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## Multi-Objective Optimisation Under Uncertainty

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Broadly speaking, Bayesian optimisation methods for a single objective function (without constraints) proceed by (i) assuming a prior for the unknown function  $f$  (ii) selecting new points  $x$  at which to evaluate  $f$  according to some infill criterion that maximises an acquisition function; and (iii) updating an estimate of the function optimum, and its location, using the updated posterior for  $f$ . The most common prior for  $f$  is a Gaussian process (GP).

Optimisation under uncertainty is important in many areas of research. Uncertainty can come from various sources, including uncertain inputs, model uncertainty, code uncertainty and others. Multi-objective optimisation under uncertainty is a powerful tool and a big area of research.

In this talk, I will give an overview of Bayesian optimisation and talk about a few extensions to the emulation-based optimisation methodology called expected quantile improvement (EQI) to a two-objective optimisation case. We demonstrate how this multi-objective optimisation technique handles uncertainty and finds optimal solutions under high levels of uncertainty.

### Keywords

DOE, Bayesian, Optimisation

### Classification

Mainly methodology

**Primary author:** Dr DASHA, Semochkina (Southampton Statistical Sciences Research Institute (S3RI))

**Presenter:** Dr DASHA, Semochkina (Southampton Statistical Sciences Research Institute (S3RI))

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