

A critical problem in benchmarking and analysis of evolutionary computation methods

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Alongside the shift operator investigated in Table 3 of the paper, another popular modification to benchmark functions is the rotation/scaling operator. The table below shows the results of the computations where both shift and rotation/scaling were added (the details about the rotation/scaling operator can be found in the Code Ocean compute capsule). Comparing this table to Table 3, one can see that there is not much difference between the two.

Supplement Table 1: Mean error over 30 independent runs on the shifted and rotated/scaled benchmark functions, in bold are results that are worse than PSO or DE.

ID	HHO	SMA	GBO	BOA	MPA	KMA	STOA	PSO	DE	LSHADE	HSES
F01	1.22E-03	8.02E-03	3.35E-08	2.82E+03	2.44E-06	7.70E-03	1.91E+03	3.21E-01	5.07E-02	0.00E+00	0.00E+00
F02	1.06E-02	7.56E-02	2.07E-03	2.25E+01	2.53E-03	1.83E+00	1.77E+01	6.04E-02	1.38E-01	6.28E-06	3.52E-03
F03	4.19E-01	9.06E-01	3.00E+01	1.08E+04	9.59E+00	1.44E+02	3.75E+03	2.79E+03	5.16E+02	2.35E-04	1.99E+02
F04	1.11E-02	5.79E-02	7.54E+00	1.65E+01	9.19E+00	5.80E-01	1.40E+01	1.46E+01	2.06E+00	4.77E-03	4.68E-02
F05	2.87E+01	2.82E+01	5.41E+01	3.79E+05	8.87E+01	4.08E+01	1.75E+05	4.09E+02	3.55E+01	2.17E+01	3.21E+01
F06	1.37E-01	1.51E-02	1.79E-07	3.83E+03	2.48E-06	1.60E+00	2.66E+03	2.60E-01	4.24E-02	0.00E+00	0.00E+00
F07	2.95E-04	5.71E-03	2.37E-02	4.52E-01	4.77E-02	3.23E-03	2.86E-01	7.95E-02	3.24E-02	3.42E-03	2.04E-02
F08	6.69E+03	2.75E+03	3.62E+03	7.74E+03	2.71E+03	3.62E+03	3.72E+03	9.47E+03	7.14E+03	2.66E+03	7.09E+03
F09	3.15E-03	8.37E-03	3.49E+01	2.02E+02	2.45E+01	6.46E+00	1.08E+02	6.31E+01	2.03E+02	3.28E+01	2.23E+01
F10	8.89E-03	4.08E-02	3.56E+00	1.13E+01	3.51E+00	2.04E-01	1.06E+01	1.01E+00	8.75E-02	4.72E-07	8.99E-04
F11	3.47E-03	5.47E-02	2.14E-02	3.00E+01	8.65E-03	4.17E-02	2.21E+01	4.22E-01	1.36E-01	0.00E+00	0.00E+00
F12	7.97E-03	7.61E-04	5.08E+00	2.84E+01	6.63E+00	7.90E-05	1.74E+01	3.51E+00	3.83E-03	0.00E+00	0.00E+00
F13	1.09E-01	1.49E-02	2.58E+00	3.50E+04	5.01E+00	2.12E-03	5.75E+03	6.48E+00	3.77E-02	0.00E+00	1.08E-06

For the comparison by the Glicko-2 rating each pair of methods “played” 25 games for each of the 32 benchmark functions, resulting in 8800 games played (as each algorithm competed with the other eleven). The results are summarized in the table below.

Supplement Table 2: Detailed results of the Glicko-2 rating.

Method	Rating	Deviation	Volatility	Wins	Draws	Losses
LSHADE	1983	15.2	0.0474	7738	83	979
HSES	1885	13.7	0.0437	7231	53	1516
MPA	1821	13.6	0.0472	6616	75	2109
DE	1792	13.6	0.0477	6445	88	2267
KMA	1630	12.7	0.0423	5182	34	3584
PSO	1625	12.5	0.0402	5147	47	3606
SMA	1518	13.1	0.0422	4328	0	4472
GBO	1505	13	0.0431	4329	16	4455
STOA	1220	15.9	0.0507	2465	0	6335
HHO	1110	17.6	0.0577	1821	0	6979
BOA	881	21	0.0714	928	0	7872
RS	700	28.5	0.1087	372	0	8428

For completion we also include the values of the Friedman rank-sum test of the 32 benchmark functions (alongside the associated p-values) in the table below. The resulting ranking is very similar to the one obtained by the Glicko-2, with the only exception being GBO and SMA swapping places (but they have a very similar Rating in Glicko-2).

Supplement Table 3: Friedman rank-sum test on the ambiguous benchmark set.

ID	HHO	SMA	GBO	BOA	MPA	KMA	STOA	PSO	DE	LSHADE	HSES	RS	p
f1	8.53	7.53	6.40	11.27	3.70	4.73	8.60	4.20	7.73	1.47	2.37	11.47	1.43E-51
f2	10.53	7.23	7.68	10.60	3.22	6.43	7.47	5.15	2.23	2.15	3.67	11.63	2.13E-54
f3	10.17	8.37	7.03	10.50	2.48	5.33	8.77	5.77	2.43	2.60	3.48	11.07	4.16E-52
f4	9.43	7.57	5.87	10.80	2.62	4.48	9.90	6.13	4.67	2.50	2.90	11.13	1.09E-49
f5	10.00	6.23	6.07	10.77	2.17	5.07	8.63	3.93	7.00	1.70	5.00	11.43	2.52E-49
f6	10.30	7.80	7.22	10.23	3.35	5.12	9.53	5.32	2.00	2.20	3.57	11.37	1.00E-55

f7	9.20	7.93	5.47	10.07	4.37	2.63	11.10	6.43	3.20	4.77	1.20	11.63	8.02E-59
f8	6.93	4.93	4.13	10.50	2.10	4.37	10.13	7.47	7.57	2.00	6.37	11.50	1.87E-47
f9	8.77	8.17	7.35	11.60	5.65	4.97	8.93	4.40	3.13	1.07	2.60	11.37	1.01E-56
f10	9.73	6.63	8.13	11.13	4.90	6.57	7.40	3.90	1.68	1.35	4.77	11.80	9.85E-56
f11	10.77	6.27	7.13	10.70	3.93	6.57	8.53	4.43	3.33	1.57	3.43	11.33	3.63E-52
f12	10.03	6.33	5.83	11.30	2.97	5.13	9.13	5.63	6.43	1.77	2.63	10.80	5.77E-50
f13	9.83	5.20	5.63	10.73	2.80	4.20	8.20	3.50	8.07	2.60	5.37	11.87	3.94E-48
f14	10.73	7.40	6.77	10.57	3.97	5.97	9.00	5.67	1.00	3.33	2.07	11.53	7.48E-60
f15	10.73	7.60	6.67	10.80	2.07	3.77	9.07	6.60	3.17	2.33	3.83	11.37	4.28E-58
f16	8.73	4.17	4.23	11.07	2.13	5.93	8.60	7.17	9.50	2.67	2.40	11.40	1.92E-55
f17	8.30	8.67	6.53	11.17	4.70	3.90	9.77	6.13	3.77	2.10	1.13	11.83	5.09E-60
f18	8.40	7.20	7.53	11.03	4.33	5.27	9.47	6.80	1.53	2.03	2.43	11.97	1.08E-58
f19	9.27	6.80	7.40	11.07	4.33	6.27	8.90	5.73	1.57	2.27	2.67	11.73	2.80E-55
f20	9.60	6.87	6.40	10.90	3.07	5.17	9.37	5.47	5.40	2.87	1.47	11.43	5.17E-51
f21	9.50	7.23	7.30	10.97	2.97	5.60	9.33	4.80	3.13	3.60	1.60	11.97	8.40E-57
f22	9.87	7.40	7.43	10.97	4.90	5.00	8.93	5.43	1.07	3.03	2.03	11.93	1.25E-60
f23	11.27	6.90	6.83	10.23	2.00	5.97	8.97	6.23	2.67	1.37	4.10	11.47	2.92E-60
f24	9.33	5.20	4.50	11.10	2.23	4.83	7.97	7.33	9.40	2.83	1.83	11.43	3.62E-56
f25	8.77	7.47	6.57	11.50	5.50	6.57	9.83	4.00	2.43	1.10	2.77	11.50	9.10E-60
f26	9.53	5.23	7.30	11.03	6.13	7.97	8.30	4.20	1.57	1.43	3.33	11.97	4.10E-59
f27	10.50	4.90	7.37	10.73	6.07	8.00	8.07	4.03	1.40	1.73	3.47	11.73	1.68E-59
f28	10.13	6.30	6.10	11.00	4.47	5.53	9.10	5.03	4.77	2.67	1.53	11.37	7.23E-50
f29	10.00	5.87	7.70	10.93	3.87	6.30	8.97	5.63	2.00	3.50	1.23	12.00	4.08E-60
f30	10.17	6.20	7.20	10.90	4.93	6.53	8.60	5.47	1.00	3.07	2.00	11.93	2.64E-59
f31	11.73	6.67	6.90	10.07	3.17	5.57	9.00	6.67	1.57	1.60	3.87	11.20	1.14E-60
f32	10.47	4.93	4.60	10.53	2.30	4.83	7.90	7.87	8.43	3.37	1.20	11.57	1.33E-57
mean	9.73	6.66	6.54	10.84	3.67	5.46	8.92	5.52	3.90	2.33	2.88	11.55	

Detailed results of the computational comparison on the ambiguous benchmark set are shown in the table below. The reported statistics of the 30 independent runs over the 32 functions (in the respective dimension D) are: min (best found solution), median, mean, max (worst found solution), and standard deviation (std). Value in bold indicates that for the given method was worse for this statistic than either PSO or DE (with std being left out). Value in red indicates that the given method was worse for this statistic than RS.

Supplement Table 4: Detailed statistics of the computations on the ambiguous benchmark set.

		HHO	SMA	GBO	BOA	MPA	STOA	KMA	PSO	DE	LSHADE	HSES	RS
	min	9.97E-01	2.50E-01	1.48E-01	2.54E+00	0.00E+00	5.63E-01	2.27E-01	0.00E+00	1.94E-01	2.76E-05	1.48E-01	5.09E+00
	median	2.50E+00	1.35E+00	8.34E-01	7.82E+00	2.67E-01	2.12E+00	6.11E-01	3.85E-01	1.87E+00	2.03E-02	1.48E-01	8.28E+00
f1, D = 5	mean	3.15E+00	2.19E+00	1.60E+00	7.92E+00	3.57E-01	2.95E+00	5.40E-01	5.74E-01	1.94E+00	7.29E-02	1.69E-01	8.38E+00
	max	1.36E+01	5.27E+00	9.32E+00	1.19E+01	8.39E-01	1.10E+01	9.08E-01	1.85E+00	4.35E+00	3.75E-01	2.27E-01	1.20E+01
	std	2.66E+00	1.51E+00	1.94E+00	1.95E+00	2.12E-01	2.33E+00	2.66E-01	4.85E-01	1.07E+00	1.02E-01	3.55E-02	1.60E+00
	min	6.11E+00	9.24E-03	1.15E+00	4.13E+00	0.00E+00	1.01E+00	1.15E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.43E+00
	median	9.76E+00	3.46E+00	5.38E+00	1.16E+01	0.00E+00	4.01E+00	3.31E+00	1.72E+00	0.00E+00	0.00E+00	0.00E+00	1.29E+01
f2, D = 5	mean	1.00E+01	4.15E+00	4.90E+00	1.11E+01	6.60E-01	4.08E+00	2.99E+00	2.15E+00	1.26E-08	0.00E+00	9.74E-01	1.31E+01
	max	2.14E+01	1.01E+01	8.60E+00	1.53E+01	4.14E+00	7.69E+00	4.46E+00	6.62E+00	3.25E-07	0.00E+00	2.16E+00	1.62E+01
	std	2.98E+00	2.62E+00	1.93E+00	2.83E+00	9.94E-01	1.79E+00	1.13E+00	1.89E+00	5.98E-08	0.00E+00	1.07E+00	1.72E+00
	min	5.61E+00	3.48E+00	3.21E+00	7.53E+00	0.00E+00	3.98E+00	1.61E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.15E+00
	median	1.04E+01	7.68E+00	6.66E+00	1.12E+01	1.61E+00	8.52E+00	4.27E+00	5.10E+00	3.99E-05	4.67E-03	1.89E+00	1.19E+01

f3, D = 5	mean	1.12E+01	7.81E+00	6.31E+00	1.14E+01	1.25E+00	8.86E+00	4.12E+00	4.70E+00	7.55E-01	4.34E-01	1.67E+00	1.22E+01
	max	1.81E+01	1.46E+01	1.22E+01	1.61E+01	3.49E+00	1.64E+01	6.37E+00	1.15E+01	5.56E+00	2.29E+00	3.78E+00	1.52E+01
	std	3.24E+00	2.39E+00	1.96E+00	1.95E+00	1.32E+00	2.99E+00	1.54E+00	2.33E+00	1.70E+00	7.82E-01	9.16E-01	1.51E+00
	min	1.95E+00	4.73E-01	6.37E-01	6.20E+00	0.00E+00	1.77E+00	0.00E+00	1.99E-01	3.61E-07	0.00E+00	0.00E+00	7.22E+00
	median	6.77E+00	4.15E+00	1.74E+00	9.26E+00	4.69E-01	8.21E+00	1.02E+00	2.03E+00	1.52E+00	1.34E-01	6.37E-01	1.03E+01
f4, D = 5	mean	7.05E+00	4.07E+00	2.14E+00	9.46E+00	4.51E-01	8.24E+00	9.80E-01	2.61E+00	1.95E+00	2.80E-01	5.10E-01	1.00E+01
	max	1.43E+01	8.13E+00	5.80E+00	1.32E+01	1.11E+00	1.28E+01	1.74E+00	6.47E+00	5.50E+00	1.35E+00	1.27E+00	1.21E+01
	std	2.93E+00	1.79E+00	1.24E+00	1.85E+00	3.76E-01	2.72E+00	4.46E-01	1.99E+00	2.04E+00	3.25E-01	3.09E-01	1.34E+00
	min	3.17E+01	2.48E+01	2.44E+01	4.10E+01	1.38E+01	2.83E+01	2.63E+01	2.09E+01	2.22E+01	1.78E+01	2.63E+01	4.34E+01
	median	4.31E+01	3.23E+01	3.16E+01	4.64E+01	2.72E+01	3.90E+01	3.04E+01	2.72E+01	3.41E+01	2.46E+01	3.04E+01	5.03E+01
f5, D = 5	mean	4.49E+01	3.28E+01	3.24E+01	4.59E+01	2.50E+01	3.85E+01	3.03E+01	2.76E+01	3.36E+01	2.41E+01	3.03E+01	4.92E+01
	max	6.46E+01	4.46E+01	4.47E+01	5.18E+01	3.04E+01	4.62E+01	3.48E+01	3.54E+01	4.10E+01	2.75E+01	3.52E+01	5.49E+01
	std	7.59E+00	5.23E+00	4.76E+00	2.57E+00	3.89E+00	5.11E+00	2.23E+00	3.57E+00	3.93E+00	2.01E+00	2.12E+00	3.01E+00
	min	8.95E+00	5.28E+00	0.00E+00	2.07E+01	0.00E+00	1.50E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.94E+01
	median	3.13E+01	1.60E+01	1.34E+01	3.00E+01	1.78E+00	2.71E+01	5.14E+00	6.09E+00	0.00E+00	0.00E+00	3.55E+00	3.69E+01
f6, D = 5	mean	3.36E+01	1.64E+01	1.48E+01	2.99E+01	2.36E+00	2.73E+01	4.53E+00	6.88E+00	0.00E+00	3.48E-01	2.98E+00	3.67E+01
	max	5.67E+01	3.21E+01	4.18E+01	3.59E+01	1.09E+01	4.59E+01	8.80E+00	1.82E+01	8.16E-08	4.01E+00	3.89E+00	4.43E+01
	std	1.10E+01	5.14E+00	8.86E+00	3.46E+00	2.79E+00	6.85E+00	2.12E+00	5.40E+00	1.62E-08	1.07E+00	1.36E+00	3.61E+00
	min	1.37E+02	8.21E+01	2.75E+01	1.52E+02	2.92E+01	1.35E+02	1.20E-02	5.42E+01	7.05E+00	0.00E+00	5.48E-02	1.73E+02
	median	1.54E+02	1.17E+02	6.80E+01	1.67E+02	5.48E+01	1.81E+02	2.98E+01	8.57E+01	3.75E+01	6.19E+01	2.82E-01	1.82E+02
f7, D = 5	mean	1.53E+02	1.18E+02	7.24E+01	1.66E+02	5.16E+01	1.77E+02	3.34E+01	8.44E+01	3.89E+01	5.89E+01	3.01E-01	1.82E+02
	max	1.70E+02	1.60E+02	1.11E+02	1.75E+02	8.65E+01	1.93E+02	6.56E+01	1.18E+02	7.55E+01	8.41E+01	8.18E-01	1.87E+02
	std	8.72E+00	1.82E+01	2.27E+01	5.02E+00	1.53E+01	1.41E+01	1.65E+01	1.63E+01	1.59E+01	2.13E+01	1.80E-01	3.06E+00
	min	2.56E+01	1.73E+01	1.46E+01	3.32E+01	1.46E+01	3.33E+01	2.35E+01	2.20E+01	2.71E+01	1.72E+01	1.90E+01	4.28E+01
	median	3.43E+01	2.69E+01	2.42E+01	4.51E+01	2.00E+01	4.30E+01	2.59E+01	3.56E+01	3.56E+01	2.03E+01	3.32E+01	4.92E+01
f8, D = 5	mean	3.41E+01	2.76E+01	2.57E+01	4.46E+01	2.03E+01	4.43E+01	2.60E+01	3.57E+01	3.55E+01	2.05E+01	3.25E+01	4.94E+01
	max	4.34E+01	3.85E+01	4.64E+01	5.14E+01	2.81E+01	5.48E+01	2.87E+01	4.47E+01	4.24E+01	2.56E+01	4.47E+01	5.86E+01
	std	4.84E+00	5.80E+00	6.06E+00	3.97E+00	3.24E+00	5.77E+00	2.05E+00	6.80E+00	3.29E+00	2.10E+00	8.44E+00	4.54E+00
	min	1.97E+00	1.14E+00	5.43E-01	2.80E+01	4.54E-01	2.58E+00	8.48E-01	3.15E-01	0.00E+00	9.89E-03	3.06E-01	2.92E+01
	median	1.01E+01	4.96E+00	3.48E+00	3.85E+01	2.02E+00	9.09E+00	1.18E+00	1.03E+00	6.12E-01	1.33E-01	4.64E-01	3.73E+01
f9, D = 10	mean	1.19E+01	6.32E+00	5.89E+00	3.84E+01	2.12E+00	1.03E+01	1.31E+00	1.28E+00	1.06E+00	1.30E-01	4.77E-01	3.65E+01
	max	3.58E+01	1.50E+01	2.59E+01	4.56E+01	5.46E+00	2.00E+01	2.55E+00	3.19E+00	1.44E+01	2.45E-01	6.12E-01	4.39E+01
	std	9.30E+00	3.14E+00	5.74E+00	4.59E+00	1.36E+00	4.52E+00	4.53E-01	8.23E-01	2.55E+00	6.65E-02	9.48E-02	4.06E+00
	min	9.83E+00	1.16E+00	6.59E+00	3.42E+01	3.44E+00	4.57E+00	4.46E+00	2.30E+00	0.00E+00	0.00E+00	4.46E+00	3.45E+01
	median	2.55E+01	1.01E+01	1.31E+01	4.22E+01	6.50E+00	1.15E+01	9.33E+00	5.57E+00	0.00E+00	0.00E+00	6.75E+00	4.88E+01
f10, D = 10	mean	2.56E+01	1.02E+01	1.36E+01	4.14E+01	7.10E+00	1.21E+01	9.92E+00	5.51E+00	7.18E-01	4.65E-04	6.24E+00	4.79E+01
	max	4.13E+01	2.16E+01	2.24E+01	4.91E+01	1.20E+01	2.83E+01	1.70E+01	8.60E+00	3.44E+00	1.40E-02	1.01E+01	5.44E+01
	std	8.97E+00	4.04E+00	3.78E+00	4.61E+00	2.52E+00	5.07E+00	4.33E+00	1.72E+00	1.08E+00	2.55E-03	1.43E+00	4.32E+00
	min	2.74E+01	5.38E+00	7.02E+00	3.04E+01	3.79E+00	7.34E+00	1.22E+01	1.61E+00	0.00E+00	5.13E-02	5.10E+00	3.21E+01
	median	3.71E+01	1.54E+01	1.74E+01	3.78E+01	8.73E+00	2.48E+01	1.52E+01	9.96E+00	3.01E+00	3.73E+00	7.70E+00	4.04E+01
f11, D = 10	mean	3.81E+01	1.50E+01	1.75E+01	3.76E+01	8.93E+00	2.50E+01	1.63E+01	9.89E+00	8.25E+00	3.37E+00	7.54E+00	4.02E+01
	max	4.80E+01	2.64E+01	3.34E+01	4.38E+01	1.36E+01	4.03E+01	2.48E+01	1.63E+01	3.01E+01	5.58E+00	1.17E+01	4.63E+01
	std	5.57E+00	5.44E+00	4.99E+00	3.51E+00	2.36E+00	8.54E+00	3.94E+00	3.61E+00	1.00E+01	1.33E+00	1.70E+00	3.16E+00
	min	2.21E+01	1.71E+00	4.62E+00	2.60E+01	4.69E-01	1.14E+01	3.00E+00	1.09E+00	0.00E+00	2.01E-02	1.47E+00	2.69E+01

	median	2.97E+01	1.23E+01	9.03E+00	3.49E+01	2.63E+00	2.61E+01	6.72E+00	1.03E+01	1.78E+01	1.33E+00	2.55E+00	3.33E+01
f12, D = 10	mean	2.93E+01	1.24E+01	9.81E+00	3.41E+01	2.90E+00	2.55E+01	6.93E+00	1.07E+01	1.55E+01	1.63E+00	2.48E+00	3.31E+01
	max	3.88E+01	2.45E+01	2.03E+01	3.80E+01	5.98E+00	3.74E+01	1.18E+01	2.93E+01	2.97E+01	3.35E+00	3.77E+00	3.76E+01
	std	4.99E+00	6.22E+00	4.40E+00	2.97E+00	1.29E+00	6.64E+00	2.54E+00	7.37E+00	1.07E+01	8.03E-01	6.17E-01	2.44E+00
	min	7.08E+01	4.71E+01	4.39E+01	9.57E+01	4.72E+01	5.21E+01	4.62E+01	4.76E+01	5.69E+01	4.67E+01	5.76E+01	1.14E+02
	median	1.11E+02	6.37E+01	6.34E+01	1.19E+02	5.76E+01	8.98E+01	6.19E+01	5.73E+01	9.52E+01	5.63E+01	6.34E+01	1.30E+02
f13, D = 10	mean	1.08E+02	6.57E+01	6.72E+01	1.18E+02	5.70E+01	8.85E+01	5.99E+01	5.88E+01	9.02E+01	5.60E+01	6.25E+01	1.29E+02
	max	1.35E+02	9.30E+01	1.20E+02	1.31E+02	6.52E+01	1.18E+02	6.94E+01	8.00E+01	1.16E+02	6.06E+01	6.65E+01	1.37E+02
	std	1.73E+01	1.15E+01	1.37E+01	8.43E+00	4.28E+00	1.55E+01	6.43E+00	8.03E+00	1.79E+01	2.81E+00	1.86E+00	5.60E+00
	min	5.09E+01	2.78E+01	2.50E+01	8.50E+01	5.14E+00	4.21E+01	1.58E+01	7.65E+00	0.00E+00	4.95E+00	3.55E+00	9.37E+01
	median	1.05E+02	4.22E+01	3.89E+01	9.63E+01	1.64E+01	6.16E+01	3.14E+01	2.98E+01	0.00E+00	1.29E+01	3.72E+00	1.12E+02
f14, D = 10	mean	9.70E+01	4.38E+01	4.06E+01	9.69E+01	1.79E+01	6.52E+01	3.26E+01	2.94E+01	1.18E-01	1.28E+01	5.24E+00	1.11E+02
	max	1.21E+02	6.59E+01	7.37E+01	1.12E+02	3.45E+01	9.79E+01	5.76E+01	6.30E+01	3.55E+00	2.14E+01	7.44E+00	1.25E+02
	std	2.02E+01	9.10E+00	1.14E+01	7.60E+00	7.55E+00	1.29E+01	1.28E+01	1.07E+01	6.49E-01	3.80E+00	1.81E+00	7.92E+00
	min	3.38E+02	2.29E+02	1.85E+02	3.62E+02	5.79E+01	3.19E+02	1.59E+02	1.97E+02	1.28E+02	1.42E+02	1.59E+02	3.77E+02
	median	3.80E+02	3.04E+02	2.73E+02	3.82E+02	1.14E+02	3.45E+02	1.86E+02	2.72E+02	1.82E+02	1.62E+02	1.87E+02	3.88E+02
f15, D = 10	mean	3.75E+02	2.98E+02	2.75E+02	3.81E+02	1.31E+02	3.44E+02	1.89E+02	2.68E+02	1.81E+02	1.62E+02	1.91E+02	3.88E+02
	max	3.96E+02	3.32E+02	3.31E+02	3.96E+02	2.64E+02	3.71E+02	2.40E+02	3.27E+02	2.25E+02	1.87E+02	2.36E+02	3.98E+02
	std	1.73E+01	2.36E+01	3.02E+01	9.09E+00	6.08E+01	1.50E+01	2.27E+01	2.75E+01	2.22E+01	1.09E+01	2.06E+01	5.32E+00
	min	8.87E+01	4.69E+01	4.81E+01	1.10E+02	4.23E+01	8.40E+01	5.90E+01	4.68E+01	1.02E+02	4.80E+01	3.83E+01	1.15E+02
	median	1.10E+02	6.73E+01	6.79E+01	1.29E+02	5.29E+01	1.09E+02	7.78E+01	9.58E+01	1.18E+02	5.78E+01	5.30E+01	1.30E+02
f16, D = 10	mean	1.11E+02	6.63E+01	6.72E+01	1.28E+02	5.45E+01	1.10E+02	8.01E+01	9.49E+01	1.17E+02	5.76E+01	5.31E+01	1.29E+02
	max	1.37E+02	9.35E+01	8.70E+01	1.36E+02	6.87E+01	1.32E+02	1.13E+02	1.21E+02	1.33E+02	6.36E+01	6.44E+01	1.40E+02
	std	1.04E+01	1.03E+01	1.06E+01	6.17E+00	6.28E+00	1.31E+01	1.49E+01	1.62E+01	7.11E+00	4.03E+00	8.17E+00	5.98E+00
	min	3.15E+00	3.06E+00	5.43E-01	4.33E+01	5.33E-01	7.59E+00	5.36E-01	6.91E-01	2.37E-01	2.92E-01	1.58E-01	5.21E+01
	median	4.96E+00	8.16E+00	2.94E+00	5.29E+01	1.60E+00	2.24E+01	6.57E-01	2.40E+00	7.14E-01	4.33E-01	2.37E-01	6.18E+01
f17, D = 15	mean	7.91E+00	8.81E+00	3.39E+00	5.42E+01	1.44E+00	2.28E+01	8.89E-01	2.42E+00	1.15E+00	4.46E-01	2.40E-01	6.15E+01
	max	2.61E+01	1.93E+01	8.19E+00	6.68E+01	2.65E+00	4.90E+01	1.75E+00	4.94E+00	1.22E+01	6.32E-01	5.33E-01	6.71E+01
	std	6.01E+00	3.97E+00	1.93E+00	6.35E+00	6.81E-01	1.06E+01	4.07E-01	9.36E-01	2.12E+00	8.69E-02	9.32E-02	3.68E+00
	min	1.16E+01	7.61E+00	5.74E+00	4.72E+01	4.46E+00	1.02E+01	4.86E+00	5.60E+00	0.00E+00	1.65E-03	1.15E+00	6.35E+01
	median	1.99E+01	1.66E+01	1.74E+01	6.14E+01	7.76E+00	2.76E+01	9.06E+00	1.42E+01	1.15E+00	1.17E+00	2.30E+00	7.60E+01
f18, D = 15	mean	2.08E+01	1.69E+01	1.78E+01	6.17E+01	7.12E+00	2.65E+01	8.84E+00	1.45E+01	1.37E+00	1.52E+00	2.22E+00	7.52E+01
	max	3.33E+01	2.67E+01	3.82E+01	7.70E+01	9.92E+00	3.73E+01	1.21E+01	2.76E+01	4.46E+00	3.32E+00	3.44E+00	8.16E+01
	std	5.85E+00	5.21E+00	6.90E+00	6.18E+00	1.39E+00	6.76E+00	2.30E+00	5.13E+00	1.24E+00	8.91E-01	7.35E-01	4.08E+00
	min	2.88E+01	1.31E+01	1.76E+01	5.47E+01	5.94E+00	2.37E+01	1.37E+01	1.04E+01	1.03E-05	6.29E+00	7.73E+00	6.36E+01
	median	4.34E+01	2.77E+01	3.11E+01	6.54E+01	1.52E+01	4.18E+01	2.37E+01	2.31E+01	5.95E+00	1.00E+01	1.03E+01	7.12E+01
f19, D = 15	mean	4.55E+01	2.72E+01	3.22E+01	6.51E+01	1.57E+01	4.13E+01	2.56E+01	2.27E+01	7.12E+00	1.01E+01	1.09E+01	7.05E+01
	max	7.31E+01	3.92E+01	5.41E+01	7.33E+01	2.21E+01	6.22E+01	4.56E+01	3.95E+01	5.13E+01	1.51E+01	1.59E+01	7.54E+01
	std	1.24E+01	6.04E+00	8.55E+00	4.44E+00	3.53E+00	9.61E+00	1.10E+01	6.07E+00	9.05E+00	1.90E+00	2.17E+00	3.08E+00
	min	2.51E+01	1.13E+01	5.37E+00	4.82E+01	1.74E+00	2.98E+01	1.19E+01	8.27E+00	4.80E-01	2.46E+00	1.69E+00	5.05E+01
	median	5.17E+01	2.56E+01	2.19E+01	5.79E+01	6.43E+00	4.78E+01	1.57E+01	1.61E+01	2.31E+01	5.88E+00	3.19E+00	6.09E+01
f20, D = 15	mean	4.98E+01	2.64E+01	2.36E+01	5.84E+01	7.71E+00	4.96E+01	1.62E+01	1.84E+01	2.64E+01	6.94E+00	3.19E+00	6.03E+01
	max	6.56E+01	5.44E+01	4.04E+01	6.43E+01	1.78E+01	6.70E+01	2.33E+01	5.47E+01	5.56E+01	1.44E+01	4.46E+00	6.54E+01
	std	9.22E+00	9.91E+00	8.62E+00	3.51E+00	3.70E+00	1.01E+01	3.61E+00	9.27E+00	2.36E+01	3.30E+00	5.45E-01	3.37E+00

	min	1.40E+02	1.01E+02	9.81E+01	1.86E+02	7.82E+01	1.21E+02	8.36E+01	7.67E+01	8.11E+01	8.20E+01	7.86E+01	2.12E+02
	median	1.78E+02	1.26E+02	1.32E+02	2.05E+02	9.09E+01	1.69E+02	1.11E+02	1.02E+02	8.95E+01	9.57E+01	8.49E+01	2.29E+02
f21, D = 15	mean	1.76E+02	1.30E+02	1.32E+02	2.05E+02	9.21E+01	1.67E+02	1.10E+02	1.02E+02	9.57E+01	9.41E+01	8.55E+01	2.28E+02
	max	2.04E+02	1.75E+02	1.73E+02	2.21E+02	1.17E+02	1.99E+02	1.27E+02	1.20E+02	1.70E+02	1.04E+02	9.00E+01	2.43E+02
	std	1.72E+01	1.74E+01	1.84E+01	9.32E+00	8.64E+00	1.96E+01	1.33E+01	9.20E+00	1.97E+01	5.02E+00	3.19E+00	9.03E+00
	min	9.30E+01	3.25E+01	5.00E+01	1.45E+02	2.85E+01	9.17E+01	3.75E+01	2.95E+01	0.00E+00	1.71E+01	1.42E+01	1.81E+02
	median	1.47E+02	8.44E+01	8.29E+01	1.78E+02	5.17E+01	1.22E+02	5.17E+01	5.63E+01	7.27E+00	3.02E+01	1.87E+01	2.08E+02
f22, D = 15	mean	1.50E+02	8.51E+01	8.72E+01	1.79E+02	5.13E+01	1.24E+02	5.20E+01	5.93E+01	8.51E+00	2.92E+01	1.95E+01	2.06E+02
	max	1.93E+02	1.20E+02	1.52E+02	2.03E+02	7.63E+01	1.73E+02	6.80E+01	9.76E+01	2.61E+01	4.00E+01	2.36E+01	2.28E+02
	std	2.13E+01	1.78E+01	2.49E+01	1.20E+01	1.18E+01	2.17E+01	9.98E+00	1.59E+01	5.84E+00	6.39E+00	2.16E+00	1.14E+01
	min	5.64E+02	4.02E+02	3.83E+02	5.68E+02	2.07E+02	4.87E+02	3.93E+02	3.86E+02	3.66E+01	2.08E+02	3.45E+02	5.84E+02
	median	6.08E+02	4.53E+02	4.58E+02	5.93E+02	2.82E+02	5.47E+02	4.11E+02	4.44E+02	3.16E+02	2.50E+02	3.83E+02	6.09E+02
f23, D = 15	mean	6.06E+02	4.58E+02	4.51E+02	5.94E+02	2.80E+02	5.40E+02	4.26E+02	4.39E+02	3.03E+02	2.48E+02	3.85E+02	6.07E+02
	max	6.36E+02	5.27E+02	4.99E+02	6.09E+02	3.84E+02	5.84E+02	4.71E+02	4.91E+02	3.78E+02	2.77E+02	4.04E+02	6.21E+02
	std	1.35E+01	3.02E+01	2.89E+01	9.30E+00	4.12E+01	2.47E+01	3.13E+01	3.15E+01	6.40E+01	1.71E+01	1.28E+01	9.35E+00
	min	1.47E+02	8.64E+01	8.57E+01	1.90E+02	7.24E+01	1.25E+02	8.84E+01	9.82E+01	1.78E+02	8.49E+01	6.23E+01	2.08E+02
	median	2.02E+02	1.22E+02	1.18E+02	2.22E+02	8.86E+01	1.88E+02	1.17E+02	1.76E+02	2.01E+02	9.93E+01	8.91E+01	2.23E+02
f24, D = 15	mean	1.97E+02	1.26E+02	1.18E+02	2.21E+02	9.43E+01	1.83E+02	1.24E+02	1.69E+02	2.01E+02	9.97E+01	8.97E+01	2.23E+02
	max	2.31E+02	1.57E+02	1.66E+02	2.42E+02	1.39E+02	2.30E+02	1.67E+02	2.03E+02	2.16E+02	1.12E+02	1.08E+02	2.40E+02
	std	1.85E+01	1.84E+01	1.79E+01	1.08E+01	1.42E+01	2.30E+01	2.50E+01	2.57E+01	9.15E+00	6.39E+00	1.18E+01	8.60E+00
	min	7.50E+00	3.42E+00	1.53E+00	8.45E+01	2.36E+00	1.63E+01	3.49E+00	8.49E-01	2.37E-01	2.54E-01	8.30E-01	8.62E+01
	median	1.92E+01	1.16E+01	6.09E+00	9.80E+01	4.17E+00	4.07E+01	5.36E+00	2.50E+00	8.69E-01	4.66E-01	1.14E+00	9.96E+01
f25, D = 20	mean	2.30E+01	1.18E+01	8.42E+00	9.76E+01	4.92E+00	4.32E+01	7.95E+00	2.62E+00	1.06E+00	4.41E-01	1.16E+00	9.88E+01
	max	4.67E+01	2.99E+01	2.58E+01	1.10E+02	1.54E+01	9.22E+01	1.56E+01	5.47E+00	2.90E+00	6.71E-01	1.51E+00	1.05E+02
	std	1.17E+01	6.54E+00	5.92E+00	7.03E+00	3.08E+00	1.88E+01	4.58E+00	1.19E+00	6.12E-01	1.00E-01	1.37E-01	4.61E+00
	min	3.14E+01	7.92E+00	1.43E+01	8.88E+01	1.62E+01	1.94E+01	3.16E+01	1.01E+01	0.00E+00	1.18E-02	1.11E+01	7.96E+01
	median	5.28E+01	2.18E+01	3.46E+01	1.04E+02	2.67E+01	4.09E+01	3.92E+01	1.58E+01	2.30E+00	2.31E+00	1.32E+01	1.22E+02
f26, D = 20	mean	5.36E+01	2.12E+01	3.44E+01	1.01E+02	2.70E+01	4.13E+01	3.95E+01	1.64E+01	3.13E+00	2.06E+00	1.36E+01	1.19E+02
	max	7.08E+01	3.46E+01	5.52E+01	1.11E+02	4.08E+01	6.68E+01	4.97E+01	2.18E+01	8.60E+00	4.47E+00	1.67E+01	1.28E+02
	std	1.06E+01	6.49E+00	1.06E+01	7.34E+00	6.83E+00	1.38E+01	5.93E+00	3.17E+00	2.39E+00	9.02E-01	1.65E+00	9.12E+00
	min	7.57E+01	1.94E+01	2.39E+01	8.48E+01	1.59E+01	2.90E+01	4.35E+01	1.31E+01	0.00E+00	7.72E+00	1.73E+01	9.12E+01
	median	9.21E+01	3.00E+01	5.30E+01	9.67E+01	3.95E+01	5.71E+01	5.50E+01	2.53E+01	9.15E+00	1.32E+01	2.37E+01	1.07E+02
f27, D = 20	mean	9.34E+01	3.16E+01	5.07E+01	9.71E+01	3.99E+01	5.83E+01	5.47E+01	2.59E+01	1.05E+01	1.29E+01	2.33E+01	1.06E+02
	max	1.12E+02	4.59E+01	7.49E+01	1.06E+02	5.87E+01	9.58E+01	6.13E+01	3.84E+01	2.69E+01	1.94E+01	3.30E+01	1.11E+02
	std	1.09E+01	6.52E+00	1.14E+01	4.91E+00	8.76E+00	1.33E+01	5.15E+00	6.59E+00	5.66E+00	2.77E+00	3.79E+00	4.62E+00
	min	6.70E+01	1.86E+01	1.63E+01	7.55E+01	5.81E+00	3.90E+01	2.53E+01	5.34E+00	0.00E+00	3.34E+00	4.42E+00	7.57E+01
	median	8.27E+01	3.79E+01	3.96E+01	8.80E+01	2.72E+01	7.53E+01	3.08E+01	2.81E+01	7.85E+00	1.25E+01	5.85E+00	9.05E+01
f28, D = 20	mean	8.35E+01	3.89E+01	3.66E+01	8.80E+01	2.70E+01	7.15E+01	3.25E+01	2.90E+01	3.65E+01	1.32E+01	6.11E+00	8.94E+01
	max	1.04E+02	7.22E+01	5.73E+01	9.82E+01	4.11E+01	8.90E+01	4.12E+01	4.74E+01	8.21E+01	2.58E+01	8.40E+00	9.62E+01
	std	7.78E+00	1.19E+01	9.05E+00	4.33E+00	7.71E+00	1.37E+01	5.54E+00	1.05E+01	3.60E+01	6.11E+00	1.05E+00	4.95E+00
	min	2.01E+02	1.34E+02	1.49E+02	2.76E+02	1.08E+02	1.74E+02	1.40E+02	1.28E+02	1.05E+02	1.19E+02	1.05E+02	3.00E+02
	median	2.67E+02	1.53E+02	1.78E+02	3.01E+02	1.37E+02	2.31E+02	1.59E+02	1.51E+02	1.20E+02	1.35E+02	1.12E+02	3.25E+02
f29, D = 20	mean	2.65E+02	1.54E+02	1.82E+02	2.99E+02	1.36E+02	2.27E+02	1.61E+02	1.51E+02	1.20E+02	1.34E+02	1.12E+02	3.23E+02
	max	3.17E+02	1.90E+02	2.24E+02	3.15E+02	1.61E+02	2.75E+02	1.91E+02	1.84E+02	1.32E+02	1.45E+02	1.20E+02	3.41E+02

	std	2.54E+01	1.35E+01	2.34E+01	9.01E+00	1.22E+01	2.57E+01	1.51E+01	1.53E+01	5.86E+00	5.67E+00	4.46E+00	1.03E+01
	min	2.04E+02	7.14E+01	6.74E+01	2.43E+02	4.85E+01	1.15E+02	7.97E+01	5.93E+01	3.89E+00	3.51E+01	1.81E+01	2.84E+02
	median	2.44E+02	1.08E+02	1.26E+02	2.65E+02	8.96E+01	1.58E+02	1.07E+02	9.54E+01	1.42E+01	5.76E+01	2.82E+01	3.02E+02
f30, D = 20	mean	2.42E+02	1.13E+02	1.28E+02	2.66E+02	8.68E+01	1.63E+02	1.19E+02	9.70E+01	1.36E+01	5.63E+01	2.86E+01	3.02E+02
	max	3.07E+02	1.75E+02	2.05E+02	2.86E+02	1.44E+02	2.15E+02	1.85E+02	1.63E+02	3.31E+01	6.53E+01	3.94E+01	3.20E+02
	std	2.45E+01	2.81E+01	3.24E+01	1.07E+01	2.05E+01	2.20E+01	3.40E+01	2.30E+01	5.79E+00	6.14E+00	4.45E+00	9.98E+00
	min	8.10E+02	5.78E+02	5.73E+02	7.68E+02	3.74E+02	6.70E+02	5.45E+02	5.22E+02	0.00E+00	2.47E+02	5.12E+02	8.18E+02
	median	8.51E+02	6.24E+02	6.39E+02	8.06E+02	4.69E+02	7.43E+02	5.79E+02	6.32E+02	2.73E+02	3.39E+02	5.27E+02	8.37E+02
f31, D = 20	mean	8.50E+02	6.26E+02	6.39E+02	8.05E+02	4.71E+02	7.39E+02	5.88E+02	6.23E+02	2.62E+02	3.33E+02	5.29E+02	8.37E+02
	max	8.86E+02	7.12E+02	6.90E+02	8.32E+02	6.28E+02	8.04E+02	6.38E+02	6.98E+02	5.43E+02	3.71E+02	5.53E+02	8.49E+02
	std	1.94E+01	3.21E+01	2.90E+01	1.38E+01	5.87E+01	2.85E+01	2.93E+01	4.53E+01	1.90E+02	2.35E+01	1.07E+01	6.46E+00
	min	2.74E+02	1.33E+02	1.31E+02	2.55E+02	1.00E+02	2.19E+02	1.27E+02	1.82E+02	2.60E+02	1.28E+02	8.98E+01	3.16E+02
	median	3.17E+02	1.77E+02	1.71E+02	3.22E+02	1.36E+02	2.64E+02	1.71E+02	2.67E+02	2.79E+02	1.54E+02	1.20E+02	3.34E+02
f32, D = 20	mean	3.16E+02	1.78E+02	1.71E+02	3.19E+02	1.34E+02	2.66E+02	1.77E+02	2.62E+02	2.80E+02	1.51E+02	1.19E+02	3.33E+02
	max	3.71E+02	2.51E+02	2.04E+02	3.40E+02	1.63E+02	3.34E+02	2.57E+02	3.02E+02	2.96E+02	1.73E+02	1.42E+02	3.45E+02
	std	2.72E+01	2.84E+01	1.96E+01	1.63E+01	1.49E+01	2.84E+01	3.45E+01	2.95E+01	1.01E+01	1.06E+01	1.51E+01	7.05E+00