5G (ENCQOR) Technology Development Challenge

Interference Management in Heterogeneous Wireless Networks

Challenge Launch Date	January 3, 2019
Challenge Deadline	January 31, 2019
Challenge Statement	The project will aim to develop new analysis, machine learning, and optimization techniques for interference management in multi-tier heterogeneous wireless networks with a focus on potential 5G standardization. Particular emphasis will be targeted towards multi-tier heterogeneous wireless networks solutions facilitating the integration of Massive MIMO technology for Device-to-Device (D2D) communications including Internet-of-Things (IoT) solutions, Machine-to-Machine (M2M) systems, Vehicle-to-Vehicle (V2V) networks, and smart city/infrastructure solutions. It is becoming well known that the computational complexity of finding an optimal discrete-decision control policy is prohibitive for most realistic models of 5G networking systems. As such this study will focus on developing new online machine learning and stochastic control techniques that prescribe appropriate choices of 5G heterogeneous network operating modes, spectrum allocation, transmission power and massive MIMO configurations.
Project Partner	• Ericsson Canada Inc.
Timeline	• 1 year
Available funding	• $100 K
Applicant Type	• Ontario based College/University
Location	• Work can be completed remotely
Project Details	The expected research outcomes are applicable to a wide range of radio systems operated under conventional LTE frequency bands, higher frequency bands in the 5G standard, and hybrid spectrum sharing schemes such as Ericsson's License Assisted Access (LAA). These systems are often characterized by complex user dynamics and interference patterns, which are known to present difficulties in their design and performance evaluation under conventional solution techniques. In response to this challenge, the academic researchers will develop new stochastic optimization and machine

	learning techniques to adaptively manage interference and improve performance in these systems. Ericsson is interested in both large-scale centralized processing and light-weight distributed variants. Through mathematical analysis, computer simulation, and system experimentation, researchers will generate practical guidelines on how to design and operate future heterogeneous wireless systems, to optimally balance the tradeoff between service performance and operating cost.
Project Goals/ Outcomes	○ Development of new dynamic online approximation and machine learning techniques for Massive-MIMO interference management and rate maximization, with consideration for minimum-SINR constraints and fairness among users. ○ Performance evaluation and design tuning for D2D and M-MIMO relays in the 5G environment, aiming toward optimal or near-optimal tradeoff between system performance and resource usage. ○ Computer simulation with realistic indoor/outdoor wireless channel models and user mobility patterns; further optimization and tuning for applications in current and future products. ○ Synthesis of numerical and experimental results on system design; identification of new technology
Applicant Capabilities	The lead applicant and the supporting research team will have extensive research expertise in areas closely related to the proposed project, including wireless network modeling and optimization, spectrum and resource allocation, multi-hop wireless networks, machine learning and mobility management.
Additional Information	