# Complexity Science mini-project: Evolution of Hospital Management Policies

**Background:** A hospital is a complex operation. Furthermore, it is necessary to quickly and dynamically react to external stochastic events such as the arrival of emergency patients. The ultimate goal of this project would be to identify action rules (policies) which, when applied e.g. for scheduling and patient admittance decisions, lead to good overall performance of the hospital. Several conflicting goals can play a role, e.g., high utilisation of resources, low cost, low patient waiting times, etc.

**Mini-project:** The goal of the project would be to evolve decision rule parameters similar to [1]. However, where [1] uses multiple optimisation runs to find different policies for different weighting of the criteria, in this project a multi-objective evolutionary algorithm shall be used that is capable of evolving the entire set of Pareto-optimal solutions. An evolutionary algorithm library is available. A simulation model may also be available, or might have to be constructed from scratch.

**PhD prospect:** There are many avenues to extend this to a PhD. Much more complex management policies could be devised, including the movement of beds, the sequencing of patients, or the consideration of different classes of patients. Forecasting and on-line learning are other interesting extensions.

**Deliverables:**

A multi-objective optimisation of policies for a hospital simulation model.

**Student’s requirements:**

Knowledge of simulation and/or genetic algorithms

**References:**

[1] Helm, Lapp, See: Characterizing an effective hospital admissions scheduling and control management system: A genetic algorithm approach. Winter Simulation Conference 2010, http://www.informs-sim.org/wsc10papers/219.pdf