BRIEF DESCRIPTION OF RESEARCH ACTIVITIES

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Up to10 Keywords (expertise): Machine learning, software engineering, distributed systems, cloud computing, network function virtualization, 5G systems, IoT, data analytics, high availability, and software-defined network

Introduction and Research program

My research focuses on using machine learning algorithms and AI to empower the Cloud, Edge Computing, Network function virtualization (NFV)/software-defined networking (SDN), and Internet of Things (IoT) with sophisticated real-time and historical analytics, comprehensive real-time operations, and automation capabilities. My research builds a distributed intelligent computing orchestration framework for NFV components and SDN controllers for IoT applications. The main objective of this proposed work is automating the NFV and SDN orchestration and dynamically enhancing their performance through predicting/detecting the quality of service (QoS)aware issues (i.e. latency/security-aware applications), automated resource management, and predicting/balancing workloads in real-time across the network infrastructure.

Main undertaken research projects

Project 1: One of the current projects we're working on is the Intelligent Self-Optimizing Network for 5G Open-RAN Management in a Cloud-Based Virtualized Environment. We are working on defining, assessing, and implementing machine learning (ML) approaches to enable self-optimization and self-healing of O-RAN in a 5G system (automated radio configuration, interference, and cell outage management).

Project 2: As IoT, applications are everywhere now and generating data regularly, this project focuses on providing Smart Gateway Based Communication for Cloud of Things. In other words, we are working on introducing a smart gateway to minimize data loss over the network and avoid unnecessary resource utilization and simultaneously monitor the health of IoT systems and predict their failures using machine learning models. One of the applications that we're aiming to use for such a solution is a smart city.

Recently Completed research projects

We have worked on introducing Security Functions into the NFV Management platform. In this research work, we introduced virtual security functions (VSFs) into the latency-aware deployment of NFV applications to enhance security while maintaining the performance baseline.

Support (Grants and Contracts)

Manar is the Principal Investigator of a submitted NSERC Discovery Grant. She is also a co-PI on OCE ENCQOR 5G challenge (2 years project) with Ciena Canada.