

EPSRC CDT in Distributed Algorithms

PhD Project: Uncertain Heterogeneous Algorithmic Teamwork

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Project Description

This project has been developed by the University of Liverpool in partnership with IBM.

This project is focused on showing that raw aggregated capability can outperform carefully constructed co-ordination. More specifically, while dedicated high-performance computing resources provide a carefully constructed homogeneous environment that can make best use of the available hardware, there are settings where the availability of vast quantities of computational hardware should more than make up for the disparate connectivity and capability of the hardware.

Recent collaboration between the University of Liverpool and IBM Research has developed numerical Bayesian techniques (Sequential Monte Carlo samplers) that exploit homogeneous super-computing hardware to outperform algorithms that are, by default, configured to make use of a single processing core (e.g., Markov chain Monte Carlo). These techniques pave the way for a generic solution to the problem of performing algorithmic teamwork in the context of data science.

This PhD will investigate whether it is possible to adapt the pre-defined divide-and-conquer algorithm at the heart of the aforementioned numerical Bayesian techniques to adapt to and operate effectively within an uncertain computational environment. This will involve the development of fast distributed algorithms to identify and instantiate a divide-and-conquer architecture that is near-optimal given the available resources.

The aim of the project is to develop the infrastructure that makes it possible for vast heterogeneous compute resources (e.g., based on a disparate mix of GPUs, desktop PCs and android devices) to operate effectively in a team. If successful, the aim is to use spare computer infrastructure available globally (e.g., via a system akin to SETI@home) to deploy algorithms based on teamwork to answer a fundamental societal question to be identified by the student.

Go to the [EPSRC CDT in Distributed Algorithms](#) website.