CORS · SCRO

Canadian Operational Research Society
Société canadienne de recherche opérationnelle

Wednesday, February 26th, 2025
9:00 – 10:00 a.m. EST

CORS Micro-Event (online):

Hybrid Quantum-Classical Computing for Internet of Everything Optimization

Presented by

Mahzabeen Emu, Assistant Professor, Lakehead University, Ontario

Dr. Mahzabeen Emu is a Tenure-Track Assistant Professor in the Department of Computer Science at Lakehead University and leads the Quantum Computing research group. She earned her PhD from Queen's University, ON, Canada, and an MSc in Computer Science from Lakehead University, where she was awarded the prestigious Governor General Gold Medal (2021). She was awarded the PhD Research Achievement Award (2024) from Queen's University for her thesis in quantum computing and optimization. During her undergraduate studies in Bangladesh, she graduated as the top student among 1,700 peers, earning an academic gold medal. Her research focuses on quantum computing, optimization, and artificial intelligence in networking. She is a recipient of numerous other prestigious awards, including the Vanier Canada Graduate Scholarship, the Vector Institute AI Scholarship, the International Ontario Graduate Scholarship (awarded three consecutive years), Mitacs awards, the distinguished Women in Tech Scholarship, and a joint research award from the National Research Council and Deep Tech Canada at Quantum Days 2024.

Abstract

Internet of Everything (IoE) refers to the intelligent connection among people, things, data and processes, essentially inclining toward the next-generation networks. To unleash the full potential of the IoE framework, it often requires nearly real-time management decisions regarding deployment and scheduling operations. The IoE service management problems, primarily formulated as traditional mathematical programming models, are NP-hard, hence inappropriate for time-sensitive IoE environments. This research talk promotes the need to go beyond the realms and leverage quantum computing-based service management. Next, the feasibility of applying quantum computing for IoE optimization, based on today's available quantum resources (qubits), is intended for evaluation. Further along this line, the vision includes determining the advantages of solving NP-hard problems using quantum computing over classical approaches, as well as identifying major trade-offs that hinder applicability. Based on the research progress, hybrid quantum-classical computing is the key to solve futuristic IoE service management optimizations, considering the limited availability of quantum computing resources (qubits). The synergistic research for quantum computing-enabled network optimization and analytics can be regarded as an effort to scale down massive resource fabrication costs and upgrade profit margins for service providers.

Register at: https://forms.gle/Z3FGWmWg3ai31ZVo6

Questions? Email:president@cors.ca

Organized by: Anjali Awasthi, President CORS, and CORS Montreal Local Section

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Wednesday, February 26th, 2025
10:00 – 11:00 a.m. EST

CORS Micro-Event (online):

Digital Twin-based Reinforcement Learning for Smart Manufacturing

Presented by

Amel Jaoua, Professor, National Engineering School of Tunis

Amel Jaoua is a Professor of Stochastic Simulation Modelling and Optimization of Industrial and Service systems in the Department of Industrial Engineering at National Engineering School of Tunis, Tunisia. She received her Master's degree in Automation and Computer Science from the National Institute of Applied Science, Tunisia, and her PhD in Industrial Engineering from Polytechnique Montréal, Canada. She has co-authored 30+ scientific publications and is an Expert in developing cutting-edge curricula in Industrial Engineering for the emerging era of interconnected industries and the Metaverse. She is the founder of Industry 4.0 Laboratory for the Next Production Revolution Erasmus Project. This project is supported by funding from the European Union's Erasmus+ Capacity Building program in the field of Higher Education. Her research interests include Smart Digital Twins, Machine Learning, Simulation-based Optimization, Cyber-Physical Systems, and Immersive Learning.

Abstract

In this talk, the challenges of implementing Digital Twins (DTs) and the proposed technology standards will be discussed. Specifically, the DT's capability to enhance real-time Production Planning and Control by utilizing a connected and synchronized virtual replica of a physical system, enabled by IoT devices and sensors, will be explained. This will be followed by a case study on the effective implementation of a DT in an Industry 4.0 laboratory for Autonomous Mobile Robot Dispatching. Then, the integration of Reinforcement Learning capabilities to achieve the fourth level of DT maturity, focusing on autonomous smart DTs, will be exposed. Finally, the talk will conclude with a discussion on the future challenges of implementing DTs in Manufacturing systems, with a particular focus on data scalability and their connection to the emerging concept of the Metaverse.

Register at: https://forms.gle/Z3FGWmWg3ai31ZVo6

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