EPSRC CDT in Distributed Algorithms

PhD Project: Bayesian Optimisation for Ever-Improving Immersive Emulation of Engagements with Fighter Jets

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Project Description

Conventionally, live operational readiness training involves special aircraft acting as "threats" to provide live training effects that trigger blue sensors (e.g. radars, warning receivers) in the same way as a real threat. Injection of virtual entities can also occur to simulate weapons firings and platforms of friendly/hostile forces, which may be live aircraft interacting with ground simulators.

Draken Europe, an organisation providing the "red air" component of the training to the Royal Navy, the RAF, and NATO in air-to-ground engagements, air-to-air combat, and both, respectively, needs to ensure said effect behaviours are realistic and appropriate for the training objectives. Machine learning can be employed to understand similarities between historic training exercises and propose future training scenarios, however parts of the data space of all scenarios will be sparsely populated. Therefore, this real-world data will be augmented with synthetic simulation. It will be necessary to understand disparities between data from simulations and the real-world, and adaptively run simulations that aid in both the understanding and reduction of those disparities.

This challenge prompts the need for Machine Learning algorithms such as Gaussian Processes (GPs) that can represent the uncertainty associated with interpolation and extrapolation across simulations and real-world data. AI techniques such as Bayesian Optimisation (BO) can be used to recommend which simulation or real-world exercise to run next.

This project will focus on how to capitalise on distributed computational resources to process a large dataset describing a portfolio of both simulated and real-world engagements. The aim is to develop models for articulating similarity (between data recorded from two engagements) and to integrate those models with, for example, GPs and BO, as well as adapting these models to help automate and reduce "red air" operator workload in the delivery aircraft.

Go to the EPSRC CDT In Distributed Algorithms website.