**PhD project available**

School of Engineering and Information Technology,
The University of New South Wales,
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**Project Title:** Development of optimization methods for computationally expensive many-objective optimization
**Supervisors:** Professor Tapabrata Ray
**Degree:** PhD in Mechanical Engineering / Computer Science

**Project description:**
Multi-objective Optimization (MO) problems are those which involve more than one conflicting objectives to be maximized/minimized. Such problems occur frequently in engineering design, and development of efficient algorithms for MO is a highly active field of research. *Many-objective optimization (MaO)* problems are further differentiated as the MO problems which contain four or more objectives.

MaO problems are significantly challenging compared to 2-3 objective problems for a number of reasons:
(1) The foremost is that Pareto-dominance/non-domination principle, which forms the key ranking procedure for evolutionary multi-objective algorithms scales poorly beyond 2-3 objectives. Thus, there is a loss of selection pressure required to drive the solutions towards the Pareto-optimal front (POF). As a result, the convergence to POF is not achieved even after exorbitant computational effort.
(2) The number of solutions required to cover the POF grows exponentially with number of objectives. Thus it becomes increasingly challenging to achieve a good representation of the POF using a finite set of solutions.
(3) There is no definitively established way of visualizing POF of MaO problems, since they contain more than three dimensions. Therefore, selection of final solutions for implementation from the POF is not straightforward.

While in recent years, algorithms have been introduced to deal with many objective optimization, none of the existing algorithms can deal with problems when evaluation of a solution is computationally expensive. Surrogate assisted optimization methods have been suggested in the literature to deal with multiobjective optimization problems. There are no reports on surrogate assisted optimization algorithms for many objective optimization. This research aims to develop a framework for surrogate assisted optimization for problems involving many objectives (typically more than four).

**Required Background:**
Good programming (Matlab, C/C++) and analytical skills, preferably with a Masters Degree in Engineering / Computer Science. Prior research experience in optimization is desirable but not necessary. Demonstrated competence in academic writing and oral presentation skills will be beneficial. Must meet UNSW admission criteria and English Language requirements.

**Expected joining:**
As soon as possible. Please send scanned copies of transcripts and CV to t.ray@adfa.edu.au

**For more information:**
About our Multi-disciplinary Design Optimization (MDO) group, please visit our website:
http://www.mdolab.net/index.html

About recent work in MaO field, refer to this repository:
http://www.mdolab.net/Resources/mao_repository_main.html