

Supplementary Material

TABLE S-I
ACCURACY RESULT COMPARISON ON DIFFERENT PARAMETER σ

Functions	0.02	0.1	0.2	0.3	vs. 0.02	vs. 0.2	vs. 0.3
1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0	0	0
2	4.41E+05	7.08E+05	1.15E+06	1.59E+06	-1	1	1
3	1.06E+06	4.90E+05	1.39E+06	1.77E+06	1	0	1
4	3.37E+01	1.23E+02	1.88E+02	2.44E+02	-1	1	1
5	1.21E-03	1.47E-03	1.88E-03	2.12E-03	-1	1	1
6	1.56E+01	1.48E+01	1.50E+01	1.69E+01	0	1	1
7	4.95E+01	4.52E+01	5.32E+01	5.20E+01	0	1	1
8	2.09E+01	2.09E+01	2.09E+01	2.09E+01	0	0	0
9	1.41E+01	1.10E+01	1.14E+01	1.20E+01	1	0	1
10	8.94E-03	9.37E-03	1.25E-02	2.65E-02	0	0	1
11	3.33E+01	2.49E+01	2.48E+01	2.71E+01	1	0	0
12	3.36E+01	2.58E+01	2.31E+01	2.16E+01	1	0	0
13	7.08E+01	5.89E+01	5.27E+01	4.66E+01	1	0	-1
14	2.58E+03	2.49E+03	2.49E+03	2.44E+03	0	0	0
15	2.42E+03	2.22E+03	2.25E+03	2.24E+03	0	0	0
16	1.17E-01	6.33E-02	6.70E-02	7.69E-02	1	0	1
17	6.74E+01	5.13E+01	4.80E+01	4.61E+01	1	-1	-1
18	6.22E+01	4.91E+01	4.61E+01	4.76E+01	1	-1	0
19	2.71E+00	2.13E+00	2.11E+00	2.14E+00	1	0	0
20	1.21E+01	1.21E+01	1.21E+01	1.25E+01	0	0	1
21	2.41E+02	2.45E+02	2.61E+02	2.47E+02	0	0	0
22	3.18E+03	3.11E+03	3.04E+03	2.98E+03	0	0	0
23	2.77E+03	2.97E+03	2.84E+03	2.68E+03	0	0	0
24	2.22E+02	2.08E+02	2.05E+02	2.08E+02	1	-1	1
25	2.65E+02	2.58E+02	2.63E+02	2.66E+02	1	0	1
26	2.00E+02	2.00E+02	2.00E+02	2.00E+02	0	0	1
27	6.07E+02	3.97E+02	3.57E+02	3.80E+02	1	-1	0
28	2.84E+02	3.00E+02	3.00E+02	2.96E+02	-1	0	-1
Average Ranking	2.86	2.00	2.21	2.68	12+/12/4-	5+/19/4-	13+/12/3-

TABLE S-II
ABLATION EXPERIMENTAL RESULTS ON CEC 2017

Func		LoTFWA	PC-FWAv	PC-FWAs	PC-FWA	Func		LoTFWA	PC-FWAv	PC-FWAs	PC-FWA
1	Mean	1.65E+02	2.48E+02	3.35E+02	2.73E+02	16	Mean	5.84E+02	5.08E+02	6.23E+02	6.37E+02
	Std.	3.10E+02	3.91E+02	1.16E+03	6.96E+02		Std.	1.39E+02	1.37E+02	1.89E+02	1.42E+02
2	Mean	2.11E+04	5.84E+05	3.05E+04	1.80E+04	17	Mean	1.25E+02	1.05E+02	1.87E+02	1.62E+02
	Std.	6.98E+04	2.12E+06	1.41E+05	3.75E+04		Std.	3.86E+01	3.47E+01	9.08E+01	9.49E+01
3	Mean	6.15E-04	1.38E-03	6.65E-05	1.29E-04	18	Mean	5.24E+04	4.12E+04	5.15E+04	4.02E+04
	Std.	7.69E-04	1.41E-03	5.66E-05	1.53E-04		Std.	2.11E+04	1.36E+04	2.55E+04	1.69E+04
4	Mean	5.82E+01	6.77E+01	6.60E+01	7.34E+01	19	Mean	8.30E+04	5.39E+04	2.72E+04	4.65E+04
	Std.	3.21E+01	2.03E+01	3.38E+01	2.56E+01		Std.	7.45E+04	4.26E+04	3.20E+04	4.05E+04
5	Mean	6.96E+01	4.12E+01	4.12E+01	2.62E+01	20	Mean	2.44E+02	2.16E+02	2.77E+02	2.93E+02
	Std.	1.21E+01	8.87E+00	1.07E+01	6.51E+00		Std.	6.33E+01	5.53E+01	9.73E+01	9.97E+01
6	Mean	7.92E-01	3.25E-03	4.39E+00	1.34E-02	21	Mean	2.68E+02	2.46E+02	2.35E+02	2.28E+02
	Std.	1.62E+00	5.87E-03	5.51E+00	3.57E-02		Std.	2.58E+01	7.59E+00	2.13E+01	7.30E+00
7	Mean	7.19E+01	6.53E+01	4.99E+01	4.76E+01	22	Mean	1.00E+02	1.00E+02	1.62E+02	1.00E+02
	Std.	8.84E+00	8.24E+00	5.65E+00	4.86E+00		Std.	0.00E+00	0.00E+00	4.42E+02	0.00E+00
8	Mean	6.50E+01	3.98E+01	3.38E+01	2.73E+01	23	Mean	4.37E+02	4.07E+02	3.97E+02	3.90E+02
	Std.	1.00E+01	6.67E+00	9.01E+00	8.04E+00		Std.	1.75E+01	4.54E+01	4.58E+01	1.40E+01
9	Mean	3.36E+00	0.00E+00	1.75E+02	0.00E+00	24	Mean	4.96E+02	4.66E+02	4.62E+02	4.46E+02
	Std.	2.36E+01	0.00E+00	3.21E+02	0.00E+00		Std.	1.52E+01	1.34E+01	1.83E+01	9.47E+00
10	Mean	2.46E+03	2.38E+03	2.51E+03	2.21E+03	25	Mean	3.87E+02	3.87E+02	3.86E+02	3.87E+02
	Std.	3.49E+02	3.10E+02	4.47E+02	4.47E+02		Std.	8.26E-01	8.01E-01	1.22E+00	4.72E-01
11	Mean	9.45E+01	8.74E+01	6.79E+01	6.71E+01	26	Mean	7.17E+02	7.34E+02	1.26E+03	1.16E+03
	Std.	3.07E+01	2.42E+01	2.47E+01	2.40E+01		Std.	7.30E+02	6.60E+02	5.43E+02	4.63E+02
12	Mean	4.11E+05	3.92E+05	3.20E+05	3.42E+05	27	Mean	5.34E+02	5.23E+02	5.18E+02	5.12E+02
	Std.	3.33E+05	2.42E+05	2.52E+05	2.07E+05		Std.	1.17E+01	9.90E+00	1.04E+01	1.09E+01
13	Mean	2.09E+04	1.65E+04	1.89E+04	1.51E+04	28	Mean	3.27E+02	3.21E+02	3.08E+02	3.03E+02
	Std.	7.64E+03	4.44E+03	7.92E+03	3.67E+03		Std.	4.14E+01	3.82E+01	2.72E+01	1.51E+01
14	Mean	8.02E+02	4.84E+02	4.94E+02	4.28E+02	29	Mean	7.26E+02	6.80E+02	6.89E+02	6.33E+02
	Std.	5.10E+02	2.66E+02	4.67E+02	3.47E+02		Std.	8.27E+01	6.67E+01	1.31E+02	8.35E+01
15	Mean	1.35E+04	7.45E+03	1.15E+04	8.16E+03	30	Mean	3.75E+05	2.95E+05	3.61E+05	3.06E+05
	Std.	4.74E+03	2.84E+03	8.20E+03	3.32E+03		Std.	1.95E+05	1.52E+05	2.80E+05	1.80E+05

TABLE S-III
COMPARISONS WITH OTHER ALGORITHMS ON CEC 2017

Func		ALCPSO	TAPSO	MAPSO	CoFFWA	GFWA	LoTFWA	PC-FWA
1	Mean	4.53E+03	2.29E+03	3.09E+03	4.01E+03	2.84E+03	1.65E+02	2.73E+02
	Std.	5.14E+03	2.89E+03	3.76E+03	4.37E+03	3.95E+03	3.10E+02	6.96E+02
2	Mean	2.24E+17	1.46E-04	7.34E+05	3.43E+01	2.58E+03	2.11E+04	1.80E+04
	Std.	1.58E+18	2.30E-04	3.22E+06	9.31E+01	6.16E+03	6.98E+04	3.75E+04
3	Mean	2.49E+00	0.00E+00	1.53E+00	0.00E+00	0.00E+00	6.15E-04	1.29E-04
	Std.	7.92E+00	0.00E+00	1.43E+00	0.00E+00	0.00E+00	7.69E-04	1.53E-04
4	Mean	1.03E+02	3.68E+01	9.00E+01	8.77E+01	9.98E+01	5.82E+01	7.34E+01
	Std.	4.77E+01	2.96E+01	6.31E+00	2.22E+01	2.28E+01	3.21E+01	2.56E+01
5	Mean	8.91E+01	5.43E+01	3.42E+01	1.28E+02	8.72E+01	6.96E+01	2.62E+01
	Std.	3.00E+01	1.24E+01	1.14E+01	3.82E+01	2.75E+01	1.21E+01	6.51E+00
6	Mean	3.48E+00	6.93E-03	3.57E-01	2.04E+01	1.75E+00	7.92E-01	1.34E-02
	Std.	4.12E+00	6.98E-03	4.54E-01	8.40E+00	6.61E+00	1.62E+00	3.57E-02
7	Mean	1.18E+02	8.14E+01	9.58E+01	1.50E+02	8.54E+01	7.19E+01	4.76E+01
	Std.	2.81E+01	1.53E+01	1.85E+01	3.34E+01	2.29E+01	8.84E+00	4.86E+00
8	Mean	9.22E+01	5.50E+01	3.47E+01	1.25E+02	8.99E+01	6.50E+01	2.73E+01
	Std.	2.48E+01	1.49E+01	9.64E+00	3.91E+01	3.81E+01	1.00E+01	8.04E+00
9	Mean	8.66E+02	8.61E+01	5.06E+01	3.06E+03	5.71E+02	3.36E+00	0.00E+00
	Std.	1.05E+03	9.47E+01	4.20E+01	1.83E+03	1.53E+03	2.36E+01	0.00E+00
10	Mean	2.98E+03	2.52E+03	2.64E+03	3.33E+03	3.65E+03	2.46E+03	2.21E+03
	Std.	5.74E+02	6.12E+02	4.85E+02	4.64E+02	5.56E+02	3.49E+02	4.47E+02
11	Mean	1.22E+02	8.16E+01	8.21E+01	1.44E+02	1.45E+02	9.45E+01	6.71E+01
	Std.	4.55E+01	3.26E+01	2.99E+01	5.66E+01	4.55E+01	3.07E+01	2.40E+01
12	Mean	2.82E+05	2.62E+04	3.49E+04	9.46E+05	1.09E+06	4.11E+05	3.42E+05
	Std.	7.91E+05	2.37E+04	2.78E+04	7.24E+05	9.44E+05	3.33E+05	2.07E+05
13	Mean	1.92E+04	1.73E+04	1.79E+04	4.90E+04	7.56E+04	2.09E+04	1.51E+04
	Std.	3.48E+04	1.81E+04	1.53E+04	2.64E+04	4.95E+04	7.64E+03	3.67E+03
14	Mean	3.73E+04	5.38E+03	2.85E+03	8.29E+03	1.79E+03	8.02E+02	4.28E+02
	Std.	6.98E+04	2.72E+04	3.66E+03	6.88E+03	1.42E+03	5.10E+02	3.47E+02
15	Mean	1.13E+04	6.25E+03	4.70E+03	8.95E+03	6.01E+04	1.35E+04	8.16E+03
	Std.	1.12E+04	8.60E+03	6.52E+03	9.94E+03	3.58E+04	4.74E+03	3.32E+03
16	Mean	9.24E+02	8.02E+02	5.09E+02	8.28E+02	9.35E+02	5.84E+02	6.37E+02
	Std.	2.86E+02	2.45E+02	2.55E+02	2.00E+02	3.22E+02	1.39E+02	1.42E+02
17	Mean	4.03E+02	3.26E+02	1.08E+02	4.28E+02	3.78E+02	1.25E+02	1.62E+02
	Std.	1.81E+02	1.73E+02	5.85E+01	1.31E+02	1.85E+02	3.86E+01	9.49E+01
18	Mean	1.50E+05	3.81E+04	6.19E+04	1.20E+05	9.13E+04	5.24E+04	4.02E+04
	Std.	1.30E+05	1.85E+04	3.56E+04	8.48E+04	4.35E+04	2.11E+04	1.69E+04
19	Mean	1.18E+04	6.19E+03	4.47E+03	1.13E+04	1.32E+05	8.30E+04	4.65E+04
	Std.	1.40E+04	8.81E+03	7.07E+03	1.18E+04	4.76E+04	7.45E+04	4.05E+04
20	Mean	3.51E+02	2.95E+02	1.55E+02	4.56E+02	5.35E+02	2.44E+02	2.93E+02
	Std.	1.71E+02	1.46E+02	5.44E+01	1.48E+02	1.94E+02	6.33E+01	9.97E+01
21	Mean	2.97E+02	2.60E+02	2.34E+02	3.19E+02	2.88E+02	2.68E+02	2.28E+02
	Std.	2.92E+01	1.69E+01	9.32E+00	3.11E+01	4.13E+01	2.58E+01	7.30E+00
22	Mean	1.68E+03	7.54E+02	1.00E+02	1.78E+03	2.72E+02	1.00E+02	1.00E+02
	Std.	1.62E+03	1.21E+03	9.95E-01	1.84E+03	8.62E+02	0.00E+00	0.00E+00
23	Mean	4.79E+02	4.23E+02	3.87E+02	4.98E+02	4.83E+02	4.37E+02	3.90E+02
	Std.	4.76E+01	2.29E+01	9.89E+00	4.67E+01	4.04E+01	1.75E+01	1.40E+01
24	Mean	5.65E+02	5.14E+02	4.54E+02	5.36E+02	5.31E+02	4.96E+02	4.46E+02
	Std.	6.07E+01	2.93E+01	9.81E+00	9.58E+01	4.49E+01	1.52E+01	9.47E+00
25	Mean	4.06E+02	3.90E+02	3.88E+02	3.89E+02	3.87E+02	3.87E+02	3.87E+02
	Std.	2.46E+01	1.08E+01	4.81E-01	8.43E+00	7.25E-01	8.26E-01	4.72E-01
26	Mean	1.36E+03	1.42E+03	1.37E+03	2.10E+03	2.10E+03	7.17E+02	1.16E+03
	Std.	9.38E+02	6.87E+02	1.93E+02	1.06E+03	5.23E+02	7.30E+02	4.63E+02
27	Mean	4.99E+02	5.18E+02	5.08E+02	5.55E+02	5.69E+02	5.34E+02	5.12E+02
	Std.	4.15E+00	1.11E+01	8.97E+00	2.54E+01	4.11E+01	1.17E+01	1.09E+01
28	Mean	4.14E+02	3.40E+02	3.90E+02	3.62E+02	3.66E+02	3.27E+02	3.03E+02
	Std.	5.87E+01	5.81E+01	4.50E+01	5.70E+01	6.15E+01	4.14E+01	1.51E+01
29	Mean	7.47E+02	7.21E+02	5.23E+02	1.01E+03	9.71E+02	7.26E+02	6.33E+02
	Std.	2.26E+02	1.60E+02	7.61E+01	1.64E+02	2.03E+02	8.27E+01	8.35E+01
30	Mean	2.76E+03	5.12E+03	5.02E+03	1.40E+05	5.75E+05	3.75E+05	3.06E+05
	Std.	2.67E+03	2.46E+03	2.47E+03	8.67E+04	3.00E+05	1.95E+05	1.80E+05