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INDUSTRIAL OPTIMISATION WITH MULTIOBJECTIVE BAYESIAN METHODS AND CFD

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Design optimisation often requires optimising multiple (and often conflicting) objectives simultaneously. As an example, a heat exchanger design will attempt to maximise the heat transfer while minimising the pressure drop across the system. In such cases there will be a range of solutions, the Pareto set, which represents a trade-off between the design objectives. Genetic Algorithms perform well in exploring the design space and determining the Pareto set, but typically require thousands of function evaluations, which is impractical with CFD even with modern computing power. An alternative is to use Bayesian Optimisation methods which iteratively seek to improve an approximation of the cost function for the system. This has been proved to be an effective approach to find optimal solutions with the minimum number of direct evaluations of the (expensive) cost function [1]. In this work, we demonstrate the application of Bayesian methods to the optimisation of real engineering problems including heat exchangers (see figure 1), draft tubes and vortex separators.

a. b.

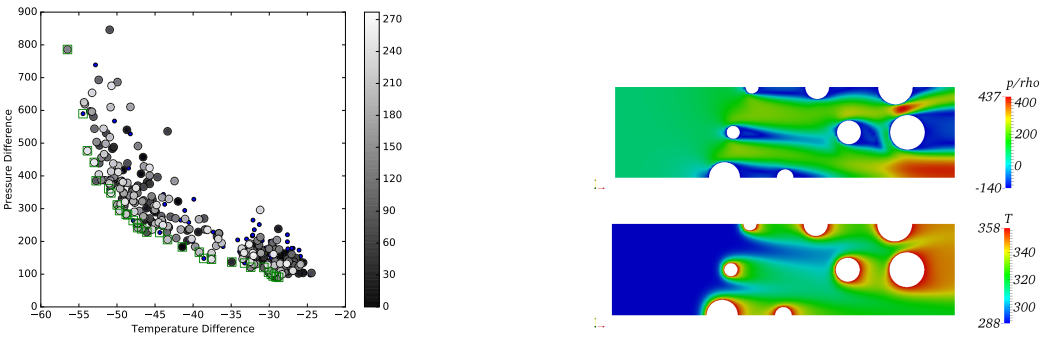

Figure 1: a. Pareto front for heat exchanger problem. b. Optimised (dominating) solution.

REFERENCES

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