PRACTICAL 6: One-Variable Optimisation

Aim the practical:

  (i) Be able to download code (from Canvas) and run it for each search algorithm;

 (ii) Be able to understand the code and how the search algorithm works;

(iii) Be able to improve the code in each algorithm to run better;

(iv) Be able to determine if you have a good answer;

(iv) Be able to determine which algorithm works better.

Examples:

1. Find the best solution for

$$\text{maximise} \quad f(x) = -x^6 + 28x^5 - 307x^4 + 1660x^3 - 4564x^2 + 5872x + 2688$$
$$\text{s.t.} \quad 0 \le x \le 10$$

  (a) Perform a **Random Search** on this problem, using `RandomSearch1.txt`.

  (b) Perform a **hill-climb** on this problem, using `HillClimb1.txt`.

You should:

  (i) Run each algorithm, and determine which gives you a better (higher) value for f;

 (ii) Run each algorithm multiple times, e..g 10 times, and see which performs better;

(iii) Try to improve each algorithm, e.g. running them for longer (increasing *steps*) or doing multiple runs of each.

2. Repeat Question 1 for the problem below:

$$\text{max} \quad f(x) = \sin(x)\cos(6x)$$
$$\text{s.t.} \quad 0 \le x \le 10$$

`f=math.sin(x)*math.cos(6*x)`

3. Find the best solution for

$$\max \quad f(x) = \sin(e^x)\cos(6x)$$
$$\text{s.t.} \quad 3 \le x \le 5$$

   `f=math.sin(math.exp(x))*math.cos(6*x)`

4. Find the best solution for

$$\max \quad f(x) = \sin(5x^2) - \cos(5x)$$
$$\text{s.t.} \quad 0 \le x \le 5$$

   `f=math.sin(5*x**2)-math.cos(5*x)`

ADVANCED: Repeat the questions, but use:

1. a **Iterated Local Search (ILS)**, using `ILS1.txt`.

2. a **Simulated Annealing** search, using `SimAnneal1.txt`.