



# COLLEGE of ENGINEERING AND PHYSICAL SCIENCES

SCHOOL OF COMPUTER SCIENCE

## MSc Defence

Monday September 30, 2019 at 10AM in Reynolds, Room 3324  
Implicit Multi Objective Coevolutionary Algorithms  
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**Chair:** Dr. Joe Sawada

**Advisor:** Dr. Mark Wineberg

**Advisory Committee Member:** Dr. Dave Calvert

**Non-Advisory Committee:** Dr. Yang Xiang

### Abstract

Coevolutionary algorithms are powerful tools for solving increasingly complex problems by explicitly evolving solutions in the form of interacting co-adapted subcomponents. It operates under incomplete information (uncertainty), focusing on evaluation and interaction schemes, although less so on search operators. Its fitness is subjective – fitness of individuals relative to other individuals in the population(s) – which theoretically aids the convergence rate but unfortunately births the red-queen effect. Consequently, although elitism is easy to define within a generation, it becomes hard to define across generations. Furthermore, this effect can cause forgetfulness to occur, where solutions become quickly overspecialized based on what seems to be an obvious immediate goal, but which changes from generation to generation.

We noticed that, while coevolutionary systems typically have only a single objective for evaluation, there's a subtle multi-objective aspect to evaluation that we feel necessitates a method to regulate the pairings of individuals both within and between generations. This research investigates this implicit multi-objective nature of coevolutionary systems, which, as it turns out, makes it possible to manage elitism by addressing forgetfulness, controlling and often reducing the pace at which the algorithm specializes, thus providing robust solutions.