



Candidate: **Hesham Abed**

For the degree of: Doctor of Philosophy

Department: Computer Science

Title: **Developing an Efficient Failure Prediction Model in Support of a Distributed Operating System for Autonomic Networks**

Committee: Dr. Ala Al-Fuqaha, Chair

Dr. Li Yang

Dr. Bilal Khan

Dr. Ammar Rayes

Time/Place: **Friday, May 15, 2015**

**3 to 5 p.m.**

**D 212 Parkview Campus**

This study describes an efficient Failure Prediction System based on new algorithms that model and detect anomalous behaviors using a multi-scale trend analysis of multiple network parameters.  This approach has many advantages over prior approaches.  By operating at multiple time scales simultaneously, the new system achieves robustness against unreliable, redundant, incomplete, and contradictory information. The algorithms employed operate with low time complexity, making the system scalable, and feasible in real-time environments. Furthermore, anomalous behaviors identified by the system can be stored efficiently with low space complexity, making it possible to operate with minimal resource requirements even when processing the high rate streams of network parameter values. Moreover, the developed algorithms generate accurate failure predictions quickly, and the system can be deployed in a distributed setting. Prediction quality can be improved by considering larger sets of network parameters, allowing the approach to scale as network complexity increases. The system is validated by experiments that demonstrate their ability to produce accurate failure predictions in an efficient and scalable manner.