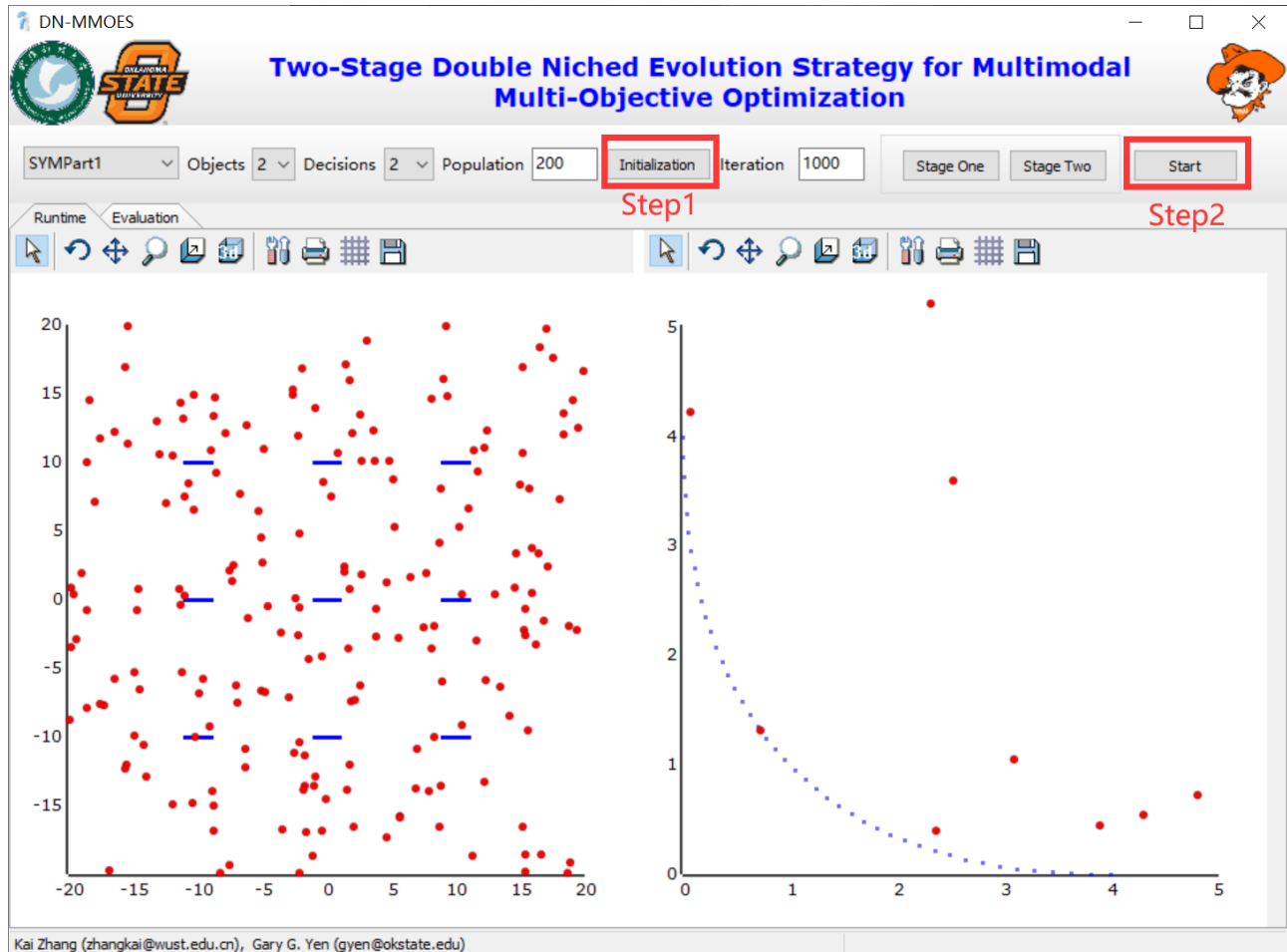
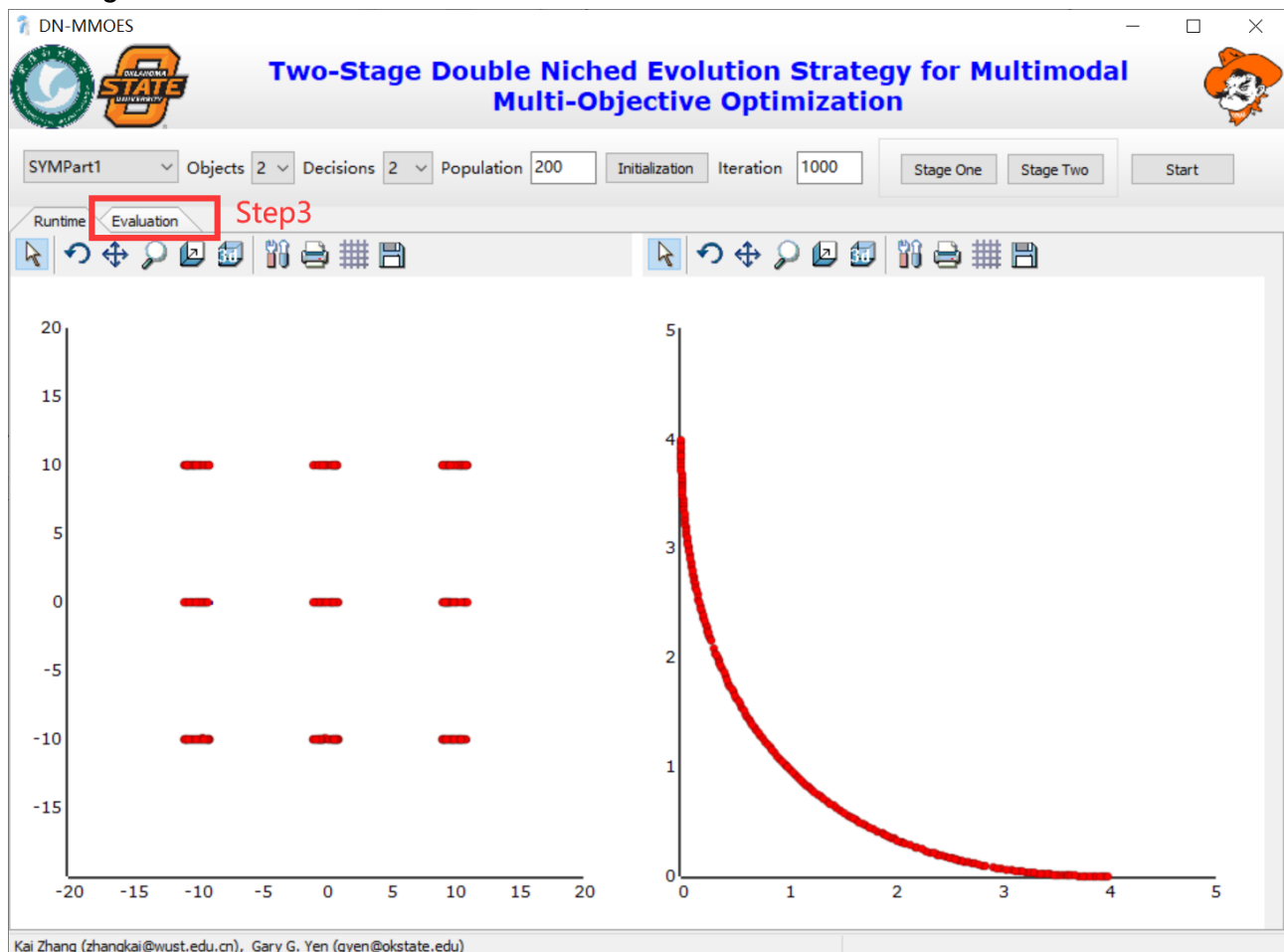


1. Initialization and Run the program of DN-MMOES



2. Change the Evaluation Tab



3. After load the PF and obtained objective values, the IGD value can be calculated.

DN-MMOES

Two-Stage Double Niche Evolution Strategy for Multimodal Multi-Objective Optimization

SYMPart1 Objects 2 Decisions 2 Population 200 Initialization Iteration 1000 Stage One Stage Two Start

Step4 Pareto Front Ture **Step5** Pareto Front Obtain **Step6** Pareto Set True Pareto Set Obtain

Load IGD = 0.00897424 Load Clear Calculate Load IGDx = Load Clear Calculate

0 4
 0.00216333153055707 3.81611681
 0.00865332612222826 3.63656030
 0.0194699837750136 3.46133044
 0.0346133044889130 3.29042725
 0.0540832882639266 3.12385073
 0.0778799351000544 2.96160086
 0.106003244997296 2.80367766
 0.138453217955652 2.65008112
 0.175229853975122 2.50081124
 0.216333153055707 2.35586803
 0.261763115197405 2.21525148
 0.311519740400215 2.07896160
 0.365603028664142 1.94699837
 0.424012979989183 1.81936181
 0.486749594375337 1.69605191
 0.553812871822606 1.57706868
 0.625202812330989 1.46241211
 0.700919415900486 1.35208220
 0.780962682531098 1.24607896
 0.865332612222823 1.14440237
 0.954029204975663 1.04705246
 1.047052460789620 0.954029204975663
 1.144402379664680 0.865332612222823
 1.246078961600870 0.780962682531098
 1.352082206598160 0.700919415900486
 1.462412114656570 0.625202812330989
 1.577068685776100 0.553812871822606
 1.696051919956730 0.486749594375337
 1.819361817198490 0.424012979989183
 1.946998377501350 0.365603028664142
 2.078961600865330 0.311519740400217
 2.215251487290420 0.261763115197405
 2.355868036776630 0.216333153055707
 0.6730405, 1.3915197
 0.0927353, 2.8746986
 0.0067642, 3.6777847
 0.1557409, 2.5775375
 1.5356386, 0.5799234
 0.1735515, 2.5072005
 0.7922223, 1.2319502
 2.7600675, 0.1146914
 2.5729032, 0.1567945
 0.0809715, 2.9428298
 3.4948454, 0.0170432
 2.2179096, 0.2609280
 0.8143449, 1.2047105
 0.0869757, 2.9097373
 0.0041621, 3.7513278
 0.0002790, 3.9334798
 2.3032382, 0.2326698
 2.2589319, 0.2475449
 0.0752208, 2.9786289
 1.1282036, 0.8795265
 0.3343657, 2.0213964
 3.0480077, 0.0645900
 0.5381582, 1.6037904
 0.0573675, 3.0998862
 0.0053196, 3.7135785
 0.4337521, 1.8006268
 2.7932174, 0.1080493
 0.0652285, 3.0436335
 3.6931968, 0.0061202
 0.8573005, 1.1536796
 0.1468396, 2.6140752
 0.0013825, 3.8528543

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4. After load the PS and obtained decision variables, the IGDx value can be calculated.

DN-MMOES

Two-Stage Double Niche Evolution Strategy for Multimodal Multi-Objective Optimization

SYMPart1 Objects 2 Decisions 2 Population 200 Initialization Iteration 1000 Stage One Stage Two Start

Step7 Pareto Set True **Step8** Pareto Set Obtain **Step9** Pareto Set Obtain

Load IGD = 0.00897424 Load Clear Calculate Load IGDx = 0.03002401 Load Clear Calculate

0 4
 0.00216333153055707 3.81611681
 0.00865332612222826 3.63656030
 0.0194699837750136 3.46133044
 0.0346133044889130 3.29042725
 0.0540832882639266 3.12385073
 0.0778799351000544 2.96160086
 0.106003244997296 2.80367766
 0.138453217955652 2.65008112
 0.175229853975122 2.50081124
 0.216333153055707 2.35586803
 0.261763115197405 2.21525148
 0.311519740400215 2.07896160
 0.365603028664142 1.94699837
 0.424012979989183 1.81936181
 0.486749594375337 1.69605191
 0.553812871822606 1.57706868
 0.625202812330989 1.46241211
 0.700919415900486 1.35208220
 0.780962682531098 1.24607896
 0.865332612222823 1.14440237
 0.954029204975663 1.04705246
 1.047052460789620 0.954029204975663
 1.144402379664680 0.865332612222823
 1.246078961600870 0.780962682531098
 1.352082206598160 0.700919415900486
 1.462412114656570 0.625202812330989
 1.577068685776100 0.553812871822606
 1.696051919956730 0.486749594375337
 1.819361817198490 0.424012979989183
 1.946998377501350 0.365603028664142
 2.078961600865330 0.311519740400217
 2.215251487290420 0.261763115197405
 2.355868036776630 0.216333153055707
 0.6730405, 1.3915197
 0.0927353, 2.8746986
 0.0067642, 3.6777847
 0.1557409, 2.5775375
 1.5356386, 0.5799234
 0.1735515, 2.5072005
 0.7922223, 1.2319502
 2.7600675, 0.1146914
 2.5729032, 0.1567945
 0.0809715, 2.9428298
 3.4948454, 0.0170432
 2.2179096, 0.2609280
 0.8143449, 1.2047105
 0.0869757, 2.9097373
 0.0041621, 3.7513278
 0.0002790, 3.9334798
 2.3032382, 0.2326698
 2.2589319, 0.2475449
 0.0752208, 2.9786289
 1.1282036, 0.8795265
 0.3343657, 2.0213964
 3.0480077, 0.0645900
 0.5381582, 1.6037904
 0.0573675, 3.0998862
 0.0053196, 3.7135785
 0.4337521, 1.8006268
 2.7932174, 0.1080493
 0.0652285, 3.0436335
 3.6931968, 0.0061202
 0.8573005, 1.1536796
 0.1468396, 2.6140752
 0.0013825, 3.8528543
 -11 10
 -10.9534883720930 10
 -10.9069767441860 10
 -10.8604651162791 10
 -10.8139534883721 10
 -10.7674418604651 10
 -10.7209302325581 10
 -10.6744186046512 10
 -10.6279069767442 10
 -10.5813953488372 10
 -10.5348837209302 10
 -10.4883720930233 10
 -10.4418604651163 10
 -10.3953488372093 10
 -10.3488372093023 10
 -10.3023255813954 10
 -10.2558139534884 10
 -10.2093023255814 10
 -10.1627906976744 10
 -10.1162790697674 10
 -10.0697674418605 10
 -10.0232558139535 10
 -9.97674418604651 10
 -9.93023255813954 10
 -9.88372093023256 10
 -9.83720930232558 10
 -9.79069767441860 10
 -9.74418604651163 10
 -9.69767441860465 10
 -9.65116279069767 10
 -9.60465116279070 10
 -9.55813953488372 10
 -9.51162790697675 10
 -9.46511627906977 10
 -10.1796196, -10.0040989
 9.3045092, -10.0030766
 -10.9177551, -10.0000134
 -0.6054491, 0.0083961
 -9.7610712, 0.0263440
 -0.5834122, 0.0024853
 -10.1099319, -9.9989071
 0.6613440, 10.0018740
 0.6040272, -10.0002394
 -10.7154646, -9.9966679
 10.8694506, 10.0000057
 10.4892454, -10.0075998
 -10.0975914, 10.0019121
 -10.7056904, 9.9810905
 9.0632086, 0.0129134
 9.0166998, 9.9996691
 0.5176421, -9.9991875
 -9.4971533, -9.9804153
 9.2741480, 0.0079826
 0.0621693, 0.0001280
 9.5782423, 10.0012493
 0.7458544, -10.0001297
 -0.2664081, 10.0010128
 -10.7606297, 9.9916744
 -0.9270647, -9.9998847
 9.6582813, 9.9795599
 0.6712921, -10.0006027
 -0.7446012, -9.9999619
 10.9217691, 9.9997072
 -10.0740948, -0.0000899
 9.3831911, -9.9979620
 -0.9628679, 0.0019302

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5. If you need the obtained data, please use Ctrl+A to select all the data, then Ctrl+C and Ctrl+V to copy and paste the data.

Two-Stage Double Niched Evolution Strategy for Multimodal Multi-Objective Optimization

SYMPart1 Objects 2 Decisions 2 Population 200 Initialization Iteration 1000 Stage One Stage Two Start

Runtime Evaluation

Pareto Front Ture Load IGD = 0.00897424

Pareto Front Obtain Load Clear Calculate

Pareto Set True Load IGDx = 0.03002401

Pareto Set Obtain Load Clear Calculate

Ctrl + A
Ctrl + C
Ctrl + V

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The obtained data is shown as below.

0.7475473,1.2891146	0.9250877,1.0778618	1.2270547,0.7961579	0.6093037,1.4876077	0.0005757,3.9046474
1.6480125,0.5130180	0.0256561,3.3849702	0.3433727,1.9994587	3.7663000,0.0035170	2.1463337,0.2873974
2.1948695,0.2688327	0.4918292,1.6866077	0.3531242,1.9767379	3.5537226,0.0131947	2.038018,0.3305632
0.0105593,3.6015475	0.2417243,2.2751334	0.3621641,1.9549773	0.6407035,1.4392723	0.1393040,2.6463726
2.6628480,0.1355539	1.5670636,0.5599836	3.8333764,0.0017723	0.9931858,1.0196059	0.6730405,1.3915197
3.5824358,0.0115071	0.0228042,3.4187622	3.1736221,0.0477598	0.3715087,1.9334487	0.0927353,2.8746986
2.4869478,0.1807955	3.4012995,0.0242568	0.5074223,1.6590438	3.6367173,0.0086502	0.0067642,3.6777847
3.2411265,0.0398750	1.4290100,0.6474128	3.4628179,0.0193900	2.4158199,0.1986569	0.1557409,2.5775375
3.7302651,0.0047077	0.3078782,2.0884073	1.7695568,0.4485692	0.6566632,1.4152730	1.5356386,0.5799234
0.0461320,3.1930015	0.2131964,2.3662686	0.2735089,2.1823108	0.1258886,2.7066572	0.1735515,2.5072005
2.0781209,0.3118456	0.2513666,2.2459078	0.9021938,1.1030301	3.3434851,0.0294173	0.7922223,1.2319502
3.8667679,0.0011330	0.1965025,2.4233587	3.2741029,0.0363100	0.1885892,2.4515285	2.7600675,0.1146914
0.0419750,3.2224636	0.5226884,1.6308007	3.9560547,0.0001222	0.9499778,1.0513190	2.5729032,0.1567945
0.2318096,2.3061543	0.0201933,3.4517806	0.6900312,1.3673066	3.3083985,0.0327980	0.0809715,2.9428298
2.0019040,0.3498730	0.1813977,2.4777653	1.6209862,0.5282815	0.2574263,2.2279387	3.4948454,0.0170432
1.4987316,0.6018886	0.4632969,1.7406632	3.4320168,0.0217385	0.3250342,2.0448446	2.2179096,0.2609280
0.4505364,1.7656686	0.8357858,1.1789331	0.0154797,3.5178103	0.0532365,3.1303163	0.8143449,1.2047105
0.0019331,3.8234959	0.7689461,1.2613815	3.2071660,0.0347490	1.0516450,0.9496552	0.0869757,2.9097373
1.3099207,0.7318605	1.0262067,0.9741324	2.4490650,0.1896503	0.0000000,4.0000000	0.0041621,3.7513278
0.4180867,1.8317066	1.3683224,0.6893101	1.7067243,0.4814740	3.6556432,0.0077491	0.0002790,3.9334798
0.1194086,2.7372446	2.6946588,0.1284927	1.2530584,0.7754968	1.0010799,0.9989207	2.3032382,0.2326698
0.1002607,2.8342886	1.1031717,0.9019121	0.0386134,3.2526064	0.0319864,3.3165972	2.2589319,0.2475449
1.9819704,0.3507792	2.3933475,0.2051685	1.3994774,0.6675057	0.8790523,1.1287408	0.0752208,2.9786289
1.8442854,0.4121068	1.1767224,0.8376493	0.0028882,3.7884128	3.5244377,0.0150535	1.1282036,0.8795265
0.0091825,3.6258817	0.0614758,3.0706577	3.1377008,0.0522783	2.5894506,0.1527428	0.3343657,2.0213964
1.0770524,0.9258072	0.6242663,1.4638582	2.7273321,0.1214781	3.9293404,0.0003166	3.0480077,0.0645900
1.8862329,0.3926263	0.0134503,3.5495489	0.0354162,3.2826483	3.3785048,0.0262240	0.5381582,1.6037904
1.8024004,0.4322602	3.6190975,0.0095280	0.2646522,2.2068779	2.9352946,0.0822140	0.0573675,3.0998862
3.7995021,0.0025775	0.0080180,3.6498446	0.0009506,3.8776257	0.2219676,2.3374302	0.0053196,3.7135785
2.8265681,0.1016079	3.9831073,0.0000179	0.1657348,2.5373130	2.9679928,0.0771580	0.4337521,1.8006268
1.2020057,0.8172376	1.2806338,0.7540301	2.3397632,0.2212520	2.5222273,0.1696192	2.7932174,0.1080493
1.9088331,0.3824123	0.5698259,1.5504510	1.1533635,0.8576902	0.1065415,2.8009918	0.0652285,3.0436335
3.8983538,0.0006627	2.9998174,0.0718351	0.3843365,1.9045582	0.4022448,1.8653338	3.6931968,0.0061202
1.4640043,0.6241655	0.1130213,2.7683656	0.5539129,1.5769002	0.1324726,2.6766009	0.8573005,1.1536796
2.0644977,0.3171681	2.8599906,0.0953879	0.0000710,3.9664025	4.0000000,0.0000000	0.1468396,2.6140752
3.0988333,0.0574325	0.0177404,3.4849684	0.0700800,3.0111752	0.7076445,1.3427801	0.0013825,3.8528543
1.7368876,0.4652465	1.5940449,0.5438321	0.0287503,3.3505208	2.3682797,0.2138657	
0.0492537,3.1615279	0.4764227,1.7154897	0.9751114,1.0252023	0.5916486,1.5149007	
0.0118777,3.5759378	1.9587816,0.3605227	1.9273450,0.3748738	1.6736140,0.4990017	
2.5476687,0.1631015	1.3392361,0.7102223	0.2800093,2.1641874	0.7277327,1.3162183	
2.6130781,0.1470709	0.2049424,2.3952348	2.6376297,0.1414445	2.1052117,0.3014740	