**ABSTRACT**

The topic of evolutionary computation has seen increased attention in the last decade and for good reason. A perfect result to a problem is not always needed, instead an approximation is acceptable, the difference between the two being negligible in most cases. Evidently, given their non-deterministic nature, their answers are slightly different every time evolutionary algorithms are run and on the plus side, they are faster in performance than deterministic alternatives.

Estimation of distribution algorithms (EDA) are stochastic optimization techniques that explore the solution space by inducing an explicit probabilistic model, basing it on the most promising individuals in that particular generation. Other than EDA, 3 other algorithms are implemented: a classic genetic algorithm with mutation and crossover, simple hill climbing and simulated annealing. All of these 3 algorithms use an implicit probabilistic model, meaning that the individuals are sampled from the uniform distribution. Obviously, that implies more randomness, whereas in EDA, we change that model with each generation, resulting in more focused populations and faster convergence.

The benchmark functions were chosen to give diversity to the tests: De Jong (simple, sum of squared values, unimodal), Half Min (the optimal solution is the bit string of alternating 1s and 0s, with its fitness half of the length), Rastrigin (slightly trickier, highly multimodal, regularly distributed minima), Rosenbrock (hard convergence, the global optimum is inside a parabolic valley, almost flat), Royal Roads R1 (maximizable, the goal is finding a combination of blocks with maximum order, optimum bit string is ‘all ones’), Six-Hump Camel Back (has six local minima, of which two are global).

The results favor EDA, in each case performing better or at least as good as the other 3 algorithms. Also, the convergence to an acceptable solution takes considerably fewer generations, whilst the other algorithms were still trying, near the end, to reach the optimum found by EDA in the first quarter of its runtime.

***References***: Machine Learning, Genetic Algorithms, Probabilities and Statistics.