Artificial Intelligence
A WIL Digital Initiative
Presented by the Information and Communications Technology Council

Welcome to ICTC's WIL Digital: Artificial Intelligence

ICTC's WIL Digital is an innovative Work Integrated Learning program that helps students gain insight and skills to advance learning and meaningful work experience.

MODEL OVERVIEW

The AI TALENT COLLABORATIVE is an innovative model of developing the next generation of Artificial Intelligence (AI) talent driven by a network of technology-forward companies and partners. The model offers a highly practical, yet strategic learning journey for students and recent graduates, and combines:

1. On the job learning and work experience offered by companies actively leveraging or perusing AI capabilities.
2. Interactive, industry-led stackable micro-learning modules supplementing on the job learning.
3. Activation of students' career development and self-learning skills.

This 6-module, online course will serve to introduce post-secondary students and recent graduates to the field of a diverse set of topics related to the field of AI. It will contextualize students' on the job learning, and provide a framework for further learning and career development by providing them with strategic insights, and industry experience.

The impact of AI technologies on businesses is projected to increase labour productivity by up to 40 percent and enable people to make more efficient use of their time. Upon completion of this course, students will have a broad understanding of the AI and machine learning landscapes, key terminology, and a range of industry applications. The course is not meant to be a comprehensive or inclusive overview of the industry, but rather empower learners to not only try to understand AI at a high level, but to further equip them to dive deeper into their specific areas of interest through supplemental readings, online resources, and on the job learning.

TOPIC OVERVIEW

While Artificial Intelligence as a technology was first developed in the 1950's, it's only recently had a second wave of popularization due to the convergence of large data sets (big data), cloud storage, and increases in computing power. These three factors combined have allowed AI to gain mainstream adoption and applications to be developed in virtually every industry. No industry has been so fundamentally disrupted by AI as the financial services vertical. AI, simply put, aims to empower machines (computers) to be think in ways similar to human cognition. There are hundreds of fields of specialization within AI, but we'll focus primarily on machine learning (with a quick look at deep learning as well). Machine learning is a set of algorithms that use data to "learn" from, train against and then make future predictions from.

COURSE FORMAT

You will be introduced to several different types of learning activities throughout *WIL AI*. Below is a list of these activities, as well as a brief description of what it involves, and what is expected of you:

- **QUIZ** – This model will have a single short quiz that you will be required to complete at the end of module 3.
- **PADLET WALLS** - Short reflection activities that will require you to post your thoughts on a topic relevant to the unit.

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1.1 - Introduction to AI

This primer module will introduce participants to the core terms in the AI landscape, high level definitions, and some of the primary use cases for AI (aligned to the 7 patterns of AI). This module will also make AI more relevant by showing familiar examples of how AI is impacting everyday work and personal lives.

Module Learning Objectives

Upon completion of this module, participants should feel comfortable:

- Describing what AI is as well as the difference between weak (narrow) and strong (general) AI
- Explaining how machine learning fits into the AI landscape
- Speaking to specific applications or patterns of AI, such as predictive analytics or autonomous systems

Additional Topic Details

While AI is certainly a highly technical topic where industry experts spend years or even decades become proficient, there's a need for the wider population to understand not only the fundamentals of AI but also how this unique set of technologies will impact aspects of the Canadian labour force and future of work.

A basic understanding of the AI landscape will require a both a grasp of certain foundational technologies as well as knowledge of specific applications of these technologies. The foundational technologies that will be introduced in the two subsequent modules include:

- Machine learning, both supervised (dealing primarily with structured data sets) and unsupervised (dealing instead with unstructured data)
- Deep learning and advanced topics in AI (advanced topics include high level introductions to parts of the AI landscape that aren't strictly forms of machine learning, such as computer vision and natural language processing (NLP))

The module will wrap up with an exploration of the 7 patterns of AI and at least one example of each of these patterns, through a specific use case. As much as possible, the examples will span a wide range of industries to show the breadth of AI applications.

Module 1 Video 1 - Introduction to AI

In this video, Ramy Nassar will be introducing the concept of AI.

About Ramy Nassar - Partner, 1000 Days Out

In this video, Ramy Nassar will be introducing the concept of Deep Learning and Advanced Topics.

About Ramy Nassar - Partner, 1000 Days Out

Ramy is the founder of 1000 Days Out and author of the AI Product Design Handbook. As the former Managing Director of Design & Strategy for Architech and Head of Innovation for Mattel, he has led diverse teams in the creation of disruptive new digital products, services & platforms. Ramy teaches Design Thinking at McMaster University and in the Master's of Engineering, Innovation & Entrepreneurship program at Ryerson University. You can contact Ramy through 1000 Days Out.

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2.1 - Data and Responsible Use of AI

The incredible disruptive potential of most AI applications is deeply rooted in data (specifically, training data), and as such, bias in data sets has the risk of being not only reflected but even reinforced in AI algorithms. An understanding of AI Ethics and the responsible use of data is fundamental for anyone who will either design such systems, or rely on AI in their own decision making, strategy or solution design. The term **explainability** will be introduced in this section as well, given its growing impact on real-world use of AI.

Module Learning Objectives

Upon completion of this module, participants should feel comfortable:

- With a basic understanding of how data bias can impact AI systems
- Asking basic critical questions about how and where data is collected with respect to use in AI systems
- Describing what explainable AI or explainability is with respect to algorithms

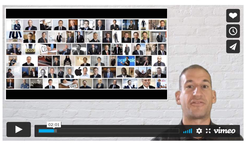
Additional Topic Details

This module will wrap up with a brief discussion about the ethical considerations of AI and moving towards more machine-based systems. There are specific cases in financial services where this could become immediately apparent. For example, an AI-based loan approval application may (inadvertently or by design) make certain approval decisions based on racial or other background data that is present in the training set. How should this be treated? While there are no right answers here, it's important to raise the topic with students to give some thought to.

There is also a great example about how the main big tech companies' gender detection algorithms perform with different genders and races, which can be very powerful in terms of provoking a reaction and applying critical thinking.

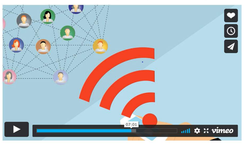
Module 2 Video 1 - Data and Responsible Use of AI

In this video, Ramy Nassar will be introducing the concept of Data and Responsible Use of AI.



About Ramy Nassar - Partner, 1000 Days Out

In this video, Ramy Nassar will be introducing the concept of Machine Learning Fundamentals.



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3.1 - Machine Learning Fundamentals

Machine learning is one of the most fundamental branches within the AI landscape and the majority of current real-world applications of AI fall under the machine learning umbrella. While a discipline from the field of computer science, a foundational understanding of machine learning will be important for professionals and leaders across a wide range of industries, given the expected impacts of this disruptive set of technologies.

Module Learning Objectives

Upon completion of this module, participants should feel comfortable:

- Understanding the difference between structured and unstructured data sets
- Describing the relationship between data and the results of any predictive algorithm
- Understanding at a conceptual level what types of problems supervised machine learning is able to solve

Additional Topic Details

As one of the primary fields of AI, an understanding of machine learning is fundamental.

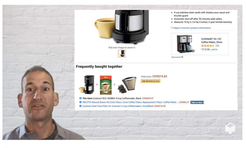
A commonly used example in the field of AI would be looking at housing prices. If one knew the square footage and distance from an urban centre, for example, perhaps it would be possible to predict the price or value of a home. Using machine learning algorithms, one would "train" the computer based on historic size & distance data, as well as the price of the respective homes.

After training based on hundreds, thousands or even millions of records, the algorithm would then be able to predict the price of a home for which the price is not known, based on the size and distance. This is a simple example, but where machine learning gains its potential is when there are not two, but two thousand variables, and there are not hundreds - but rather, millions, of records. Most machine learning algorithms get more accurate, as more data is available (though there are a lot of other factors that are involved in determining accuracy).

Beyond the example above of supervised machine learning, a brief introduction to unsupervised machine learning will follow. The focus of this segment of the module will be on the use case of cluster and the applications in prediction engines and experience personalization. This example is chosen as it will be resurfaced in a later module when looking at eCommerce and intelligent retail applications of AI.

Module 3 Video 1 - Machine Learning Fundamentals

In this video, Ramy Nassar will be introducing the concept of Machine Learning Fundamentals.



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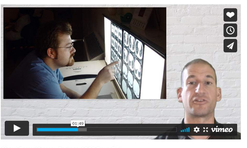

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4.1 - Deep Learning and Advanced Topics

As one of the fastest growing fields of machine learning, deep learning promises to unlock the real disruptive potential of AI across a wide range of industries and use cases. Why don't we see a lot of real-world deep learning yet, well mostly because traditional approaches are still working well and because explainability is becoming more and more important. Beyond deep learning, this module will introduce other elements of the AI landscape such as computer vision and natural language processing to ensure that participants appreciate the breadth of the AI industry. We will also frame the fact that AI is ultimately math and statistics and the importance of critical thinking when dealing with data.

Module Learning Objectives

Upon completion of this module, participants should feel comfortable:

- With how deep learning relates to the way in which we, as humans, learn and process information
- Describing a use case or application area of deep learning
- Understanding the terms computer vision and natural language processing

Additional Topic Details

Deep learning is a sub-field of machine learning and based on the use of neural networks. Neural networks seek to implement algorithms in a way that's analogous to how the human brain works. At its lowest level, the neural network is based on a single "neuron" (often called a perceptron).

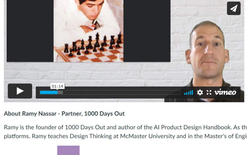
While individual neurons display virtually no intelligence, creating networks of these neurons is what gives deep learning its power. One example of a deep learning algorithm is called a recurrent neural network (RNN) and it's one of the primarily algorithms involved in natural language processing (NLP) - what allows Amazon Alexa, Google Home and the like to understand human language.

This module will introduce what deep learning networks are, how they arose (mimicry of human brains) and some key application areas. Based on SME feedback, we'll also include information about when deep learning networks are used, and why they're not used in production environments commonly yet (more data needs, more computational power, and often more fundamental ML approaches can perform comparably).

The module will wrap up with a very brief introduction to some of the other topic areas within AI that aren't strictly under the machine learning umbrella, such as computer vision and natural language processing. For these, we're looking for familiarity with the terminology and nothing deeper.

Module 4 Video 1 - Deep Learning and Advanced Topics

In this video, Ramy Nassar will be introducing the concept of Deep Learning and Advanced Topics.



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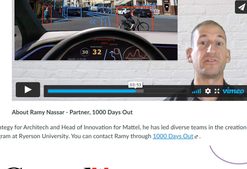

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