Programs in *Data Science*

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What is *Data Science*?

As the amount of data produced has exploded, organizations are working harder to find ways to turn that data into value through processes, technologies and algorithms making data science one of the most in-demand fields today.

Using an interdisciplinary blend of systems, algorithms, and scientific methods, data science offers methods to explore, analyze and visualize data. Data Scientists then transform that data into new technologies that solve complex problems through analytics, machine learning and artificial intelligence (AI). From manufacturing, agriculture and mining to health care, education and finance, a growing number of industries is turning to data science to optimize decision-making and drive innovation.

Why Study *Data Science and AI*?

The study of data science will serve to either advance your career or help you transition into this fast-growing field. Develop your skills to confidently structure, analyze, visualize and report data, lead data analytics teams and create a data-driven organizational culture. Equip yourself with actionable industry-relevant knowledge and skills required to become a Data Analyst, Data Scientist or AI Specialist.
As the amount of data produced has exploded, organizations are working harder to find ways to turn that data into value through processes, technologies and algorithms making *data science one of the most in-demand fields today*.

By 2025, the global AI market is expected to be worth $US 390 billion and Canada will be a hotspot for AI research and businesses. The 2019 Global AI Talent Report 2019 ranks Canada at #5 for the number of high-impact AI researchers and for AI-related job openings. Add to this that the big data and business analytics market will be worth US $189 Billion by 2019 according to data from *Market Reports World*, evidence that these fields will continue providing countless opportunities for individuals and enterprises who choose to invest in data science skills.

### Key Facts

- **USD $77.6 billion**: Market growth estimate in data analytics from 2020 to 2023 (*Market Reports World*)
- **USD $274.3 billion**: Estimated revenue generated by the big data and business analytics market globally by 2022. (*Market Reports World*)
- **CAD $1.1 billion per year**: Estimates for the Canadian analytics market (Canada’s Information and Communications Technology Council ICTC)
- **USD $390 billion**: Size of AI market value by 2025 (*Grand View Research Inc.*)
- **Canada #5 worldwide**: For the number of high-impact AI researchers and for AI-related job openings (*Global AI Talent Report 2019*)
- **18,000**: Number of new jobs expected in the field of data science from 2019 - 2028 (*Government of Canada*)
- **1,300 surplus positions**: With only 16,700 positions expected to be filled between 2019 – 2028, demand will outpace supply (*Government of Canada*)

### Interesting Careers in Data Sciences

- Analytics and Machine Learning Project Manager
- Analytics and Machine Learning Product Manager
- Artificial Intelligence Developer
- Business Intelligence (BI) Developer
- Data Analyst
- Data Analytics Consultant
- Data Architect
- Data Engineer
- Data Scientist
- Digital Marketing Manager
- Machine Learning Engineer
- Machine Learning Practitioner

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**Salaries: Data Scientist**

- **Entry-level Salary**: CAD $61,000
- **Mid-Level Salary**: CAD $83,000
- **Managerial Salary**: CAD $109,000

Source: Glassdoor
With data in plentiful supply, it’s more and more important for organizations to be able to turn data into meaningful insights that lead to concrete decisions and business results. This practical program aims to equip professionals and business leaders with essential data analytics skills, as well as tools and techniques required to collect, analyze and interpret business data, create forecast and machine learning models, design visualizations, and communicate insights.

Admission Requirements

Applicants must hold a minimum of one of the following degrees:
- Bachelor’s degree in Business Administration
- Bachelor’s degree in Commerce

Applicants with a non-business Bachelor’s degree should have:
- A minimum of 2 years' experience in a managerial position
  OR
- Completed the Introduction to Business course

Applicants should have:
- A solid quantitative and business background
- A proficiency in Microsoft Excel or other data analysis tools
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Credits</th>
<th>Description</th>
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<tr>
<td>YCBS 256</td>
<td>4 CEUs</td>
<td><strong>Data Science for Business Decisions</strong>&lt;br&gt;Overview of how data science can help drive business decisions and create new business models. Emphasis on data strategy, the data science lifecycle and process, business and analytics problem framing, overcoming challenges of implementing a data-driven business, including ethics, data governance, and privacy. Application of data science across various industries and business areas. Data science tools, including Alteryx and Tableau for data preparation, analysis, and visualization.</td>
</tr>
<tr>
<td>YCBS 260</td>
<td>4 CEUs</td>
<td><strong>Statistics for Business Decision Making</strong>&lt;br&gt;This course provides an overview of fundamental statistical and mathematical concepts needed to perform statistical data analysis to support business decision-making and projections such as probability, random variables, descriptive statistics, regression modelling, common probability distributions, experimental design.</td>
</tr>
<tr>
<td>YCBS 261</td>
<td>4 CEUs</td>
<td><strong>Data Analytics Fundamentals</strong>&lt;br&gt;Introduction to fundamental analytical methods, tools and techniques used to collect, analyze, interpret and predict business outcomes based on data. Overview of NoSQL databases, RDBMS databases and data structures. Complete data processing cycle and predictive analytics using machine learning with Alteryx, Excel, SQL and Tableau to analyze data, create forecasts and models, design visualizations, and communicate insights.</td>
</tr>
<tr>
<td>YCBS 262</td>
<td>4 CEUs</td>
<td><strong>Leading Data Science Projects &amp; Teams</strong>&lt;br&gt;Overview of organizational capabilities and structures required to successfully create a data-driven business culture, including analytics maturity models, an integrated approach to defining and staffing data science projects, roles and responsibilities within a data project, development of data products and services, AI Canvas, collaboration and innovation tools and techniques including Design Thinking. Challenges and best practices in data governance and compliance. Data Science tools and techniques including Alteryx, Tableau, GitHub, and Google Cloud Platform.</td>
</tr>
<tr>
<td>YCBS 299</td>
<td>6 CEUs</td>
<td><strong>Data Science Capstone Project</strong>&lt;br&gt;Integration and application of knowledge and skills gained during the program through hands-on projects supported by our industry partners to build a full data science pipeline from preparing, analyzing and visualizing data to building and testing models. Communication and presentation of insights and recommendations derived from data analysis using visualization and storytelling techniques.</td>
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This practical program aims to equip professionals with essential data science and machine learning knowledge and skills needed for a career as a data analyst, machine learning practitioner, or junior data scientist. Participants have an opportunity to work through all the phases of a complete data science pipeline with structured and unstructured data, formulate a business need or problem into a data science project and select the proper tools and algorithms needed. Focus is placed on interpreting and effectively communicating data insights by using data visualization and storytelling techniques to translate data into business-specific knowledge.

Admission Requirements

Applicants must hold a minimum of one of the following degrees:

- Bachelor of Engineering (B.Eng.)
- Bachelor of Science (B.Sc.)
- Bachelor of Commerce in MIS (B.Com MIS)

Note: Applications from mature students* who do not meet the above criteria but have extensive and relevant experience in software programming or data analytics and have previously completed relevant coursework in calculus, statistics, or computer science will be evaluated on a case by case basis.

*Applicants who are 21 years of age or older
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>CEUs</th>
<th>Cost</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>YCBS 256</td>
<td>Data Science for Business Decisions</td>
<td>4</td>
<td>$1,163.80</td>
<td>Overview of how data science can help drive business decisions and create new business models. Emphasis on data strategy, the data science lifecycle and process, business and analytics problem framing, overcoming challenges of implementing a data-driven business, including ethics, data governance, and privacy. Application of data science across various industries and business areas. Data science tools, including Alteryx and Tableau for data preparation, analysis, and visualization.</td>
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<tr>
<td>YCBS 255</td>
<td>Statistical Machine Learning</td>
<td>4</td>
<td>$1,373.80</td>
<td>Fundamental statistical machine learning concepts and tools using Python. Emphasis on descriptive statistics, statistical distributions, random number generation, basic data visualization; linear regression; basic classification; error estimation; cross-validation, bias-variance trade-off; shrinkage methods; dimension reduction; beyond linearity: smoothing splines, local regression, additive models; tree and ensemble methods; powerful classifiers; unsupervised learning.</td>
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<tr>
<td>YCBS 257</td>
<td>Data at Scale</td>
<td>6</td>
<td>$1,478.80</td>
<td>Overview of various aspects of large data sets and how they are managed both on site and in the Cloud. Emphasis on hands-on experience from data ingestion to analysis of large data sets, both data-at-rest and data-in-motion (streaming data), including defining Big Data and its 5 V’s: Volume, Velocity, Variety, Veracity, and Value.</td>
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<tr>
<td>YCBS 258</td>
<td>Practical Machine Learning</td>
<td>6</td>
<td>$1,478.80</td>
<td>This course aims to introduce participants to essential machine learning methods and techniques through an end-to-end machine learning project. Emphasis is placed on practical experience with machine learning using Python programming language, scikit-learn and TensorFlow, as well as on understanding classification and training models. The course will provide an introduction to artificial Neural Networks, deep learning, convolutional and recurrent neural nets and reinforcement learning.</td>
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<tr>
<td>YCBS 299</td>
<td>Data Science Capstone Project</td>
<td>6</td>
<td>$1,376.80</td>
<td>Integration and application of knowledge and skills gained during the program through hands-on projects supported by our industry partners to build a full data science pipeline from preparing, analyzing and visualizing data to building and testing models. Communication and presentation of insights and recommendations derived from data analysis using visualization and storytelling techniques.</td>
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This advanced professional development certificate program is designed to equip participants with the skills required to be highly proficient Data Scientists and AI specialists. Through practical and relevant exercises and hands-on projects, the program aims to help students acquire the key skills required to design, construct, analyze and optimize advanced software systems using machine learning models and artificial intelligence algorithms to solve real-world problems.

**Admission Requirements**

**McGill's School of Continuing Studies** Professional Development Certificate in Data Science and Machine Learning;

OR

A minimum of a Bachelor’s (or higher) degree or equivalent in one of the following areas: Engineering, Computer Science, Software Engineering, Mathematics, Statistics or a related discipline;

As well as:

Prior experience in Machine Learning and strong programming skills in Python. Applicants must complete:

- An online Skills Assessment Test in Machine Learning & Python or

- YCBS 255 Statistical Machine learning course

**Note:** Applications from mature students (21 years of age or older) who do not meet the above criteria but have extensive and relevant experience in software development, machine learning, data science, and have previously completed relevant coursework in calculus, statistics, machine learning will be evaluated on a case by case basis.
2 Required Courses (12 CEUs)

**YCNG 228**
**Predictive & Classification Modelling**

Predictive modelling is a process that uses data and statistics to predict outcomes using data models. These models are used to detect fraud, optimize marketing campaigns, reduce risk, manage resources and improve operations. This course will familiarize students with how to design experiments and optimize ML models and interpret their output. Students will test hypotheses by using different techniques, design experiments, use machine learning algorithms to evaluate the output of different machine learning models, and explore methods to increase precision and/or accuracy.

**Cost:** $1,478.80

**YCNG 229**
**Neural Networks & Deep Learning**

Artificial neural networks are a set of algorithms, inspired by the way human brain processes information, which are designed to recognize patterns. Deep learning is one of machine learning methods based on artificial neural networks. Neural networks and deep learning offer the most powerful techniques to deal with different aspects of data science such as natural language processing, computer vision and time series analysis. Building on the knowledge and skills acquired during YCBS 258 Practical Machine Learning course, this course will focus on the practical application of neural network models with the objective to develop students’ ability to implement them using Python and Keras.
3 Complementary Courses (17-18 CEUs)

**YCNG 230**

**Intelligent Agents & Reinforcement Learning**

Intelligent agents are programs that can be applied to autonomously solve real-world optimization and planning problems, as well as help deal with incomplete information or uncertain environments. Reinforcement Learning is an approach to build goal-oriented intelligent agents, which help find strategies to optimize a desired outcome. In this course, students will explore the development of intelligent agents using different techniques, algorithms and approaches; the design and implementation of systems that exhibit intelligent behaviour through an end-to-end project; practical application of the most current programming tools, search methods, knowledge representation using logic and probability, planning and decision making under uncertainty and constraint satisfaction problems; reinforcement learning fundamentals including design of intelligent agents and integration with deep learning.

**Cost:** $1,478.80

**YCNG 231**

**Deep Learning for Computer Vision**

Computer vision is one of the fields of study, which has benefited tremendously from the latest advancements in artificial intelligence. Computer vision is concerned with helping machines learn to “see” and understand the context of their environment. It involves acquiring, processing, transforming, modifying, analyzing and understanding digital images or videos. The result is the extraction of data needed to understand the content of digital images, infer something from the environment, thus allowing complex decisions to be made. In this course, participants will learn more about computer vision from acquisition of image data to complex decision-making using deep learning methods and techniques. Image acquisition through sensors; feature detection; image classification, detection, segmentation. Convolutional Neural Networks (CNN) architectures and their applications. Most current computer vision applications, libraries and image databases will be explored.

**Cost:** $1,376.80

**YCNG 232**

**Natural Language Processing Fundamentals**

Natural Language Processing (NLP) is a subfield of artificial intelligence concerned with the ability of computers to process, understand and interpret human languages. Deep learning has revolutionized NLP by improving many aspects of the field since its transition from classic linguistic approaches. This course will provide an overview of Natural Language Processing fundamentals such as language models, word embeddings, Recurrent Neural Networks (RNNs), wide variety of applications of neural networks in NLP, intrinsic and extrinsic evaluation, most current NLP tools.

**Cost:** $1,376.80
3 Complementary Courses (17-18 CEUs)

**YCNG 233**

**Time Series Analysis Fundamentals**

Time series is an area of machine learning concerned with the analysis of series of data points ordered in time. Time series analysis is used in many fields to predict trends: from industrial machinery data, smart home, precision agriculture, cyber security, customer usage/engagement, marketing, asset management, finance, etc. Due to the temporal aspect of the data, time series data require specific preprocessing, feature engineering, algorithms, and validation strategy. This course will dive into the fundamentals of applying artificial intelligence techniques on time series data, statistical, machine and deep learning models for time series. Emphasis is placed on the main applications of time series analysis: forecasting, clustering and anomaly detection. Data science techniques applicable to time series. Deep learning methods, rolling predictions, online learning, backtesting.

**YCNG 234**

**Internet of Things**

The Internet of Things (IoT) is an important source of relevant data for different industries. It permits to collect and process information about the physical world in real time. This course will examine applications of IoT, the fundamental technologies that support IoT devices and the transmission, processing, the analysis of the data they generate, and the fundamental software and hardware technologies that support IoT devices; data transmission protocols; tools to process the data generated by IoT devices; data analysis techniques that enable common applications related to IoT devices.

**YCNG 235**

**Recommender Systems**

Have you ever wondered how the message: “Customers like you also purchased the following items...” appears on your screen when you are shopping online? Recommender Systems use machine learning algorithms that help users discover new products and services. There exists a wide spectrum of recommender systems applications that help users choose movies, restaurants, music to listen to, jobs to apply to, products to purchase, social media profiles, among many others. This course will explore fundamental concepts and techniques in recommender systems: similarity models, non-personalized, content-based, and hybrid systems; association rules mining; collaborative filtering: user-, item-, and graph-based models; matrix factorization; graph recommenders, sequential recommenders, evaluation of recommender systems.
As digital transformation creates more and more data with companies using only a fraction of the data they collect and store, it’s more critical than ever to be able to ensure your data is turned into value for your organization, its stakeholders and customers. But how can you find the best way to extract insight, present it visually, and communicate with impact?

This interactive online workshop also introduces participants to key strategies for effective data visualization using real-world examples and then allows them to develop practical skills through hands-on exercises using Tableau – a powerful business intelligence platform that helps turn data into meaningful insight.
Blockchain will impact multiple existing business models across almost every domain. With over 90% of financial institutions, 30 governments, and thousands of companies from almost every industry already riding the wave, Blockchain is expected to impact the world in the same manner the internet did many years ago.

This workshop will provide a comprehensive 360° overview of the origins, evolution, building blocks and technologies of Blockchain. Practical use cases, benefits and challenges across various industries will be explored. You will gain a clear understanding of Blockchain and where it stands today beyond the hype, the building blocks of Distributed Ledger Technologies and its most common platforms used today. Furthermore, you will identify what are the profiles and steps needed to adopt Blockchain in business.

**Topics Covered**
- Overview
- Blockchain Fundamentals
- Blockchain Building Blocks
- Evolution of Blockchain
- Use Cases and Practical Applications
- Benefits of Blockchain
- Challenges
- Blockchain Technology, Most Common Platforms & Uses
- Required Profiles in Organizations
- Governance & Security

**Course Fee:** $595  
**Duration (hours):** 7  
**Discounts:** McGill alumni and current students, as well as corporate groups of 3 or more participants, benefit from a 15% discount.
Have you ever wondered how data scientists tackle a data related problem, summarize the main features of a data set and derive the insights they need to decide which analytics or machine learning techniques to apply? Did you know that Data Scientists and their teams spend more than 80% of their time cleaning, preparing and transforming a data set?

This hands-on workshop addresses the challenge of analysing different data sets and summarizing their main characteristics using tables and graphs. Using the Alteryx Data Analytics Platform, participants learn the iterative process and techniques to perform an exploratory data analysis.

Topics Covered
- Key Alteryx features and tools
- Extracting data from various data sources (databases, websites, APIs)
- CRISP: Cross-industry standard process for data mining
- Enriching data by combining features of the existing data set and blending in new data sets
- Fundamentals of modeling and model evaluation
- Communicating the results

Course Fee: $695
Duration (hours): 7
Discounts: McGill alumni and current students, as well as corporate groups of 3 or more participants, benefit from a 15% discount.
STEP 1: PREPARE
1. Choose the professional development Certificate you would like to apply to.
2. Ensure you have a valid email address and credit card on hand to pay the application fee (Visa, MasterCard or American Express).
3. From the list of programs, select the certificate you would like to apply for. Click “Learn More”. Then click on “Apply Now” at the top of the page.
4. Review the admission requirements for the program to ensure you meet the criteria.
5. Ensure you have all necessary documentation required for your application as indicated in the “Documents Required” section.

STEP 2: APPLY
1. Scroll down and click on “Apply Now” in the righthand column of the screen.
2. Review the information displayed and click “Apply Now”.
3. If you have Athena credentials, log in. If not, create an account.
4. Complete the rest of the application with all required information.
5. Once you have applied online, you will receive a confirmation email acknowledging receipt of your application.

STEP 3: CHECK STATUS
1. You can check the status of your application at any time using Athena.
2. Once a decision has been made, admitted students will receive a notification by email confirming their admission to the program, along with registration instructions. You can then register for courses online during the appropriate registration period.

Difficulty Applying Online?
If you have any problems with your online application, or if you have questions regarding admission requirements and procedures, contact Client Services.
Training in Data Science Just Became More Accessible Thanks to Funding from Scale AI

Thanks to
SCALE|AI | Québec

To meet the growing demand for skilled data science and AI professionals, training in these fields just became more accessible. The McGill School of Continuing Studies and Scale AI, an investment and innovation hub that accelerates the rapid adoption and integration of artificial intelligence, are delighted to announce new funding for professional development programs in data science which aim to develop in-demand skills in data analytics, data science, machine learning and artificial intelligence.

As part of the agreement, Scale AI will fund a portion of tuition fees for eligible students who meet specific criteria and register in any of the following programs or courses offered by the McGill School of Continuing Studies:

- Professional Development Certificate in Data Analytics for Business
- Professional Development Certificate in Data Science and Machine Learning
- Professional Development Certificate in Applied Artificial Intelligence
- Data Visualization and Storytelling with Tableau Workshop

Eligible students will receive a 25% rebate on tuition fees.

For customized digital intelligence training offered by McGill SCS, eligible organizations will be able to receive a refund of up to 85% of eligible expenses for the first $100,000 and 50% for the balance upon approval of their training project by Scale AI.

This funding agreement will last for as long as funds are available (depending on the level of demand).

Learn more about requirements and eligibility criteria in the full article.

Read More
Scale AI is an investment and innovation hub that accelerates the rapid adoption and integration of artificial intelligence (AI) and contributes to the development of a world-class Canadian AI ecosystem.

As one of Canada's five innovation super-clusters, supported by nearly 120 industry partners, research institutes and other players in the AI field, Scale AI develops programs to support investment projects of companies that implement real-world applications in AI, the rising of future Canadian flagships in the sector, as well as the development of a skilled workforce.

Situated in the heart of Montreal on the main campus of one of Canada's leading universities, the McGill School of Continuing Studies offers innovative programs that aim to help adult learners gain the skills they need to launch their careers, advance their current careers or switch into a whole new field.

With over 70 programs in more than 25 subjects such as marketing, management, human resources, accounting, finance, data science and AI, the School is dedicated to creating skilled, future-ready leaders who can thrive in a rapidly changing world.
Contact

Career and Professional Development (Non-Credit)

680, Sherbrooke St. West, Suite 1029
Montreal QC, H3A 3RI

Program information
Tel: 514-398-5454
pd.conted@mcgill.ca

Learn more at
mcgill.ca/scs-datascience