Comparison of Ant-Colony and Genetic Algorithm

In contrast with the GA implementation, ACO is much easier.

It also helps that the ants are randomly placed in different areas of the map and allowed to make a 'guided' initial tour. This makes the initial values much lower as compared in the case of GA where initial costs are very high.

GA depends on the initial path representation given to it, whereas in ACO, ants find a better initial path depending on probability to choose an edge (inversely proportional to distance). Initially there is no pheromone on any edge.

ACO is faster but doesn't necessarily give minimum final distance between cities.

#1
Coordinates:
[(109,161), (187,142), (146,152), (99,62), (184,153), (117,88), (5,88), (161,58), (26,56), (179,104), (108,39), (191,12), (62,87), (174,74), (170,148), (116,104), (91,22), (12,152), (2,7), (35,41)]
Initial distance: 1659.4759512217443

	Time elapsed in seconds	Final distance
GA	2.4589591026306152	860.1902954113216
ACO	0.06599831581115723	890.89

#2
[(106,101), (98,26), (88,8), (32,11), (111,29), (180,166), (29,196), (182,156), (42,121), (30,96), (101,156), (98,56), (198,158), (53,118), (58,84), (124,22), (193,80), (89,105), (3,179), (74,197)]
Initial distance: 1777.4185844875765

	Time elapsed in seconds	Final distance
GA	2.27998948097229	849.3156488729584
ACO	0.07599854469299316	901.05

#3
[(46,186), (63,90), (77,40), (68,148), (117,53), (122,183), (86,68), (123,75), (67,87), (153,178), (138,11), (24,76), (66,41), (113,199), (126,35), (198,106), (40,146), (52,22), (16,144), (174,106)]
Initial distance: 1545.3611282649356

	Time elapsed in seconds	Final distance
GA	2.293897867202759	744.9539745645877
ACO	0.08399558067321777	777.2

Further Steps:
- Exploring more crossover operators for GA like cycle crossover etc.
- Optimising ACO using elitist and max-min strategies

References:

- Ant Colony versus Genetic Algorithm based on Travelling Salesman Problem (https://www.researchgate.net/publication/264704807)
- Solving the Travelling Salesman Problem Using the Ant Colony Optimization (https://www.researchgate.net/publication/264855262)
- Genetic Algorithm for Traveling Salesman Problem with Modified Cycle Crossover Operator (https://doi.org/10.1155/2017/7430125)