

KEYNOTES

ABSTRACTS

	Speaker	Topic	Abstract
Morning Keynote	David Markwell, Senior Vice-President, Loblaw Technology	A Passion for the Customer: Loblaw's AI Journey	Loblaw is in the midst of a multi-year transformational journey hinged on three vital areas – digital retail, payments and rewards, and connected healthcare – with artificial intelligence (AI) as a key enabler across all. David Markwell, SVP, Loblaw Technology shares how Canada's largest retailer leverages AI across key products and services driving business value and gaining the unique competitive advantage of a complete actionable view of their customer. Through case studies, you will learn how projects and partnerships (including with Waterloo.ai) create exponential growth for Loblaw's purpose of growing its AI capabilities and resulting outcomes.
Afternoon Keynote	Professor Anindya Sen, Faculty of Arts	Data, The New Commodity	During the 1960s John Dales of the University of Toronto argued that establishing markets for pollution rights could actually result in lower pollution levels. In his talk Professor Sen will demonstrate that markets for data rights have the potential to stimulate innovation in the economy, result in more competition, and curtail some of the negative externalities associated with online behaviour.

AI - STREAM 1

ABSTRACTS

Topic	Abstract
Using AI for Software Integrity	<p>A significant amount of time, money and work goes into preventing and resolving software bugs within our systems and code. The Consortium for IT Software Quality has estimated that poor software quality has cost US Organizations \$2.8 trillion in 2018 alone. BMO has partnered with the Waterloo.AI institute to research the ability to identify and prevent bugs and defects during the development of software applications.</p>
Industry Considerations for Responsible AI	<p>Canadian Customer examples of the considerations different industries have to solve for when operationalizing AI.</p>
AI-enabled Knowledge Prediction Engine	<p>AI-enabled Knowledge Prediction Engine that uses deep learning models to accurately measure, predict, and make recommendations based on a learners' understanding of a topic or skill and its impact on education, learning and upskilling.</p>
Safety Assurance of AI-enabled Robotic Systems	<p>AI is enabling new kinds of robotic systems that are often safety critical, such as commercial space cleaning robots, autonomous cars, and autonomous agricultural equipment. Assuring their safety is a major challenge. This talk will give an overview of emerging methods for safety assurance of such systems.</p>
Robust Embeddings for Natural Language Processing	<p>Natural Language Processing (NLP) models often struggle to perform adequately in noisy domains due to typos, abbreviations, new expressions. In this talk I will describe a novel probabilistic embedding to improve the robustness of NLP models.</p>
AI for Ocular Health	<p>In 2019, the World Health Organization stated that 2.2 billion people have a vision impairment. Fortunately, technology has enhanced the potential for clinical decision support with AI paving the way for making "big data" more accessible to eye care providers and patients alike.</p>

AI - STREAM 2

ABSTRACTS

Topic	Abstract
Strategy in the Age of AI Disruption: How Predicting the Future Can Help Your Business	<p>Machine learning is fundamentally a better prediction technology, made possible by big data and increased computing power. Because the ability to better predict the future confers significant competitive advantage, we are seeing the emergence of AI powered startups and the disruption of industries, and this is accelerating due to the pandemic. In addition to providing some historical context to the coming AI revolution, I will outline what I see as the three phases of corporate AI adoption and discuss other strategic considerations.</p>
Automating Legal Search with Semantic Search	<p>Primal’s technology in advanced semantic synthesis and knowledge representation helped to create Lexica KM, a knowledge management system that automates the legal research process. Lexica was designed for legal teams to work together on one single platform to maximize their efficiency and time.</p>
Confidence in AI Systems – Can we trust AI-based systems?	<p>AI-based systems have demonstrated impressive levels of effectiveness across a variety of application domains. As more and more applications come to rely on AI, we face the question of how to assess and improve the trustworthiness of AI-based systems in the presence of possible adversarial behaviour by some entities in those systems. In this talk, I will give an overview of security and privacy considerations in AI-based systems, and give some examples.</p>
Using AI to Find Legal Evidence and COVID-19 Treatments	<p>Professor Maura R. Grossman pioneered the use of machine learning to find relevant documents in civil litigation. In 2020, she applied the same methods to assist Health Canada and other organizations to find treatments for COVID-19. Come hear how AI traveled from law to medicine.</p>
Advancing Transportation Engineering Using AI and Big Data	<p>An overview of a few recent research projects related to ML applications, including winter road conditions monitoring, adaptive traffic signal control and road safety analysis.</p>
AI for In-vehicle Driver and Occupant Monitoring	<p>In this talk, we demonstrate the use of low-cost radars paired with AI algorithms for alerting to left-behind infants, detecting distracted driving, counting number of occupants, and gesture control of infotainment systems.</p>

AMC - STREAM

ABSTRACTS

Topic	Abstract
Integrated Additive Manufacturing and AI Platforms for Smart Manufacturing	<p>The industrial demand for enhancing Additive Manufacturing (AM) to serial production has opened up many opportunities to integrate artificial intelligence (AI) with AM processes. In this talk, an overview of AM, its benefits, challenges and opportunities will be provided, followed by current state-of-the-art AI platforms integrated into AM processes and AM production line.</p>
Robots at Work: Cobots for Tomorrow's Industry	<p>Wider adoption of collaborative robots in industrial settings can offers great benefits but will also present noticeable challenges. This talk will highlight the benefits of adopting collaborative robots as a pillar of industry 4.0 as well as highlight the road-blocks which may impact the scale of such adoption.</p>
High Performance Manufacturing	<p>There is a common phrase “if it ain’t broke, don’t fix it” That is great till things do break or your competition pulls ahead. Without understanding your processes and equipment it is very difficult to get better. With the above sentiments in tact what things can you do to identify problems and learn without jeopardizing current production?</p>
Boosting Manufacturing through Virtualization and Intelligence	<p>Digitalization and machine intelligence promise great benefits for the manufacturing industry in terms of boosting productivity, enhancing part quality, and improving overall equipment availability. This presentation will give case studies of such new technologies developed at the University of Waterloo, including: Virtual machining and virtual quality control for complex parts, such as gears; Machine tool ‘digital-twin’ construction from real-time manufacturing data; Time-optimal trajectory planning for multi-axis machines; and Active damping of machining chatter vibrations, to increase productivity.</p>
AI Methods are Solving Complex Beam-forming Antenna and Radio Systems	<p>Intelligent antenna and radio systems, which can optimize valuable radio resources in a highly complex and unpredictable mobile environment, are essential for all emerging millimeter-wave systems including 5G/6G networks, mobile satellite communication, and high-resolution automotive radar. Ultimate complexity of massive antenna arrays with numerous embedded beam-forming active control devices cannot be handled by traditional direct engineering analysis and design methods.</p>
Smart Automated High-Performance Composite Manufacturing	<p>The advanced manufacturing industry is looking to implement state of the art composite manufacturing technologies for various applications. These processes require high precision in mold placing and accurate timing. In-scrap reduction through machine learning algorithms is important due to the high cost of materials and production timelines. Process automation is a key element to solve these issues.</p>

AI FOR SOCIAL GOOD - STREAM

ABSTRACTS

Topic	Abstract
Optimizing Pre-trained Clinical Embeddings for Automatic COVID-related ICD Coding	<p>In response to the COVID-19 pandemic, there is an urgent need to extracting and reporting crucial information about patients, treatment and outcomes in the format of codified data from the vast amount of electronic patient records. Our team has been focusing on developing natural language processing models that automatically assign a set of International Classification of Diseases (ICD) related to infectious diseases and their treatment (procedures).</p>
Perspectives on Machine Learning in Medical Imaging	<p>Machine learning approaches are increasingly being used in the field of medical imaging. To date, much of the work has been in the research domain, but techniques are increasingly finding their way into the clinic and into commercial software package to assist clinicians. This talk will review perspectives on this domain, with an emphasis on nuclear medicine.</p>
AI, Global Governance, and International Public Policy	<p>As the technological, economic, and social impacts of AI make the leap from keyboards to crossing continents, it is essential to establish multi-disciplinary conversations probing the promise and perils of new forms of global AI. This presentation examines five key sociopolitical aspects of how AI intersects with our lives today, and where its governance may develop going forth.</p>
A Human-Machine Collaborative Design Strategy to Efficient Deep Learning for Real-Time Video Expression Analysis	<p>One of the key initiatives in my research group around AI for social group is the development of assistive technology for aiding those with cognitive impairments in human-to-human interactions. This talk will be present a human-machine collaborative design strategy for the rapid development of highly efficient, high performing deep neural network architectures for real-time expression analysis from video.</p>
Wildfire Management: Disaster Response, Climate Change	<p>The theory and methods being developed for Artificial Intelligence research are empowering human decision-makers to deal with increasingly complex problems in real-world domains of huge societal importance through the use of deep learning, reinforcement learning and game theory. In this talk, I will provide a window into this exciting trend through the lens of Forest Fire Management which includes all the elements of a “wicked problem” including complex dynamics, large datasets, conflicting societal priorities and critical short-term/long-term decision goals.</p>
Towards Adaptive Social Robots: Integrating Physiological Adaptation in Human-Robot Interactions	<p>To make more engaging human-robot interaction (HRI), social robots should have some ability to infer their human interaction partner’s psychological and affective states. Measurements of the body signals via non-invasive physiological sensors provide a convenient window into a person’s internal states, namely their emotions and specific psychological states such as stress or engagement.</p>