage of the data to trace data back to the source
› Experience with managing distributed systems, developing ETL processes, overseeing data architecture, pipelining, and ensuring data integrity are key
› Ability to convert and cleanse large amounts of noisy data (e.g., gigabytes) into condensed (e.g., kilobytes), useful information
› Ability to perform data normalization, feature engineering, and dimensionality reduction

## Tools
› Big data tools (Apache Hadoop, Apache Spark, Apache Kafka, Amazon Redshift, Databricks, Snowflake)
› ETL frameworks (Apache NiFi, Azure Data Factory)
› Containerization (Docker, Kubernetes)
› Cloud platforms (AWS, Azure, GCP)

**Entry-Level Assessment Tip:** Build a portfolio of projects that display proficiency in programming languages like SQL. Demonstrate an understanding of database management systems and business use cases, paired with an ability to design and maintain scalable pipelines.

**Career Advancement Tip:** Display expertise in building and maintaining data collection systems and pipelines that are fast and scalable, and require low latency.

# DATA SCIENTIST

**Data scientists resemble AI researchers in that they prioritize hypothesis testing over DevOps.** They extract actionable insights from data by developing and utilizing models and algorithms to address business challenges and connect technical teams with business stakeholders. Additionally, data scientists are frequently tasked with presenting complex findings clearly, often using visualizations and dashboards.

## Education Requirements

› Bachelor's or master's degree in a related field (computer science, statistics, mathematics, etc.)

## Certifications

› Certifications are not critical, but doing online data science courses (e.g., through Coursera, Udemy, etc.) shows a positive mindset toward learning and provides an indication of strong work ethic

## Technical Skills

› Strong grasp of Python, R, deep learning, time series analysis, predictive analytics, and statistical modelling

› Must have in-depth knowledge and understanding of models, algorithms, and the mathematics that underpins them

› Able to work with sparse or imperfect data and transform data into a form that can be verified, analyzed, and validated

› Data visualization and analysis to draw key insights from the data

## Tools

› Big data tools (Apache Hadoop, Apache Spark)

› Data cleaning and analysis (R, Pandas)

› Data visualization (NumPy, Power BI, Tableau)

› ML tools (Scikit-learn, PyTorch, TensorFlow, Keras)

› Cloud platforms (AWS, Azure, GCP)

› Collaboration tools (Jupyter Notebook, GitHub)

**Entry-Level Assessment Tip:** Complete take-home exercises with dummy datasets. Look for competition sites like Kaggle to build your data project portfolio. Emphasize your ability to write efficient code, produce good documentation, and clearly communicate key findings and insights. Often accompanied by follow-up interview to discuss the approach to problem solving.

**Career Advancement Tip:** Demonstrate expertise in statistical and time-series data analysis, paired with an ability to use ML algorithms and deep learning methods to inform advanced predictive modelling.

# MACHINE LEARNING ENGINEER

ML engineers are similar to AI engineers but focus more on developing and improving ML models, which are a subset of AI. **They specialize in building and optimizing ML models to tackle complex problems.** The daily responsibilities of an ML engineer involve a comprehensive understanding of algorithms, data structures, and distributed systems, as they are often tasked with collecting and preparing data, training models, and deploying models into production. Moreover, ML engineers must be effective communicators since their role requires collaboration with cross-functional teams to ensure that their models are accurate and integrate smoothly into applications.

## Education Requirements

› Master's degree/PhD in computer science, ML, data science, mathematics, or other related field

## Certifications

› Cloud certifications (AWS, Azure, GCP) are beneficial

## Technical Skills

› Proficiency in programming languages (Python, R, Java)
› Displayed understanding of scale, reliable and secure system design concepts
› Experience deploying ML models and managing pipelines
› Understanding of MLOps, GitOps, DevOps, and cloud platforms
› Experience with CI/CD pipelines and monitoring tools, like MLflow

## Tools

› Data processing tools (Pandas, NumPy, Scikit-learn)
› ML frameworks and libraries (PyTorch, TensorFlow, Keras)
› Model deployment and containerization (Kubernetes, Docker, Databricks)
› Data collection and processing (Apache Hadoop)
› Cloud platforms (AWS, Azure, GCP)

**Entry-Level Assessment Tip:** Build a portfolio of projects that display proficiency in programming languages and adept knowledge of ML libraries, paired with an ability to provide sound reasoning regarding data structure, algorithms, model selection, and evaluation techniques.

**Career Advancement Tip:** Display an ability to provide business insights through building software systems and developing algorithms that facilitate ML in production and at scale.

# SOFTWARE DEVELOPER

**Software developers are responsible for designing, building, and maintaining software systems across a wide variety of products for both user and business use cases.** Their role involves developing web applications and designing back-end systems while ensuring scalability, security, and reliability. Software developers play a crucial part in the software life cycle, from gathering requirements to deploying solutions. A demonstrated understanding of programming, algorithms, data structures, and version control systems is essential. Additionally, gaining expertise in specific domains such as AI integration may accelerate career progression.

## Education Requirements

› Bachelor's degree in computer science, software engineering, or a related field

## Certifications

› Certifications in relevant programming languages or frameworks, and cloud platforms are beneficial

## Technical Skills

› Proficiency in programming languages (Java, JavaScript, Python, C++ and C#)
› Experience with data structures and algorithms, databases, APIs, and software testing frameworks (JUnit, Selenium, etc.)
› DevOps practices

## Tools

› Integrated development environments (IDEs)
› CI/CD platforms (Jenkins, GitLab CI/CD, etc.)
› Database management (SQL)
› Containerization (Docker, Kubernetes)
› Collaboration and version control (Git, GitHub)
› ML frameworks and libraries (PyTorch, TensorFlow, Scikit-learn)
› Cloud platforms (AWS, Azure, GCP)
› Project management tools (Jira, Trello)

**Entry-Level Assessment Tip:** Solve coding challenges and complete take-home exercises. Demonstrate problem-solving skills, and an understanding of algorithms, data structures, and software design principles. Key areas of assessment include producing clean, maintainable, and efficient code with proper documentation.

**Career Advancement Tip:** Demonstrate autonomy and consistently provide clean, maintainable, and efficient code. Be able to identify areas for process improvement.

# TRANSFERABLE KNOWLEDGE AND SKILLS

In addition to role-specific requirements, participants in this study shared transferable knowledge areas and skills essential for AI talent. Transferable skills are skills that can be applied across various roles, functions, and industries. In Canada's rapidly evolving digital economy and technology landscape, these skills distinguish professionals, enabling them to adapt to diverse roles, projects, and business needs. Experts involved in roundtables and interviews underscored the significance of these skills in navigating swift technological advancements and shifting to new roles and sectors.

**AI Domain Knowledge:** Roles that involve AI typically require professionals to have a comprehensive understanding of a wide range of AI tools, their strengths and weaknesses, and their practical applications. This includes the ability to balance AI usage with human oversight. Ultimately, leveraging AI to enhance human capabilities is an important trend for both AI developers and those who are working alongside AI.

**AI Development Skills:** AI product and service development roles typically require a more technical understanding of coding, building, maintaining, and implementing AI systems. Mastery of programming languages like Python, R, Java, or C++ is essential. Python stands out due to its extensive libraries for data manipulation (Pandas, NumPy), ML (Scikit-learn, TensorFlow, PyTorch), and computer vision (OpenCV, TensorFlow). Familiarity with SQL for querying databases and scripting skills for automation further enhances productivity, while familiarity with cloud platforms (AWS, Azure, GCP) is increasingly beneficial with trends toward cloud migration.

**Mathematical Skills:** Current AI workforce trends highlight the importance of having applied mathematical skills, as linear algebra, probability, calculus, and optimization form the backbone of modelling and analysis. These concepts are critical for understanding algorithms, designing neural networks, and interpreting results.

**Interpersonal Skills:** In highly technical fields and roles, interpersonal skills are critical for fostering collaboration, driving innovation, and delivering impactful results. Interviewees stressed the growing importance of interpersonal skills in the tech ecosystem, particularly those related to communication, collaboration, problem-solving, and curiosity. These transferable interpersonal skills complement technical expertise, ensuring well-rounded professionals capable of adapting to dynamic environments.

**Problem-Solving Skills:** Problem-solving skills are foundational to AI roles, from the interview process to day-to-day tasks. Further, professionals working in Canada's AI ecosystem need to be able to approach complex challenges with logical reasoning and creativity.

**Collaboration and Communication:** Given the interdisciplinary nature of the roles covered in this brief, professionals in these roles must frequently collaborate with a wide variety of stakeholders. Conveying technical concepts to non-technical stakeholders, such as by presenting data findings, explaining model decisions, or advocating for technological investments and/or adoption, is an essential application of communication skills in the field of AI. In addition, the ability to collaborate cross-sectionally is necessary for team and project success.

**Continuous Learning:** Having a strong affinity to stay up to date with the latest technological advancements is essential for career entrants in AI. AI professionals need to engage in continuous learning to develop agile technical skills that will enable them to thrive in the ever-evolving world of AI. Moreover, staying informed about industry trends, swiftly adapting to emerging challenges and new opportunities, and maintaining a willingness to learn are deemed essential in the rapidly changing AI and tech environments. Consequently, the relevant skill sets are also evolving swiftly, indicating that professionals who are eager to learn what they do not know, challenge their existing knowledge, and enhance their strengths will be best positioned to succeed.

**Personal Portfolios:** Formal credentials are not enough to secure roles in AI. It is important for candidates to be able to showcase their competencies through project history. AI professionals not only need to demonstrate strong technical skills but are frequently distinguished from their peers by their portfolios and personal projects, which can convey to employers their genuine interest and understanding of the field's intricacies.

# CONCLUSION

In Canada's rapidly evolving AI industry, entry-level positions are increasingly influenced by demonstrable skills and experience.

Experts consulted in this study emphasize that it is crucial for candidates to demonstrate foundational knowledge, well-rounded interpersonal skills, and a passion for AI, which naturally includes a willingness to learn. Increasingly, employers are seeking candidates who are well-versed across many organizational functions, indicating they possess relevant skills along with domain knowledge or business acumen.

Regarding certifications, employers highlighted the importance of complementing traditional education with additional learning resources, such as online courses and micro-credentials. However, they noted that standout candidates did not simply have the "right" degrees and certifications; they showcased impressive professional portfolios that highlighted their skills.

Ultimately, those best positioned to excel in Canada's AI ecosystem are those who combine foundational skills relevant to AI—like mathematics, programming, and data visualization—with a healthy balance of interpersonal skills. Due to the rapid pace of change in the field, it is essential for new entrants to remain committed to continuous learning.

# APPENDIX A—METHODOLOGY

To map the evolving AI job landscape, ICTC used Vicinity data to analyze jobs posted between January 2022 and July 2024.[5] The team filtered these postings using specific National Occupational Classification (NOC) codes relevant to the digital economy, then refined the results by identifying positions with AI-related keywords.[6]

This analysis revealed key roles driving the AI industry: AI engineers, AI researchers, ML engineers, computer vision engineers, data engineers, data scientists, and software developers. Between May 2024 and October 2024, ICTC determined talent needs in the industry by conducting primary research across Canada, including interviews with 16 industry experts and roundtable discussions engaging 40 AI professionals. The responses will help inform entry-level talent about the essential skills and competencies needed to succeed in each of these roles.

Beyond the purposes of this policy brief, ICTC intends to use the findings from this research to develop an entry-level assessment framework for these key AI roles. The framework will be available through ICTC's eTalent Canada client portal in spring 2025.

## Table 1: NOC Codes and Categories Used for Vicinity Data Job Scraping Information

| Code/Category | Title/Description |
| --- | --- |
| NOC 21211 | Data scientists |
| NOC 21231 | Software engineers and designers |
| NOC 22313 | Aircraft instrument, electrical and avionics mechanics, technicians and inspectors |
| NOC 21300 | Civil engineers |
| NOC 92100 | Power engineers and power systems operators |
| NOC 21311 | Computer engineers (except software engineers and designers) |
| NOC 20010 | Engineering managers |
| NOC 21223 | Database analysts and data administrators |
| NOC 21301 | Mechanical engineers |
| NOC 21232 | Software developers and programmers |
| Sub-category | Natural and applied sciences |

---

**5**   Source: Vicinity Jobs Inc. Data generated on September 6, 2024.
**6**   Keywords used to enhance scraping results: artificial intelligence, AI, machine learning, NLP, prompt, generative.

# GLOSSARY OF KEY TERMS

**Apache Hadoop/Spark:** Open-source tools for processing large datasets.

**Apache Kafka:** Distributed data streaming platform that can publish, subscribe to, store, and process streams of records in real time.

**Apache NiFi:** Open-source platform used to manage data transfer between different sources and destination systems.

**Amazon Redshift:** A fast, scalable data warehouse in the cloud that is used to analyze terabytes of data in minutes.

**Application programming interface (API):** Tools allowing software programs to interact.

**Artificial intelligence (AI):** Technology that enables machines to perform tasks otherwise requiring human intelligence.

**Azure Data Factory (ADF):** A fully managed, serverless data integration solution for ingesting, preparing, and transforming data at scale.

**Cloud computing:** Online delivery of computing services like storage and software.

**Cloud platforms:** Services for cloud-based computing, like Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform (GCP).

**Computer vision:** AI that interprets visual data like images and videos.

**Containerization:** Software deployment process that bundles an application's code with all the files and libraries it needs.

**Continuous integration/continuous deployment (CI/CD):** A set of practices that automates the software development process, making it faster and more efficient.

**Databricks:** A unified, open analytics platform for building, deploying, sharing, and maintaining enterprise-grade data, analytics, and AI solutions at scale.

**Data visualization:** Representing data graphically for better insights.

**Development operations (DevOps):** Practices integrating software development and IT operations.

**Distributed systems:** Networked systems working together for shared tasks.

**Docker/Kubernetes:** Tools for containerization and managing distributed applications.

**Extract, transform, load (ETL):** Processes to gather, refine, and store data for use.

**GitHub:** A platform that allows developers to create, store, manage, and share their code.

**GitLab:** Web-based platform that helps teams develop, secure, and deploy software

**Git operations (GitOps):** Framework that leverages Git repositories to automate infrastructure changes and deployments.

**Integrated development environment:** Software application that combines various tools like a code editor, compiler, debugger, and terminal into a single graphical user interface, allowing developers to write, edit, compile, and debug code.

**Jira/Trello:** Project management tools for tracking tasks and collaboration.

**Jupyter notebook:** Open-source web application that allows users to create and share interactive documents that include code, text, and other elements.

**JUnit:** framework designed to facilitate unit testing in Java.

**Keras:** A high-level Python library used for deep learning, providing a user-friendly interface to build and train neural networks.

**Machine learning (ML):** Algorithms trained to identify patterns and make predictions.

**Machine learning operations (MLOps):** Practices combining ML and DevOps to manage models in production.

**Matplotlib:** is a Python library for creating static, animated, and interactive visualizations.

**Medallion architecture:** Data design pattern that involves processing data through stages (Bronze, Silver, and Gold).

**MLflow:** Open-source platform for developing models and generative AI applications.

**Natural language processing (NLP):** is a subfield of AI that uses machine learning to enable computers to recognize, understand, generate and communicate with human language through text and or speech.

**Neural networks:** Algorithms for recognizing patterns, modelled on the human brain.

**NumPy:** Open source mathematical and scientific computing library for Python.

**OpenCV:** Free and open-source software library for computer vision and machine learning used to process images and videos.

**Pandas:** A Python library used for working with data sets.

**Python:** A versatile programming language widely used in AI and ML.

**Scikit-learn:** A Python library for machine learning and data analysis.

**Seaborn:** A library for making statistical graphics in Python.

**Selenium:** Testing tool used for web application testing.

**Snowflake:** A cloud-based data warehouse as a service that provides scalability and flexibility when managing and analyzing data.

**Structured query language (SQL):** A language for managing and querying databases.

**TensorFlow/PyTorch:** Machine learning frameworks for building and deploying AI models.

**Version control systems:** Tools like Git that track and manage code changes.

ICTC ✦ CTIC
www.ictc-ctic.ca