ECEN 4493 AI in Engineering
Spring 2023

Homework Assignment #2

Statement of Academic Honesty:

For this homework, I make the following truthful statements:

- I have not received, I have not given, nor will I give or receive, any assistance to another student taking this quiz.
- I will not plagiarize someone else's work and turn it in as my own.
- I understand that acts of academic dishonesty may be penalized to the full extent allowed by the University Student Conduct Code, including receiving a failing grade (F!) for the course. I recognize that I am responsible for understanding the provisions of the University Student Conduct Code as they relate to this academic exercise.

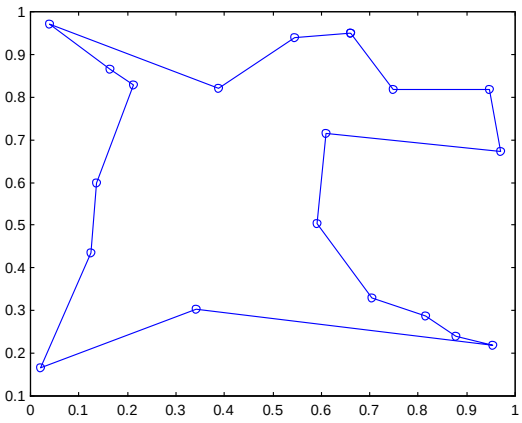
_____

Your Signature

Problem 1: Develop a simulated annealing algorithm in any language of your preferance to solve the traveling salesman problem with 20 cities that are uniformly distributed within a unit square in a 2-dimensional plane. The coordinates of 20 cities are given below in a 2×20 matrix:

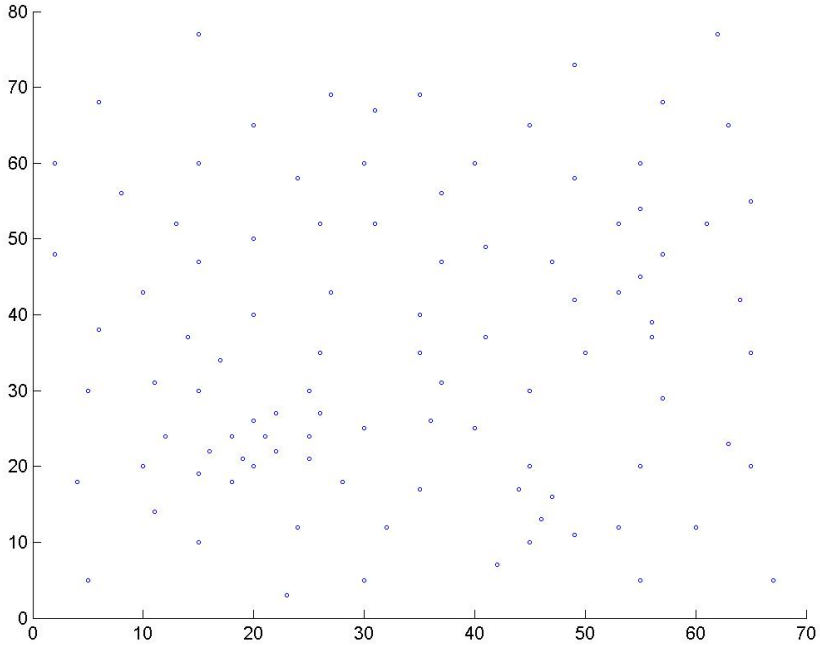
$$\text{cities} = \begin{bmatrix} 0.6606,0.9695,0.5906,0.2124,0.0398,0.1367,0.9536,0.6091,0.8767,0.8148 \\ 0.9500,0.6740,0.5029,0.8274,0.9697,0.5979,0.2184,0.7148,0.2395,0.2867 \\ 0.3876,0.7041,0.0213,0.3429,0.7471,0.5449,0.9464,0.1247,0.1636,0.8668 \\ 0.8200,0.3296,0.1649,0.3025,0.8192,0.9392,0.8191,0.4351,0.8646,0.6768 \end{bmatrix}.$$

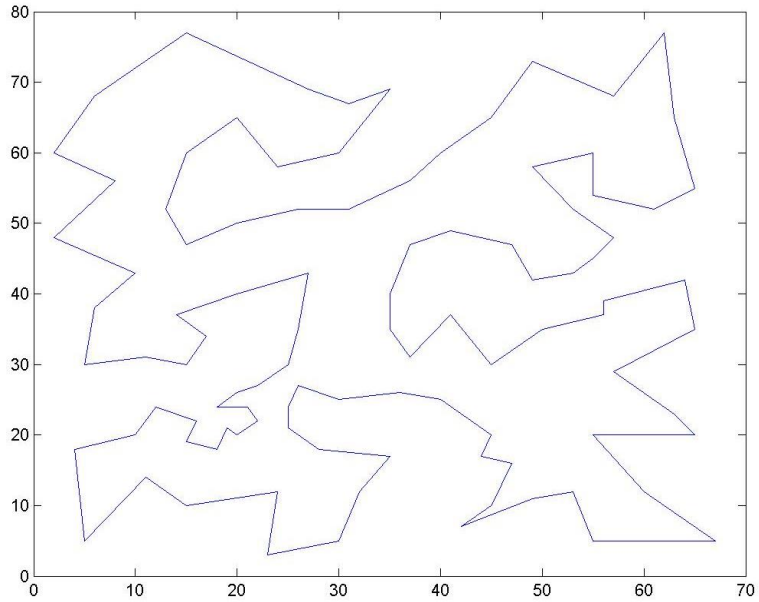
Show the "best" route you can find and the associated distance with attached computer coding (with *comment to add understanding*). An example is given below for reference.



Problem 2: Extend your simulated annealing algorithm to solve the benchmark 101-city symmetric TSP problem (i.e., eil101 due to Christofides and Eilson) as coordinates listed below. Symmetric TSP problem is defined as given a set of *n* cities and diatnaces for each pair of cities, find a roundtrip of minimal total length visiting each node exactly once and return to its origin city. In this case, the distance from city *i* to city *j* and the distance from city *j* to city *i* are exactly the same. No need to turn in the codes. Only the best route found (i.e., its configuration and distance in the form of above fogure) is to be turned in. This problem is to test if your algorithm can scale up slightly.

1	41	49	**2**	35	17	**3**	55	45	**4**	55	20	**5**	15	30
6	25	30	**7**	20	50	**8**	10	43	**9**	55	60	**10**	30	60
11	20	65	**12**	50	35	**13**	30	25	**14**	15	10	**15**	30	5
16	10	20	**17**	5	30	**18**	20	40	**19**	15	60	**20**	45	65
21	45	20	**22**	45	10	**23**	55	5	**24**	65	35	**25**	65	20
26	45	30	**27**	35	40	**28**	41	37	**29**	64	42	**30**	40	60
31	31	52	**32**	35	69	**33**	53	52	**34**	65	55	**35**	63	65
36	2	60	**37**	20	20	**38**	5	5	**39**	60	12	**40**	40	25
41	42	7	**42**	24	12	**43**	23	3	**44**	11	14	**45**	6	38
46	2	48	**47**	8	56	**48**	13	52	**49**	6	68	**50**	47	47
51	49	58	**52**	27	43	**53**	37	31	**54**	57	29	**55**	63	23
56	53	12	**57**	32	12	**58**	36	26	**59**	21	24	**60**	17	34
61	12	24	**62**	24	58	**63**	27	69	**64**	15	77	**65**	62	77
66	49	73	**67**	67	5	**68**	56	39	**69**	37	47	**70**	37	56
71	57	68	**72**	47	16	**73**	44	17	**74**	46	13	**75**	49	11
76	49	42	**77**	53	43	**78**	61	52	**79**	57	48	**80**	56	37
81	55	54	**82**	15	47	**83**	14	37	**84**	11	31	**85**	16	22
86	4	18	**87**	28	18	**88**	26	52	**89**	26	35	**90**	31	67
91	15	19	**92**	22	22	**93**	18	24	**94**	26	27	**95**	25	24
96	22	27	**97**	25	21	**98**	19	21	**99**	20	26	**100**	18	18
101	35	35												





Problem 3: Based upon your experience gained, please comment on the potential problematic issues that you have observed or have read from literature survey. Please provide sufficient argument to justify your arguments.

Please submit your work, including all reference materials and citations, in a single standalone PDF file to be submitted through ***Canvas Assignments***, folder, "4493-homework2-Spring23 (assign 2-13-23, due 2-27-23)" by the deadline, February 27, 2023, 11:59pm.