

IM39003

Assignment 2: Simulated Annealing

Due Date: Jan 27, 2022 Time: 5:30PM

Instructions:

- 1. Submit this assignment via MS teams by 5:30 PM by turn- in/hand-in*
- 2. You need to submit 2 files in zip file format: 1) Report 2) Code.*
- 3. In case of copying you will get a 0 grade for this assignment.*

Simulated Annealing- Pseudocode

Simulated Annealing Algorithm

Objective function $f(x)$, $x = (x_1, \dots, x_p)^T$
Initialize initial temperature T_0 and initial guess $x^{(0)}$
Set final temperature T_f and max number of iterations N
Define cooling schedule $T \mapsto \alpha T$, ($0 < \alpha < 1$)
while ($T > T_f$ and $n < N$)
 Move randomly to new locations: $x_{n+1} = x_n + \epsilon$ (random walk)
 Calculate $\Delta f = f_{n+1}(x_{n+1}) - f_n(x_n)$
 Accept the new solution if better
 if not improved
 Generate a random number r
 Accept if $p = \exp[-\Delta f/T] > r$
 end if
 Update the best x_* and f_*
 $n = n + 1$
end while

Activity 1: Understand the code.

Activity 2: $z = \frac{-5}{1+x_1^2+x_2^2} + \sin\left(\cot\left(e^{\frac{-5}{1+x_1^2+x_2^2}}\right)\right); -3 \leq x_1 \leq 3; -3 \leq x_2 \leq 3$

Activity 2.1: You need to add following piece of codes in the code provided to you: **[Code submission required]**

- A. Introduce three parameters:
max_rej = ; %Maximum Number of Rejections
max_accept = ; %Maximum Number of accepts at a temperature
initial_search= ; %Initial search period
- B. Stopping criteria for main program: T>T_min and j> max_rej
- C. Criteria for changing cooling schedule either (i>=max_run) or (accept>=max_accept)
- D. If total evaluation is less than initial_search then search around (as already given in the code). But, if total evaluation is greater than initial search do a local search that means around the point using some step size and generate a random number.

Activity 2.3: Find the optimal solution. While finding the optimal solution, you can report how following parameter affected you search using plots/tables. **[Submission required in report (pdf) format]**

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|-------------------------------|--------------------|
| A. Starting solution | [-3,3] or [-3, -3] |
| B. Initial_search | [100:100:600] |
| C. Cooling factor | [0.1:0.1:0.9] |
| D. max_accept | [10:10:100] |
| E. step size for local search | [0.1:0.1:0.9] |

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