

Tab. 1 Comparison results among comparison algorithms on twenty four benchmarks, D=10

Fun		BBO	DE	PSO	Firework	ABC	OCABC	ILABC	dABC	distABC	ABCVSS	ABCM	ILTDABC
1	mean	2.42E+01	8.37E-50	8.08E-25	1.19E-112	1.32E-16	2.55E-52	4.59E-10	2.33E-51	1.38E-76	9.13E-71	1.68E-50	0
	SD	1.02E+01	9.47E-50	1.72E-24	5.31E-112	5.64E-17	1.14E-51	2.05E-09	8.72E-51	2.83E-76	3.54E-70	5.38E-50	0
	ranking	12	8	9	2	10	5	11	6	3	4	7	1
	wilcoxon	-	-	-	-	-	-	-	-	-	-	-	-
2	mean	1.19E+03	1.28E-18	1.63E-07	3.26E-83	6.18E+01	1.64E+01	2.87E+02	6.89E+01	4.62E+01	1.20E+02	3.81E+01	0
	SD	5.90E+02	2.11E-18	2.00E-07	1.43E-82	3.48E+01	2.20E+01	2.00E+02	4.38E+01	2.73E+01	1.12E+02	2.37E+01	0
	ranking	12	3	4	2	8	5	11	9	7	10	6	1
	wilcoxon	-	-	-	-	-	-	-	-	-	-	-	-
3	mean	1.38E+06	2.20E-48	1.65E-23	2.03E-120	8.55E-17	1.01E-51	1.22E-106	1.32E-47	9.10E-74	8.73E-10	2.66E-49	0
	SD	1.86E+06	2.85E-48	6.92E-23	8.99E-120	2.99E-17	4.51E-51	3.81E-106	5.59E-47	4.02E-73	3.90E-09	6.89E-49	0
	ranking	12	7	9	2	10	5	3	8	4	11	6	1
	wilcoxon	-	-	-	-	-	-	-	-	-	-	-	-
4	mean	1.80E+02	1.20E-48	2.02E-24	1.76E-108	1.43E-16	1.61E-40	3.87E-23	7.75E-49	5.87E-77	7.74E-68	2.35E-47	0
	SD	1.75E+02	2.90E-48	3.85E-24	7.81E-108	6.51E-17	7.19E-40	1.73E-22	3.39E-48	8.93E-77	3.44E-67	1.05E-46	0
	ranking	12	6	9	2	11	8	10	5	3	4	7	1
	wilcoxon	-	-	-	-	-	-	-	-	-	-	-	-
5	mean	2.54E+01	0	0	0	0	0	0	0	0	0	0	0
	SD	1.63E+01	0	0	0	0	0	0	0	0	0	0	0
	ranking	12	1	1	1	1	1	1	1	1	1	1	1
	wilcoxon	-	=	=	=	=	=	=	=	=	=	=	=
6	mean	3.07E-02	1.81E-03	3.80E-03	3.27E-04	9.54E-03	1.90E-03	2.69E-03	8.84E-03	4.02E-03	3.68E-03	8.40E-03	2.92E-05
	SD	1.75E-02	9.48E-04	2.23E-03	2.53E-04	4.02E-03	8.84E-04	1.70E-03	3.09E-03	1.23E-03	1.49E-03	3.36E-03	2.68E-05
	ranking	5	1	8	6	12	2	3	11	9	7	10	4
	wilcoxon	-	+	-	-	-	+	+	-	-	-	-	-
7	mean	9.19E-01	1.99E-26	1.23E-14	9.71E-62	3.31E-16	6.82E-32	3.95E-47	1.08E-27	1.32E-40	1.39E-08	1.35E-27	0
	SD	2.85E-01	2.32E-26	3.00E-14	3.47E-61	8.65E-17	2.99E-31	1.74E-46	1.61E-27	1.67E-40	5.82E-08	3.21E-27	0
	ranking	12	8	10	2	9	5	3	6	4	11	7	1
	wilcoxon	-	-	-	-	-	-	-	-	-	-	-	-
8	mean	1.26E+01	5.92E-46	7.78E-24	1.49E-132	1.07E-16	4.30E-51	5.79E-111	1.89E-50	3.01E-74	9.00E-14	1.53E-49	0
	SD	1.04E+01	1.58E-45	2.25E-23	6.65E-132	3.64E-17	1.92E-50	1.77E-110	6.23E-50	9.00E-74	2.84E-13	4.60E-49	0

	ranking wilcoxon	12 -	8 -	9 -	2 -	10 -	5 -	3 -	6 -	4 -	11 -	7 -	1
9	mean	9.51E+00	2.36E-05	4.34E-07	1.41E-41	7.94E-03	7.01E-07	2.71E-03	6.35E-03	7.48E-05	1.49E-01	7.11E-03	0
	SD	3.07E+00	1.03E-04	8.65E-07	6.32E-41	3.21E-03	1.08E-06	5.18E-03	2.47E-03	3.49E-05	2.76E-01	1.62E-03	0
	ranking	12	5	3	2	10	4	7	8	6	11	9	1
	wilcoxon	-	-	-	-	-	-	-	-	-	-	-	
10	mean	4.79E+00	1.06E+01	2.79E+00	0	0	4.97E-02	4.97E-02	0	0	2.05E-01	0	0
	SD	1.58E+00	3.89E+00	8.67E-01	0	0	2.22E-01	2.22E-01	0	0	6.32E-01	0	0
	ranking	11	12	10	1	1	7	7	1	1	9	1	1
	wilcoxon	-	-	-	=	=	-	-	=	=	-	=	
11	mean	1.24E+00	7.38E-02	9.14E-02	4.19E-02	1.07E-02	1.17E-02	1.34E-02	9.76E-03	8.36E-03	1.18E-02	1.03E-02	8.91E-03
	SD	9.40E-02	6.21E-02	4.56E-02	2.23E-02	3.83E-03	5.80E-03	1.08E-02	2.65E-03	8.47E-04	8.33E-03	3.39E-03	2.45E-03
	ranking	12	10	11	9	5	6	8	3	1	7	4	2
	wilcoxon	-	-	-	-	-	-	-	-	+	-	-	
12	mean	2.87E-01	1.57E-32	1.95E-25	5.01E-03	8.78E-17	1.57E-32	4.11E-21	1.57E-32	1.57E-32	5.86E-06	1.57E-32	1.57E-32
	SD	2.95E-01	8.21E-48	8.51E-25	4.82E-03	1.27E-17	2.81E-48	1.84E-20	2.81E-48	2.81E-48	2.62E-05	2.81E-48	2.81E-48
	ranking	12	6	7	11	9	1	8	1	1	10	1	1
	wilcoxon	-	-	-	-	-	=	-	=	=	-	=	
13	mean	1.07E+01	1.35E-32	4.45E-22	2.78E+00	1.21E-16	1.35E-32	2.82E-19	1.35E-32	1.35E-32	1.35E-32	1.35E-32	1.35E-32
	SD	6.60E+00	2.74E-48	1.60E-21	2.07E+00	4.61E-17	2.81E-48	1.26E-18	2.81E-48	2.81E-48	2.81E-48	2.81E-48	2.81E-48
	ranking	12	1	8	11	10	1	9	1	1	1	1	1
	wilcoxon	-	=	-	-	-	=	-	=	=	=	=	
14	mean	1.52E+00	9.99E-02	1.25E-01	2.29E-32	2.65E-01	1.95E-01	2.75E-01	3.00E-01	2.60E-01	1.90E-01	2.80E-01	1.50E-02
	SD	3.70E-01	1.57E-08	4.33E-02	1.02E-31	7.45E-02	6.05E-02	9.67E-02	6.49E-02	5.03E-02	5.53E-02	5.23E-02	3.66E-02
	ranking	12	3	4	1	8	6	9	11	7	5	10	2
	wilcoxon	-	-	-	+	-	-	-	-	-	-	-	
15	mean	22.5095	0	1.31E-23	1.74E+02	1.22E-16	0	3.28E-28	0	0	3.97E-12	0	0
	SD	14.78769	0	5.21E-23	2.04E+02	6.55E-17	0	1.36E-27	0	0	1.77E-11	0	0
	ranking	12	1	8	11	9	1	7	1	1	10	1	1
	wilcoxon	-	=	-	-	-	=	-	=	=	-	=	
16	mean	3.95E+03	8.13E-17	4.44E-04	2.81E+03	2.67E+03	5.31E+02	2.13E+03	1.95E+03	2.21E+03	2.22E+03	2.02E+03	1.44E+03
	SD	2.02E+03	1.19E-16	1.13E-03	1.73E+03	1.04E+03	3.97E+02	1.14E+03	9.88E+02	8.01E+02	1.05E+03	1.29E+03	9.19E+02

	ranking wilcoxon	12 -	1 +	2 +	11 -	10 -	3 +	7 -	5 -	8 -	9 -	6 -	4
17	mean	2.42E+03	0.00E+00	3.01E+02	4.16E+03	4.71E+02	6.77E+01	1.88E+02	4.75E+02	7.07E+02	9.02E+02	6.48E+02	1.00E-01
	SD	1.06E+03	0.00E+00	1.61E+02	2.15E+03	6.31E+02	1.80E+02	2.61E+02	4.29E+02	6.35E+02	1.82E+03	7.10E+02	1.40E-01
	ranking	11	1	5	12	6	3	4	7	9	10	8	2
	wilcoxon	-	+	-	-	-	-	-	-	-	-	-	
18	mean	4.97E+00	3.16E-01	2.44E-01	7.85E+00	2.18E-01	3.31E-01	2.98E-01	1.86E-01	2.86E-01	2.50E-01	2.49E-01	2.32E-01
	SD	3.29E+00	2.07E-01	1.13E-01	6.50E+00	1.35E-01	2.28E-01	1.84E-01	9.82E-02	3.90E-01	2.32E-01	1.43E-01	1.56E-01
	ranking	11	9	4	12	2	10	8	1	7	6	5	3
	wilcoxon	-	-	-	-	+	-	-	+	-	-	-	
19	mean	3.12E+01	2.93E+01	1.87E+01	5.14E+01	3.46E+01	1.95E+01	1.97E+01	3.86E+01	2.36E+01	2.28E+01	3.86E+01	2.00E+01
	SD	9.10E+00	4.34E+00	6.31E+00	1.94E+01	8.75E+00	6.60E+00	7.01E+00	9.22E+00	7.25E+00	1.25E+01	1.18E+01	5.41E+00
	ranking	8	7	1	12	9	2	3	10	6	5	10	4
	wilcoxon	-	-	+	-	-	+	+	-	-	-	-	
20	mean	8.84E+00	5.99E+00	4.24E+00	7.37E+00	6.29E+00	5.82E+00	6.32E+00	6.17E+00	6.56E+00	5.66E+00	6.45E+00	4.73E+00
	SD	1.15E+00	2.74E+00	1.05E+00	1.29E+00	8.19E-01	1.43E+00	8.46E-01	8.07E-01	6.99E-01	8.64E-01	6.00E-01	1.34E+00
	ranking	12	5	1	11	7	4	8	6	10	3	9	2
	wilcoxon	-	-	+	-	-	-	-	-	-	-	-	
21	mean	3.96E+00	3.48E+00	3.24E+00	3.69E+00	3.46E+00	3.62E+00	3.33E+00	3.43E+00	3.54E+00	3.44E+00	3.43E+00	3.16E+00
	SD	2.25E-01	2.19E-01	3.26E-01	3.07E-01	2.50E-01	3.22E-01	2.48E-01	2.88E-01	1.93E-01	3.08E-01	1.72E-01	2.51E-01
	ranking	12	8	2	11	7	10	3	5	9	6	4	1
	wilcoxon	-	-	-	-	-	-	-	-	-	-	-	
22	mean	1.77E+02	1.52E+02	1.39E+02	2.43E+02	1.67E+02	1.38E+02	1.42E+02	1.80E+02	1.52E+02	1.56E+02	1.73E+02	1.26E+02
	SD	2.26E+01	1.41E+01	1.73E+01	5.35E+01	2.55E+01	2.30E+01	2.18E+01	2.36E+01	2.09E+01	2.05E+01	2.92E+01	1.67E+01
	ranking	10	5	3	12	8	2	4	11	6	7	9	1
	wilcoxon	-	-	-	-	-	-	-	-	-	-	-	
23	mean	2.02E+02	1.73E+02	1.34E+02	2.43E+02	1.89E+02	1.45E+02	1.47E+02	1.87E+02	1.71E+02	1.75E+02	1.87E+02	1.39E+02
	SD	2.66E+01	1.46E+01	2.32E+01	4.04E+01	2.89E+01	3.05E+01	1.22E+01	2.79E+01	2.22E+01	3.36E+01	2.25E+01	2.09E+01
	ranking	11	6	1	12	10	3	4	9	5	7	8	2
	wilcoxon	-	-	+	-	-	-	-	-	-	-	-	
24	mean	9.07E+02	7.81E+02	8.03E+02	9.50E+02	7.99E+02	8.16E+02	8.03E+02	7.76E+02	7.61E+02	8.07E+02	7.71E+02	7.09E+02
	SD	8.59E+01	2.44E+01	1.22E+02	7.18E+01	1.59E+01	6.83E+01	4.45E+01	1.13E+02	1.09E+02	5.49E+01	1.11E+02	1.77E+02

	ranking	11	5	8	12	6	10	7	4	2	9	3	1
	wilcoxon	-	-	-	-	-	-	-	-	-	-	-	

Tab. 2 Comparison results among comparison algorithms on twenty four benchmarks, D=30

Fun		BBO	DE	PSO	Firework	ABC	OCABC	ILABC	dABC	distABC	ABCVSS	ABCM	ILTDABC
1	mean	1.18E+01	6.04E-48	8.66E-18	1.60E-312	5.34E-16	1.46E-18	4.61E-07	3.65E-49	1.13E-71	1.39E-66	1.97E-42	0
	SD	4.37E+00	7.11E-48	1.37E-17	0	1.00E-16	6.46E-18	2.06E-06	6.55E-49	2.45E-71	4.51E-66	8.19E-42	0
	ranking	12	5	8	11	9	7	10	4	2	3	6	1
	wilcoxon	-	-	-	-	-	-	-	-	-	-	-	
2	mean	1.21E+04	2.25E-01	1.39E+02	1.91E-227	6.67E+03	4.29E+03	1.02E+04	6.16E+03	6.05E+03	7.95E+03	4.28E+03	6.66E-45
	SD	3.53E+03	2.45E-01	6.70E+01	0	1.45E+03	1.37E+03	2.49E+03	1.19E+03	1.11E+03	1.88E+03	1.16E+03	2.98E-44
	ranking	12	3	4	1	9	6	11	8	7	10	5	2
	wilcoxon	-	-	-	+	-	-	-	-	-	-	-	
3	mean	1.74E+05	3.09E-47	1.01E-17	4.04E-303	5.20E-16	1.80E-25	3.04E-102	1.26E-46	5.70E-70	5.18E-08	1.17E-45	0
	SD	4.53E+05	7.07E-47	1.49E-17	0	9.99E-17	7.92E-25	6.09E-102	4.02E-46	1.55E-69	2.31E-07	1.91E-45	0
	ranking	12	5	9	2	10	8	3	6	4	11	7	1
	wilcoxon	-	-	-	-	-	-	-	-	-	-	-	
4	mean	2.06E+02	4.23E-47	8.73E-17	1.71E-301	5.65E-16	5.44E-18	1.04E-05	2.90E-47	6.04E-70	2.60E-10	3.64E-43	0
	SD	1.37E+02	5.18E-47	1.54E-16	0	7.71E-17	2.11E-17	4.65E-05	9.27E-47	1.28E-69	1.16E-09	1.48E-42	0
	ranking	12	5	8	2	9	7	11	4	3	10	6	1
	wilcoxon	-	-	-	-	-	-	-	-	-	-	-	
5	mean	1.53E+01	0	0	0	0	0	0	0	0	0	0	0
	SD	4.45E+00	0	0	0	0	0	0	0	0	0	0	0
	ranking	12	1	1	1	1	1	1	1	1	1	1	1
	wilcoxon	-	=	=	=	=	=	=	=	=	=	=	
6	mean	6.42E-02	5.32E-03	2.27E-02	1.37E-04	4.38E-02	5.54E-03	1.85E-02	4.57E-02	2.62E-02	2.06E-02	3.77E-02	9.66E-05
	SD	2.31E-02	1.49E-03	8.67E-03	1.78E-04	1.05E-02	1.70E-03	4.78E-03	1.03E-02	9.58E-03	9.69E-03	9.14E-03	6.49E-05
	ranking	12	3	7	2	10	4	5	11	8	6	9	1
	wilcoxon	-	-	-	-	-	-	-	-	-	-	-	
7	mean	1.22E+00	1.94E-25	9.44E-13	5.15E-169	1.22E-15	1.00E-13	1.59E-49	5.47E-27	1.36E-37	7.69E-08	9.72E-25	1.04E-209
	SD	1.94E-01	1.87E-25	6.87E-13	0	1.72E-16	4.47E-13	7.04E-49	4.55E-27	2.12E-37	2.40E-07	3.44E-24	0
	ranking	12	5	10	2	8	9	3	7	4	11	6	1

	wilcoxon	-	-	-	-	-	-	-	-	-	-	-	
8	mean	1.02E+01	2.15E-43	2.00E-10	0	5.82E-16	5.88E-25	9.00E-100	1.76E-48	3.33E-69	4.57E-65	4.44E-44	0
	SD	3.59E+00	6.46E-43	8.71E-10	0	9.02E-17	2.63E-24	2.24E-99	2.93E-48	1.05E-68	1.52E-64	1.06E-43	0
	ranking	12	8	11	1	10	9	3	6	4	5	7	1
	wilcoxon	-	-	-	=	-	-	-	-	-	-	-	
9	mean	1.09E+01	6.72E+00	3.08E+00	1.36E-104	2.48E+00	1.04E+01	4.53E-01	2.34E+00	6.53E-01	3.73E+00	2.47E+00	1.28E-110
	SD	1.59E+00	4.84E+00	7.16E-01	6.08E-104	6.73E-01	6.18E+00	3.25E-01	8.79E-01	1.22E-01	2.43E+00	7.73E-01	5.74E-110
	ranking	12	10	8	2	7	11	3	5	4	9	6	1
	wilcoxon	-	-	-	-	-	-	-	-	-	-	-	
10	mean	5.48E+00	1.14E+02	2.79E+01	0	0	3.84E-01	3.42E-04	0	0	0	0	0
	SD	1.69E+00	2.55E+01	7.01E+00	0	0	6.90E-01	1.21E-03	0	0	0	0	0
	ranking	10	12	11	1	1	9	8	1	1	1	1	1
	wilcoxon	-	-	-	=	=	-	-	=	=	=	=	
11	mean	1.11E+00	1	1	1	1	1	1	1	1	1	1	1
	SD	4.10E-02	2.22E-16	3.48E-16	5.76E-16	2.24E-16	1.44E-16	4.76E-16	4.87E-16	5.04E-16	4.76E-15	5.21E-16	1.14E-16
	ranking	12	3	5	10	4	1	6	7	8	11	9	1
	wilcoxon	-	-	-	-	-	-	-	-	-	-	-	
12	mean	1.15E-01	1.58E-32	4.66E-02	9.61E-02	5.25E-16	1.84E-22	9.92E-31	1.57E-32	1.57E-32	1.46E-06	1.57E-32	1.57E-32
	SD	1.02E-01	2.81E-34	6.93E-02	1.72E-01	7.47E-17	6.69E-22	4.36E-30	2.81E-48	2.81E-48	6.53E-06	2.81E-48	2.81E-48
	ranking	12	1	9	10	8	7	6	1	1	11	1	1
	wilcoxon	-	=	-	-	-	-	-	=	=	-	=	
13	mean	5.19E+00	8.79E+01	3.42E+02	6.15E+00	5.49E-16	2.09E-18	7.00E-11	1.35E-32	1.35E-32	1.35E-32	1.35E-32	1.35E-32
	SD	2.68E+00	9.91E+01	2.57E+02	5.87E+00	9.74E-17	8.33E-18	2.36E-10	2.81E-48	2.81E-48	2.81E-48	2.81E-48	2.81E-48
	ranking	9	11	12	10	8	6	7	1	1	1	1	1
	wilcoxon	-	-	-	-	-	-	-	=	=	=	=	
14	mean	2.14E+00	1.95E-01	4.35E-01	2.06E-52	9.85E-01	6.55E-01	9.55E-01	9.86E-01	9.25E-01	8.96E-01	9.40E-01	9.49E-02
	SD	3.70E-01	1.93E-02	7.26E-02	9.22E-52	1.39E-01	1.39E-01	2.06E-01	9.91E-02	1.41E-01	5.09E-01	1.47E-01	2.23E-02
	ranking	12	3	4	1	10	5	9	11	7	6	8	2
	wilcoxon	-	-	-	+	-	-	-	-	-	-	-	
15	mean	1.20E+01	1.14E-28	1.67E-17	2.29E+03	4.89E-16	2.54E-19	5.72E-19	0	0	0	0	0
	SD	1.87E+00	1.15E-28	2.18E-17	1.03E+03	6.67E-17	7.93E-19	1.59E-18	0	0	0	0	0
	ranking	11	6	9	12	10	7	8	1	1	1	1	1

	wilcoxon	-	-	-	-	-	-	-	=	=	=	=	
16	mean	3.82E+04	1.03E+01	4.11E+03	3.26E+04	4.89E+04	2.71E+04	3.95E+04	4.49E+04	3.86E+04	4.41E+04	4.18E+04	2.73E+04
	SD	1.13E+04	1.29E+01	2.09E+03	2.82E+03	6.48E+03	8.98E+03	8.16E+03	8.11E+03	3.55E+03	6.72E+03	9.46E+03	2.09E+03
	ranking	6	1	2	5	12	3	8	11	7	10	9	4
	wilcoxon	-	+	+	-	-	+	-	-	-	-	-	
17	mean	8.42E+03	4.26E+02	4.84E+03	1.97E+04	1.23E+04	5.92E+03	9.95E+03	1.22E+04	1.12E+04	1.14E+04	1.29E+04	4.35E+03
	SD	2.29E+03	2.56E+02	1.44E+03	2.44E+03	2.15E+03	1.31E+03	1.27E+03	2.75E+03	1.54E+03	1.85E+03	2.13E+03	1.14E+03
	ranking	5	1	3	12	10	4	6	9	7	8	11	2
	wilcoxon	-	+	-	-	-	-	-	-	-	-	-	
18	mean	3.55E+00	3.94E-03	2.29E-02	6.81E+01	8.45E-02	7.82E-02	8.41E-01	6.14E-02	3.76E+00	2.39E-01	4.54E-02	3.67E-02
	SD	1.68E+00	4.83E-03	1.78E-02	5.32E+01	2.69E-02	9.06E-02	3.87E-01	2.01E-02	1.93E+00	4.56E-01	1.24E-02	1.43E-02
	ranking	10	1	2	12	7	6	9	5	11	8	4	3
	wilcoxon	-	+	+	-	-	-	-	-	-	-	-	
19	mean	9.44E+01	1.83E+02	1.06E+02	4.07E+02	3.76E+02	1.07E+02	1.89E+02	3.96E+02	2.41E+02	2.42E+02	3.55E+02	2.39E+02
	SD	1.38E+01	6.78E+00	4.66E+01	4.83E+01	4.81E+01	2.44E+01	2.91E+01	4.13E+01	4.84E+01	3.03E+01	7.37E+01	4.55E+01
	ranking	1	4	2	12	10	3	5	11	7	8	9	6
	wilcoxon	+	+	+	-	-	+	+	-	-	-	-	
20	mean	3.39E+01	4.07E+01	2.78E+01	3.41E+01	3.07E+01	2.90E+01	3.03E+01	2.97E+01	2.90E+01	2.89E+01	3.05E+01	2.80E+01
	SD	3.42E+00	8.37E-01	2.98E+00	3.95E+00	1.55E+00	3.67E+00	1.51E+00	1.97E+00	2.71E+00	1.58E+00	1.85E+00	2.09E+00
	ranking	10	12	1	11	9	5	7	6	4	3	8	2
	wilcoxon	-	-	+	-	-	-	-	-	-	-	-	
21	mean	1.35E+01	1.34E+01	1.32E+01	1.34E+01	1.31E+01	1.33E+01	1.29E+01	1.32E+01	1.31E+01	1.30E+01	1.32E+01	1.29E+01
	SD	2.75E-01	2.74E-01	2.86E-01	2.32E-01	3.38E-01	3.74E-01	2.82E-01	1.53E-01	1.89E-01	2.81E-01	1.33E-01	3.54E-01
	ranking	12	11	8	10	5	9	2	7	4	3	6	1
	wilcoxon	-	-	-	-	-	-	-	-	-	-	-	
22	mean	2.82E+02	2.13E+02	2.15E+02	4.64E+02	3.43E+02	1.66E+02	2.66E+02	3.39E+02	2.94E+02	2.66E+02	3.52E+02	2.49E+02
	SD	1.69E+02	2.08E+01	1.25E+02	1.00E+02	3.89E+01	3.43E+01	4.95E+01	6.21E+01	5.94E+01	8.29E+01	4.53E+01	5.99E+01
	ranking	7	2	3	12	9	1	5	10	8	6	11	4
	wilcoxon	-	+	+	-	-	+	-	-	-	-	-	
23	mean	3.75E+02	2.65E+02	3.64E+02	5.11E+02	3.99E+02	1.64E+02	3.02E+02	4.29E+02	3.72E+02	3.57E+02	4.21E+02	2.63E+02
	SD	1.68E+02	6.62E+01	1.04E+02	9.99E+01	6.96E+01	5.78E+01	4.37E+01	3.86E+01	4.23E+01	9.13E+01	4.24E+01	4.41E+01
	ranking	8	4	3	12	9	1	5	11	7	6	10	2

	wilcoxon	-	-	-	-	-	+	-	-	-	-	-	
24	mean	1.04E+03	8.89E+02	5.24E+02	1.26E+03	1.11E+03	9.99E+02	1.07E+03	1.11E+03	1.13E+03	1.06E+03	1.09E+03	9.65E+02
	SD	4.59E+01	1.86E+01	6.52E+00	6.23E+01	3.28E+01	2.42E+01	4.36E+01	3.85E+01	3.95E+01	3.31E+01	3.03E+01	1.54E+01
	ranking	5	2	1	12	9	4	7	10	11	6	8	3
	wilcoxon	-	+	+	-	-	-	-	-	-	-	-	

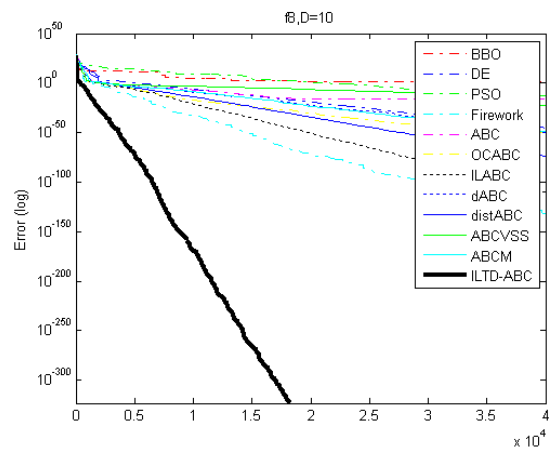
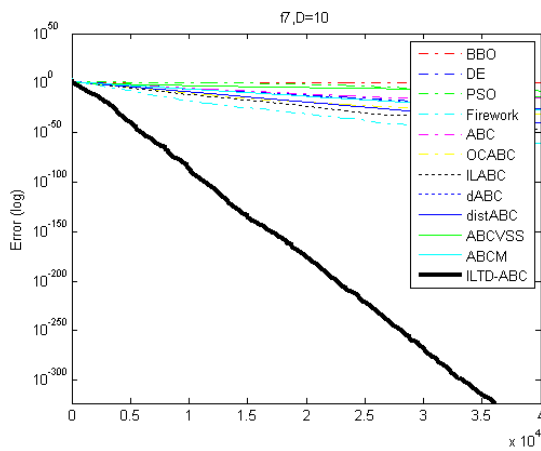
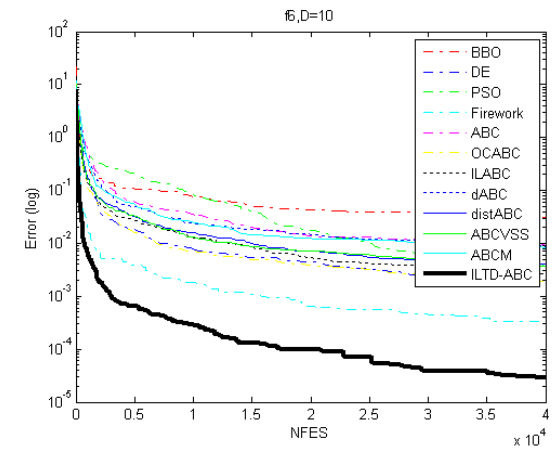
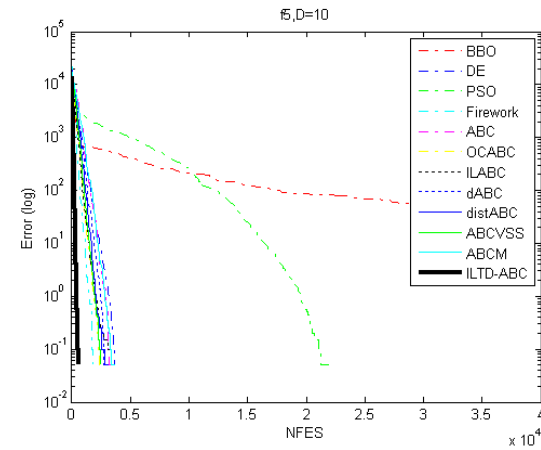
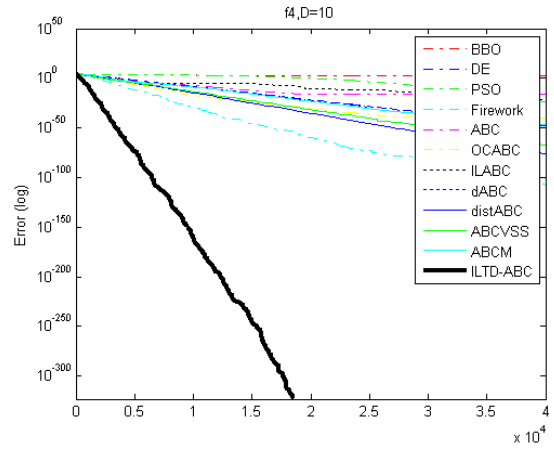
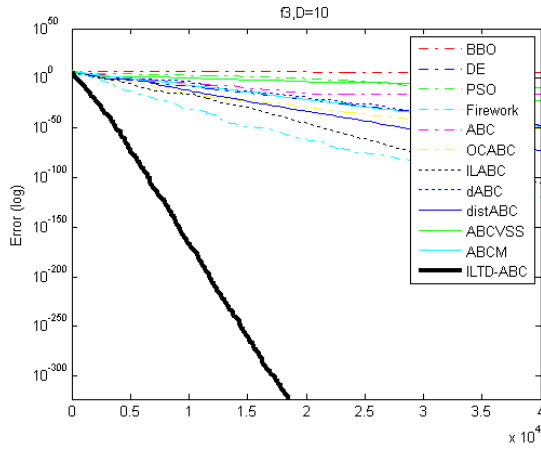
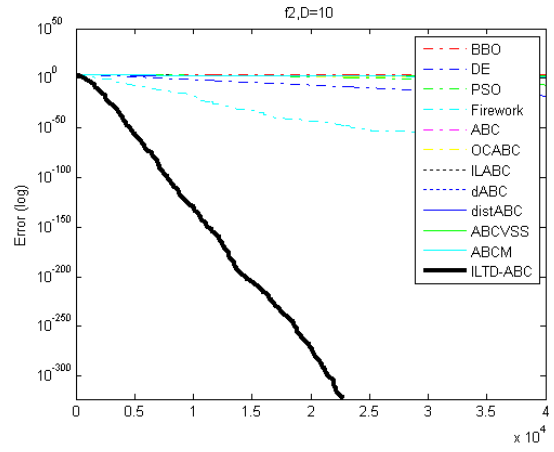
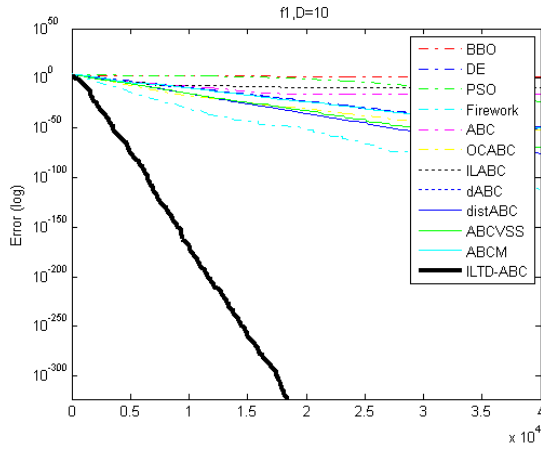
Tab. 3 Comparison results among comparison algorithms on twenty four benchmarks, D=50

[illegible]

7	mean	1.47E+00	4.05E-27	3.96E-10	1.21E-286	2.33E-15	2.00E-06	2.20E-47	2.82E-26	9.59E-37	8.79E-08	1.23E-22	6.0639000 0000000e-319
	SD	2.32E-01	3.44E-27	3.78E-10	0	1.74E-16	8.72E-06	9.68E-47	1.83E-26	1.01E-36	3.93E-07	2.93E-22	0
	ranking	12	5	9	2	8	11	3	6	4	10	7	1
	wilcoxon	-	-	-	-	-	-	-	-	-	-	-	-
8	mean	9.67E+00	5.44E-45	8.24E+04	0	1.02E-15	6.35E-03	2.22E-80	1.28E-47	3.95E-68	3.04E-11	9.59E-41	0
	SD	3.03E+00	2.22E-44	8.89E+04	0	1.57E-16	2.84E-02	9.93E-80	1.72E-47	6.98E-68	1.36E-10	3.23E-40	0
	ranking	11	6	12	1	8	10	3	5	4	9	7	1
	wilcoxon	-	-	-	=	-	-	-	-	-	-	-	-
9	mean	1.23E+01	2.34E+01	2.17E+01	2.84E-176	1.08E+01	2.66E+01	2.14E+00	1.03E+01	4.76E+00	9.97E+00	1.09E+01	6.37E-160
	SD	2.19E+00	6.19E+00	2.91E+00	0	2.33E+00	5.61E+00	8.52E-01	1.94E+00	6.30E-01	3.28E+00	2.07E+00	2.65E-159
	ranking	9	11	10	1	7	12	3	6	4	5	8	2
	wilcoxon	-	-	-	=	-	-	-	-	-	-	-	-
10	mean	4.41E+00	1.37E+02	6.82E+01	0	0	7.81E-01	3.26E-02	0	0	0	0	0
	SD	1.20E+00	5.51E+01	1.34E+01	0	0	9.41E-01	1.45E-01	0	0	0	0	0
	ranking	10	12	11	1	1	9	8	1	1	1	1	1
	wilcoxon	-	-	-	=	=	-	-	=	=	=	=	-
11	mean	1.09E+00	1	1	1	1	1	1.00E+00	1	1	1	1	1
	SD	2.63E-02	3.91E-16	9.01E-15	0	3.10E-16	3.04E-08	4.02E-05	4.38E-16	3.34E-16	5.43E-12	3.38E-16	0
	ranking	12	6	8	1	3	10	11	7	4	9	5	1
	wilcoxon	-	-	-	=	-	-	-	-	-	-	-	-
12	mean	3.69E-02	5.18E-03	2.82E-01	7.85E-02	9.51E-16	5.18E-03	1.45E-07	1.57E-32	1.57E-32	1.57E-32	1.57E-32	1.57E-32
	SD	2.16E-02	2.26E-02	6.38E-01	9.67E-02	1.55E-16	2.32E-02	6.50E-07	2.81E-48	2.81E-48	2.81E-48	2.81E-48	2.81E-48
	ranking	10	8	12	11	6	9	7	1	1	1	1	1
	wilcoxon	-	-	-	-	-	-	-	=	=	=	=	-
13	mean	4.25E+00	6.27E+02	1.44E+03	7.73E+00	1.09E-15	3.83E-14	3.14E-04	1.35E-32	1.35E-32	2.50E+01	1.35E-32	1.35E-32
	SD	1.12E+00	2.74E+02	3.16E+02	7.02E+00	1.48E-16	1.71E-13	1.26E-03	2.81E-48	2.81E-48	1.12E+02	2.81E-48	2.81E-48
	ranking	8	11	12	9	5	6	7	1	1	10	1	1
	wilcoxon	-	-	-	-	-	-	-	=	=	-	=	-
14	mean	2.91E+00	2.25E-01	8.10E-01	0	1.64E+00	9.90E-01	1.59E+00	1.68E+00	1.58E+00	1.68E+00	1.68E+00	9.99E-02
	SD	4.06E-01	4.32E-02	9.42E-02	0	1.82E-01	3.67E-01	2.05E-01	1.86E-01	2.31E-01	8.31E-01	1.99E-01	4.18E-17

	ranking wilcoxon	12 -	3 -	4 -	1 +	11 -	5 -	7 -	8 -	6 -	10 -	9 -	2
15	mean	1.05E+01	9.92E-28	6.72E-14	1.21E+04	1.04E-15	1.69E-08	3.78E-03	0	0	0	0	2.52E-29
	SD	3.00E+00	8.71E-28	5.53E-14	5.70E+03	1.17E-16	5.33E-08	1.20E-02	0	0	0	0	6.41E-29
	ranking	11	6	8	12	7	9	10	1	1	1	1	5
	wilcoxon	-	-	-	-	-	-	-	+	+	+	+	
16	mean	8.62E+04	4.73E+03	5.64E+04	7.77E+04	1.21E+05	8.78E+04	1.05E+05	1.06E+05	1.03E+05	1.06E+05	1.17E+05	4.77E+04
	SD	1.78E+04	1.69E+03	1.39E+04	9.82E+03	1.75E+04	2.09E+04	1.23E+04	1.66E+04	1.39E+04	1.27E+04	1.75E+04	5.35E+03
	ranking	4	1	3	5	12	6	8	10	7	9	11	2
	wilcoxon	-	+	-	-	-	-	-	-	-	-	-	
17	mean	1.44E+04	2.83E+03	1.17E+04	2.84E+04	2.76E+04	1.59E+04	2.36E+04	2.66E+04	2.41E+04	2.60E+04	2.72E+04	1.72E+04
	SD	1.28E+03	8.02E+02	2.10E+03	2.72E+03	3.43E+03	3.74E+03	2.75E+03	3.13E+03	2.36E+03	3.06E+03	2.68E+03	1.94E+03
	ranking	4	1	2	12	11	3	6	9	7	8	10	5
	wilcoxon	+	+	+	-	-	+	-	-	-	-	-	
18	mean	3.47E+00	9.35E-03	1.51E-01	1.56E+02	4.89E-02	3.93E-01	1.17E+00	3.49E-02	1.23E+01	2.87E-02	2.95E-02	2.65E-02
	SD	1.03E+00	1.04E-02	9.22E-02	1.13E+02	9.37E-03	3.60E-01	1.36E-01	1.11E-02	6.08E+00	1.39E-02	1.16E-02	1.75E-02
	ranking	11	1	7	12	6	8	9	5	10	3	4	2
	wilcoxon	-	+	-	-	-	-	-	-	-	-	-	
19	mean	1.56E+02	3.63E+02	2.89E+02	8.97E+02	1.13E+03	1.65E+02	5.30E+02	1.12E+03	7.68E+02	6.78E+02	1.11E+03	7.39E+02
	SD	2.44E+01	1.28E+01	8.51E+01	5.52E+01	1.33E+02	4.02E+01	6.97E+01	1.31E+02	9.46E+01	6.39E+01	1.05E+02	1.07E+02
	ranking	1	4	3	9	12	2	5	11	8	6	10	7
	wilcoxon	+	+	+	-	-	+	+	-	-	+	-	
20	mean	6.36E+01	7.42E+01	5.85E+01	6.63E+01	6.07E+01	5.37E+01	5.56E+01	5.96E+01	5.80E+01	5.78E+01	5.93E+01	5.52E+01
	SD	6.53E+00	9.66E-01	3.55E+00	4.04E+00	2.59E+00	5.56E+00	2.63E+00	2.69E+00	4.63E+00	2.78E+00	2.02E+00	2.90E+00
	ranking	10	12	6	11	9	1	3	8	5	4	7	2
	wilcoxon	-	-	-	-	-	+	-	-	-	-	-	
21	mean	2.30E+01	2.34E+01	2.30E+01	2.26E+01	2.28E+01	2.30E+01	2.27E+01	2.29E+01	2.28E+01	2.29E+01	2.30E+01	2.21E+01
	SD	2.46E-01	9.23E-02	3.33E-01	4.06E-01	3.46E-01	4.81E-01	2.49E-01	2.82E-01	1.53E-01	1.93E-01	2.30E-01	5.31E-01
	ranking	9	12	10	2	5	11	3	7	4	6	8	1
	wilcoxon	-	-	-	-	-	-	-	-	-	-	-	
22	mean	1.74E+02	2.75E+02	2.72E+02	6.33E+02	4.00E+02	1.71E+02	3.49E+02	3.97E+02	3.88E+02	3.59E+02	4.02E+02	3.86E+02
	SD	1.26E+02	2.60E+01	1.08E+02	9.84E+01	2.62E+00	8.96E+01	5.00E+01	1.46E+01	1.95E+01	3.83E+01	2.52E+00	2.35E+01

	ranking wilcoxon	2 +	4 +	3 +	12 -	10 -	1 +	5 +	9 -	8 -	6 +	11 -	7
23	mean	2.68E+02	2.84E+02	3.61E+02	6.31E+02	4.85E+02	1.64E+02	4.19E+02	4.90E+02	4.78E+02	4.74E+02	4.88E+02	4.29E+02
	SD	1.05E+02	7.09E+00	9.27E+01	1.28E+02	1.32E+01	3.19E+01	5.70E+01	8.95E+00	3.19E+01	9.25E+01	1.69E+01	5.07E+01
	ranking	2	3	4	12	9	1	5	11	8	7	10	6
	wilcoxon	+	+	+	-	-	+	+	-	-	-	-	
24	mean	1.09E+03	9.12E+02	5.00E+02	1.41E+03	1.18E+03	9.75E+02	1.10E+03	1.21E+03	1.16E+03	1.07E+03	1.21E+03	1.01E+03
	SD	3.47E+01	1.75E+01	2.48E-01	7.02E+01	3.48E+01	2.49E+01	3.24E+01	5.36E+01	4.19E+01	2.68E+01	4.07E+01	1.52E+01
	ranking	6	2	1	12	9	3	7	11	8	5	10	4
	wilcoxon	-	+	+	-	-	+	-	-	-	-	-	



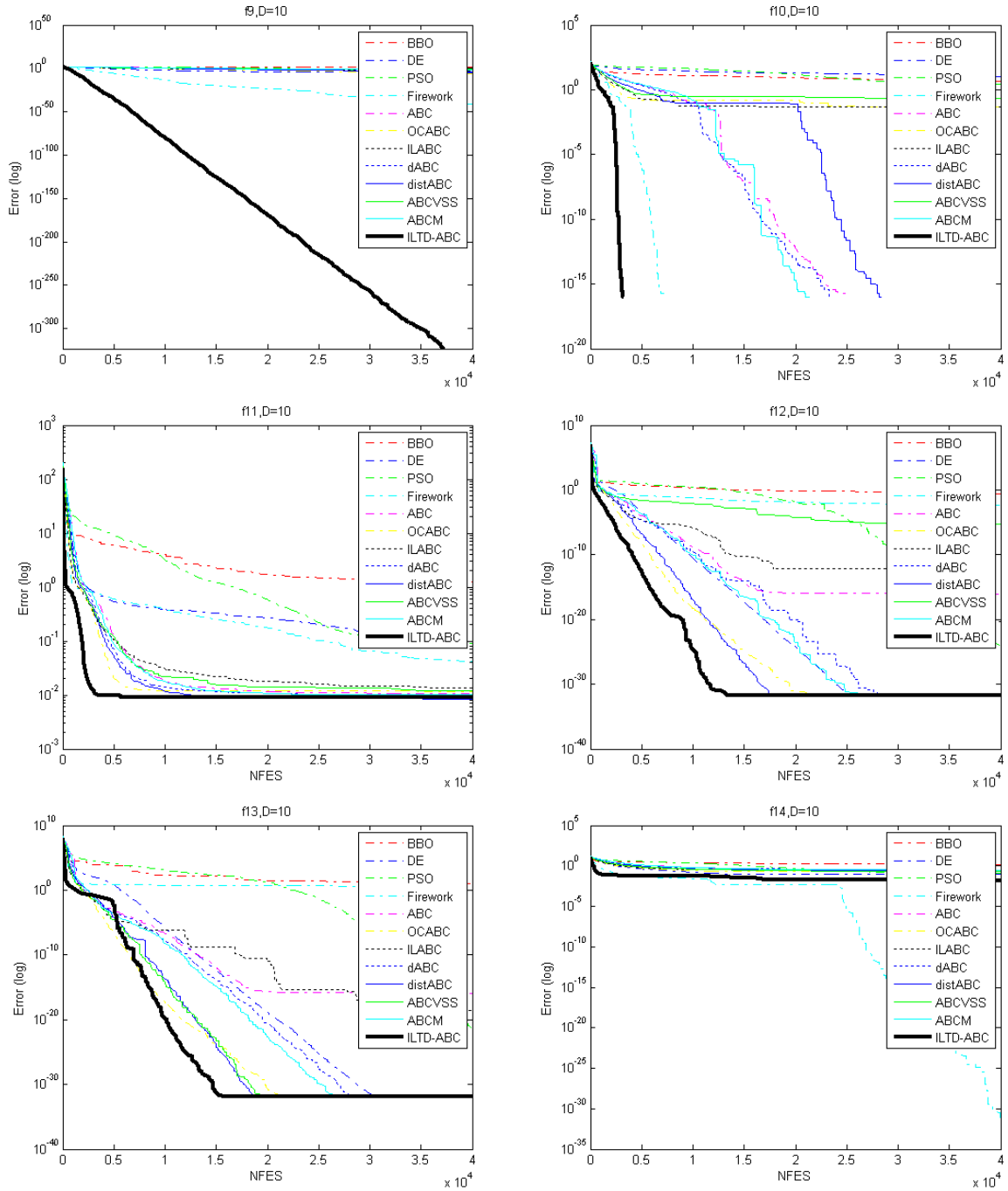
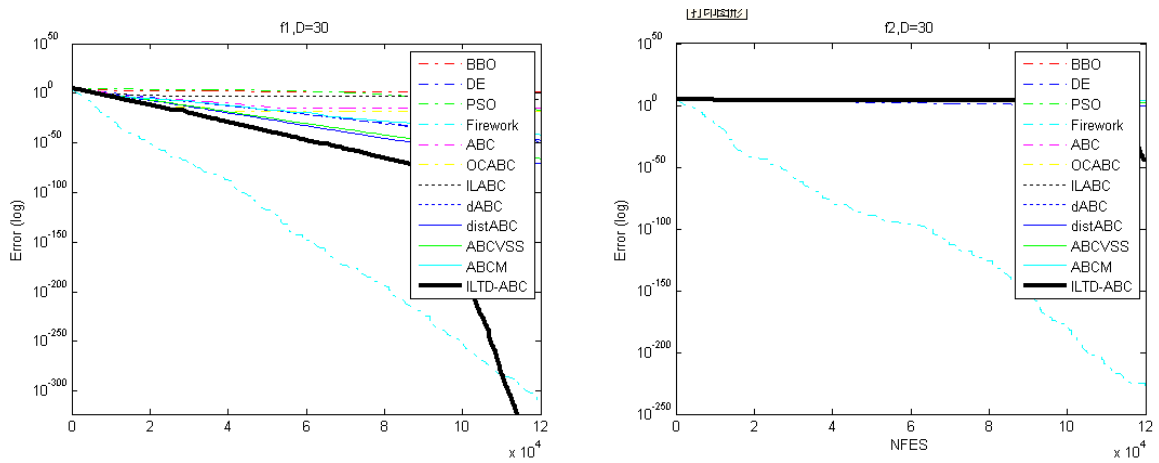
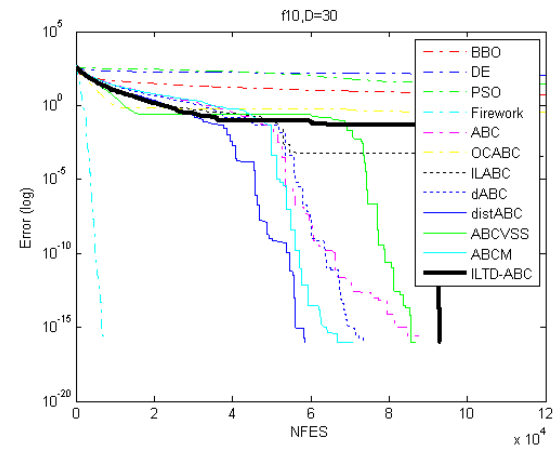
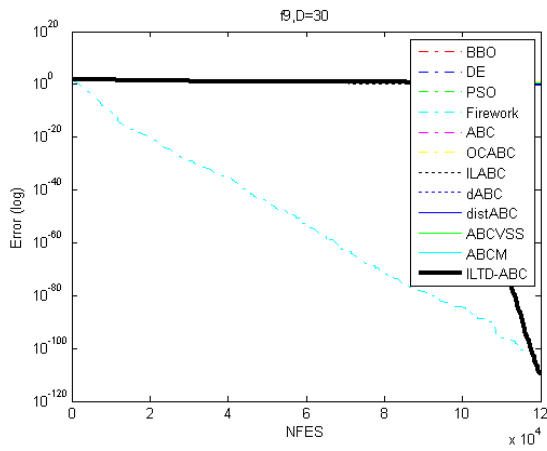
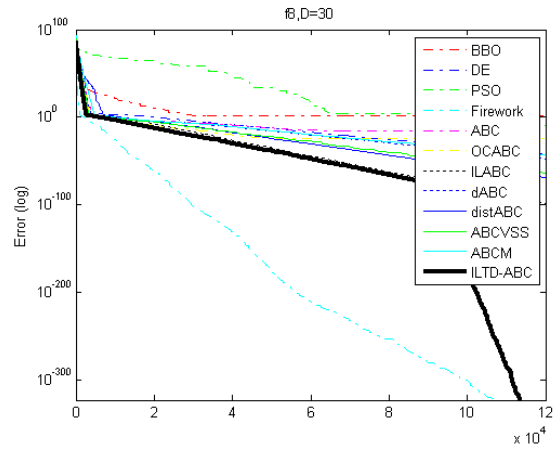
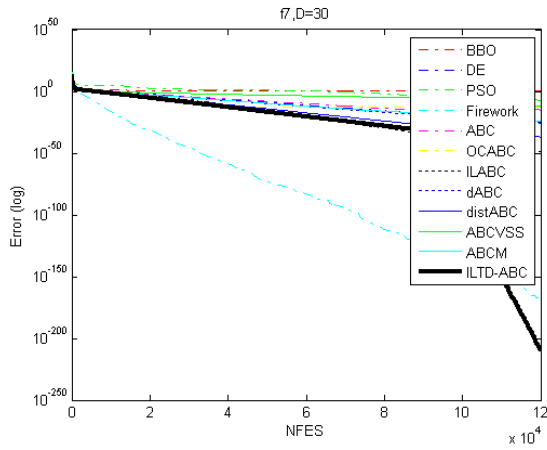
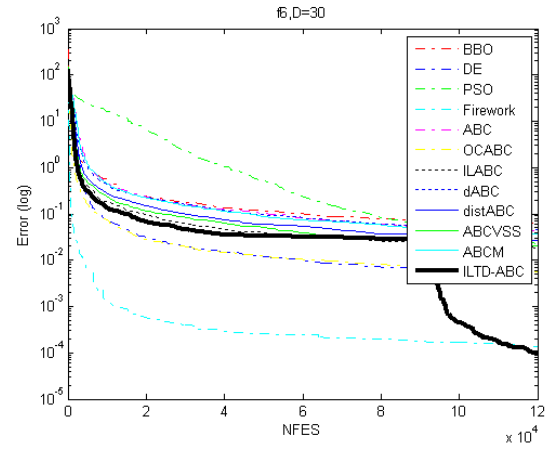
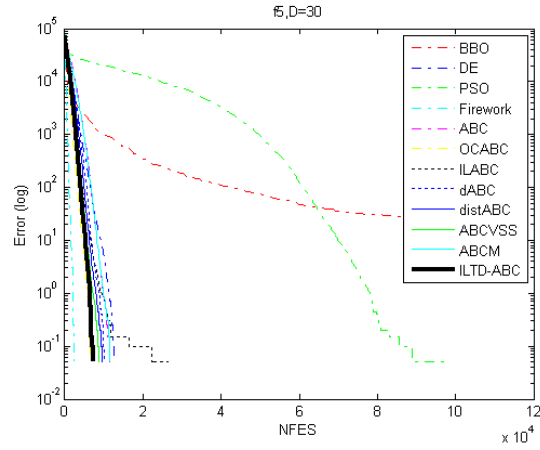
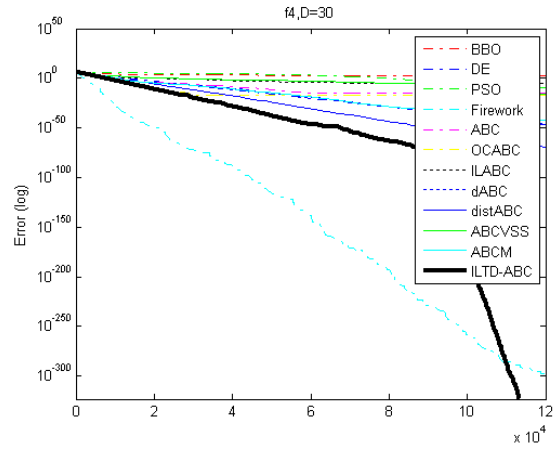
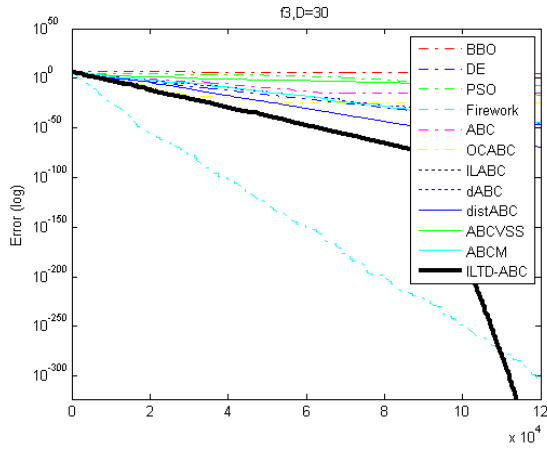


Fig. 1 Convergence curves, $D=10$





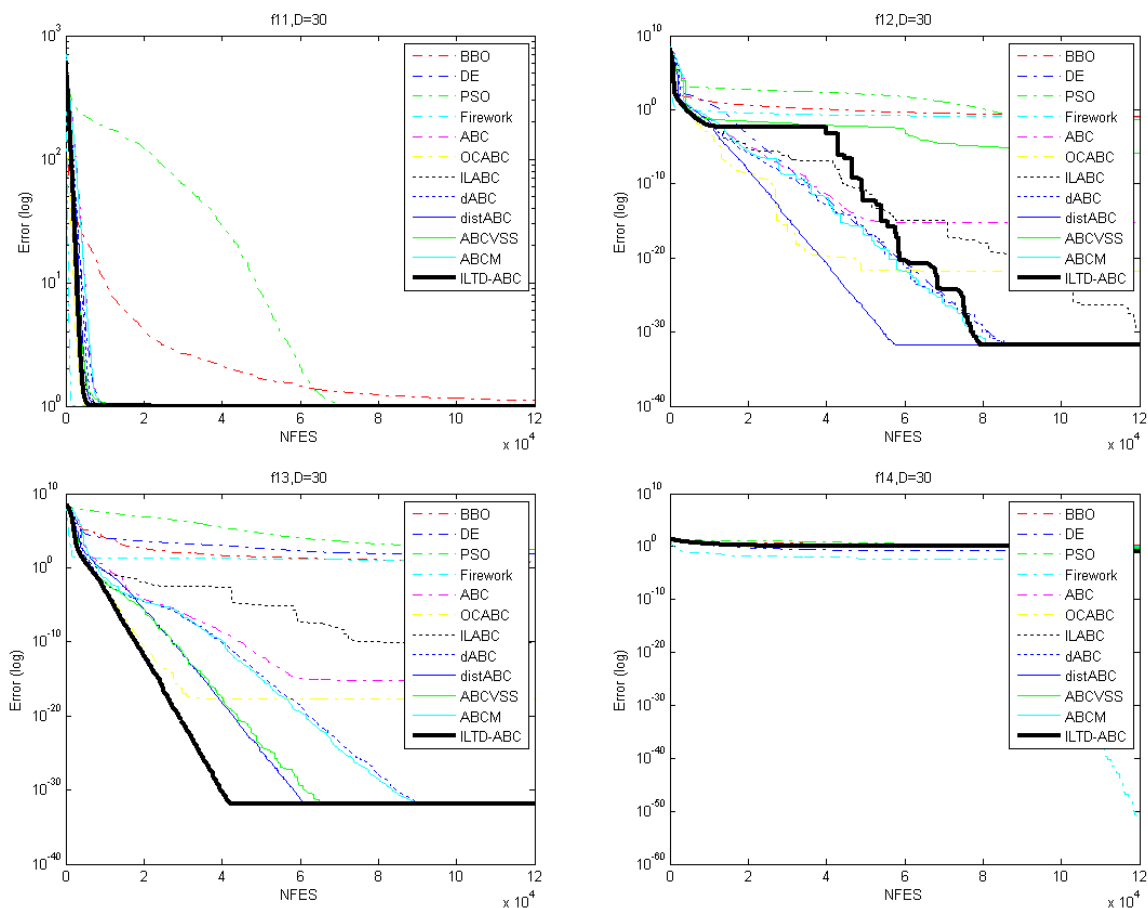
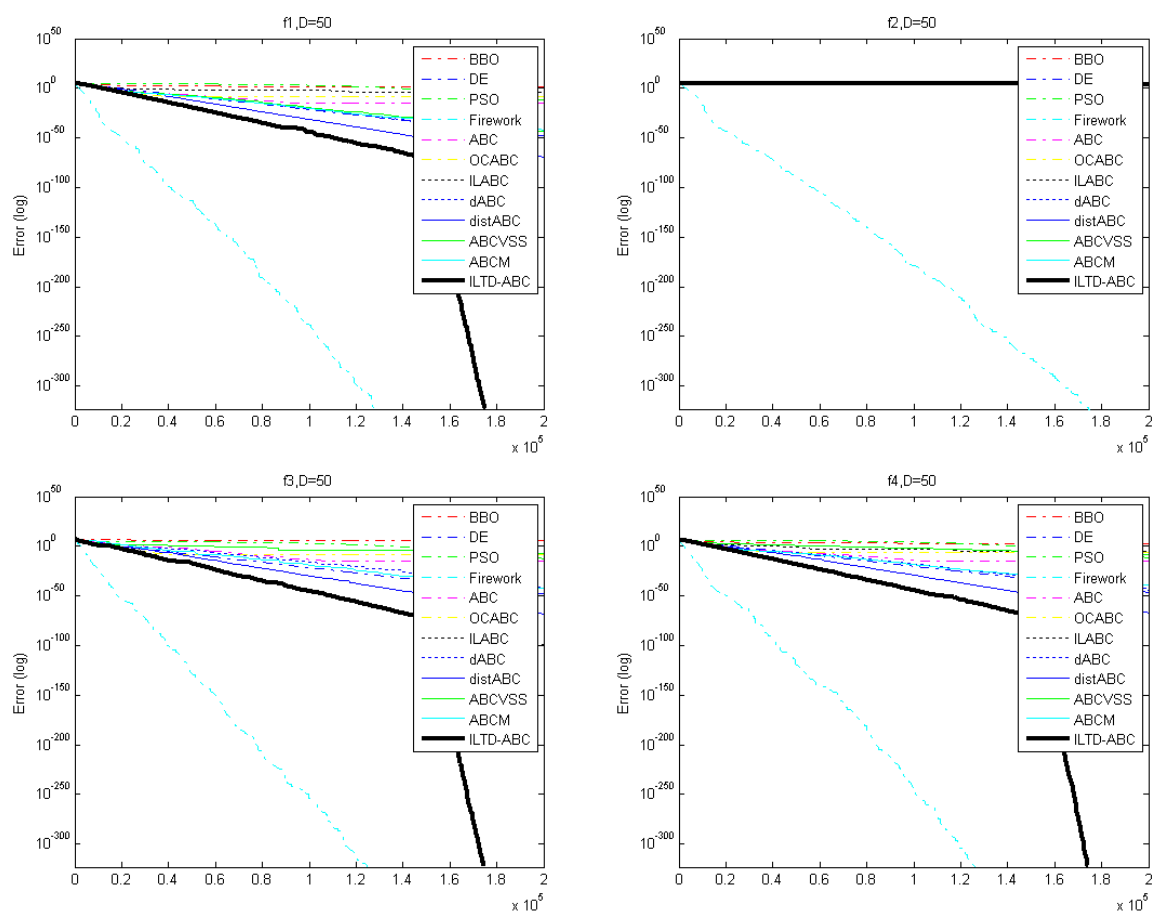
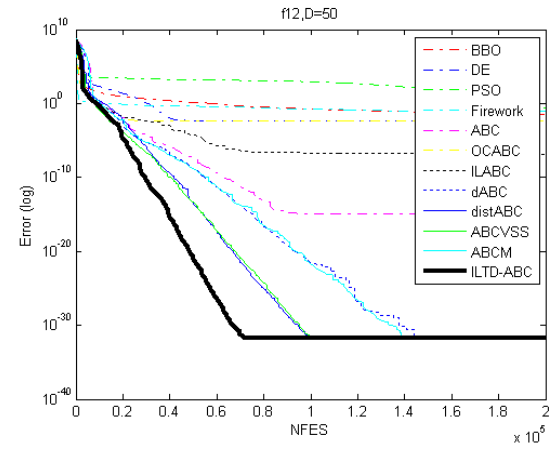
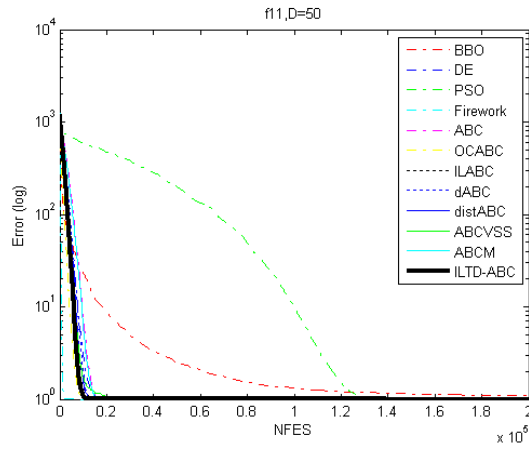
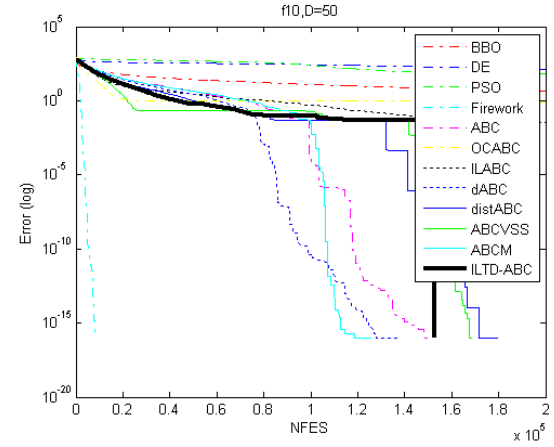
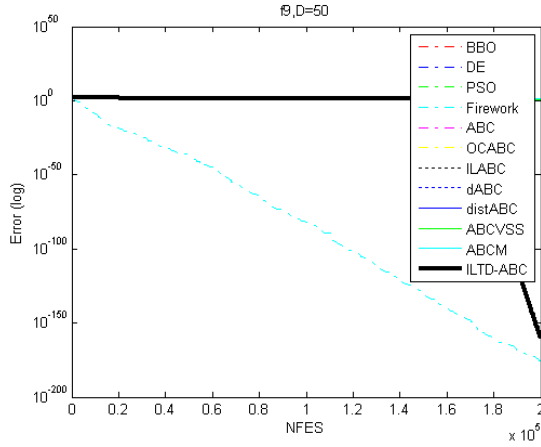
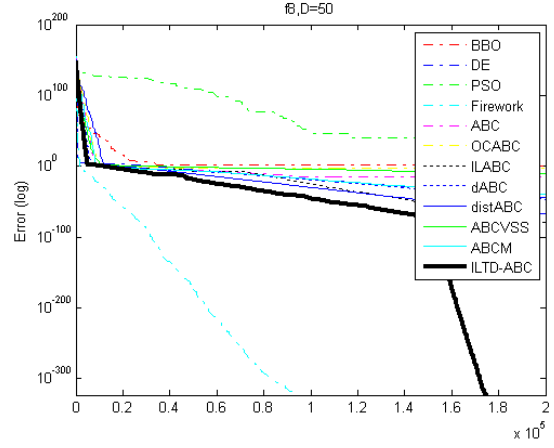
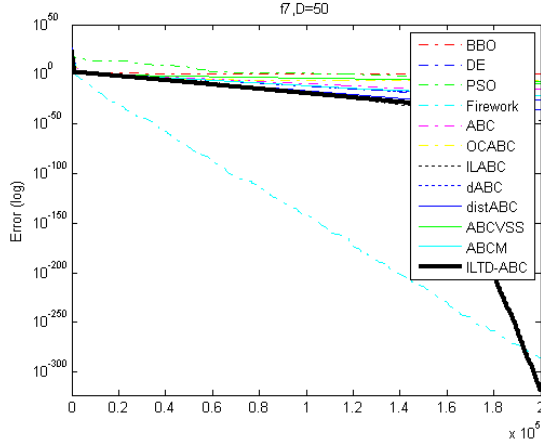
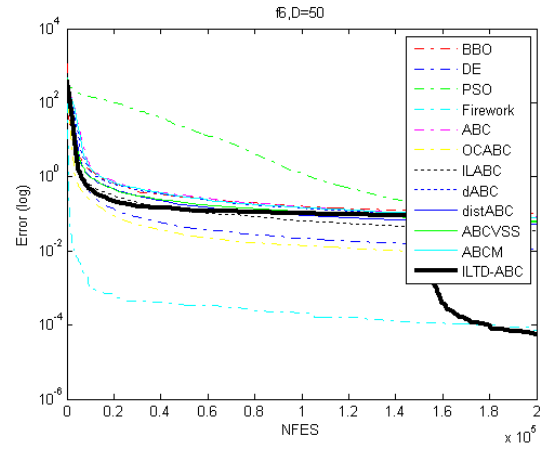
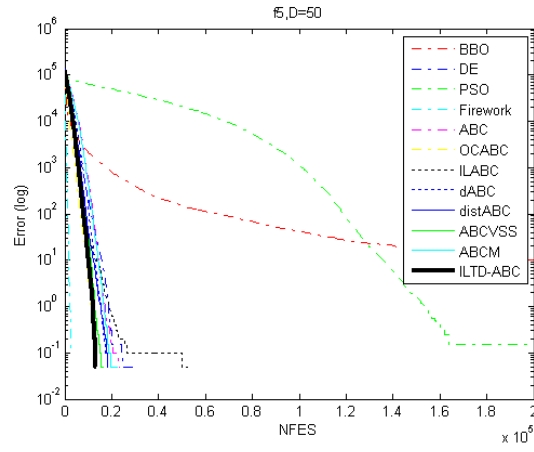


Fig. 2 Convergence curves, $D=30$





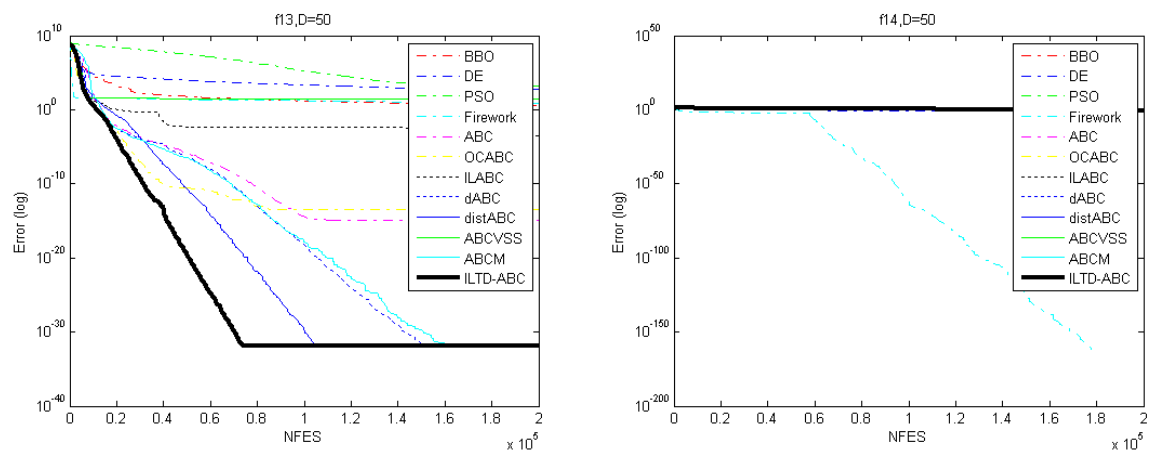


Fig. 3 Convergence curves, D=50