Evolutionary Multi-Objective Optimization Algorithms

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Goal

To develop and implement a **new multi-objective evolutionary algorithm**, and compare it with **NSGA-2** (*Non-dominated Sorting Genetic Algorithm II)* & **EMOCA** (*Evolutionary Multi Objective Crowding Algorithm)*.

Progress Till Date

1. Understood the notion of an evolutionary algorithm. Under EA literature, studied a plain genetic algorithm structure. Implemented a **"Single-Objective Genetic Algorithm"** on the *Travelling Salesman Problem (TSP)* to get an idea of the working of a GA. Compared the performance using different selection operators.

2. Studied an existing elitist evolutionary algorithm, particularly **Non-dominated Sorting Genetic Algorithm-2** (NSGA-2).

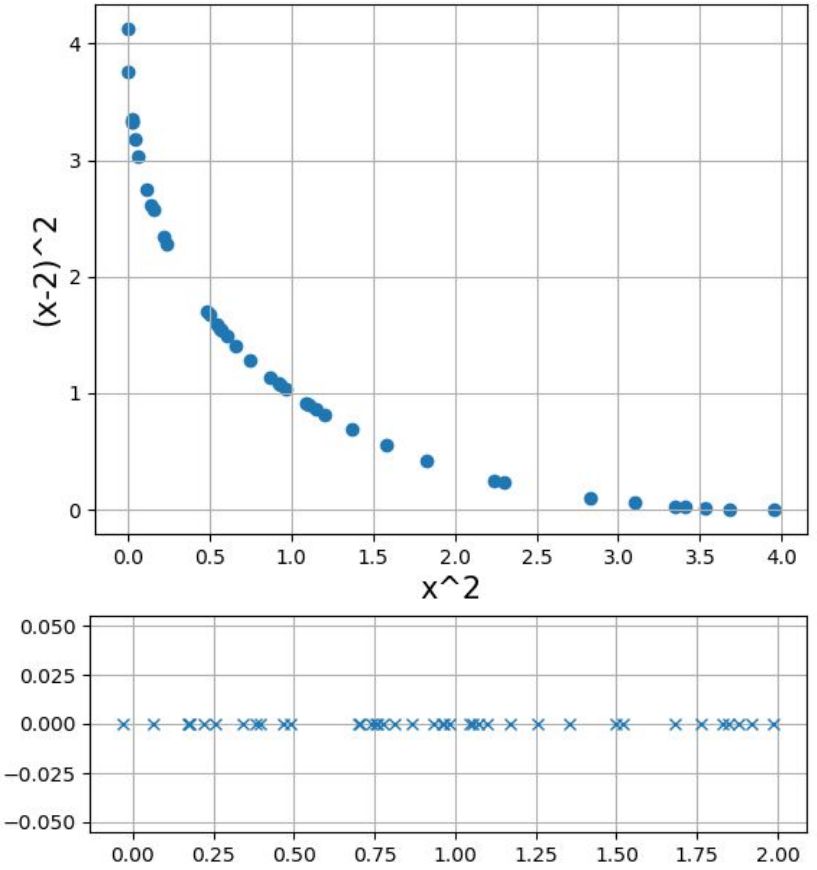
   Implemented the **NSGA-2** in Python 3 on a Multi-Objective Optimization Problem (*considering diversity only in **"objective space"***).

Successful NSGA-2 Implementation

Tested on following Two-Objective Problem :-

$\min x^2$
$\min (x-2)^2$

Result : Obtained a *diverse pareto-front*



Population size = 40 , evolved for 1000 generations

Progress Till Date (continued)

3

Formulated some improvement ideas, like, considering diversity of solutions in both, "***data space***" and "***objective space***" simultaneously.

I am currently working on modification of the existing NSGA-2 , taking into consideration the diversity in "***data space***" along with "***objective space***".

Future Plan

Formulate more improvement ideas on NSGA-2

Eg:- Using an "***Archive***" to store elite individuals, etc.

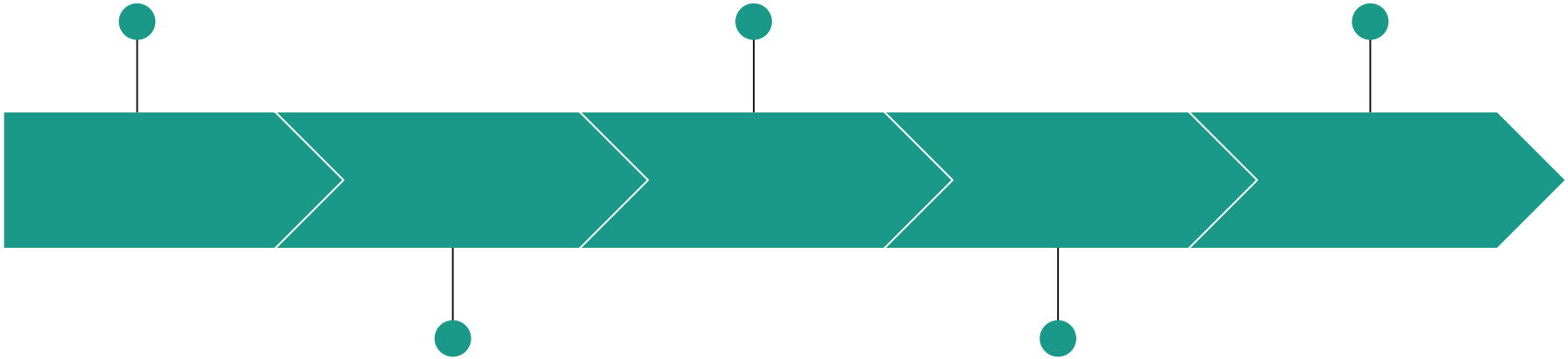
Implement improvements in the existing NSGA-2.

Test on small and large problems.

Study and implement another EA, namely EMOCA

Implement the formulated improvement ideas on EMOCA.
Test on small/large problems

Refine algorithm design and finally, compare with EMOCA and NSGA-2



I hope to bring nice results under the able guidance of my advisor.

Thank you !