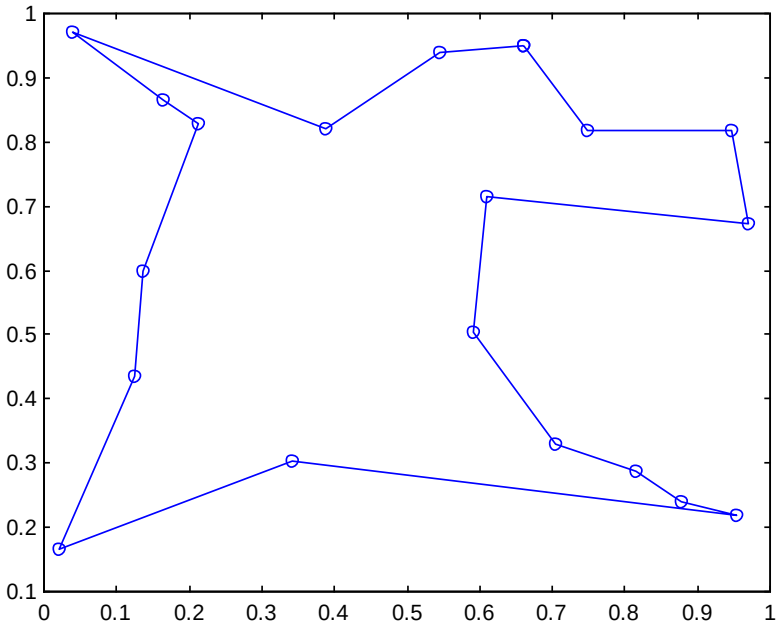
ECEN/MAE 5773
Evolutionary Computation
Fall 2020
Homework Assignment #2

Problem 1: Develop a generic simulated annealing algorithm 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 find and the associated distance with attached computer coding (with *documentation*). An example is given below for reference.

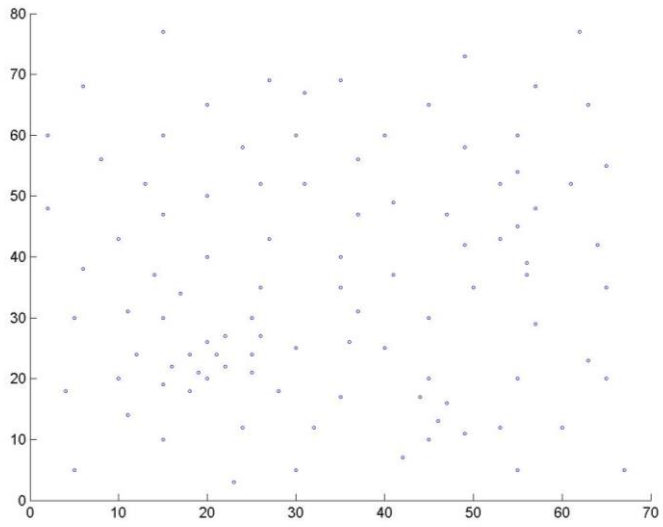


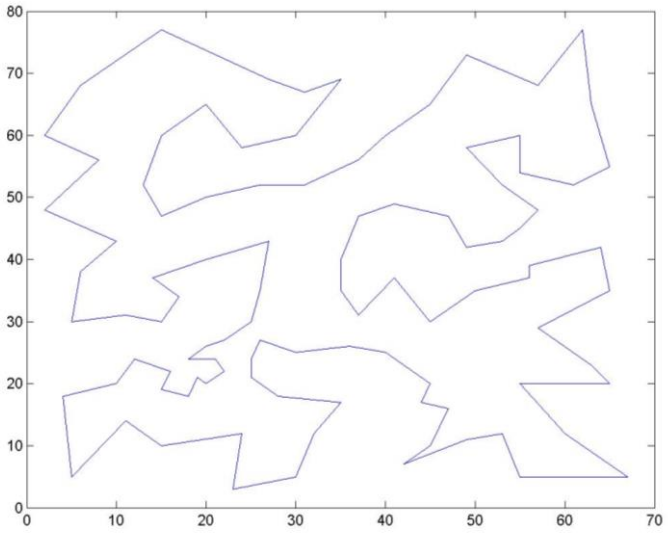
Problem 2: Extend your simulated annealing algorithm to solve the benchmark 101-city symmetric TSP problem (i.e., eil101 due to Christofides and Eilson). Symmetric TSP problem is defined as given a set of *n* cities and diatnaces for each pair of cities, find a roundtrip of minimal total length visiting 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. The benchmark problem can be found from TSPLIB archive at

http://www.iwr.uni-heidelberg.de/groups/comopt/software/TSPLIB95/

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 properly.

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: Extend your simulated annealing algorithm to solve the benchmark 17-city asymmetric TSP problem (i.e., br17 due to Repetto). Asymmetric 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. In this case, the distance from city *i* to city *j* and the distance from city *j* to city *i* may be different. The benchmark problem can be found from TSPLIB archive. Program is no need to be included in the handout. Only the best route found (i.e., its configuration and distance in the form of above fogure) is to be turned in.

9999	3	5	48	48	8	8	5	5	3	3	0	3	5	8	8	5
3	9999	3	48	48	8	8	5	5	0	0	3	0	3	8	8	5
5	3	9999	72	72	48	48	24	24	3	3	5	3	0	48	48	24
48	48	74	9999	0	6	6	12	12	48	48	48	48	74	6	6	12
48	48	74	0	9999	6	6	12	12	48	48	48	48	74	6	6	12
8	8	50	6	6	9999	0	8	8	8	8	8	8	50	0	0	8
8	8	50	6	6	0	9999	8	8	8	8	8	8	50	0	0	8
5	5	26	12	12	8	8	9999	0	5	5	5	5	26	8	8	0
5	5	26	12	12	8	8	0	9999	5	5	5	5	26	8	8	0
3	0	3	48	48	8	8	5	5	9999	0	3	0	3	8	8	5
3	0	3	48	48	8	8	5	5	0	9999	3	0	3	8	8	5
0	3	5	48	48	8	8	5	5	3	3	9999	3	5	8	8	5
3	0	3	48	48	8	8	5	5	0	0	3	9999	3	8	8	5
5	3	0	72	72	48	48	24	24	3	3	5	3	9999	48	48	24
8	8	50	6	6	0	0	8	8	8	8	8	8	50	9999	0	8
8	8	50	6	6	0	0	8	8	8	8	8	8	50	0	9999	8
5	5	26	12	12	8	8	0	0	5	5	5	5	26	8	8	9999

Problem 4: 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 points.

Problem 5: In respond to one of deficiencies listed, please contrive possible solution to the problem identified. Just DO YOUR BEST… Again, please provide sufficient argument to substantiate your arguments made.