

EPSRC CDT in Distributed Algorithms

PhD Project: Extracting Important Information from Noisy Spectra

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Project Description

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

This studentship aims to marry Gencoa's optical plasma sensing capabilities with novel signal processing algorithms to enable smarter self-learning diagnostic tools that can be applied on, for example, the production lines for mobile phone components. Once these algorithms are embedded within the Gencoa's OPTIX gas sensing product, the production line will have increased productivity and a differentiated market position longer-term. In the context of a production line, both run-time speed and accuracy are important: while impurities may be orders of magnitude less abundant than other gasses present, the impact of not detecting them can be significant. Mature algorithms exist for processing spectra. However, these algorithms are either fast and inaccurate or accurate and (very) slow.

The aim of this project is to develop algorithms that are both fast and accurate. The proposed approach is to speed up mature numerical Bayesian algorithms that are already accurate. These algorithms are accurate because they search over the space of all combinations of peaks that could be present in each spectrum. The algorithms explicitly compare the measured spectrum with those associated with each combination and also explicitly consider the extent to which the combination is consistent with prior knowledge (Gencoa are developing libraries to make it possible to predict which set of peaks would be likely to co-occur; a single impurity will typically give rise to multiple peaks). This approach makes it possible for the algorithms to make accurate inferences about whether a bump in the noise-floor or on the side of a large peak is caused by chance or by the presence of a low-amplitude peak.

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