# EPSRC CDT in Distributed Algorithms

## PhD Project: Learning to See More: Better Bayesian Track Before Detect using Statistical Machine Learning

**University of Liverpool**

**PhD Student**: Elinor Davies
**Project Partner**: Leonardo

**Supervisors**:
Angel Garcia-Fernandez, University of Liverpool
Vassil Alexandrov, STFC Hartree
David Greig, Leonardo

## Project Description

This project has been developed by the University of Liverpool in partnership with STFC Hartree and Leonardo.

This project is concerned with improving the ability to detect faint objects in, for example, radar data. By improving detection performance, cheaper sensors will be able to emulate more expensive sensors, making the development of advanced detection algorithms very important in industrial settings. Leonardo develops such sensors.

This project will investigate how to use statistical machine learning (e.g. techniques such as particle Markov chain Monte Carlo (PMCMC) or Sequential Monte Carlo (SMC) methods such as SMC2) to learn the parameters of non-linear models (e.g. models describing nearly-constant turns or models that capitalise on knowledge of the terrain). Such learning is computationally expensive and it is therefore strongly desirable to understand how such algorithms can capitalise on emerging many-cored computational resources (e.g. GPUs). It is anticipated that using a bank of class-specific non-linear models (each of which caters for a class of object that might be encountered) will increase the benefits that TkBD can achieve.

As well as extending the TkBD theory to cater for, for example, an unknown number of objects, the project will also investigate the extent to which many-cored architectures (particularly lower power/lower cost processors) can be capitalised upon to implement TkBD. The aim would be to develop a scalable processing architecture that allows large numbers of objects to be tracked across a distributed set of processors.

The key challenges are in developing real time processing methods for distributed processors that can use low-power processor systems and using adaptive scheduling to maintain energy efficiency across a number of processors.

Go to the EPSRC CDT In Distributed Algorithms website.