



# COLLEGE of ENGINEERING AND PHYSICAL SCIENCES

SCHOOL OF COMPUTER SCIENCE

## MSc Seminar

**Tuesday July 23, 2019 at 10:30AM in Reynolds, Room 2224**

Performance Evaluation of CMA-ES Using Dual-centers

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### ABSTRACT:

IPOP-CMA-ES is one of the most powerful optimization algorithms within the field of Evolutionary Strategies. However, its power seems unexpectedly subdued with the integration of elitism, which usually improves the behaviour of most other evolutionary algorithms. This paper's focus is two-fold, involving a simple and effective approach to incorporating elitism into CMA-ES, and an efficient unbiased system for simultaneously running and comparing two different ES algorithms. This new system is called Dual-center CMA-ES. As the name describes, Dual-center-CMA-ES utilizes two centers which are synchronized in the sampling process, with the 2<sup>nd</sup> center (also known as the 'best' center or 'elite' center) dictating the generation of elite solutions.

IPOP-CMA-ES and Dual-center CMA-ES were run simultaneously with the previously mentioned system, where they share the same multivariate normally distributed random noise to remove random bias. Overall, the results suggested that Dual-center CMA-ES performed better than IPOP-CMA-ES on unimodal test functions such as rosenbrock, levy and elliptical. The system also performed better on multimodal test functions such as ackley and griewank. These results may imply that  $(\mu + \lambda)$  - CMA-ES is not effective and that other unorthodox methods of elitism could be more promising.