The Traveling Salesperson

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CS 776 Evolutionary Computing

gitHub link: https://github.com/maithreyan-kr/EvolutionaryComputing/blob/main/TSP!.py

The Canonical Genetic Algorithm (CGA) typically consists of three fundamental operators: selection, crossover, and mutation. These operators are the core components of a genetic algorithm, forming the basis for the evolutionary process. Below explains the deviations from the canonical three-operator genetic algorithm for the crossover, mutation, and selection algorithms used in my CHC genetic algorithm code.

1. Selection Algorithm:

These methods are designed to favor individuals with higher fitness, increasing the likelihood that they are chosen to be parents for the next generation.

The CHC genetic algorithm in my code uses a Best Selection strategy, specifically tools.selBest, which selects the best individuals based on their fitness values. This deviation eliminates the stochastic nature of some canonical selection methods, ensuring that only the best-performing individuals are chosen as parents.

1. Crossover Algorithm:

The CHC genetic algorithm uses a custom crossover function based on Partially Mapped Crossover (PMX). PMX is a specialized crossover operator that aims to maintain the relative order of genes in the parents, with a focus on preserving building blocks of good solutions. This deviation from the canonical operators introduces a more problem-specific recombination strategy.

1. Mutation Algorithm:

The CHC genetic algorithm uses a custom mutation function based on swap mutation. Swap mutation randomly selects two genes and swaps their positions. This mutation operator is simplistic but effective in introducing variability in the population.

The CHC genetic algorithm in the provided code deviates from the canonical genetic algorithm in terms of its selection, crossover, and mutation operators. These deviations are designed to tailor the algorithm to the specific characteristics of the Traveling Salesman Problem (TSP), aiming to strike a balance between exploration and exploitation. The use of best selection, PMX crossover, and swap mutation reflects a problem-specific approach to optimize the search for optimal TSP solutions.

My code link :

1) Burma14

GA Parameters

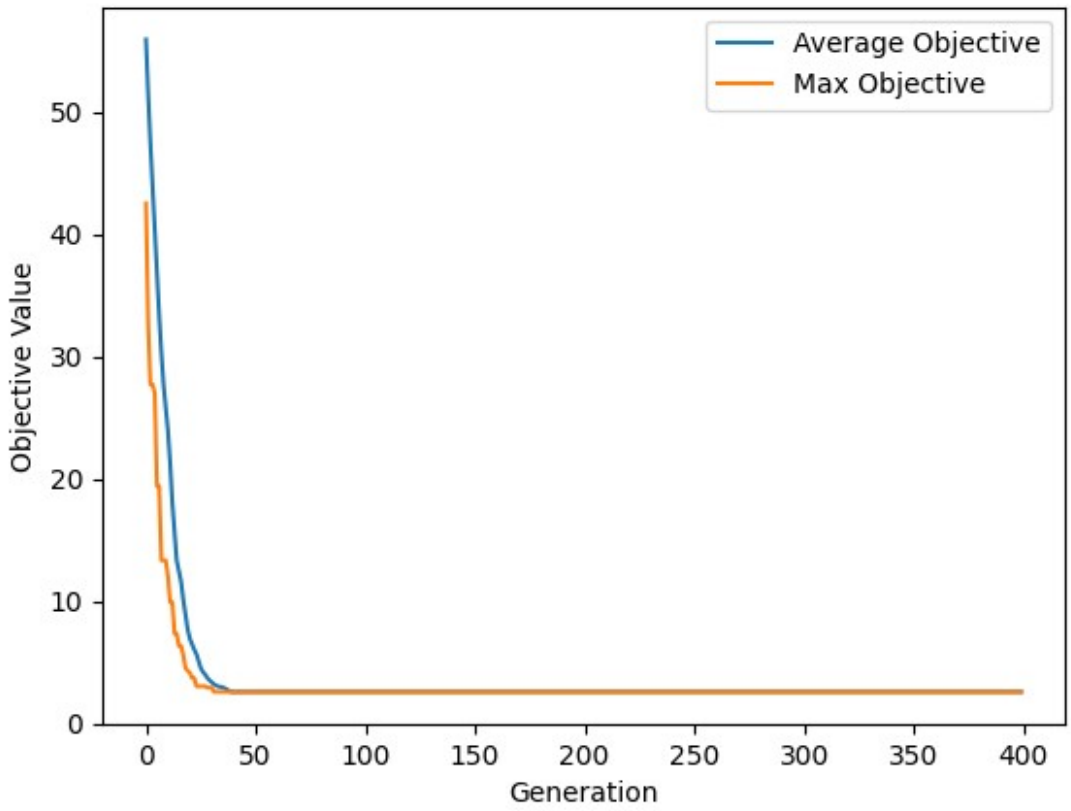
Chromosome Length	Population Size	Max Generation	Crossover Probability	Mutation Probablity
14	200	400	0.8	0.7

Best Result : 43.67

Speed : 2.7 seconds

Quality : 35%

Reliablity : 100%



2) Lin318

GA Parameters

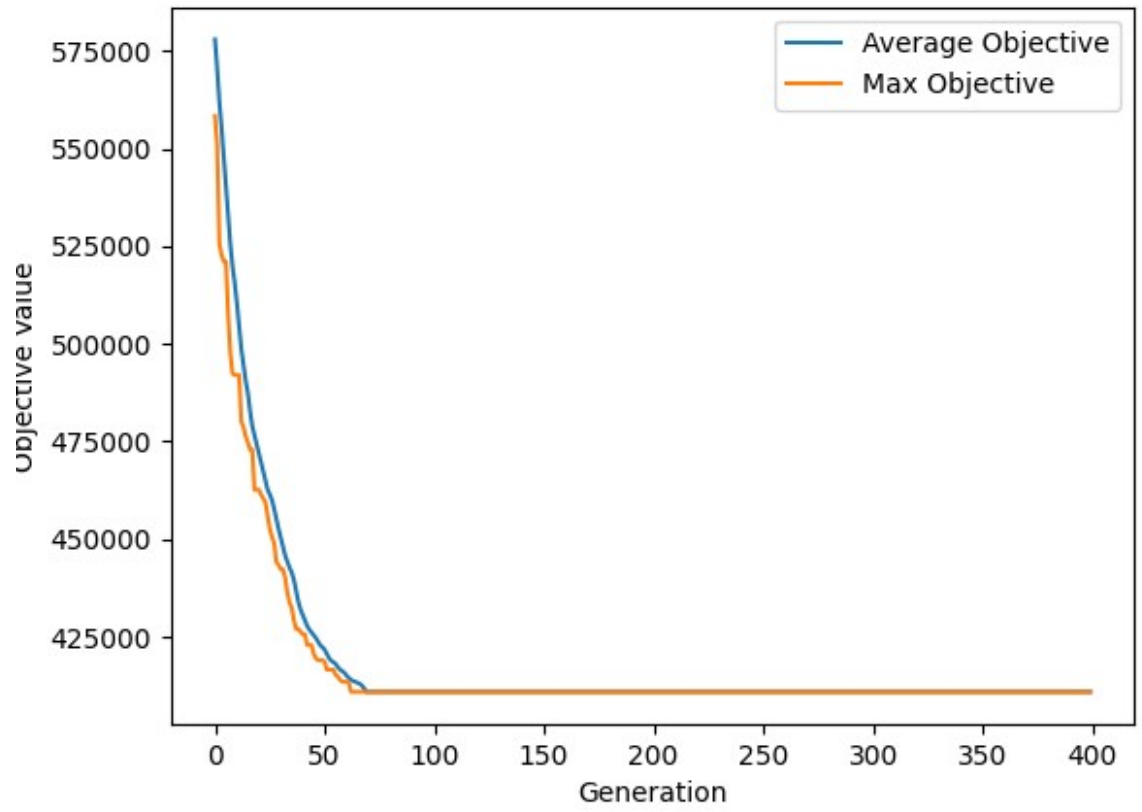
```
| Chromosome Length | Population Size | Max Generation | Crossover
Probability | Mutation Probablity |
|-------------------|
----------------|----------------|-----------------------|-----------
---------|
|        16         |       100       |      400       |
0.9         |          0.01          |
```

Best result lin318 : 410961.46

Speed : 23.7 seconds

Quality : 20%

Reliablity : 100%



3) Lin105

GA Parameters

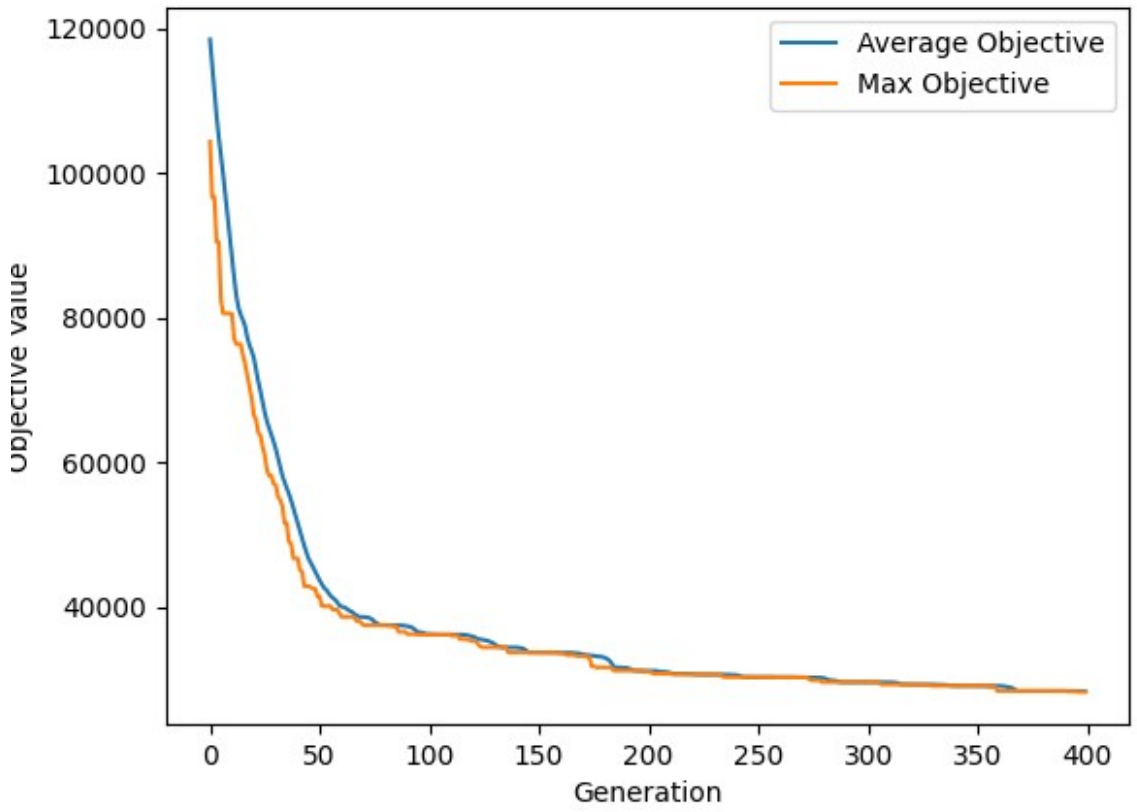
```
| Chromosome Length | Population Size | Max Generation | Crossover
Probability | Mutation Probablity |
|-------------------|
----------------|----------------|-----------------------|-----------
---------|
|        21         |       300       |      400       |
0.9         |          0.1          |
```

Best result lin105 : 28292.38

Speed : 21.5 seconds

Quality : 40%

Reliablity : 100%



4) Berlin52

GA Parameters

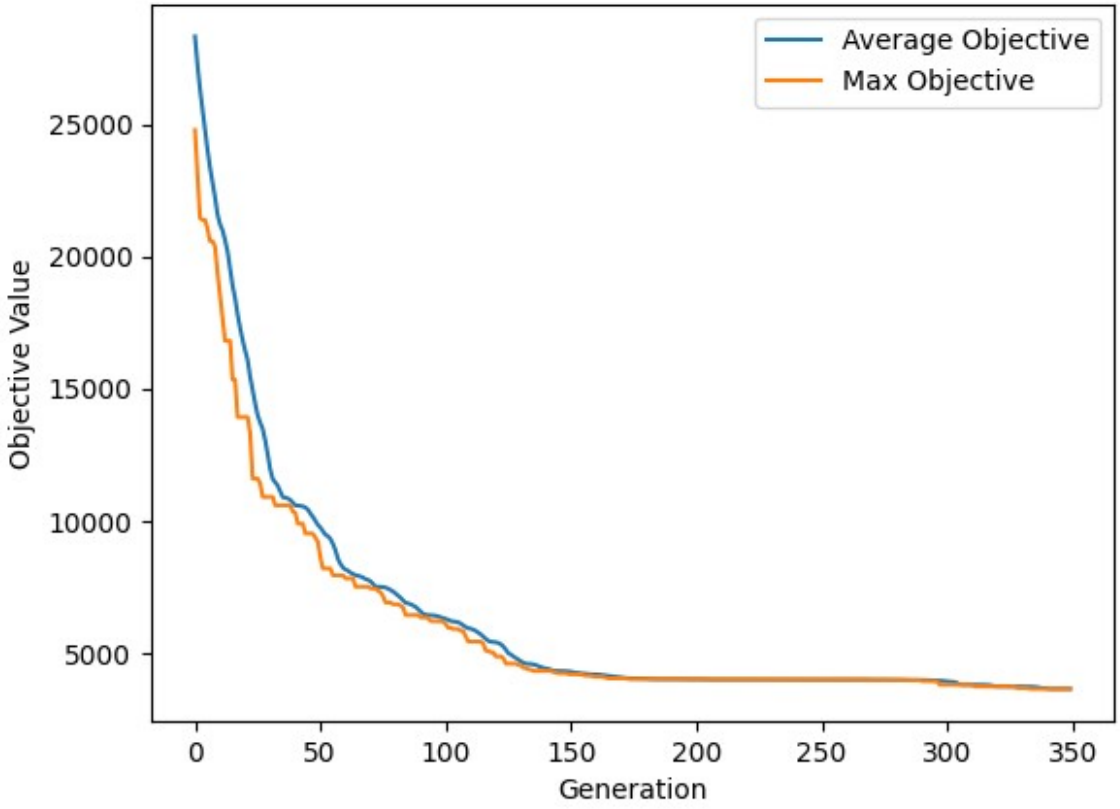
```
| Chromosome Length | Population Size | Max Generation | Crossover
Probability | Mutation Probablity |
|-------------------|
----------------|----------------|-----------------------|-----------
---------|
|        11         |       250       |      350       |
0.5         |          0.06          |
```

Best result berlin52 : 3656.39

Speed : 8.72 seconds

Quality : 35%

Reliablity : 100%



5) Eil51

GA Parameters

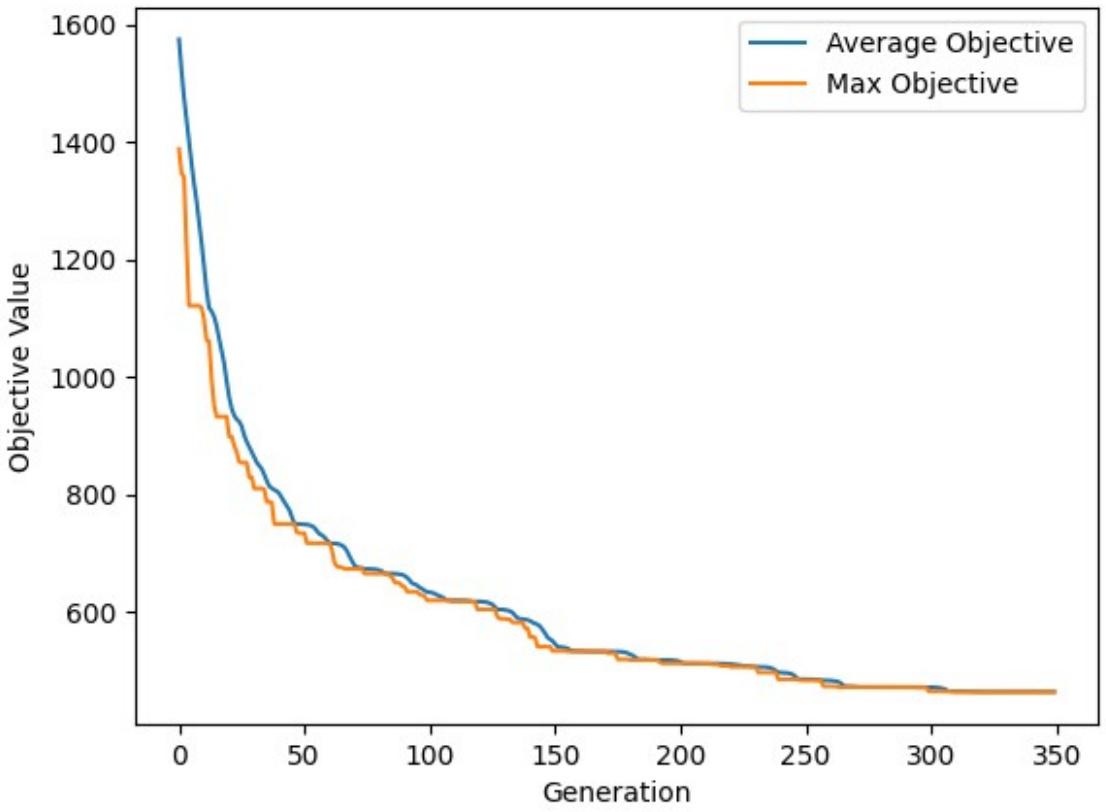
```
| Chromosome Length | Population Size | Max Generation | Crossover
Probability | Mutation Probablity |
|-------------------|
----------------|----------------|-----------------------|-----------
---------|
|        18         |       150       |      350       |
0.7         |          0.16          |
```

Best result eil51 : 463.24

Speed : 5.11 seconds

Quality : 45%

Reliablity : 100%



6) eil76

GA Parameters

```
| Chromosome Length | Population Size | Max Generation | Crossover
Probability | Mutation Probablity |
|-------------------|
----------------|----------------|-----------------------|-----------
---------|
|        24         |       200       |      375       |
1.2         |         0.43          |
```

Best result eil51 : 358.28

Speed : 10.9 seconds

Quality : 48%

Reliablity : 100%