IESO Innovation Whitepaper Series
Artificial Intelligence (AI) Whitepaper

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Webinar Participation (including audio)

- To interact, click the "Show Conversation" icon (message bubble symbol) to submit a written question or click on the "Raise hand" icon (hand symbol) at the top of the application window to indicate to the host you would like to speak

- Audio should be muted at all times. To unmute audio, click on the microphone icon at the top of the application window

- This webinar is conducted according to the IESO Engagement Principles

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Agenda

Context

The challenge of addressing the topic of Artificial Intelligence

The AI Whitepaper

The AI Whitepaper Survey

    Survey Link: https://www.surveymonkey.com/r/SJB6C7D

Today's discussion

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Context

Context – Innovation Roadmap

In 2018 the IESO published its Innovation Roadmap and work plan.

The Innovation Roadmap involved an extensive consultation process and included the stated intention to identify areas of focus for the IESO's innovation efforts and prioritize amongst them.

Within the more detailed Innovation Roadmap work plan began the development of a series of whitepapers to inform both the IESO and the industry on key innovation focus areas identified in the roadmap itself.

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The Innovation Whitepaper series

- In 2018 the IESO Innovation Roadmap articulated the IESO's initial outlook and work plan for addressing each of the focus areas.

- Within the Innovation Roadmap work plan, a whitepaper devoted to the discussion of Artificial Intelligence was identified.

- The AI Whitepaper will be the latest in the Innovation Whitepaper series, panning topics centred around a changing sector...

"The IESO's white paper series aims to deepen the understanding of emerging economic, technical, environmental and social issues that could transform the future of the electricity markets in Ontario."

https://www.ieso.ca/en/Get-Involved/Innovation/White-papers

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Past papers from the Innovation Whitepaper series

- Consumer Electricity Preferences and Behaviours Survey

- Development of a transmission-distribution interoperability framework

- Non-Wires Alternatives Using Energy and Capacity Markets

- Exploring Expanded DER Participation in the IESO-Administered Markets Part I – Conceptual Models for DER Participation

- Exploring Expanded DER Participation in the IESO-Administered Markets Part II – Options To Enhance DER Participation

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AI and the IESO's Innovation Priorities

Artificial Intelligence is a broad topic area that spans each of the original focus areas of the Innovation Roadmap.

The hypothesis, to be tested through the AI Whitepaper, is that the same holds true for many market and program participants as well.

	Area of Focus Name	Timeline for onset of potential impacts related to area of focus			
		2019	2022	2025	2028
Highest Priority areas for Resource Allocation and Engagement	Unlock value of new and existing resources				
	Leadership with respect to emerging cyber security risks				
	Increase transparency and visibility of resources operating on the distribution system				
	New capability to collect, store, share, analyze and use data				
Important Areas Core to IESO Mandate	New methods for ongoing operation of an electricity grid with more intermittent supply resources and increasingly variable loads				
	Inform new distribution system operations and business models to support bulk market efficiency and reliability				
Monitor or Support Action of Others	Prepare for increase in customer-led and LDC-led DER deployment				
	Prepare for changing consumer choice				
	Alternative approaches to provide system resiliency				

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The challenge of addressing the topic of Artificial Intelligence

A broad definition

AI research: "the study of "intelligent agents": any system that perceives its environment and takes actions that maximize its chance of achieving its goals"
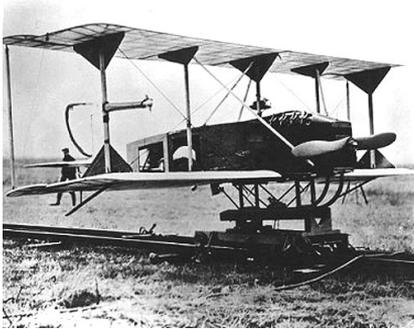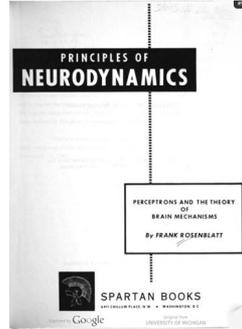Wikipedia

Though from two different time eras, both of these thermostats meet the broad definition of "intelligent agents" and employ a form of "Artificial Intelligence"

Image sources: Wikipedia

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Origins: An enduring concept accelerated by today's computational technologies

1917
Hewitt-Sperry Automatic Airplane

1962
Frank Rosenblatt's first description of neural network algorithms published
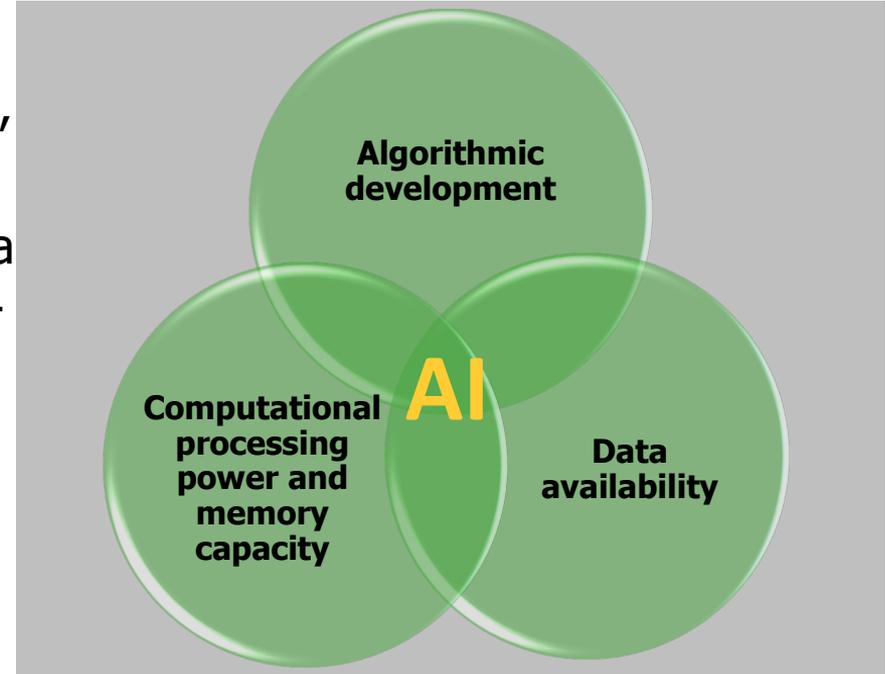
1969
Apollo Guidance Computer

1998
First Google search engine launched

2021
Amazon Echo 4th Gen. Smart Home Hub

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Origins: Three foundational disciplines

- Artificial intelligence sits at the intersection of three main disciplines, two of which (data and computational power) have been in a continuous state of acceleration over the past half century

- The definition is somewhat broad and vague… but the implications are becoming more specific.

Algorithmic development

AI

Computational processing power and memory capacity

Data availability

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AI adoption and the electricity sector

- Already there are anecdotal examples of AI applications being used in forecasting, market trading strategy, asset management, maintenance scheduling, DER management, and customer segmentation.

- Data intensity, regulatory jurisdiction, and Critical Infrastructure Protection standards are already setting the stage for AI to potentially grow at very different paces across different segments of the industry

- Managing vast numbers of Distributed Energy Resources is increasingly becoming a contextual backdrop to delegating and anticipating optimization decisions throughout the electricity system.

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Within the IESO…

- A growing interest and capabilities with machine learning and open-source tool development

- Foundational work of the IESO Data Excellence Program

- Internal machine learning pilot projects

- Establishment of a machine learning test environment

- Data collection and stakeholder dialogue – including the AI Whitepaper

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The AI Whitepaper

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The AI Whitepaper in more detail

Two main goals:

1. Begin the conversation between the IESO and its market and program participants an AI strategy by describing the current opportunities and challenges, both for the industry and the IESO

2. Gather data on the current state of AI deployment in the Ontario electricity sector and the aspirations of its key sector players.

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AI Whitepaper: what it is and what is isn't

what it is

- A high-level discussion of opportunities and challenges

- An examination of the AI-related needs of both the IESO, market participants and the broader stakeholder community

- An initial attempt to define both the problem space and potential solution space that AI presents to the industry

what is isn't

- An articulation of IESO strategy or future business plans

- A position statement of the IESO on regulatory proceedings already taking place (e.g. NERC CIP standards touching on cloud computing)
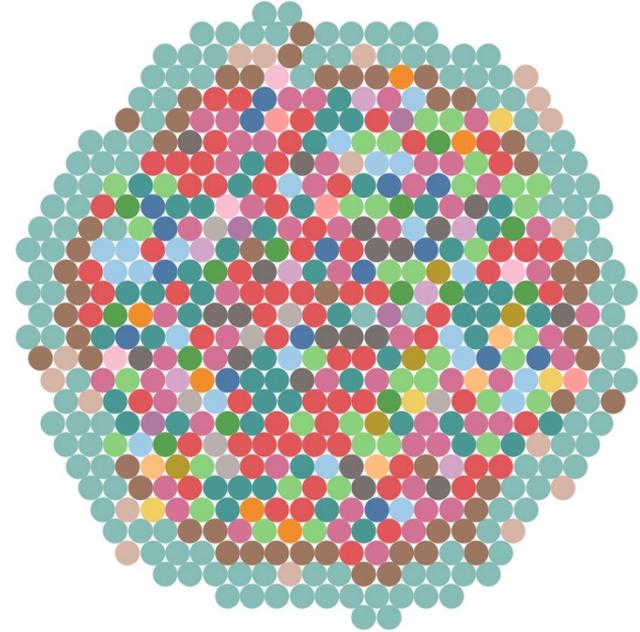
- A design document

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The AI Whitepaper Survey

Complex interactions: IESO participants span a wide variety of markets and programs
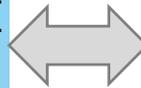
- The IESO has close to 600 organizations participating in at least 60 different permutations of service categories (e.g. Energy Trader, Retailer, Transmitter, Generator, Consumer, Capacity Market, LDC, Metering Service Provider, etc.)

- To understand the different, high-level aspirations of the organizations behind each of these diverse arrangements, is an important first task of the AI Whitepaper survey.

IESO Market Participants by service type

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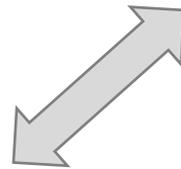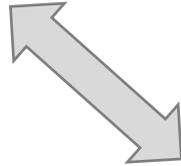Connecting Today. Powering Tomorrow.

Survey Objective: assist the IESO find its biggest opportunities for AI value-addition for market participants and ratepayers

Where are market participants on their AI journey right now? ⟷ Where do market participants hope to be five years from now?

What is the IESO's potential value addition in the transition?

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The Survey – the business case for your organization

Survey Link: https://www.surveymonkey.com/r/SJB6C7D

- It's quick! ~15-20 minutes to complete

- The greatest opportunity to influence something is at its beginning

- It puts your organization's views into focus as a foundational input into the AI Whitepaper

- Open to market participants, program participants, and companies/organizations that view themselves as interacting with the IESO-administered markets future.

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Panel Discussion

Today's panel discussion

1. Outlook on investment and venture capital trends in AI

2. An example of AI at the edge of the electricity system

3. Discussion:

   - Where are the biggest impact areas for AI in the electricity sector over the next 5-10 years?

   - How does the electricity sector avoid becoming a bottleneck to AI-related investment… and capitalize on it?

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Stakeholder Feedback

For your feedback please…

1) **Did we mention the survey?** Please complete the survey by Friday, March 18th

   Survey Link:

   https://www.surveymonkey.com/r/SJB6C7D

1) Further dialogue on your organization's future AI intentions? Please reach out to us.

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Thank You

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