The 7th Cluster Workshop on Intelligent Systems and Machine Learning

November 25 (Friday), 2022

1:30pm – 3:30pm (MDT)

Organized by: ISML Research Cluster

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Keynote Presentation

Keynote Presenter	Dr Flávia C. Delicato
Title	Challenges and Opportunities for Machine Learning in IoT Systems and the Distributed intelligence at the Edge
Abstract	The Internet of Things (IoT) aims to leverage Internet technology to the next level, by connecting an unprecedented number of devices, generating a swarm of heterogeneous sensors and actuators that can interact with the physical environment, collect several types of variables, and support dynamic decision-making processes across multiple application domains. Such a myriad of connected devices should be" smart", continually learning from behavioral patterns of humans and other devices, and then autonomously adapting to changes at runtime. Such ability is based on the implicit assumption that IoT systems can make real-time decisions about data, usually on the move. Ultimately, the great potential of IoT is not about getting data, but about extracting valuable knowledge from that data. In this context, Machine Learning (ML) techniques can make a great contribution to make IoT systems more intelligent. However, the intrinsic features of IoT, such as the high heterogeneity, velocity, volume, dynamism, volatility and uncertainty of the sensor generated data makes applying ML techniques very challenging. The IoT requires a new generation of distributed algorithms based on lightweight, online and incremental learning. In this context, the traditional view of executing ML algorithms centrally in the cloud does not always meet the requirements of latency, security and the decentralized nature of IoT applications. A promising approach is to explore the resource capacity of edge nodes to execute such algorithms, giving rise to the paradigm known as Edge Intelligence. In this talk, we will analyze the main characteristics of IoT that motivated the Edge Intelligence paradigm, and then enumerate the challenges related to the execution of distributed ML solutions at the edge of the network.

Presenter's short bio	 Flávia C. Delicato received her PhD from Federal University of Rio de Janeiro in 2005 and her Doctoral Thesis was selected as one of the six best in the year by the Brazilian Computer Society. She is an Associate Professor of the Department of Computer Science at the Fluminense Federal University, Brazil where she teaches for undergraduate and post-graduate courses, and integrates the MídiaCom Research Lab. In 2010 and 2016 she was at the University of Sydney as a visiting researcher, and she integrates the Centre for Distributed and High-Performance Computing from (http://sydney.edu.au/distributed_computing/). She is a Level 1 Researcher Fellow of the National Council for Scientific and Technological Development (CNPq). She has 2 books and over 200 published papers. She currently serves as Senior Associate Editor of the ACM Computer Surveys, Area Editor of the IEEE Open Journal of the Communications Society and Associate Editor of the Ad hoc Networks, IEEE Transactions on Service Computing, ITU Journal on Future and Evolving Technologies and Journal of Interconnection Networks. She has been coordinating and participating in several R&D projects with funding from International and Brazilian government agencies. Since 2017 she is a member of the IEEE Technical Committee on Smart World – SWTC (http://www.cybermatics.org/swtf/indexTC.html). She is Her main research interests are Internet of Things, adaptive middleware, Edge/Fog Computing, sensor and network virtualization, and resource management.

Student Presentation

Presenter	Dr Benjamin Quito (MSC IS, Athabasca University) (Supervisor: Dr Larbi Esmahi, Athabasca University)
Title	Compare and Contrast LiDAR and Non-LiDAR Technology in an Autonomous Vehicle: Developing a Safety Framework
Abstract	Safety has always been paramount in every vehicle we drive, and for years a driver has been synonymous with driving. However, with the advent of technology, we are now on the verge of having an Autonomous Vehicle wherein the control of the vehicle is gradually transferred to Artificial Intelligence. There is public clamour regarding the safety of such vehicles. Regarding safety, a human driver relies heavily on what the driver can see. Seeing the surroundings, controlling the vehicle, being able to react, and perceiving what will happen are some of the factors that make driving safe.

	With Autonomous Vehicles, these factors did not change. These vehicles rely on what they see using two technologies; LiDAR and Non-LiDAR. This study developed an Image Processing Model that takes input from the two technologies using Supervised Learning to make the Autonomous Vehicle see and be aware of its surroundings. The study also developed a Safety Framework measuring the ability of the two technologies in gathering images fed into the Image Processing Model for comparing and contrasting. The study also proposed Experimental Research to create a baseline on the safety of an Autonomous Vehicle compared with a human driver in a controlled environment. The result of the proposed research can be a basis for trusting the Autonomous Vehicle if it performs at par with the performance of a human driver in the simulation developed in this study.
Presenter's short bio	 Benjamin Quito has more than 21 years of experience in Academic and Information Technology. A proponent of using Information and Communication Technology in teaching and learning in South East Asia through the South East Asian Ministers of Education Organization (SEAMEO). He spent five years studying Master of Information Systems at Athabasca University, focusing on Technology Management. He resides in Kitchener, Ontario, and is currently a Part-time professor at Conestoga College. His research interest includes the use of IT in teaching and learning. He has copyrighted several concept papers, such as Smart Traffic Operations Procedure: The Use of Technology in Enhancing Traffic Apprehension and Operations in EDSA and Smart Transport System: The Role of Technology in the Efficient Management of Traffic Situation in EDSA, among others.