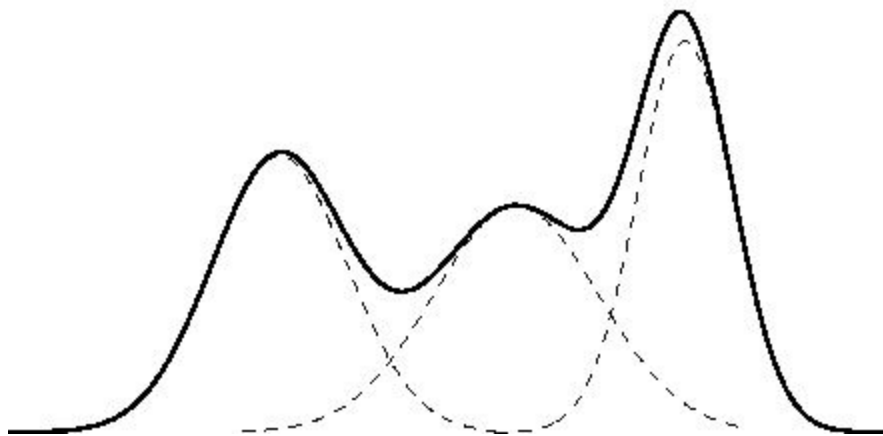


Sum of Gaussians Optimization with Hill Climbing and Simulated Annealing

The Sum of Gaussians function, seen below in Fig 1, is a function which generates a number of Gaussian distributions and adds them together to create a new function. This function acts like terrain for an optimization algorithm analogous to the board states in the first lab where we had A* solve boards. This time we had the Hill Climbing algorithm and the Simulated Annealing algorithms which we used to find the largest value in the function.

Fig 1. The Sum of Gaussians function generates a number of Gaussian distributions and adds them together to create a new function.



In addition to having a highest value the Sum of Gaussians function also has a certain number of dimensions and the number of centers or individual Gaussian distributions which are then combined. By changing these variables the max value and the shape of the graph changes, becoming more hilly as more distributions are added. The algorithms we used to find the max value of the function: Hill Climbing and Simulated Annealing go about doing so in completely different ways.

Hill Climbing also known as Greedy Local Search or Gradient Ascent works by moving in the direction of the Gradient or the derivatives of each of the dimensions. This means that the search is always moving upward as the derivative will tell the places where the function is moving up. In theory this algorithm can get stuck in local minima or places where there is a hill, but that is below the max value overall like a hill

next to a mountain. In practice, I did not encounter this problem, in fact Hill Climbing outperformed the other algorithm Simulated Annealing by winning 395 times to Simulated Annealing which won 243 times.

Simulated Annealing was the second algorithm we used. This algorithm looks at a random nearby neighbor and if it is greater it moves to that location. If it is less or equal it moves with a probability called the Metropolis Criterion that is it moves to that location with a probability: $e^{((G(Y)-G(X))/T)}$ for points X and Y where T is the temperature.

The temperature is what determines whether or not Simulated Annealing takes a move or stays put. For my project I decided to use a starting temperature of 10,000 and decrease it by 1 each iteration. I settled on this due to wanting to have a high starting temperature and wanting to decrease it steadily over time.

Looking at the data, Simulated Annealing wins in the lower dimensions such as 1, except in the case with 1000 Gaussians. It also wins in the 2 dimensional cases. By the time we get to the 3 dimensional cases, however Hill Climbing starts to win more often than not. With an exception at 3-100 in which Simulated Annealing wins. However, in 3-1000 Hill Climbing wins handily with 50 to 7. Simulated Annealing again wins at 4-10, but just barely. Again at 4-100 Hill Climbing wins with a landslide 71 to 11. This continues at 4-1000. Once again, at 5-10 Simulated Annealing wins, but loses at all the rest of the 5 dimensional cases.

This data shows some interesting trends. Firstly, Simulated Annealing tends to win at either low dimensions or low number of Gaussians and Hill Climbing tends to win in all other cases. Secondly, with the astounding number of wins for Hill Climbing it is definitely not getting stuck on local maxima at least not enough to count for much. This means that in this project Hill Climbing is performing at least as good as expected if not better.

Throughout this project I've worked on various optimization algorithms namely: Hill Climbing and Simulated Annealing and have seen first-hand the ways in which they perform under various conditions. One issue that I have with this approach is there is no way to tell if Hill Climbing ever got stuck in local maxima. Looking through some of the wins for Simulated Annealing definitely might be due to this factor, but without further study we can't really make a definitive conclusion one way or the other. However, we did learn that Hill Climbing is a good choice for this problem as it tends to maximize better.

Sources Cited:

Figure 1 is from the site:

<https://prateekvjoshi.com/2013/06/29/gaussian-mixture-models/>

Times Greedy Won	395
Times SA Won	243

1-10					
Greedy V	Simulated Annealing V	Simulated Annealing - Greedy			
2.618097	2.618097	0			
3.407177	3.407177	0		Times SA Won	26
3.304755	3.304755	0		Times Greedy Won	0
4.788089	4.788089	0			
3.583709	3.583709	0			
2.201585	2.201585	0			
3.155992	3.155992	0			
4.633725	4.633726	0.000001			
2.108583	2.108583	0			
2.259296	2.259296	0			
4.107652	4.107652	0			
2.019213	2.019213	0			
2.016749	2.016749	0			
2.031072	2.031072	0			
1.041673	1.041673	0			
2.983009	2.983009	0			
1.923384	1.923385	0.0000009999999999			
1.931054	1.931054	0			
1.607847	1.607848	0.0000009999999999			
1.016569	1.016569	0			
2.67746	2.67746	0			
3.15132	3.151321	0.0000009999999997			
1.105528	1.105529	0.0000009999999999			
2.014202	2.014202	0			
4.072062	4.072062	0			
3.032989	3.032989	0			
3.754367	3.754367	0			
3.958182	3.958182	0			
2.885324	2.885324	0			
2.847444	2.847445	0.000001			

3.406057	3.406057	0			
1.000656	1.000656	0			
3.872692	3.872692	0			
3.079866	3.079866	0			
2.28787	2.28787	0			
2.334826	2.334826	0			
3.067362	3.067362	0			
3.883714	3.883714	0			
2.36831	2.36831	0			
2.206332	2.206333	0.0000009999999997			
3.026658	3.026659	0.000001			
3.367064	3.367064	0			
1.00622	1.006221	0.000001			
1.021325	1.021326	0.0000009999999999			
1.857413	1.857413	0			
1.735759	1.73576	0.0000009999999999			
4.004649	4.004649	0			
2.944427	2.944427	0			
1.040299	1.040299	0			
2.069999	2.069999	0			
4.255605	4.255605	0			
1.202403	1.202404	0.0000009999999999			
3.404242	3.404242	0			
3.376213	3.376213	0			
1.988444	1.988444	0			
2.275347	2.275347	0			
2.099778	2.099778	0			
2.114974	2.114974	0			
1.994024	1.994024	0			
3.678157	3.678157	0			
2.410005	2.410006	0.000001			

3.816608	3.816608	0			
3.63425	3.63425	0			
2.059378	2.059378	0			
2.4982	2.498201	0.0000009999999997			
2.676614	2.676614	0			
3.303964	3.303964	0			
1.940066	1.940067	0.0000009999999999			
1.001013	1.001013	0			
1.026748	1.026748	0			
3.734839	3.734839	0			
2.580161	2.580162	0.000001			
2.253416	2.253416	0			
2.815874	2.815876	0.000002			
4.307304	4.307305	0.000001			
2.062935	2.062935	0			
2.127972	2.127973	0.0000009999999997			
2.356677	2.356678	0.000001			
3.589228	3.589228	0			
1.877701	1.877701	0			
3.510787	3.510788	0.0000009999999997			
2.209623	2.209623	0			
2.029581	2.029582	0.000001			
1.450665	1.450665	0			
1.999204	1.999204	0			
2.799502	2.799503	0.000001			
3.75583	3.75583	0			
2.730787	2.730787	0			
2.465637	2.465637	0			
2.70933	2.70933	0			
4.71391	4.71391	0			
2.728867	2.728868	0.0000009999999997			

2.079709	2.079709	0			
2.98162	2.98162	0			
2.526019	2.526019	0			
3.038097	3.038097	0			
3.918481	3.918482	0.000001			
3.005812	3.005812	0			
3.502268	3.502268	0			
3.55805	3.558051	0.0000009999999997			

1-100					
Greedy V	Simulated Annealing V	Simulated Annealing - Greedy			
18.599938	18.599938	0			
21.662086	21.662086	0		Times SA Won	7
15.846085	15.846085	0		Times Greedy Won	1
23.31546	23.31546	0			
24.285526	24.285526	0			
21.895093	21.895093	0			
22.400903	22.400903	0			
15.777193	15.777193	0			
18.670401	18.670401	0			
14.898817	14.898818	0.0000010000000001			
24.138776	24.138776	0			
21.956269	21.956269	0			
20.541918	20.541918	0			
21.762876	21.762877	0.0000010000000001			
16.464808	16.464808	0			
17.867556	17.867556	0			
20.71485	20.71485	0			
25.354901	25.354901	0			
18.3644	18.3644	0			
22.706499	22.706499	0			
21.347343	21.347343	0			
20.991182	20.991182	0			
23.181001	23.181001	0			
24.160211	24.160211	0			
19.366333	19.366333	0			
21.201983	21.201983	0			
23.268087	23.268087	0			
22.397912	22.397912	0			
21.514617	21.514617	0			
18.641465	18.641466	0.0000010000000001			

16.409028	16.409028	0			
17.767305	17.767305	0			
22.865445	22.865445	0			
18.137486	18.137486	0			
18.23769	18.23769	0			
23.573018	23.573018	0			
18.342478	18.342478	0			
24.108696	24.108697	0.000001000000001			
11.526296	11.526296	0			
17.169287	17.169287	0			
14.082722	14.082722	0			
22.078724	22.078724	0			
19.035433	19.035433	0			
21.435659	21.435659	0			
18.345973	18.345973	0			
20.110404	20.110404	0			
17.053106	17.053106	0			
17.155716	17.155716	0			
20.810254	20.810254	0			
20.86582	20.86582	0			
20.370658	20.370658	0			
20.034646	20.034646	0			
20.050551	20.050551	0			
14.9357	14.9357	0			
21.627507	21.627507	0			
23.193273	23.193273	0			
16.595642	16.595642	0			
19.165462	19.165462	0			
19.809898	19.809898	0			
18.119299	18.119299	0			
19.808079	19.808079	0			

20.442074	20.442074	0			
16.240054	16.240054	0			
24.690844	24.690844	0			
19.692339	19.692339	0			
14.292352	14.292352	0			
25.062755	25.062755	0			
18.458493	18.458494	0.000001000000001			
16.063114	16.063114	0			
20.161189	20.161189	0			
23.345035	23.345035	0			
17.493543	17.493543	0			
21.999249	21.999249	0			
16.938616	16.938616	0			
20.268527	20.268528	0.000001000000001			
21.682581	21.682581	0			
21.787039	21.787039	0			
15.459305	15.459305	0			
18.583217	18.583217	0			
20.335323	20.335323	0			
20.893786	20.893786	0			
20.103604	20.103603	-0.000001000000001			
17.748938	17.748938	0			
24.382122	24.382122	0			
18.256954	18.256954	0			
19.384654	19.384654	0			
15.00666	15.00666	0			
24.337109	24.33711	0.0000009999999975			
16.745555	16.745555	0			
22.149719	22.149719	0			
22.463869	22.463869	0			
21.822728	21.822728	0			

24.909959	24.909959	0			
21.918833	21.918833	0			
25.272711	25.272711	0			
20.708649	20.708649	0			
17.03787	17.03787	0			
22.887652	22.887652	0			
20.126863	20.126863	0			
25.651325	25.651325	0			

1-1000					
Greedy V	Simulated Annealing V	Simulated Annealing - Greedy			
201.270059	201.270059	0			
192.538092	192.538092	0		Times SA Won	0
177.142288	177.142288	0		Times Greedy Won	2
193.608054	193.608054	0			
180.80265	180.80265	0			
179.449312	179.449312	0			
167.444858	167.444858	0			
183.508928	183.508928	0			
190.647836	190.647836	0			
181.457039	181.457039	0			
180.882111	180.882111	0			
178.498892	178.498891	-0.000001000000026			
175.588981	175.588981	0			
199.999852	199.999852	0			
188.806594	188.806594	0			
195.816524	195.816524	0			
185.631877	185.631877	0			
170.832498	170.832498	0			
186.050086	186.050086	0			
183.138901	183.138901	0			
183.648946	183.648946	0			
190.683804	190.683804	0			
188.222784	188.222784	0			
186.109816	186.109816	0			
194.299012	194.299012	0			
182.070969	182.070969	0			
179.398728	179.398728	0			
174.06293	174.06293	0			
184.226044	184.226044	0			
199.018407	199.018407	0			

186.601896	186.601896	0			
191.339361	191.339361	0			
173.573898	173.573898	0			
182.058251	182.058251	0			
176.501536	176.501536	0			
176.229333	176.229333	0			
185.146856	185.146856	0			
173.248265	173.248265	0			
186.683611	186.683611	0			
182.310886	182.310886	0			
172.222945	172.222945	0			
191.823453	191.823453	0			
200.352387	200.352387	0			
182.87334	182.87334	0			
193.554743	193.554743	0			
189.745514	189.745514	0			
175.476397	175.476397	0			
185.40047	185.40047	0			
178.178859	178.178859	0			
200.676651	200.676651	0			
185.85479	185.85479	0			
187.169709	187.169709	0			
176.841816	176.841816	0			
174.125629	174.125629	0			
208.528036	208.528036	0			
179.039049	179.039049	0			
186.518161	186.518161	0			
173.805848	173.805847	-0.0000009999999975			
182.805563	182.805563	0			
186.088057	186.088057	0			
174.278319	174.278319	0			

182.854717	182.854717	0			
185.706131	185.706131	0			
181.629477	181.629477	0			
161.096773	161.096773	0			
187.074536	187.074536	0			
195.385067	195.385067	0			
181.310812	181.310812	0			
195.179974	195.179974	0			
200.449893	200.449893	0			
194.352558	194.352558	0			
184.996301	184.996301	0			
188.12893	188.12893	0			
170.102284	170.102284	0			
184.397187	184.397187	0			
186.215565	186.215565	0			
173.446371	173.446371	0			
187.333849	187.333849	0			
172.296362	172.296362	0			
178.901407	178.901407	0			
193.31501	193.31501	0			
198.209552	198.209552	0			
186.055141	186.055141	0			
173.434714	173.434714	0			
184.671639	184.671639	0			
180.007557	180.007557	0			
187.715565	187.715565	0			
193.958443	193.958443	0			
159.292672	159.292672	0			
175.936426	175.936426	0			
194.928605	194.928605	0			
167.163089	167.163089	0			

203.655219	203.655219	0			
196.763539	196.763539	0			
203.92934	203.92934	0			
188.82349	188.82349	0			
184.931294	184.931294	0			
186.976666	186.976666	0			
200.945259	200.945259	0			
190.962801	190.962801	0			

2-10					
Greedy V	Simulated Annealing V	Simulated Annealing - Greedy			
0	0	0			
1.01851	1.01851	0		Times SA Won	39
1.947374	1.947374	0		Times Greedy Won	4
2.532232	2.532232	0			
1.035238	1.035238	0			
1.007093	1.007093	0			
1.843325	1.843325	0			
1.000005	1.000005	0			
1.001571	1.001571	0			
0.000055	1	0.999945			
1.823696	1.823696	0			
1.137869	1.137869	0			
1	1	0			
1.002303	1.002303	0			
0.000008	0.000009	0.000001			
1.037637	1.037637	0			
1.005872	1.005872	0			
1.406363	1.406364	0.0000009999999999			
1.004034	1.004035	0.0000009999999999			
1.113006	1.113007	0.000001			
0	0	0			
1.066007	1.001644	-0.064363			
1.000001	1.000002	0.000001			
1.243203	1.243203	0			
1.742653	1.742653	0			
1.02351	1.02351	0			
0.000074	2.202197	2.202123			
1	1.000001	0.0000009999999999			
1.02889	1.02889	0			
1.514354	1.514355	0.0000009999999999			

1.106499	1.1065	0.000001			
1.755826	1.755826	0			
1.057162	1.057162	0			
1.012675	1.012676	0.0000009999999999			
1.271181	1.271183	0.000002			
1.916041	1.916042	0.0000009999999999			
1.831669	1.831669	0			
0.000055	1.000235	1.00018			
0.000046	0.000046	0			
1.002033	1.002033	0			
1.227633	1.227641	0.000008			
0.000003	0.000005	0.000002			
1.004257	1.004257	0			
1.000014	1.000014	0			
1.044936	1.044937	0.0000009999999999			
1.183205	1.183207	0.000002			
1.077247	1.077247	0			
1.000617	1.000617	0			
1.006168	1.006169	0.000001			
0.000061	1.008858	1.008797			
1.033185	1.033185	0			
1.007363	1.007363	0			
1.110668	1.110669	0.0000009999999999			
1	0.999999	-0.000001			
1.000015	1.000016	0.0000009999999999			
1.002596	1.002596	0			
0.000043	2.010878	2.010835			
0	0	0			
2.029379	2.029379	0			
1.000007	1.000007	0			
1.424547	1.424548	0.0000009999999999			

1.852732	1.852732	0			
1.996029	1.99603	0.0000009999999999			
1.964473	1.964473	0			
1.012814	1.012814	0			
1.000007	1.000007	0			
1.051507	1.051507	0			
1.153792	1.153793	0.000001			
0.000004	1.634701	1.634697			
1.053238	1.053238	0			
0.000036	1.000286	1.00025			
1.026868	1.026868	0			
1.54853	1.548531	0.000001			
1.073231	1.073231	0			
1.000001	1.000001	0			
0.000055	2.122571	2.122516			
1.072882	1.07288	-0.000002			
1.610963	1.610963	0			
1.358308	1.35831	0.000002			
1.483417	1.483418	0.0000009999999999			
1.00002	1.00002	0			
1.001686	1.001687	0.0000009999999999			
0.000167	1.000009	0.999842			
1.00095	1.000945	-0.000005			
1.014478	1.014478	0			
1.02476	1.02476	0			
2.256643	2.256643	0			
1.001913	1.001913	0			
1.002333	1.002334	0.000001			
1.135724	1.135725	0.000001			
1.826415	1.826415	0			
1.000001	1.000001	0			

2.577849	2.577849	0			
1.000002	1.000002	0			
2.02252	2.02252	0			
1.166745	1.166747	0.000002			
1.063087	1.063088	0.000001			
1.959897	1.959897	0			
1.001959	1.00196	0.0000009999999999			
1.568566	1.568566	0			

2-100					
Greedy V	Simulated Annealing V	Simulated Annealing - Greedy			
5.191442	5.191442	0			
5.803603	5.803604	0.000001		Times SA Won	23
3.43715	3.43715	0		Times Greedy Won	1
5.758009	5.758009	0			
10.321175	10.321175	0			
3.088165	3.088165	0			
3.329702	3.329702	0			
6.324852	6.324852	0			
4.375763	4.375764	0.000001			
3.573111	3.573112	0.000001			
3.952785	3.952785	0			
5.945729	5.94573	0.000001			
4.429408	4.429408	0			
5.424344	5.424345	0.000001			
4.889413	4.889413	0			
5.249212	5.249212	0			
3.800481	6.42548	2.624999			
4.283522	4.283522	0			
2.90974	2.909741	0.0000009999999997			
5.098225	5.098226	0.000001			
4.753618	4.753619	0.0000009999999993			
4.424255	4.424256	0.000001			
5.904324	5.904324	0			
4.608306	4.608306	0			
4.601137	4.601137	0			
5.244229	5.244229	0			
4.166532	4.166533	0.000001			
3.175626	3.175626	0			
5.397961	5.397961	0			
4.651162	4.651162	0			

4.595955	4.595955	0			
2.536653	2.536654	0.000001			
7.115659	7.115659	0			
4.402223	4.402223	0			
7.386727	7.386727	0			
2.86722	2.86722	0			
5.508801	5.508801	0			
4.182573	4.182573	0			
5.13907	5.139071	0.000001			
5.404698	5.404698	0			
6.098271	6.098271	0			
4.368252	4.368252	0			
4.784288	4.784288	0			
2.635516	2.635516	0			
6.233814	6.233814	0			
4.296759	4.296759	0			
4.387475	4.387468	-0.000007			
5.929479	5.929479	0			
5.766193	5.766193	0			
6.329811	6.329811	0			
4.227693	4.227693	0			
3.882768	3.882768	0			
3.015693	3.015693	0			
7.571596	7.571596	0			
6.001086	6.001086	0			
5.43024	5.43024	0			
4.018685	4.018685	0			
6.929237	6.929237	0			
5.941946	5.941946	0			
2.827447	2.827447	0			
5.413588	5.413589	0.000001			

6.282767	6.282767	0			
6.934356	6.934356	0			
5.344016	5.344016	0			
6.497685	6.497685	0			
4.856707	4.856707	0			
4.225896	4.225897	0.000001			
2.946935	2.946935	0			
6.74815	6.748151	0.000001			
4.544355	4.544355	0			
4.554271	4.554271	0			
4.829646	4.829646	0			
5.942204	5.942205	0.000001			
4.224091	4.224091	0			
4.304008	4.304008	0			
5.571659	5.571659	0			
4.403958	4.403958	0			
3.336298	3.336298	0			
2.706986	2.706986	0			
4.074202	4.074202	0			
6.497803	6.497803	0			
5.033481	5.033482	0.000001			
6.499434	6.499434	0			
6.383153	6.383153	0			
6.152255	6.152255	0			
4.960057	4.960057	0			
4.529813	4.529814	0.000001			
4.714994	4.714995	0.000001			
4.798705	4.798706	0.000001			
3.395816	3.395817	0.000001			
1.915374	1.915374	0			
4.455486	4.455486	0			

2.666767	2.666767	0			
5.077746	5.077747	0.0000009999999993			
4.708683	4.708683	0			
5.907888	5.907888	0			
4.431697	4.431697	0			
5.016648	5.016648	0			
2.413125	2.413125	0			
5.256922	5.256922	0			

2-1000					
Greedy V	Simulated Annealing V	Simulated Annealing - Greedy			
37.758816	37.758816	0			
37.159629	37.159629	0		Times SA Won	0
34.399895	34.399895	0		Times Greedy Won	0
39.746019	39.746019	0			
30.49402	30.49402	0			
35.313315	35.313315	0			
32.63559	32.63559	0			
32.386705	32.386705	0			
34.858531	34.858531	0			
35.639277	35.639277	0			
37.513786	37.513786	0			
32.4111	32.4111	0			
43.106281	43.106281	0			
32.292109	32.292109	0			
33.506112	33.506112	0			
34.403511	34.403511	0			
38.164007	38.164007	0			
37.467199	37.467199	0			
37.516641	37.516641	0			
40.495768	40.495768	0			
33.436336	33.436336	0			
31.269055	31.269055	0			
32.849885	32.849885	0			
31.289266	31.289266	0			
40.678756	40.678756	0			
39.389343	39.389343	0			
36.662939	36.662939	0			
36.8654	36.8654	0			
38.084817	38.084817	0			
41.783278	41.783278	0			

47.337056	47.337056	0			
38.963994	38.963994	0			
42.247658	42.247658	0			
30.552719	30.552719	0			
36.786259	36.786259	0			
37.1907	37.1907	0			
35.770335	35.770335	0			
34.588257	34.588257	0			
38.30105	38.30105	0			
37.407921	37.407921	0			
37.047017	37.047017	0			
36.821015	36.821015	0			
39.193702	39.193702	0			
33.995752	33.995752	0			
41.299282	41.299282	0			
37.824089	37.824089	0			
36.647156	36.647156	0			
31.655719	31.655719	0			
35.467073	35.467073	0			
36.723077	36.723077	0			
33.490826	33.490826	0			
36.538108	36.538108	0			
35.427938	35.427938	0			
33.657913	33.657913	0			
36.557634	36.557634	0			
41.902349	41.902349	0			
30.880608	30.880608	0			
33.017183	33.017183	0			
33.213061	33.213061	0			
37.816273	37.816273	0			
38.654357	38.654357	0			

34.616377	34.616377	0			
36.945144	36.945144	0			
40.468646	40.468646	0			
44.321773	44.321773	0			
31.879003	31.879003	0			
33.609681	33.609681	0			
32.738634	32.738634	0			
35.588385	35.588385	0			
43.012041	43.012041	0			
29.567286	29.567286	0			
33.411795	33.411795	0			
37.600925	37.600925	0			
39.155986	39.155986	0			
36.071624	36.071624	0			
39.052906	39.052906	0			
33.677851	33.677851	0			
33.545275	33.545275	0			
38.085543	38.085543	0			
38.216246	38.216246	0			
30.651309	30.651309	0			
28.55895	28.55895	0			
39.712949	39.712949	0			
37.978944	37.978944	0			
38.615315	38.615315	0			
32.503726	32.503726	0			
38.831359	38.831359	0			
38.134421	38.134421	0			
31.916271	31.916271	0			
34.753323	34.753323	0			
37.355342	37.355342	0			
39.849875	39.849875	0			

39.822344	39.822344	0			
45.229351	45.229351	0			
48.232922	48.232922	0			
38.441865	38.441865	0			
39.352754	39.352754	0			
36.59159	36.59159	0			
34.835561	34.835561	0			
34.68111	34.68111	0			

3_10					
Greedy V	Simulated Annealing V	Simulated Annealing - Greedy			
0.000002	0.000002	0			
1	1	0		Times SA Won	15
0	0	0		Times Greedy Won	17
1	0.999999	-0.000001			
0.000014	0.000094	0.00008			
1.000815	1.000815	0			
0.000007	1.000033	1.000026			
1.00118	1.00118	0			
0	0	0			
0	0	0			
0.000001	0.000001	0			
1.001814	1.001814	0			
1	0.999999	-0.000001			
0	0	0			
0.00001	1.000172	1.000162			
0	0	0			
0	0	0			
1.000416	1.000416	0			
1.001445	1.001445	0			
1.002976	1.002976	0			
1	1	0			
0.000002	0.000002	0			
0.000004	0.000004	0			
1.037074	1.037074	0			
0	0	0			
1.060655	1.060654	-0.0000009999999999			
1.067117	1.067117	0			
0	0	0			
1.000003	1.000002	-0.0000009999999999			
0	0	0			

0	0	0			
1.00106	1.00106	0			
0.000002	1	0.999998			
0.000016	1.000005	0.999989			
0	0	0			
1	0.000274	-0.999726			
0	0	0			
1.00256	1.002559	-0.0000009999999999			
1.00042	1.00042	0			
0	0	0			
0.000071	1.000025	0.999954			
0.000067	1.000047	0.99998			
1	0.999999	-0.000001			
1	1	0			
1.00006	1.00006	0			
1	1	0			
0.00003	1.000004	0.999974			
0	0	0			
0	0	0			
0.000015	1	0.999985			
0.000001	0.000001	0			
0	0	0			
0.000007	1	0.999993			
0	0	0			
0	0	0			
1.000282	1.000282	0			
0.000001	0.000001	0			
1.005508	1.005508	0			
1.024359	1.024359	0			
0.000008	0.000011	0.000003			
1	1	0			

0.00001	0.000012	0.000002			
0.000001	0.000001	0			
1.000008	1.000007	-0.0000009999999999			
1	1	0			
1	0.999999	-0.000001			
1.000747	1.000747	0			
0	0	0			
1	1	0			
1.02071	1.020709	-0.0000009999999999			
1.006132	1.006131	-0.0000009999999999			
1.449141	1.449141	0			
1.000225	1.000225	0			
0.000118	0.000615	0.000497			
1.035014	1.035014	0			
1	0.999999	-0.000001			
0.000024	1	0.999976			
0	0	0			
1	1	0			
1	0.999999	-0.000001			
1.000019	1.000019	0			
1	1	0			
1.000065	1.000064	-0.0000009999999999			
1.00001	1.00001	0			
1.027299	1.027299	0			
1	0.999999	-0.000001			
1.000009	1.000009	0			
0.000003	0.000005	0.000002			
0	0	0			
0	0	0			
0	0	0			
1.013722	1.013722	0			

1.932714	1.932713	-0.000001			
1	1	0			
0	0	0			
1.002206	1.002206	0			
1.000084	1.000083	-0.0000009999999999			
0	0	0			
1	1	0			
0	0	0			

3_100					
Greedy V	Simulated Annealing V	Simulated Annealing - Greedy			
2.393074	2.393073	-0.000001			
1.972813	1.972814	0.000001		Times SA Won	24
1.011189	1.011188	-0.0000009999999999		Times Greedy Won	16
2.985532	2.985532	0			
1.018696	1.018696	0			
2.696474	1.031798	-1.664676			
1.942248	1.942249	0.0000009999999999			
2.418334	2.418333	-0.000001			
1.123713	1.123714	0.000001			
1.008027	1.008027	0			
2.104998	2.104998	0			
1.100834	1.100834	0			
1.934992	1.443116	-0.491876			
1.118648	1.118648	0			
1.954031	1.95403	-0.000001			
1.835901	1.835901	0			
1.016427	1.016427	0			
2.219663	2.219663	0			
1.901195	1.901195	0			
2.039527	2.039527	0			
1.362446	1.362447	0.0000009999999999			
1.009152	1.009152	0			
2.296582	2.296583	0.000001			
1.606766	1.606766	0			
1.939906	1.939906	0			
1.253513	1.25352	0.000007			
2.57927	2.579268	-0.000002			
1.0031	1.003099	-0.000001			
2.05325	2.053251	0.000001			
1.52974	1.52974	0			

2.359315	2.359315	0			
0.000001	0.000001	0			
2.422216	2.422216	0			
1.661937	1.661937	0			
1.046447	1.046447	0			
1.863889	1.863889	0			
2.715346	2.166788	-0.548558			
1.055788	1.055788	0			
1.002639	1.002639	0			
1.055299	1.055299	0			
0.000092	1.02532	1.025228			
1.326162	1.326162	0			
1.18731	1.187311	0.0000009999999999			
2.175859	2.175859	0			
3.174274	3.174273	-0.000001			
2.948819	2.948819	0			
1.045956	1.045957	0.0000009999999999			
1.799061	1.799061	0			
1.328309	1.32831	0.000001			
1.44297	1.442971	0.0000009999999999			
1.33994	1.339941	0.000001			
1.592469	1.59247	0.000001			
1.878796	1.878796	0			
1.552608	1.552608	0			
1.086944	1.086944	0			
1.102401	1.102401	0			
1.057386	1.057386	0			
1.68229	1.68229	0			
1.063457	1.063458	0.0000009999999999			
1.064117	1.064117	0			
2.109645	2.109645	0			

1.931834	1.931834	0			
1.650061	1.650061	0			
1.135583	1.135584	0.0000009999999999			
1.012275	1.012275	0			
1.94099	1.94099	0			
1.106152	1.912162	0.80601			
1.021071	1.021069	-0.000002			
1.872702	1.872703	0.0000009999999999			
1.682246	1.682246	0			
1.716717	1.716717	0			
1.165692	1.225952	0.06026			
2.135712	2.135711	-0.0000009999999997			
1.682787	1.682788	0.0000009999999999			
1.11083	1.11083	0			
1.822347	1.822347	0			
1.017663	1.017663	0			
0.000135	1.046735	1.0466			
2.354975	2.354975	0			
1.073779	1.073779	0			
1.736612	1.736611	-0.000001			
2.285693	2.285693	0			
2.002067	2.002066	-0.0000009999999997			
1.952199	1.952198	-0.0000009999999999			
2.465819	2.465819	0			
2.616477	2.616477	0			
1.020672	1.020672	0			
2.253216	2.253216	0			
1.036776	1.036776	0			
1.025164	1.025164	0			
1.15941	1.160058	0.000648			
1.036137	1.036137	0			

2.290027	3.742458	1.452431			
1.873917	1.873916	-0.000001			
1.003136	1.003136	0			
1.924502	1.924501	-0.0000009999999999			
1.351631	1.351635	0.000004			
1.148186	1.148186	0			
1.954737	1.954737	0			
1.542135	1.542135	0			

3_1000					
Greedy V	Simulated Annealing V	Simulated Annealing - Greedy			
9.695607	9.695606	-0.0000010000000001			
10.108636	10.108633	-0.0000030000000001		Times SA Won	7
9.100286	9.100285	-0.0000010000000001		Times Greedy Won	50
6.353226	6.353226	0			
7.654091	7.65409	-0.000001			
9.340133	9.340131	-0.000002			
8.939909	8.939909	0			
7.061202	7.061201	-0.000001			
10.563381	10.56338	-0.0000009999999993			
8.017959	8.017958	-0.0000009999999993			
5.20458	5.204579	-0.000001			
6.756944	6.756943	-0.000001			
9.146884	9.146884	0			
8.558489	8.558491	0.000002			
8.962973	8.962972	-0.0000009999999993			
10.048451	10.048451	0			
6.83697	6.83697	0			
10.684231	10.684231	0			
7.574503	7.574505	0.000002			
8.166038	8.166038	0			
7.92163	7.921629	-0.000001			
7.246693	7.246693	0			
7.406482	7.406481	-0.0000009999999993			
9.111433	9.111432	-0.0000009999999993			
7.317113	7.317113	0			
7.118005	7.118004	-0.000001			
9.610501	9.610501	0			
6.943644	6.943643	-0.000001			
8.94045	8.940449	-0.0000010000000001			
5.998333	5.998332	-0.0000009999999993			

6.823187	6.823185	-0.000002			
10.697056	10.697055	-0.0000009999999993			
7.376044	7.376043	-0.000001			
8.806861	8.806861	0			
8.354869	8.354868	-0.0000010000000001			
8.676809	8.676809	0			
7.654763	7.654763	0			
9.903514	9.903513	-0.0000009999999993			
10.204082	10.204081	-0.0000009999999993			
8.059541	8.05954	-0.0000009999999993			
12.114135	12.114134	-0.0000009999999993			
6.657478	6.657477	-0.000001			
8.440291	8.440294	0.000003			
8.470303	8.470303	0			
8.766259	8.766259	0			
6.235142	6.235142	0			
11.673621	11.67362	-0.0000010000000001			
8.900971	8.900971	0			
10.63257	10.63257	0			
4.388953	4.388952	-0.000001			
7.284734	7.284734	0			
6.977679	6.977679	0			
7.935929	7.935929	0			
8.163967	8.163967	0			
7.563914	6.677762	-0.886152			
9.02931	9.02931	0			
7.657289	7.657289	0			
7.106314	7.106313	-0.000001			
7.034378	7.034379	0.000001			
7.846247	7.846247	0			
7.642392	7.642392	0			

8.606544	8.606543	-0.0000009999999993			
8.915269	8.915269	0			
7.18358	7.18358	0			
8.327158	9.982259	1.655101			
7.144085	7.144084	-0.0000009999999993			
8.339395	8.339394	-0.0000009999999993			
7.624781	7.624778	-0.000003			
11.190922	11.19092	-0.000002			
8.077833	8.077833	0			
5.676087	5.676087	0			
9.733756	9.733756	0			
7.079722	7.079721	-0.000001			
9.389001	9.388999	-0.000002			
8.754206	8.754205	-0.0000009999999993			
12.673556	12.673555	-0.0000009999999993			
8.625423	8.625423	0			
9.253623	9.253622	-0.0000009999999993			
7.205477	7.205476	-0.000001			
7.348999	7.348999	0			
7.378778	7.378777	-0.0000009999999993			
8.658136	8.658135	-0.0000010000000001			
8.063057	8.063057	0			
8.123868	8.123868	0			
7.92026	7.92026	0			
8.076663	8.076663	0			
9.150757	9.150757	0			
9.475681	9.47568	-0.0000009999999993			
8.169632	8.169632	0			
10.038519	10.038519	0			
7.233822	6.586755	-0.647067			
8.156013	8.156014	0.0000010000000001			

10.266439	10.266438	-0.0000009999999993			
9.086391	9.086389	-0.000002			
4.703717	4.703717	0			
7.163538	7.163537	-0.000001			
10.12791	10.127909	-0.0000009999999993			
11.510445	11.510444	-0.0000010000000001			
7.464345	7.464345	0			
7.307382	7.307383	0.000001			

4_10					
Greedy V	Simulated Annealing V	Simulated Annealing - Greedy			
1.000001	1	-0.0000009999999999			
0	0	0		Times SA Won	26
0	0	0		Times Greedy Won	21
1	0.999999	-0.000001			
0	0	0			
0.00001	0.000272	0.000262			
0	0	0			
0	0	0			
0.000038	0.999999	0.999961			
0	0	0			
0.000003	0.000047	0.000044			
0.000004	0.00004	0.000036			
0.00004	0.999997	0.999957			
0	0	0			
0	0	0			
0.000023	0.000093	0.00007			
1.000135	1.000134	-0.0000009999999999			
0	0	0			
0	0	0			
0	0	0			
0.000001	0.000002	0.000001			
0	0	0			
1	0.999998	-0.000002			
1	0.999998	-0.000002			
0	0	0			
0	0	0			
0.000091	1.000074	0.999983			
0	0	0			
1	0.006684	-0.993316			
0	0	0			

0	0	0			
0	0	0			
1.00001	1.000009	-0.000001			
0	0	0			
0.000001	0.000001	0			
0.000088	1.000258	1.00017			
0	0	0			
0.000037	0.000083	0.000046			
0	0	0			
0	0	0			
0.000108	0.999999	0.999891			
0.000002	0.000002	0			
0	0	0			
1	0.999999	-0.000001			
0	0	0			
0.000015	0.999999	0.999984			
0.000001	0.000001	0			
0.000004	0.000007	0.000003			
0	0	0			
1.000004	1.000004	0			
0.000102	0.999998	0.999896			
0.000026	1.001263	1.001237			
0	0	0			
0	0	0			
0.000001	0.000001	0			
1.000002	1	-0.000002			
0	0	0			
0.000002	0.000004	0.000002			
0	0	0			
0	0	0			
1	0.999998	-0.000002			

0	0	0			
1	0.999999	-0.000001			
0.000036	1.073592	1.073556			
0	0	0			
1	0.999999	-0.000001			
0	0	0			
0.000003	0.000003	0			
1.004365	1.004364	-0.0000009999999999			
0.000016	0.999998	0.999982			
0	0	0			
0.000031	0.000045	0.000014			
0	0	0			
0.000007	0.000013	0.000006			
1	0.999999	-0.000001			
1.015097	1.015097	0			
0	0	0			
1	0.999999	-0.000001			
1	1	0			
0	0	0			
0	0	0			
0.000017	0.000054	0.000037			
1.000025	1.000024	-0.0000009999999999			
1.002526	1.002524	-0.000002			
0.000094	0.000146	0.000052			
0.000012	0.999997	0.999985			
1.000024	1.000023	-0.0000009999999999			
1.002391	1.002389	-0.000002			
0.00006	0.999997	0.999937			
0	0	0			
0.000012	0.000033	0.000021			
1.177976	1.177977	0.000001			

1.000002	1.000001	-0.000001			
0	0	0			
0	0	0			
1	0.999999	-0.000001			
1.000002	1.000002	0			
0	0	0			
1.000003	1.000002	-0.0000009999999999			
0	0	0			

4_100					
Greedy V	Simulated Annealing V	Simulated Annealing - Greedy			
1.080559	1.080558	-0.000001			
1.000276	1.000271	-0.000005		Times SA Won	11
1.013642	1.01364	-0.000002		Times Greedy Won	71
1.001138	1.001138	0			
1.501522	1.501519	-0.000003			
1.096774	1.096773	-0.0000009999999999			
1.207136	1.208554	0.001418			
1.000279	1.000276	-0.000003			
0.000004	0.000006	0.000002			
1.000017	1.000016	-0.0000009999999999			
0.000033	1.495193	1.49516			
1.101921	1.101919	-0.000002			
1.000009	1.000005	-0.000004			
1.002095	1.002093	-0.000002			
1.105135	1.105134	-0.0000009999999999			
0.000004	0.000006	0.000002			
1.001085	1.001085	0			
1.000037	1.000035	-0.000002			
1.01942	1.019419	-0.0000009999999999			
1.162663	1.162663	0			
1.009027	1.009026	-0.0000009999999999			
1.002271	1.002271	0			
1.011299	1.011297	-0.000002			
1.123236	1.123235	-0.0000009999999999			
1.001938	1.001936	-0.000002			
1.089391	1.089389	-0.000002			
1.000049	1.000048	-0.0000009999999999			
1.00143	1.001427	-0.000003			
1.020293	1.020291	-0.000002			
1.152972	1.152972	0			

1.019464	1.019463	-0.0000009999999999			
1.003296	1.003294	-0.000002			
1.003633	1.003632	-0.0000009999999999			
1.058855	1.058854	-0.000001			
1.121364	1.121363	-0.0000009999999999			
1.00722	1.007218	-0.000002			
1.005517	1.005517	0			
1.089687	1.089685	-0.000002			
1.000383	1.000382	-0.0000009999999999			
1.0003	1.000298	-0.000002			
1.001039	1.001039	0			
0.00012	1.065142	1.065022			
1.147656	1.040658	-0.106998			
1.000763	1.000761	-0.000002			
1.000149	1.000147	-0.000002			
1.01456	1.01456	0			
1.002842	1.002841	-0.0000009999999999			
1.000705	1.000699	-0.000006			
1.017308	1.017308	0			
1.00039	1.000389	-0.0000009999999999			
0.000083	0.000134	0.000051			
1.003066	1.003066	0			
1.000047	1.000047	0			
1.00012	1.00012	0			
1.306172	1.306172	0			
1.085573	1.085573	0			
1.000093	1.000088	-0.000005			
1.002967	1.002966	-0.0000009999999999			
1.002666	1.002664	-0.000002			
1.000121	1.00012	-0.000001			
1.006631	1.00663	-0.000001			

1.00322	1.003213	-0.000007			
1.001824	1.001822	-0.000002			
1.012279	1.012278	-0.0000009999999999			
1.114914	1.114913	-0.0000009999999999			
1.648424	1.648421	-0.000003			
1.0018	1.0018	0			
1.396159	1.396159	0			
1.017729	1.017725	-0.000004			
1.001519	1.063243	0.061724			
1.536556	1.536552	-0.000004			
1.086656	1.086655	-0.000001			
1.00092	1.000919	-0.000001			
1.010064	1.010063	-0.000001			
1.008764	1.008762	-0.000002			
1.0065	1.006497	-0.000003			
1.000256	1.000255	-0.000001			
1.347816	1.347815	-0.0000009999999999			
1.032933	1.032932	-0.000001			
1.000452	1.00045	-0.000002			
1.000042	1.000041	-0.000001			
1.008283	1.008282	-0.000001			
0.000054	1.005244	1.00519			
0.000003	0.000004	0.000001			
1.015927	1.015926	-0.0000009999999999			
1.006521	1.006518	-0.000003			
1.095397	1.095396	-0.0000009999999999			
1.091323	1.091322	-0.000001			
1.00922	1.009219	-0.0000009999999999			
0.000155	1.000151	0.999996			
1.004898	1.004894	-0.000004			
1.016675	1.016674	-0.0000009999999999			

0.000007	0.000014	0.000007			
1.025782	1.025779	-0.000003			
1.000054	1.000052	-0.000002			
1.003373	1.00337	-0.000003			
1.000728	1.000727	-0.000001			
1.000159	1.000158	-0.0000009999999999			
1.005574	1.005573	-0.0000009999999999			
1.108366	1.108366	0			

4_1000					
Greedy V	Simulated Annealing V	Simulated Annealing - Greedy			
2.123244	2.123242	-0.000002			
2.115735	2.115736	0.000001		Times SA Won	9
1.105673	1.105672	-0.0000009999999999		Times Greedy Won	73
2.797946	2.797938	-0.000008			
1.919676	1.919671	-0.000005			
2.448325	2.448324	-0.000001			
1.925385	1.925385	0			
3.38585	3.385847	-0.000003			
1.27612	1.276119	-0.0000009999999999			
2.048656	2.048654	-0.000002			
1.765086	1.765084	-0.000002			
2.705798	2.705798	0			
2.686296	2.686295	-0.000001			
2.092134	2.09213	-0.000004			
3.933669	3.93366	-0.000009			
3.166515	3.166513	-0.000002			
1.807743	1.807741	-0.000002			
2.704817	2.704811	-0.000006			
3.057946	3.057938	-0.000008			
1.545082	1.545083	0.0000009999999999			
1.656357	1.656357	0			
1.95417	1.954169	-0.0000009999999999			
2.978567	2.978566	-0.000001			
3.034149	3.034147	-0.000002			
2.167657	3.490273	1.322616			
1.878285	1.878284	-0.0000009999999999			
2.90409	2.904087	-0.000003			
2.824787	2.824786	-0.000001			
2.56443	2.564428	-0.000002			
1.793358	1.793357	-0.0000009999999999			

1.113919	1.113919	0			
2.17006	2.170056	-0.000004			
3.355216	3.355209	-0.000007			
3.349271	3.349269	-0.000002			
1.661224	1.661223	-0.000001			
3.095644	3.095644	0			
2.631323	2.63132	-0.000003			
1.395172	1.395172	0			
1.043053	1.043051	-0.000002			
3.630719	3.630719	0			
2.079711	2.079709	-0.000002			
2.968629	2.968629	0			
2.397869	2.397865	-0.000004			
3.409985	3.409981	-0.000004			
3.100209	3.100207	-0.000002			
3.130592	3.130584	-0.000008			
3.119217	3.119215	-0.000002			
3.411781	3.411778	-0.000003			
1.910177	1.910174	-0.000003			
2.10553	2.105529	-0.0000009999999997			
2.772017	2.772014	-0.000003			
1.416787	1.416787	0			
2.039305	2.039305	0			
2.860888	1.245234	-1.615654			
1.582082	1.582085	0.000003			
2.783549	2.783548	-0.0000009999999997			
2.208039	2.208036	-0.000003			
1.365548	1.365546	-0.000002			
3.297515	3.29751	-0.000005			
2.725625	2.639647	-0.085978			
2.623915	2.623914	-0.000001			

2.561254	2.561254	0			
1.832019	1.832018	-0.000001			
3.227726	3.227726	0			
1.654863	1.654864	0.0000009999999999			
2.335556	2.335556	0			
1.975954	1.975953	-0.0000009999999999			
2.337887	2.337886	-0.0000009999999997			
3.618783	3.618781	-0.000002			
1.2113	1.2113	0			
2.154752	2.154751	-0.0000009999999997			
2.45731	2.457308	-0.000002			
3.014005	3.014007	0.000002			
1.341442	1.341442	0			
2.439505	2.439502	-0.000003			
1.227224	1.227223	-0.000001			
3.413953	3.41395	-0.000003			
2.183876	2.183872	-0.000004			
2.732369	2.732366	-0.000003			
2.806584	2.806584	0			
3.040645	3.040642	-0.000003			
2.270096	2.270095	-0.000001			
1.758065	1.758064	-0.0000009999999999			
1.706608	1.70661	0.000002			
3.299832	3.299832	0			
3.155824	3.155814	-0.000001			
1.81129	1.811291	0.0000009999999999			
1.05177	1.051769	-0.000001			
1.770652	1.770649	-0.000003			
3.333589	3.333585	-0.000004			
2.951485	2.951482	-0.000003			
1.97938	3.070094	1.090714			

2.784544	2.784539	-0.000005			
2.659199	2.659195	-0.000004			
1.119315	1.119313	-0.000002			
3.764931	3.764928	-0.000003			
1.849726	1.849723	-0.000003			
2.113017	2.113016	-0.000001			
2.955595	2.95559	-0.000005			
2.874368	2.874364	-0.000004			

[illegible]

0	0	0			
0.000038	0.999996	0.999958			
0.000008	0.999998	0.99999			
0	0	0			
0.000025	0.01767	0.017645			
0	0	0			
0	0	0			
0.000003	0.000003	0			

5_100					
Greedy V	Simulated Annealing V	Simulated Annealing - Greedy			
1.103282	1.103275	-0.000007			
1.000006	1.000004	-0.000002		Times SA Won	34
0.000059	0.000146	0.000087		Times Greedy Won	44
0.000074	1.001843	1.001769			
1.035696	1.03569	-0.000006			
1	0.999995	-0.000005			
1.014329	1.014326	-0.000003			
1.000244	1.000238	-0.000006			
1.001679	1.001669	-0.00001			
1	0.999995	-0.000005			
0	0	0			
0	0	0			
0.00002	0.000075	0.000055			
1.000093	1.00009	-0.000003			
1.000503	1.000494	-0.000009			
1.000004	0.999994	-0.00001			
0.000087	1.526975	1.526888			
0	0	0			
0.000008	0.000008	0			
0	0	0			
1.000012	1.000004	-0.000008			
1.002445	1.002439	-0.000006			
0.000035	0.999996	0.999961			
0	0	0			
1	0.999988	-0.000012			
0	0	0			
0.000122	1.000854	1.000732			
0.000005	0.000006	0.000001			
1.028452	1.028445	-0.000007			
1.001083	1.001077	-0.000006			

0.000001	0.000001	0			
0	0	0			
0.00002	0.000021	0.000001			
1.00078	1.000771	-0.000009			
1.00127	1.001265	-0.000005			
0	0	0			
0.000063	1.004489	1.004426			
1.000021	1.000014	-0.000007			
0	0	0			
1.000001	0.999996	-0.000005			
1.001645	1.001637	-0.000008			
0.000104	1.000058	0.999954			
1.001185	1.001183	-0.000002			
0	0	0			
0.000022	1.018132	1.01811			
0.000023	0.999997	0.999974			
0.000009	0.00004	0.000031			
0.000029	1.161561	1.161532			
0	0	0			
0	0	0			
0.000035	0.999999	0.999964			
0.000047	1.000053	1.000006			
1.005852	1.005842	-0.00001			
0.000002	0.000004	0.000002			
1.000205	1.000202	-0.000003			
0	0	0			
0.000024	1.010954	1.01093			
0.000055	1.038079	1.038024			
0.00001	0.000011	0.000001			
1.013679	1.013675	-0.000004			
0.000001	0.000001	0			

0.000065	0.999994	0.999929			
1.000298	1.000295	-0.000003			
0.000002	1.000204	1.000184			
1.001268	1.001264	-0.000004			
0.000059	0.000336	0.000277			
1.187828	1.187825	-0.000003			
0.000007	1.006072	1.006065			
1.000007	1.000005	-0.000002			
0.000053	0.000061	0.000008			
1.005754	1.005747	-0.000007			
0.000166	0.999993	0.999827			
1.000001	0.999996	-0.000005			
0	0	0			
1.000001	0.999996	-0.000005			
1.001769	1.001765	-0.000004			
0.000003	0.000005	0.000002			
0.000001	0.000001	0			
0	0	0			
1.000006	1.000001	-0.000005			
1	0.99999	-0.00001			
0.000103	1.047875	1.047772			
1.000168	1.000165	-0.000003			
1.000008	0.999999	-0.000009			
1.000003	0.999995	-0.000008			
1.001452	1.001446	-0.000006			
0.000003	0.999995	0.999992			
1.000074	1.000068	-0.000006			
1.003927	1.003923	-0.000004			
1.000026	1.000018	-0.000008			
0.000001	0.000002	0.000001			
1.002541	1.00254	-0.0000009999999999			

1	0.999996	-0.000004			
0.000008	0.99999	0.999982			
1.004758	1.004752	-0.000006			
0	0	0			
0.000032	0.999991	0.999959			
0	0	0			
0.000015	0.000058	0.000043			
0.000142	1.033353	1.033211			

5_1000					
Greedy V	Simulated Annealing V	Simulated Annealing - Greedy			
2.120966	2.120956	-0.00001			
1.237176	1.237175	-0.000001		Times SA Won	8
1.148827	1.148823	-0.000004		Times Greedy Won	90
1.332531	1.33253	-0.0000009999999999			
1.005307	1.005304	-0.000003			
1.868807	1.868801	-0.000006			
1.184823	1.184814	-0.000009			
1.021159	1.021157	-0.000002			
1.172025	1.172021	-0.000004			
1.022423	1.022418	-0.000005			
1.088174	1.088164	-0.00001			
1.037136	1.037129	-0.000007			
0.000009	0.000014	0.000005			
1.040331	1.040329	-0.000002			
2.105413	2.105411	-0.000002			
1.080131	1.080127	-0.000004			
1.052741	1.052732	-0.000009			
1.084519	1.084517	-0.000002			
1.000141	1.000137	-0.000004			
1.320491	1.320488	-0.000003			
1.010025	1.010019	-0.000006			
1.078817	1.078813	-0.000004			
1.781465	1.781461	-0.000004			
1.36228	1.362278	-0.000002			
1.006544	1.00654	-0.000004			
1.059141	1.059134	-0.000007			
1.015771	1.015765	-0.000006			
1.12816	1.128155	-0.000005			
1.032618	1.032615	-0.000003			
1.029607	1.029604	-0.000003			

1.014833	1.092587	0.077754			
1.001101	1.001092	-0.000009			
1.741997	1.741991	-0.000006			
1.242159	1.242129	-0.000003			
1.074956	1.074955	-0.0000009999999999			
1.003284	1.003278	-0.000006			
1.377394	1.377376	-0.000018			
1.588718	1.588714	-0.000004			
1.120473	1.399768	0.279295			
1.009397	1.009391	-0.000006			
1.01959	1.019584	-0.000006			
1.263777	1.263774	-0.000003			
1.086988	1.086985	-0.000003			
1.012161	1.012157	-0.000004			
1.066066	1.06606	-0.000006			
1.793488	1.793482	-0.000006			
1.598471	1.598465	-0.000006			
1.088227	1.088221	-0.000006			
1.332047	1.332049	0.000002			
1.000968	1.000962	-0.000006			
1.014769	1.014765	-0.000004			
1.045853	1.045846	-0.000007			
1.068722	1.068718	-0.000004			
1.025868	1.025863	-0.000005			
1.015846	1.015845	-0.0000009999999999			
1.065598	1.065598	0			
2.066123	2.066119	-0.000004			
1.006698	1.006694	-0.000004			
1.004636	1.004634	-0.000002			
1.053902	1.053895	-0.000007			
1.001148	1.001145	-0.000003			

1.050219	1.050215	-0.000004			
1.600641	1.600639	-0.000002			
1.861827	1.86182	-0.000007			
1.116012	1.116011	-0.0000009999999999			
1.001312	1.001302	-0.000001			
1.000375	1.000372	-0.000003			
1.35569	1.355684	-0.000006			
1.279928	1.279927	-0.0000009999999999			
1.112794	1.112789	-0.000005			
1.085117	1.085111	-0.000006			
1.111701	1.111697	-0.000004			
0.00004	1.000334	1.000294			
1.013197	1.013195	-0.000002			
0.000028	1.619216	1.619188			
1.056412	1.05641	-0.000002			
1.199363	1.19936	-0.000003			
1.130106	1.018989	-0.111117			
1.1115	1.227444	0.115944			
1.165715	1.165714	-0.000001			
1.013283	1.01328	-0.000003			
1.470925	1.470924	-0.000001			
1.044828	1.044821	-0.000007			
1.58724	1.587238	-0.000002			
1.022697	1.022694	-0.000003			
1.22514	1.225136	-0.000004			
1.035803	1.035802	-0.000001			
1.047914	1.047906	-0.000008			
1.00062	1.000616	-0.000004			
1.086761	1.516456	0.429695			
1.048184	1.04818	-0.000004			
1.039425	1.039418	-0.000007			

1.044077	1.044071	-0.000006			
1.317808	1.317801	-0.000007			
1.283052	1.283049	-0.000003			
1.072158	1.072153	-0.000005			
1.524391	1.524388	-0.000003			
1.04066	1.040656	-0.000004			
1.030836	1.030834	-0.000002			
1.130883	1.130878	-0.000005			