Differential Evolution with Adaptive Mechanism of Population Size According to Current Population Diversity - Supplementary file

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Abstract

This file is Supplementary file for the "Differential Evolution with Adaptive Mechanism of Population Size According to Current Population Diversity" paper submitted to Swarm and Evolutionary Computation journal.

Description of Tables

In tables S1-S16, there are means and standard deviations of 51 results for all 23 tested algorithms for each of all 30 tested functions. These statistics could be found in tables S1, S2, S3, and S4 for dimension 10, in tables S5, S6, S7, S8 for dimension 30, in tables S9, S10, S11, S12 for dimension 50, and in tables S13, S14, S15, S16 for dimension 100.

Medians of our results are given in tables S17-S24. They are shown for dimension 10 in tables S17 and S18, for dimension 30 in tables S19 and S20, for dimension 50 in tables S21 and S22, and for dimension 100 in tables S23 and S24. The best medians are written in bold.

In tables S25, S26, S27, and S28, ranks of medians are depicted for dimensions 10, 30, 50, and 100, respectively. Medians of algorithms which are better than median of jSO algorithm are depicted in bold there.

In tables S29, S30, S31, and S32, detailed results of all computed Wilcoxon rank-sum tests are given. Where + is given, the d-version of the algorithm is significantly better than the other version in the comparison. Where - is given, the d-version of the algorithm is significantly worse than the other version in the comparison. The zero here means that the difference between compared algorithms is not significant in weighed case.

fun	alg	DE	LDE	dDE	jDE	LjDE	djDE	IDE	LIDE	dIDE	SHADE	LSHADE	dSHADE
1	mean	41863.9	19725.8	338.98	0	5.59E-07	4.38E-09	0	2.37981	0	0	0	0
	std	18542.1	11546.3	272.273	0	2.36E-06	2.67E-08	0	1.55621	0	0	0	0
2	mean	8.10E-06	3.65E-07	0	0	0	0	0	0	0	0	0	0
	std	4.02E-06	1.02E-06	0	0	0	0	0	0	0	0	0	0
3	mean	2.29E-08	2.62E-10	0	0	0	0	0	0	0	0	0	0
	std	1.82E-08	1.87E-09	0	0	0	0	0	0	0	0	0	0
4	mean	11.3272	9.61267	12.7876	11.5915	6.64775	20.3721	19.3501	7.07279	13.5524	26.9367	25.5728	28.3007
	std	16.045	14.9292	16.4494	15.9076	13.2257	16.7606	17.2229	13.071	16.582	14.3159	15.1529	13.2848
5	mean	20.0428	20.0409	20.136	19.3981	17.1821	18.8533	16.1252	15.273	16.4835	17.403	15.4724	16.078
	std	0.584825	0.757691	0.04264	2.22175	5.80919	4.45523	8.01926	8.32973	7.6905	6.24988	8.21331	8.01938
6	mean	0.009021	0.000518	0.000535	0	0	0	0	0.000385	0	0.03508	0.000209	0.01754
	std	0.028564	0.002534	0.003817	0	0	0	0	0.001353	0	0.175365	0.000561	0.125261
7	mean	0.296349	0.283036	0.256478	0.005428	0.002358	0.004071	0.008931	0.004924	0.011347	0.003285	0.000918	0.003769
	std	0.047944	0.063227	0.065153	0.006009	0.003954	0.005798	0.010382	0.006466	0.008679	0.00748	0.00256	0.005669
8	mean	0	0	0	0	0	0	0	0	0	0	0	0
	std	0	0	0	0	0	0	0	0	0	0	0	0
9	mean	17.7805	16.0827	11.3867	4.18973	3.24237	2.62288	3.27751	3.08848	3.19948	3.02493	3.02569	2.73126
	std	2.64137	2.61763	3.62592	1.03427	1.0985	1.25894	1.62022	1.15929	1.16565	1.09112	0.931964	1.19135
10	mean	1.7232	0.332699	0.463776	0.02939	0	0.080431	0.586328	0.278753	0.641148	0.020818	0	0.028166
	std	2.44417	0.484496	0.883227	0.042087	0	0.468274	1.12817	0.158113	1.33231	0.032251	0	0.042014
11	mean	726.138	636.573	333.048	173.157	104.826	70.2297	90.8666	114.486	109.284	124.835	50.5853	79.8936
	std	121.391	123.469	160.539	78.7389	74.097	66.2667	83.6527	95.2918	118.039	104.135	53.667	73.7644
12	mean	0.549241	0.525931	0.435363	0.296781	0.270917	0.217544	0.093485	0.220974	0.045601	0.084365	0.064508	0.027694
	std	0.111072	0.102864	0.104987	0.058419	0.053738	0.051656	0.067664	0.052109	0.049726	0.035628	0.026327	0.026078
13	mean	0.213701	0.20297	0.186701	0.135029	0.10641	0.115731	0.078662	0.103521	0.0672	0.076928	0.080001	0.064996
	std	0.035277	0.032315	0.038898	0.031495	0.029447	0.027509	0.016217	0.019437	0.023481	0.025756	0.023397	0.023307
14	mean	0.151498	0.158014	0.137242	0.15941	0.129595	0.134528	0.090833	0.104704	0.093007	0.150773	0.083942	0.142983
	std	0.031008	0.034502	0.035738	0.044435	0.028448	0.048372	0.032685	0.029041	0.042632	0.060788	0.02609	0.061723
15	mean	1.81199	1.88758	1.77412	0.789964	0.731348	0.640692	0.493381	0.662648	0.479224	0.424916	0.38773	0.429648
	std	0.361499	0.274482	0.323586	0.122716	0.115203	0.12616	0.084494	0.130772	0.1035	0.084047	0.087449	0.081498

Table S1: Results' means and standard deviations of all tested version of algorithms DE, jDE, IDE, and SHADE, dimension D10, f1-f15

fun	alg	b6e6rl	Lb6e6rl	db6e6rl	CoDE	LCoDE	dCoDE	EPSDE	LEPSDE	dEPSDE	jSO	djSO
1	mean	0	0	0	0.041863	0.034145	0.00154	0	0	0	0	0
	std	0	0	0	0.023218	0.072913	0.002607	0	0	0	0	0
2	mean	0	0	0	1.26E-08	2.66E-09	0	0	0	0	0	0
	std	0	0	0	1.39E-08	1.11E-08	0	0	0	0	0	0
3	mean	0	0	0	0	0	0	0	0	0	0	0
	std	0	0	0	0	0	0	0	0	0	0	0
4	mean	18.0712	12.8705	18.2412	1.53395	3.95E-08	3.65E-10	22.418	16.2803	17.9843	29.4096	28.2157
	std	17.2463	16.4058	17.0847	6.83656	1.19E-07	2.61E-09	16.2543	16.9921	16.7053	12.5885	13.454
5	mean	18.8731	17.3225	19.7346	19.4884	19.3073	19.1097	19.2397	19.0024	18.8823	13.3855	16.8876
	std	3.75732	5.46104	2.17364	2.06628	2.52355	4.01739	2.47869	2.65445	4.76756	9.51195	7.29535
6	mean	0.05262	0	0.01754	1.56457	0.501382	0.000551	0	2.59E-06	0.01754	0	0
	std	0.212575	0	0.125261	0.667059	0.361955	0.000924	0	1.85E-05	0.125261	0	0
7	mean	0.019441	0.008819	0.012996	0.131134	0.101782	0.076545	0.101021	0.083573	0.066833	0.00058	0.00256
	std	0.013857	0.007164	0.011527	0.029942	0.041852	0.034148	0.031084	0.040723	0.024794	0.002008	0.004949
8	mean	0	0	0	0	0	0	0	0	0	0	0
	std	0	0	0	0	0	0	0	0	0	0	0
9	mean	4.81966	3.53342	3.35242	8.85495	6.82702	4.1849	9.19147	8.35117	4.6072	2.1655	2.98488
	std	1.05026	1.00541	1.0142	1.70246	2.12425	1.70752	2.0121	1.90198	1.31324	0.709313	1.0716
10	mean	0.040412	0.002449	0.037963	0.001225	0	0	0.133088	0.126133	0.080823	0.009797	0.422971
	std	0.052734	0.012244	0.045172	0.008745	0	0	0.482607	0.072286	0.061566	0.026119	1.00754
11	mean	188.938	116.7	112.932	398.771	305.545	146.866	390.073	399.482	132.739	26.6156	119.83
	std	81.6434	60.729	90.3275	99.67	100.177	97.6631	133.537	93.9421	81.4871	35.6828	104.551
12	mean	0.309642	0.256463	0.239444	0.382679	0.354568	0.175073	0.425954	0.453123	0.285988	0.096934	0.068114
	std	0.051958	0.057185	0.064134	0.055181	0.06918	0.142024	0.084241	0.069725	0.074174	0.025213	0.037453
13	mean	0.113781	0.119214	0.114764	0.222682	0.213845	0.184264	0.155902	0.15639	0.131666	0.057458	0.067286
	std	0.031201	0.024282	0.036924	0.033664	0.043116	0.032531	0.025154	0.031994	0.029803	0.012571	0.016356
14	mean	0.121192	0.104214	0.09836	0.149147	0.132083	0.136941	0.128925	0.126978	0.109199	0.049199	0.07747
	std	0.027307	0.02977	0.038524	0.036049	0.030772	0.028905	0.028387	0.029456	0.032927	0.016471	0.031845
15	mean	0.798954	0.779702	0.710528	1.32489	1.24541	1.11829	1.24589	1.20387	1.03582	0.380659	0.401515
	std	0.163733	0.1058	0.114801	0.224203	0.214946	0.199723	0.196063	0.231909	0.189863	0.073827	0.086599

Table S2: Results' means and standard deviations of all tested version of algorithms b6e6rl, CoDE, EPSDE, jSO, dimension D10, f1-f15

fun	alg	DE	LDE	dDE	jDE	LjDE	djDE	IDE	LIDE	dIDE	SHADE	LSHADE	dSHADE
16	mean	2.66028	2.4841	2.06228	1.73741	1.52047	1.35139	1.03131	1.19667	1.19714	1.6176	1.49957	1.42693
	std	0.224131	0.205209	0.410642	0.351162	0.35194	0.420611	0.436543	0.36256	0.470224	0.351284	0.288116	0.401752
17	mean	110.303	77.5743	9.12244	12.1436	1.30446	8.77498	1.92608	6.39235	1.64649	43.6434	1.79072	36.8629
	std	31.975	31.0928	10.4339	30.5562	1.32937	16.6722	2.93591	5.25612	3.32162	60.8559	2.14273	56.7159
18	mean	3.71773	3.36261	1.66608	0.874251	0.472319	0.692781	0.064095	0.340289	0.038605	0.304663	0.166726	0.285474
	std	0.897682	1.24321	0.756625	0.659398	0.529899	0.581371	0.202959	0.420286	0.142086	0.625409	0.202201	0.479458
19	mean	0.630452	0.520594	0.175051	0.183437	0.106939	0.063884	0.055309	0.09743	0.02989	0.179507	0.076453	0.143337
	std	0.133315	0.147432	0.084981	0.121751	0.047349	0.0374	0.131641	0.043431	0.020263	0.338808	0.057654	0.341191
20	mean	0.814074	0.33277	0.121915	0.074157	0.040049	0.024826	0.061774	0.136455	0.057248	0.099818	0.062593	0.089439
	std	0.389749	0.185414	0.148718	0.068462	0.047128	0.041798	0.047507	0.065692	0.057947	0.091576	0.052666	0.09859
21	mean	1.67798	0.873978	0.333824	0.253674	0.159412	0.185889	0.139656	0.33494	0.122655	1.87853	0.241458	9.10599
	std	0.715488	0.326552	0.286717	0.278887	0.20844	0.243551	0.182622	0.176486	0.17185	8.45416	0.215895	33.0097
22	mean	0.145948	0.048072	0.048868	0.05037	0.013213	0.056562	0.53063	0.500439	0.56562	0.766368	0.023057	0.442088
	std	0.11571	0.058624	0.09586	0.098393	0.044249	0.114291	2.86397	0.222873	2.79774	3.62438	0.025523	2.79547
23	mean	329.457	329.457	329.457	329.457	329.457	322.997	329.457	329.457	329.457	329.457	329.457	329.457
	std	1.72E-13	1.72E-13	1.72E-13	1.72E-13	1.72E-13	46.1332	1.72E-13	1.72E-13	1.72E-13	1.72E-13	1.72E-13	1.72E-13
24	mean	124.647	124.155	119.154	111.191	110.224	109.742	109.069	108.501	109.043	109.463	109.938	109.316
	std	4.03013	4.22555	4.28185	2.06741	2.12294	2.02037	2.45374	2.64569	3.16831	2.43898	2.25272	1.66797
25	mean	165.736	145.885	149.483	123.686	114.626	121.798	116.942	115.16	117.191	125.925	131.105	128.034
	std	16.0694	11.3109	36.2027	24.4276	5.28523	19.0024	13.6184	6.1766	13.2811	32.4392	35.1136	32.0806
26	mean	100.236	100.232	100.21	100.132	100.112	100.121	100.084	100.101	100.078	100.082	100.077	100.059
	std	0.04184	0.046034	0.047131	0.028141	0.041741	0.035224	0.020736	0.017452	0.02724	0.029056	0.031656	0.021891
27	mean	74.7772	2.96465	72.6089	101.402	7.46939	105.573	176.175	1.77178	130.239	179.551	60.46	204.805
	std	131.1	0.526424	127.404	141.828	41.7833	149.457	183.351	0.388435	178.67	172.448	129.156	168.635
28	mean	359.661	357.628	362.501	362.856	360.322	368.653	421.914	389.018	408.457	414.156	385.052	409.591
	std	5.17694	2.99923	17.6026	6.22733	5.50495	22.3978	53.9003	49.903	55.1928	52.8308	37.2122	53.8276
29	mean	333.509	273.015	233.584	223.061	222.286	223.525	211.62	212.004	206.813	34028.9	222.151	220.894
	std	33.7936	23.8793	11.1891	2.93133	0.756524	2.37938	28.8896	24.2828	36.3044	241453	0.570387	13.1436
30	mean	538.14	512.198	494.016	475.535	464.774	474.383	478.28	499.715	471.122	495.801	467.966	489.31
	std	22.2851	15.7529	10.8395	22.2599	6.3567	18.7781	23.5105	13.8052	18.7967	41.8151	16.6958	36.2692

Table S3: Results' means and standard deviations of all tested version of algorithms DE, jDE, IDE, and SHADE, dimension D10, f16-f30

fun	alg	b6e6rl	Lb6e6rl	db6e6rl	CoDE	LCoDE	dCoDE	EPSDE	LEPSDE	dEPSDE	jSO	djSO
16	mean	1.80472	1.68146	1.53924	2.3542	2.29753	1.92366	2.18088	2.09114	1.65207	0.956695	1.11707
	std	0.294452	0.261532	0.373346	0.235408	0.185936	0.324309	0.283658	0.304383	0.373847	0.272001	0.411884
17	mean	5.81125	0.820554	12.1582	46.0036	22.1501	1.90168	7.39156	4.43971	1.65588	1.44983	10.7659
	std	15.8789	0.771513	26.711	18.6307	14.627	3.84439	5.85426	4.64608	2.74369	0.981771	28.5061
18	mean	0.54853	0.314769	0.394426	2.08191	1.60716	0.343495	0.216923	0.231989	0.181835	0.077855	0.19518
	std	0.488253	0.246912	0.534045	0.640526	1.04814	0.464441	0.264544	0.182171	0.168755	0.121796	0.598276
19	mean	0.145472	0.092822	0.067482	0.446302	0.400423	0.101578	0.26338	0.257366	0.093246	0.048197	0.501091
	std	0.079449	0.047764	0.05347	0.118934	0.095993	0.056806	0.125231	0.09091	0.040228	0.031783	0.651588
20	mean	0.045395	0.040608	0.023032	0.75698	0.502366	0.161556	0.119624	0.112416	0.021979	0.083521	0.151204
	std	0.095549	0.073562	0.048354	0.202434	0.200668	0.086715	0.102024	0.105449	0.037601	0.07783	0.138096
21	mean	1.92647	0.366943	2.13204	1.88159	0.992863	0.168391	0.428954	0.277387	0.244349	0.361517	0.152474
	std	4.46661	0.222651	5.06343	0.878153	0.564476	0.191079	0.279069	0.23267	0.225624	0.338507	0.190968
22	mean	0.151646	0.070571	0.143991	0.68667	0.25988	0.056143	0.199625	0.123216	0.115416	0.686008	4.54708
	std	0.179763	0.119593	0.167448	0.908055	0.113971	0.059122	0.154499	0.122743	0.161037	2.79853	8.37779
23	mean	329.457	329.457	329.457	329.457	329.457	329.457	329.457	329.457	329.457	329.457	329.457
	std	1.72E-13	1.72E-13	1.72E-13	1.72E-13	1.72E-13	1.72E-13	1.72E-13	1.72E-13	1.72E-13	1.72E-13	1.72E-13
24	mean	112.046	110.673	111.707	118.233	115.275	112.144	116.114	114.604	111.208	108.072	109.798
	std	2.20874	1.64368	2.15434	2.91881	3.03176	3.37634	1.98725	2.55683	2.71872	2.02085	1.32249
25	mean	157.954	133.788	167.669	127.584	121.192	117.638	131.162	117.748	135.238	129.661	149.515
	std	43.4441	38.3345	41.355	15.6116	4.72808	12.7105	25.8817	6.03922	38.9882	33.1795	38.4503
26	mean	100.123	100.121	100.113	100.212	100.2	100.191	100.152	100.154	100.138	100.062	100.065
	std	0.036886	0.035954	0.038182	0.033529	0.035263	0.03379	0.030036	0.031763	0.029675	0.012561	0.016833
27	mean	234.024	15.4569	152.061	3.29523	2.99552	16.4664	123.059	41.0288	85.5442	56.0916	186.88
	std	177.693	69.0052	183.982	0.440651	0.515135	68.8256	174.849	119.571	146.789	119.978	159.339
28	mean	388.694	362.704	389.43	356.827	356.827	357.063	390.538	378.91	374.387	378.436	402.268
	std	44.7624	17.6735	46.528	1.72E-13	1.72E-13	1.68356	48.4611	41.8483	33.841	26.2039	44.9873
29	mean	220.554	221.886	34030.4	218.679	221.975	221.871	222.05	221.827	218.266	221.936	223.202
	std	12.705	0.459688	241453	17.4508	0.2313	0.23936	0.566521	0.349871	18.1037	0.3887	3.23888
30	mean	476.466	462.624	473.079	491.593	475.053	465.916	469.347	463.589	468.912	464.957	478.864
	std	26.796	0.558905	22.0673	13.9174	9.07907	5.97939	19.9948	5.42152	17.8689	9.18934	36.4823

Table S4: Results' means and standard deviations of all tested version of algorithms b6e6rl, CoDE, EPSDE, jSO, dimension D10, f16-f30

fun	alg	DE	LDE	dDE	jDE	LjDE	djDE	IDE	LIDE	dIDE	SHADE	LSHADE	dSHADE
1	mean	97054700	1.16E+08	9384640	53273.4	64910.3	91940.3	43321.5	1001660	77529.8	2019.19	0	4.77765
	std	18208000	24727800	7958840	39928.4	41638.1	86464.1	25638.8	406914	41639.6	5689.8	0	18.1123
2	mean	93.0919	37742.8	0.074152	0	0	0	0	0.945361	0	0	0	0
	std	30.3108	25442.8	0.529548	0	0	0	0	0.258759	0	0	0	0
3	mean	5.14352	68.3506	0.155467	0	0	0	0	0.051815	0	0	0	0
	std	1.64848	41.2694	0.431353	0	0	0	0	0.010406	0	0	0	0
4	mean	123.471	122.628	68.202	2.7439	50.8317	25.9567	8.18163	70.9626	0.085705	3.80762	2.63E-07	2.4863
	std	8.13777	7.04419	12.3353	12.4013	28.6648	33.6926	21.2198	3.74181	0.16524	15.0569	1.85E-06	12.429
5	mean	20.8815	20.9054	20.8765	20.257	20.3108	20.167	20.2198	20.4271	20.0157	20.0599	20.1652	20.0001
	std	0.069493	0.045765	0.063704	0.039332	0.040782	0.034274	0.058257	0.061563	0.033155	0.022761	0.049731	0.00037
6	mean	31.4734	32.149	9.79435	5.09836	8.6385	3.08612	0.681473	2.64651	0.002768	8.01649	10.544	2.35094
	std	1.07121	1.44439	10.4583	4.19884	3.05032	2.7871	0.771055	1.8124	0.00739	3.44777	0.906998	2.95826
7	mean	0.095422	0.167787	0.021236	0.00087	0	0	0.002701	4.68E-08	0	0.003909	0	0
	std	0.12332	0.236214	0.073651	0.002736	0	0	0.007097	5.25E-08	0	0.007229	0	0
8	mean	107.987	124.377	15.9779	0	0	0	0	1.31966	0.021452	0	0	0
	std	8.1695	7.08503	11.19	0	0	0	0	0.554417	0.139125	0	0	0
9	mean	203.541	206.973	188.462	33.8628	38.4032	27.6158	31.6324	37.3344	24.0354	29.7167	27.2348	21.6874
	std	9.6968	10.8167	13.4521	4.78122	4.51805	4.93325	9.12744	7.02595	5.1289	5.89744	3.252	3.70613
10	mean	3382.54	3841.11	37.0236	0.07036	0.000408	0.000408	42.4291	53.8477	6.14403	0.046537	0.010614	0.009797
	std	279.738	280.468	46.2443	0.216976	0.002915	0.002915	73.2259	31.5989	7.75448	0.031598	0.01341	0.014635
11	mean	6416.89	6517.44	6236.3	1863.96	2245.95	1609.87	1855.51	2252.66	1871.43	1702.66	1426.58	1475.21
	std	336.259	341.702	301.695	229.005	227.847	305.99	374.649	400.175	300.808	251.255	182.557	295.621
12	mean	1.9065	1.92619	1.79106	0.325696	0.396728	0.196864	0.124317	0.522629	0.076707	0.140098	0.192779	0.052293
	std	0.223487	0.302552	0.221257	0.044245	0.050936	0.031476	0.089467	0.083482	0.05347	0.041724	0.036901	0.027108
13	mean	0.529673	0.563785	0.492696	0.277589	0.291141	0.258289	0.192762	0.230601	0.189817	0.248742	0.23002	0.192182
	std	0.054237	0.064316	0.075633	0.045906	0.038347	0.045543	0.024975	0.030082	0.028692	0.062605	0.028979	0.03089
14	mean	0.316252	0.331647	0.30047	0.290872	0.271143	0.266525	0.203503	0.212375	0.204403	0.258886	0.2186	0.204046
	std	0.054729	0.047404	0.042373	0.055383	0.027144	0.02835	0.031401	0.023131	0.029868	0.076427	0.024343	0.032282
15	mean	19.6115	22.1515	18.5866	4.42795	5.28464	4.30817	2.75326	6.91807	3.19836	2.93335	2.72802	2.49381
	std	1.04301	1.51456	1.4093	0.602724	0.580849	0.59828	0.553647	0.897847	0.478789	0.589097	0.361838	0.365742

Table S5: Results' means and standard deviations of all tested version of algorithms DE, jDE, IDE, and SHADE, dimension D30, f1-f15

fun	alg	b6e6rl	Lb6e6rl	db6e6rl	CoDE	LCoDE	dCoDE	EPSDE	LEPSDE	dEPSDE	jSO	djSO
1	mean	35620	638.423	8237.28	53213.2	1209820	105046	18004.6	2.90566	392.964	0	1.33E-08
	std	24638.3	898.481	7450.32	41343.4	578862	93164	13284.1	3.42286	1019.58	0	9.52E-08
2	mean	0	5.05E-08	1.19E-07	0.379269	36158.7	133.145	0	0	0	0	0
	std	0	1.16E-07	9.21E-08	0.141543	26488.8	632.233	0	0	0	0	0
3	mean	0	4.86E-10	0	0.000107	0.631053	0.233361	0	0	0	0	0
	std	0	3.47E-09	0	4.15E-05	0.425414	0.200552	0	0	0	0	0
4	mean	5.1599	13.3349	6.22245	77.6173	126.086	71.4877	3.72947	0.174001	1.24371	0	0
	std	17.2762	24.982	19.0387	22.7392	24.2058	19.4103	15.0662	0.181399	8.87779	0	0
5	mean	20.2669	20.3067	20.2179	20.4803	20.5332	20.3653	20.5573	20.6435	20.4359	20.2105	20.0021
	std	0.031409	0.035144	0.036039	0.041579	0.056314	0.037885	0.038394	0.04586	0.052585	0.055379	0.003646
6	mean	11.7977	13.5113	10.0335	19.414	21.7424	14.1829	7.19283	20.884	2.63756	0.01021	0.136884
	std	3.42137	0.719715	2.92775	1.16598	1.03559	1.27689	8.95088	4.67592	5.45859	0.072907	0.401265
7	mean	0.000676	0.000193	0	0.01737	0.31366	0.649722	0.000193	0	0	0	0
	std	0.002834	0.00138	0	0.015405	0.149363	0.057994	0.001381	0	0	0	0
8	mean	0	0	0	3.16E-07	4.80188	0.058527	15.0871	46.3472	0.838888	0	0
	std	0	0	0	1.44E-07	1.94604	0.236437	2.51336	5.85394	0.852944	0	0
9	mean	42.5999	50.1791	36.4683	117.218	137.097	81.8292	110.38	132.254	86.3254	12.0336	14.4562
	std	6.57109	5.29553	5.0353	8.83065	7.75939	9.91366	9.41065	9.52184	9.97574	2.16258	3.05278
10	mean	0.045721	0.017555	0.0049	39.4062	347.812	0.451962	419.93	1528.43	6.6144	1.31567	88.6562
	std	0.024286	0.020556	0.010687	6.72475	70.5134	0.613498	71.0124	205.725	3.03156	0.940744	296.063
11	mean	1958.7	2315.83	1777.16	3956.25	4272.12	2665.56	4441.52	5074.19	3133.95	1098.08	1869.52
	std	256.624	183.532	252.689	285.978	278.572	336.882	274.72	297.108	440.496	233.551	353.535
12	mean	0.342824	0.419263	0.262149	0.740367	0.805835	0.470463	0.897899	1.10911	0.605949	0.199689	0.11587
	std	0.039861	0.057903	0.037376	0.107041	0.114827	0.072243	0.117617	0.155291	0.094975	0.032585	0.040523
13	mean	0.337698	0.336064	0.331364	0.481091	0.470611	0.439322	0.303054	0.361401	0.32355	0.156387	0.161795
	std	0.037014	0.037123	0.052244	0.047274	0.05048	0.052882	0.048329	0.034266	0.046276	0.017452	0.024576
14	mean	0.246147	0.212466	0.215022	0.269239	0.297966	0.272819	0.276083	0.26079	0.262922	0.142818	0.182607
	std	0.032536	0.021772	0.024238	0.036775	0.028237	0.034852	0.032707	0.031421	0.029924	0.018965	0.034079
15	mean	5.55762	6.8212	5.47437	14.0097	17.6675	13.9484	10.5268	12.3917	10.4675	2.2578	2.0353
	std	0.609998	0.696767	0.684711	1.07961	1.68203	1.33375	0.920688	1.12733	0.892178	0.337443	0.408835

Table S6: Results' means and standard deviations of all tested version of algorithms b6e6rl, CoDE, EPSDE, jSO, dimension D30, f1-f15

fun	alg	DE	LDE	dDE	jDE	LjDE	djDE	IDE	LIDE	dIDE	SHADE	LSHADE	dSHADE
16	mean	12.5262	12.6276	12.2273	9.33873	9.68512	8.63562	9.01221	10.163	8.99978	9.66158	9.30308	8.75064
	std	0.205959	0.224152	0.297632	0.34975	0.290498	0.53932	0.812033	0.372619	0.72787	0.456903	0.417921	0.502795
17	mean	2430960	2898380	291466	4964.51	550.471	807.408	753.717	1506.92	587.947	1358.25	291.24	547.824
	std	704178	896210	224860	4347.8	382.991	465.25	627.675	548.869	277.908	460.62	155.294	219.116
18	mean	17516.2	26890	211.497	118.562	11.7366	13.0556	16.2119	37.8495	15.638	144.77	8.82036	16.207
	std	7835.63	19254	199.766	558.627	5.05778	5.51014	5.73633	9.21351	4.62331	54.4209	4.38028	9.64
19	mean	10.3577	10.955	6.19892	4.40261	4.91057	4.20981	3.16318	4.27095	3.1555	6.49929	3.95307	3.4422
	std	0.680931	0.878854	1.20562	0.762843	0.609078	0.553474	0.735158	0.346298	0.488677	8.53948	0.40212	0.861418
20	mean	268.94	735.027	80.0045	15.8025	8.03351	9.05498	11.4132	17.9735	9.20562	88.9968	4.3504	7.12548
	std	43.9958	273.301	25.4475	6.20118	2.3193	2.56485	3.832	3.29848	2.21056	56.0231	0.969179	2.91945
21	mean	167293	265969	14679.8	958.131	125.109	205.005	190.801	520.91	291.205	526.118	134.827	163.699
	std	66305	106732	15393	2617.27	89.5388	124.958	114.434	123.839	142.675	235.365	85.666	112.828
22	mean	161.875	180.196	114.466	130.37	63.2839	72.6373	136.452	92.0047	52.8939	136.425	31.1112	85.8207
	std	59.7264	64.7672	68.8	69.4886	32.5605	61.5373	79.2079	58.1395	50.847	72.0351	19.8822	70.9432
23	mean	315.244	315.246	315.244	315.244	315.244	315.244	315.244	315.244	315.244	315.244	315.244	315.244
	std	2.30E-13	0.001652	2.30E-13	2.30E-13	2.30E-13	2.30E-13	2.30E-13	2.30E-13	2.30E-13	2.30E-13	2.30E-13	2.30E-13
24	mean	205.752	220.419	206.365	227.133	223.371	224.329	224.46	223.449	223.467	229.297	223.7	222.494
	std	0.916339	5.44975	7.45334	4.04488	0.773611	1.11408	0.980574	0.449821	0.672242	4.97763	1.4855	4.67168
25	mean	224.955	227.234	206.577	203.941	202.953	203.107	203.117	204.018	202.871	204.624	202.609	203.013
	std	3.53401	4.18707	2.85372	1.148	0.28891	0.42477	0.422759	0.237287	0.146092	1.92377	0.056124	0.39565
26	mean	100.504	100.537	100.467	100.251	100.269	100.252	106.064	100.223	100.178	106.127	100.227	102.159
	std	0.051333	0.051763	0.067901	0.041559	0.03116	0.04046	23.7204	0.026167	0.028749	23.7041	0.024914	13.9745
27	mean	519.865	511.386	311.27	369.82	400.935	364.62	358.227	390.084	347.337	398.494	303.945	345.199
	std	109.747	118.102	31.7142	43.8298	0.276158	45.9303	44.4605	32.1161	50.7076	50.0561	19.7221	45.1334
28	mean	997.542	1019.71	872.178	802.88	771.017	782.2	851.658	873.451	798.34	835.85	806.189	819.38
	std	22.4953	38.6445	90.151	25.1517	13.1806	25.1265	51.6195	27.7925	115.369	63.44	9.527	51.7099
29	mean	11027.7	14897.3	2182.8	853.606	811.388	810.483	554.743	1046.37	480.405	175548	719.935	711.256
	std	3263.84	4346.32	536.502	129.973	72.3551	80.5688	227.992	102.457	195.207	1248250	21.4592	62.0964
30	mean	5037.19	6939.97	1709.8	2121.39	1093.84	1496.63	623.981	685.314	462.948	1797.15	2264.31	1244.11
	std	1104.11	1746.77	421.336	758.829	258.251	696.327	283.996	114.17	53.386	825.155	901.513	750.533

Table S7: Results' means and standard deviations of all tested version of algorithms DE, jDE, IDE, and SHADE, dimension D30, f16-f30

fun	alg	b6e6rl	Lb6e6rl	db6e6rl	CoDE	LCoDE	dCoDE	EPSDE	LEPSDE	dEPSDE	jSO	djSO
16	mean	9.65521	9.71972	8.91861	11.05	11.2898	10.2289	11.3198	11.5988	10.3921	8.26723	8.47493
	std	0.349347	0.279739	0.480203	0.275929	0.244674	0.338482	0.260601	0.295768	0.359519	0.406046	0.647691
17	mean	2508.25	914.568	589.736	1599.57	2255.08	782.031	748.984	1107.9	222.357	67.9875	179.078
	std	3114.33	174.707	170.423	201.024	287.143	397.488	605.957	201.122	269.506	37.7415	111.964
18	mean	24.9675	24.9784	15.222	57.9537	96.0743	31.8219	30.1309	39.7826	19.2912	2.04478	5.79293
	std	13.9116	4.50897	4.4059	8.06007	15.9076	13.9684	10.9791	5.52426	8.38797	1.18342	2.84451
19	mean	4.38654	5.05561	3.94276	8.04156	9.43797	6.59632	4.65132	4.62621	3.645	2.31408	2.58203
	std	0.789651	0.808265	0.689048	0.534869	0.584104	1.36463	0.73324	0.298521	0.465242	0.546443	0.732181
20	mean	17.3425	20.121	13.6992	42.7311	71.9876	30.7621	22.6287	27.4921	16.6798	2.5439	4.19003
	std	9.114	3.44709	2.75722	6.24704	9.88112	11.1278	4.20477	3.44104	4.70757	0.863092	1.09215
21	mean	202.003	358.509	236.636	741.392	1212.92	386.48	313.582	595.228	144.639	23.2868	80.2428
	std	151.175	131.855	127.464	128.622	199.143	175.381	179.748	116.379	133.024	30.7112	71.3758
22	mean	72.6725	50.0275	55.9484	112.27	163.232	126.977	95.6618	101.039	60.5938	40.0962	92.6704
	std	59.4463	24.9037	58.1823	66.5388	62.4111	86.2795	57.6037	53.2315	63.4479	41.835	77.3828
23	mean	315.244	315.244	315.244	315.244	315.246	315.244	315.244	315.244	315.244	315.244	315.244
	std	2.30E-13	2.30E-13	2.30E-13	2.30E-13	0.001342	2.30E-13	2.30E-13	2.30E-13	2.30E-13	2.30E-13	2.30E-13
24	mean	223.982	220.518	218.367	226.997	229.929	226.862	223.219	207.041	217.194	201.277	212.805
	std	2.51392	6.83804	9.31404	0.77649	0.796096	1.30587	3.48902	10.2158	9.10807	5.16025	10.8253
25	mean	203.945	202.58	202.72	203.501	206.105	202.774	203.816	202.602	202.734	202.553	202.664
	std	1.05162	0.041904	0.228539	0.341913	1.16438	0.174883	1.06589	0.044452	0.207187	0.020798	0.1853
26	mean	102.282	100.326	100.313	100.463	100.454	100.413	102.26	100.357	100.328	100.144	104.065
	std	13.9591	0.026518	0.049833	0.053493	0.050744	0.040876	13.962	0.043146	0.036927	0.019296	19.5761
27	mean	346.585	400.109	374.025	407.495	403.921	400.769	349.009	392.175	339.855	300	339.93
	std	45.5885	0.227409	52.5834	47.3971	2.79664	0.275203	48.949	27.1571	48.6576	0	49.1259
28	mean	827.35	814.534	807.206	916.806	966.435	871.81	806.188	868.126	801.637	837.658	922.856
	std	34.2239	17.7823	37.0098	25.1907	20.6388	18.7055	62.4183	40.7278	44.4276	17.4263	86.1615
29	mean	795.136	715.081	705.227	722.928	1005.54	896.626	743.856	430.488	170359	716.098	1330180
	std	109.555	1.13216	70.5415	2.56276	99.8799	118.602	106.809	282.724	1213200	2.7414	3750340
30	mean	1319.23	764.96	701.687	1396.3	2476.03	921.265	1036.64	763.971	546.916	1645.4	1371.81
	std	867.243	157.227	201.688	178.583	267.544	303.606	601.282	155.205	139.887	851.463	1042.86

Table S8: Results' means and standard deviations of all tested version of algorithms b6e6rl, CoDE, EPSDE, jSO, dimension D30, f16-f30

fun	alg	DE	LDE	dDE	jDE	LjDE	djDE	IDE	LIDE	dIDE	SHADE	LSHADE	dSHADE
1	mean	4.14E+08	5.4E+08	11996000	320813	577638	760831	544580	4268080	1087010	12945.3	2359.38	53402.2
	std	66334000	73781600	9253440	144924	193297	341585	215792	911390	304726	11399.4	3090.88	34077.8
2	mean	1.02E+08	61804000	1306580	0	1980.83	7.93244	1665.8	2817.48	8.42137	0	0	0
	std	53575300	37015000	5997730	0	1471.48	13.2446	2363.8	824.114	8.04418	0	0	0
3	mean	67810.2	99679.7	1344.36	3.10E-09	0.018204	5.72E-05	4.41E-07	441.147	3.94295	2.15E-09	0	0
	std	7801.43	12475.9	630.939	1.20E-08	0.031081	5.65E-05	9.00E-07	213.019	1.81324	1.16E-08	0	0
4	mean	148.034	156.428	96.8004	77.2309	97.801	95.9175	63.675	99.2101	60.2343	6.33717	71.6583	26.1864
	std	15.2383	58.7207	3.60967	28.1784	0.79828	2.91792	41.3327	12.0737	32.9474	22.0628	41.4339	39.4465
5	mean	21.1074	21.1159	21.1004	20.3509	20.4577	20.2091	20.3456	20.6477	20.0182	20.0827	20.3249	20.0001
	std	0.044533	0.035693	0.04783	0.033739	0.030596	0.031344	0.097785	0.040594	0.041991	0.041358	0.044603	0.000438
6	mean	62.5533	64.8199	15.4109	16.2852	25.1836	8.98131	6.0072	3.20373	0.030813	18.7423	24.7831	1.45676
	std	2.0042	1.37657	16.4498	5.49609	3.53874	5.88171	1.75394	1.18335	0.12985	5.60227	1.16119	3.25201
7	mean	0.841986	1.14295	0.007078	0.002222	0	0	0.008876	0.004745	0.002175	0.007698	0	0.00029
	std	0.048921	0.0764	0.01579	0.005424	0	0	0.010469	0.004773	0.003808	0.015723	0	0.00145
8	mean	284.492	316.475	33.908	0.019509	0	0	0.298034	15.6086	0.273884	0	0	1.89E-08
	std	10.4864	12.5515	6.88653	0.139322	0	0	1.40529	2.09633	1.32793	0	0	2.57E-08
9	mean	434.424	458.399	388.879	72.5223	104.111	64.172	76.5337	110.062	57.5599	76.8842	51.4982	47.0754
	std	14.6075	15.844	22.2835	9.48568	7.82809	7.88397	16.9175	15.8847	10.1675	11.3996	6.12564	7.22291
10	mean	8911.58	9717.39	271.364	0.103949	0.001779	0.058382	191.927	300.152	93.1691	0.14037	0.392528	0.05756
	std	365.149	304.247	182.606	0.199507	0.004339	0.146185	178.748	67.5798	116.875	0.344232	0.183282	0.044276
11	mean	12968.8	13035	12872.3	4272.45	5542.81	3683.97	4254.69	6008.1	4143.21	3841.94	3889.64	3505.45
	std	296.437	385.069	351.739	323.952	309.092	416.873	524.711	652.322	592.391	353.413	278.305	404.17
12	mean	3.06352	3.13439	3.00973	0.336406	0.508792	0.186497	0.115668	0.767166	0.112829	0.137806	0.26985	0.049565
	std	0.352103	0.328986	0.284675	0.04453	0.052867	0.025906	0.041559	0.122217	0.04604	0.03495	0.035449	0.016
13	mean	0.721693	0.797556	0.715488	0.353224	0.372443	0.360574	0.340395	0.34865	0.30869	0.402068	0.284283	0.263352
	std	0.060833	0.074584	0.070493	0.041836	0.039011	0.040406	0.040418	0.029382	0.037808	0.060289	0.031484	0.041126
14	mean	0.393492	0.769885	0.41968	0.359611	0.304964	0.292278	0.29459	0.292604	0.294976	0.334651	0.294411	0.269447
	std	0.080967	0.330664	0.162585	0.111906	0.025301	0.02352	0.054466	0.017402	0.032276	0.125207	0.046936	0.085032
15	mean	53.2968	65.5153	36.1922	9.59145	13.0915	9.66318	7.50045	19.2105	8.92312	11.0965	6.73679	6.15471
	std	5.42768	89.8849	1.87291	1.03592	1.013	1.07075	2.32726	1.2853	1.11906	2.44485	0.698626	0.856877

Table S9: Results' means and standard deviations of all tested version of algorithms DE, jDE, IDE, and SHADE, dimension D50, f1-f15

fun	alg	b6e6rl	Lb6e6rl	db6e6rl	CoDE	LCoDE	dCoDE	EPSDE	LEPSDE	dEPSDE	jSO	djSO
1	mean	355572	294058	350869	998514	47697800	951847	123757	71334.5	265497	23.1876	45716
	std	165342	138879	200206	343427	54934800	319384	76048.5	38207	123404	45.8045	35372.3
2	mean	4796.84	4033.19	2429.47	1040980	1.71E+08	6733.2	117.582	5.8282	0.000758	0	0
	std	5621.62	3229.65	3056.69	334953	1.34E+08	5855.6	804.75	12.8366	0.0021	0	0
3	mean	193.964	0.349195	0.002127	23.9088	1251.05	310.992	0.000107	4.83E-06	2.35E-10	0	0
	std	306.088	0.439543	0.00116	10.6308	1523.96	207.598	0.000326	6.90E-06	1.68E-09	0	0
4	mean	53.4821	97.3779	90.0781	127.435	282.293	96.9839	29.1427	63.622	50.4148	67.761	47.936
	std	38.6878	1.29899	15.2584	18.4254	63.8862	1.35242	35.8712	34.9216	40.1701	45.3811	48.7401
5	mean	20.3699	20.4609	20.2911	20.7494	20.8284	20.6258	20.829	20.9307	20.7127	20.3169	20.0007
	std	0.023156	0.02954	0.031397	0.042381	0.034678	0.048096	0.044091	0.03872	0.050578	0.047889	0.002545
6	mean	27.3429	30.4696	24.3983	46.5582	50.9821	37.311	11.2948	48.7684	9.41169	0.035477	0.868365
	std	2.34617	1.43843	2.05193	1.49294	1.35945	1.79528	16.8346	7.44259	14.8276	0.144045	1.1686
7	mean	0	0.000147	3.31E-05	0.178362	1.58157	4.24995	0.002464	0	0	0	0.000145
	std	0	0.001036	1.85E-05	0.061025	0.363602	0.233078	0.00438	0	0	0	0.001036
8	mean	0	2.61E-08	8.18E-05	6.04306	90.2389	2.26642	95.8147	171.171	10.2667	0	0.156072
	std	0	6.77E-08	4.00E-05	2.53567	8.117	1.44641	6.95507	11.85	10.6225	0	0.502333
9	mean	105.496	135.952	86.2869	311.334	359.926	257.103	264.039	312.116	237.444	20.7407	28.6002
	std	9.62684	10.1722	8.06256	13.9461	13.5622	18.611	17.3749	13.5579	15.9132	3.67327	5.73926
10	mean	0.051681	0.288449	0.047615	1060.77	3805.57	3.27574	2875.96	5967.28	13.1722	8.4976	1196.18
	std	0.023704	0.155383	0.19148	113.295	330.961	2.0626	250.632	291.971	3.67119	2.77716	1640.24
11	mean	4437.38	5801.33	3908.04	9409.13	10253	7801.6	10168.3	11055.9	8584.03	3069.07	4234.24
	std	299.309	306.123	418.341	394.016	383.568	371.249	370.746	335.188	418.831	317.853	650.259
12	mean	0.350079	0.522814	0.250628	1.18596	1.46574	0.841511	1.44173	1.77788	0.985856	0.23112	0.104398
	std	0.046879	0.061265	0.030316	0.147353	0.119016	0.139608	0.147144	0.186143	0.142482	0.03058	0.033183
13	mean	0.454161	0.451516	0.444039	0.638464	0.658781	0.590302	0.419057	0.486053	0.439489	0.216408	0.235333
	std	0.053437	0.041825	0.038874	0.040814	0.064042	0.064891	0.051004	0.043052	0.048874	0.021745	0.032295
14	mean	0.321332	0.227958	0.229803	0.33073	0.409021	0.365224	0.323438	0.31204	0.301809	0.175633	0.22365
	std	0.150169	0.020136	0.031795	0.040341	0.068951	0.044243	0.063029	0.033876	0.0285	0.032512	0.072734
15	mean	12.5883	18.95	13.5571	37.4629	85.9169	32.4388	25.0002	28.1638	26.0266	5.04781	4.22394
	std	1.35508	1.39167	1.27594	2.13556	19.978	3.94782	1.52907	1.68519	1.5085	0.714703	0.795665

Table S10: Results' means and standard deviations of all tested version of algorithms b6e6rl, CoDE, EPSDE, jSO, dimension D50, f1-f15

fun	alg	DE	LDE	dDE	jDE	LjDE	djDE	IDE	LIDE	dIDE	SHADE	LSHADE	dSHADE
16	mean	22.3337	22.4691	22.2861	17.646	18.3687	16.9174	17.3545	19.4464	17.1568	17.9707	18.0106	16.8441
	std	0.164827	0.215629	0.199737	0.385931	0.390122	0.542461	0.692509	0.380973	0.795621	0.676268	0.321067	0.649746
17	mean	18161500	25316100	2900190	18755.2	6120.23	13172.7	21010.9	73854.7	12398.4	2749.68	1737.3	1627.24
	std	4672360	5169100	2119590	10805.5	3883.31	10324.1	15748.1	24749.5	6880.56	941.069	409.289	432.209
18	mean	38464.7	53063.8	1197.78	843.786	98.8959	344.604	290.889	261.106	58.5989	624.301	114.985	105.281
	std	17939.6	43864.7	1127.19	930.16	95.0825	393.687	444.704	78.5951	19.807	732.447	19.0447	41.4287
19	mean	27.4803	28.9674	14.0226	13.0888	14.7916	13.4423	11.5014	15.2454	9.8436	15.6266	10.7894	10.0286
	std	1.31039	3.21831	3.19908	3.40092	7.24519	6.03229	9.59403	4.39822	1.10496	9.1216	1.57528	1.64345
20	mean	20406	40289.6	395.77	97.0964	27.32	26.8428	58.9826	115.418	49.7111	321.052	19.1301	34.4858
	std	5428.36	10345.8	127.332	90.0538	7.74034	5.92087	25.8447	15.6007	13.0182	119.188	5.47835	17.7189
21	mean	7437910	9492150	1097650	15884.5	961.624	2011.51	8832.98	13525.3	1982	1437.81	638.912	735.723
	std	1943340	2549320	922327	15687.8	327.806	2185.48	13148.8	7183.69	1373.66	361.518	204.133	276.892
22	mean	1164.64	1343.42	862.995	516.449	513.763	391.073	447.535	334.593	275.186	496.465	211.377	258.292
	std	147.173	149.832	173.197	148.937	123.577	156.957	179.804	121.032	128.72	173.833	106.285	138.444
23	mean	344.007	344.055	344.005	344.005	344.005	344.005	344.005	344.005	344.005	344.005	344.005	344.005
	std	0.000726	0.028987	2.87E-13	2.87E-13	2.87E-13	2.87E-13	2.87E-13	2.87E-13	2.87E-13	2.87E-13	2.87E-13	2.87E-13
24	mean	274.485	280.505	266.263	271.078	264.028	265.288	260.334	258.409	256.94	280.358	274.661	272.872
	std	4.29025	4.26261	4.45819	2.72519	2.60464	2.39034	6.04605	1.00616	3.44779	3.93794	0.829772	2.25027
25	mean	285.209	299.262	210.083	210.548	206.634	206.801	211.175	209.724	206.872	215.369	205.336	206.374
	std	10.0204	9.63108	5.57854	4.23209	1.04963	0.906971	5.58989	0.63199	0.550696	9.60652	0.371253	1.91445
26	mean	100.703	100.789	100.675	100.361	100.384	100.368	137.469	100.29	121.789	104.404	100.295	100.3
	std	0.06457	0.056182	0.072281	0.041033	0.0399	0.044609	48.7102	0.028922	41.4817	19.5134	0.028439	0.075674
27	mean	1691.23	1756.63	414.873	553.532	432.628	375.439	487.953	364.351	326.274	716.537	367.03	421.34
	std	48.742	69.0821	142.333	112.763	83.5798	40.3769	67.7562	24.3326	30.2665	79.1497	124.758	53.1518
28	mean	1542.22	1664.3	1129.69	1154.97	1062.01	1086.68	1357.01	1415.38	1226.34	1431.46	1103.88	1294.33
	std	26.6192	51.7808	114.752	48.0623	27.2619	35.1532	104.739	79.1777	89.1738	372.129	23.949	170.975
29	mean	143235	291757	5376.02	1009.93	1369.43	1118.78	921.976	1657.16	863.566	1498880	820.579	2710870
	std	45709.6	117083	5014.97	168.83	195.305	212.17	241.914	130.531	210.799	7499640	47.0755	11046500
30	mean	31802.4	58281.7	8448.26	9074.06	8126.49	8242.47	9542.2	13097.6	9182.09	10812.3	8749.76	9048.18
	std	6879.82	22485.6	305.506	1020.43	169.272	354.515	529.289	754.856	308.958	1343.01	412.261	663.874

Table S11: Results' means and standard deviations of all tested version of algorithms DE, jDE, IDE, and SHADE, dimension D50, f16-f30

fun	alg	b6e6rl	Lb6e6rl	db6e6rl	CoDE	LCoDE	dCoDE	EPSDE	LEPSDE	dEPSDE	jSO	djSO
16	mean	17.782	18.3953	17.2541	20.6876	21.0339	19.6562	20.9364	21.4577	20.0157	16.6985	16.6188
	std	0.30342	0.296543	0.496121	0.300376	0.289717	0.359394	0.261661	0.238201	0.397812	0.482968	0.739721
17	mean	27013.3	2469.3	1662.57	5113.26	145763	7400.71	20302.9	2861.64	1254.06	387.774	706.03
	std	26220.1	330.576	271.981	3801.94	99723.3	6262.72	17194.7	441.913	636.804	216.158	279.186
18	mean	884.977	74.6087	38.3839	164.736	567.868	173.576	509.671	116.535	46.5564	18.7028	30.4179
	std	1021.02	13.171	8.82257	16.6765	164.128	112.505	412.047	12.495	30.8532	6.71213	11.4995
19	mean	11.513	14.9258	12.1234	19.1337	25.0715	15.2881	14.8504	11.8444	10.4456	9.81111	5.90474
	std	1.42905	1.91951	1.82942	0.744078	1.26946	2.66539	9.67313	0.715196	1.14732	0.636768	1.15142
20	mean	539.928	63.9033	40.5784	135.136	230.044	87.1087	121.82	81.7484	49.8081	6.56251	15.4345
	std	402.392	9.94032	6.42693	13.9104	38.4732	27.4188	92.8185	7.45455	16.7891	1.7153	5.10653
21	mean	20133.8	1655.78	1054.25	2370.53	6731.35	1337.72	7686.08	1852.09	688.682	338.835	425.466
	std	16147.1	217.128	218.063	210.407	2187.17	458.933	18039.2	199.087	363.329	107.096	145.33
22	mean	502.653	676.693	484.462	644.601	832.328	522.717	597.432	845.494	466.405	114.124	252.947
	std	175.763	145.675	182.705	146.829	136.952	156.367	158.092	154.059	161.658	89.5323	150.968
23	mean	344.005	344.005	344.005	344.005	344.198	344.005	344.005	344.005	344.005	344.005	344.005
	std	2.87E-13	2.87E-13	2.87E-13	2.87E-13	0.120623	2.87E-13	2.87E-13	2.87E-13	2.87E-13	2.87E-13	2.87E-13
24	mean	265.705	259.08	257.299	260.786	288.634	265.533	271.928	265.561	266.375	271.699	269.274
	std	3.18296	3.46803	1.86824	0.797057	2.27912	3.56207	2.52085	1.88712	1.92975	2.0253	1.59943
25	mean	208.51	205.796	205.209	208.082	229.345	205.895	212.082	205.699	205.673	204.962	205.446
	std	2.83851	0.447026	0.319356	0.979884	8.66622	0.485638	7.30601	0.332437	0.607388	0.143237	0.345839
26	mean	112.186	100.466	102.389	100.618	100.626	100.582	119.984	100.462	108.244	100.232	102.213
	std	32.4051	0.039527	13.9508	0.054981	0.052638	0.052083	39.9299	0.048204	27.0427	0.02843	13.9669
27	mean	881.209	1043.64	902.476	1398.16	1529.69	1196.48	434.858	332.405	346.05	334.015	441.3
	std	222.732	35.5562	63.9282	86.9541	65.2179	64.4537	54.9983	33.5091	31.4952	20.0065	84.1679
28	mean	1222.76	1216.22	1170.51	1491.06	1666.95	1399.9	1142.08	1323.11	1153.96	1126.33	1593.96
	std	91.3261	25.5382	49.4347	42.8171	42.8575	44.4578	115.722	132.889	101.062	36.7844	365.494
29	mean	1255.48	909.03	769.15	831.977	8090.07	1505	702662	755.089	688.822	809.139	10502700
	std	231.449	119.43	60.1667	64.1582	6282.83	235.532	5011120	64.9892	121.345	39.7973	20710400
30	mean	9471.4	7956.05	7976.18	8896.12	15049.5	8245.97	9404.65	8114.29	8175.54	8275.45	8954.34
	std	801.992	95.9846	178.82	237.743	1841.4	264.117	748.523	181.836	240.052	297.693	779.148

Table S12: Results' means and standard deviations of all tested version of algorithms b6e6rl, CoDE, EPSDE, jSO, dimension D50, f16-f30

fun	alg	DE	LDE	dDE	jDE	LjDE	djDE	IDE	LIDE	dIDE	SHADE	LSHADE	dSHADE
1	mean	2.99E+09	3.72E+09	24685100	1272830	7114110	9117770	1504270	58501000	11450000	220902	245720	545133
	std	3.05E+08	3.9E+08	8383240	425355	1876740	2801510	468240	5461240	2377780	439209	68808.7	179135
2	mean	1.26E+10	7.62E+09	7295.62	1025.64	10657.9	6425.19	12531.7	5209990	12876.7	2.60E-06	1.29E-09	0
	std	2.08E+09	2E+09	14819.4	3844.55	4268.36	5945.91	10287.3	731729	9987.6	1.11E-05	4.02E-09	0
3	mean	243047	366140	12563.4	9.32E-05	16.4332	0.985975	0.079903	5654.92	449.368	0.000686	0	0
	std	14683.4	25751.1	5433.22	0.000295	10.6196	0.373776	0.23021	826.14	199.026	0.001772	0	0
4	mean	2215.54	1443.49	203.009	166.534	232.891	195.582	193.155	393.401	242.089	101.132	176.919	125.251
	std	226.26	974.703	30.8011	30.063	18.8255	31.1378	55.2994	20.6527	51.8034	65.3673	31.3252	47.2633
5	mean	21.3165	21.3139	21.3131	20.5732	20.7496	20.3511	20.468	20.9717	20.066	20.1106	20.635	20
	std	0.019567	0.023424	0.022032	0.028378	0.028132	0.027198	0.257915	0.033661	0.123685	0.067124	0.033565	0
6	mean	146.805	151.143	43.977	57.3138	80.8151	36.4366	36.9925	33.3354	9.12459	64.6608	75.9641	8.81691
	std	2.45451	1.94212	35.5687	9.25229	2.4375	19.4821	4.38946	2.66162	2.14811	6.95201	2.38651	3.85655
7	mean	66.7458	52.5044	0.049222	0.011635	1.41E-05	9.06E-07	0.003376	0.983196	0.000779	0.006124	0	0
	std	7.2953	11.6953	0.230386	0.035972	1.78E-05	5.42E-07	0.008121	0.037109	0.003321	0.011497	0	0
8	mean	818.824	924.407	103.742	0.156072	2.04E-05	9.75E-05	4.28156	87.5117	41.5434	0.078036	0.085271	0.507573
	std	19.7932	19.6784	16.042	0.365439	3.27E-05	0.000157	10.3133	6.35745	9.73071	0.557288	0.03459	0.875667
9	mean	1091.52	1161.47	918.038	194.333	355.766	179.548	268.697	416.605	160.448	269.978	146.808	133.408
	std	20.3863	35.8831	39.098	23.0464	22.0025	17.951	33.2227	44.7435	23.141	37.2863	12.7668	14.9153
10	mean	24077.7	25505.4	1601.7	0.259937	4.64895	0.220854	1065.73	2055.01	1113.58	2.78852	66.4172	11.8363
	std	378.93	422.92	683.599	0.352172	1.65035	0.443013	474.538	219.926	324.056	16.7746	12.7481	32.1513
11	mean	30130.3	30298.7	29965.3	11229.5	15918.6	10255.5	11856.5	18957.3	11193	10609.5	12640.2	9785.76
	std	605.522	548.799	468.664	657.356	457.192	689.576	919.259	1452.96	1149.64	565.538	444.128	680.675
12	mean	4.00554	3.99296	3.93652	0.4695	0.870518	0.271442	0.208613	1.40891	0.275985	0.204451	0.531426	0.085803
	std	0.222286	0.230256	0.208683	0.056204	0.059096	0.035648	0.05872	0.140119	0.089549	0.045162	0.043989	0.024234
13	mean	0.975609	1.12809	0.796823	0.454522	0.512093	0.480475	0.406681	0.399624	0.39172	0.475331	0.335217	0.383501
	std	0.067741	0.139729	0.072196	0.045597	0.035864	0.035844	0.040224	0.027707	0.03212	0.059796	0.024552	0.040627
14	mean	141.387	84.6415	0.364286	0.23365	0.24504	0.227494	0.232332	0.248081	0.239935	0.218639	0.209815	0.207699
	std	10.5557	56.5302	0.08308	0.020189	0.01721	0.015184	0.013883	0.012553	0.011952	0.01963	0.013061	0.017272
15	mean	70188	195687	83.6042	31.3114	38.5957	31.0556	29.3273	59.3747	32.0622	57.9533	22.5602	28.8138
	std	23531.2	346533	3.15204	5.30707	2.23437	1.70607	6.31706	2.3066	2.69666	11.4982	1.25435	2.94494

Table S13: Results' means and standard deviations of all tested version of algorithms DE, jDE, IDE, and SHADE, dimension D100, f1-f15

fun	alg	b6e6rl	Lb6e6rl	db6e6rl	CoDE	LCoDE	dCoDE	EPSDE	LEPSDE	dEPSDE	jSO	djSO
1	mean	1273760	9977910	6001860	7759750	1.05E+09	8961510	463869	4352680	7023810	142292	853141
	std	354370	2786010	2325270	2280890	5.38E+08	2120900	101858	1208980	2306020	56073.9	244952
2	mean	19208	19697	13665900	7.66E+08	1.98E+10	317015	16313.9	14376	1263.48	2.35E-09	3.21E-07
	std	20867	14098.9	4323800	2.19E+08	5.25E+09	1519850	17572.4	10853.3	737.295	8.35E-09	4.82E-07
3	mean	636.024	481.251	135.856	716.971	75355.6	1495.98	7.54608	0.551872	0.03359	0	3.30E-08
	std	767.326	246.903	81.5421	430.661	39660.3	757.045	21.686	0.39012	0.033194	0	6.41E-08
4	mean	172.374	241.43	240.071	1057.88	3154.17	449.294	131.852	168.248	166.477	187.886	155.055
	std	33.9141	19.4917	26.8304	101.055	319.691	269.537	44.8573	33.5823	32.8607	29.7287	35.7782
5	mean	20.597	20.765	20.4841	21.1534	21.1992	21.0856	21.1887	21.2414	21.1333	20.5496	20.0001
	std	0.019097	0.021553	0.031255	0.026776	0.027237	0.037633	0.025839	0.025479	0.036848	0.038911	0.000629
6	mean	73.6126	85.755	68.8776	124.145	132.716	114.063	30.1551	87.8706	6.4087	1.78129	7.42891
	std	3.62006	1.85036	4.05545	2.60748	2.5557	2.8939	5.03907	43.3293	2.58883	1.42895	3.20901
7	mean	0.000145	0.036675	1.06719	1.66058	130.862	3.36146	0.004751	4.92E-08	1.28E-07	0	0
	std	0.001036	0.014065	0.015943	0.077278	31.2608	5.92802	0.017777	3.89E-08	4.95E-08	0	0
8	mean	0	0.682935	0.040423	240.474	561.793	31.2701	404.751	602.62	295.141	0.002396	2.61421
	std	0	0.231826	0.138054	9.71479	17.3197	10.1225	17.0424	20.4803	18.9993	0.001399	1.98953
9	mean	320.151	512.009	265.719	958.1	1071.61	877.565	765.497	819.522	731.584	43.2668	73.2368
	std	32.9303	20.7268	22.9503	24.7218	28.2135	34.7978	24.92	22.8294	34.609	8.0113	13.3755
10	mean	0.058746	156.312	0.073935	11031.6	16919.6	95.5419	13575.5	19607.7	4206.05	70.3336	5231.64
	std	0.049381	34.8097	0.207889	423.991	416.763	86.6256	463.023	356.825	1418.32	21.3494	4342.07
11	mean	11755.6	16594.2	10641	26202.3	27441.9	24736.5	26893.7	28380.9	25455.4	9838.12	11428.3
	std	524.404	542.878	640.625	638.309	464.468	522.753	625.407	607.701	766.854	654.903	1296.28
12	mean	0.502362	0.906152	0.363146	2.40538	2.74651	2.02065	2.68677	3.15157	2.28223	0.402263	0.182717
	std	0.035033	0.06438	0.034501	0.183368	0.200622	0.192551	0.169294	0.246612	0.226494	0.034908	0.039146
13	mean	0.515945	0.578153	0.517214	0.806845	0.973236	0.8608	0.520633	0.56749	0.546543	0.311685	0.36634
	std	0.053304	0.028979	0.033495	0.050549	0.074645	0.068501	0.045844	0.044538	0.052906	0.024276	0.033722
14	mean	0.134791	0.253507	0.215281	0.352975	73.3154	0.369195	0.246122	0.297706	0.27297	0.187236	0.183911
	std	0.01498	0.018247	0.01446	0.067574	66.4535	0.060578	0.023817	0.028551	0.024219	0.013131	0.013867
15	mean	40.3083	73.8829	47.8038	2126.19	122872	120.702	73.1957	73.404	71.0335	15.4279	15.6777
	std	4.44402	5.87629	3.43557	559.693	33309.3	20.3005	4.746	2.05368	2.38071	1.50687	2.37868

Table S14: Results' means and standard deviations of all tested version of algorithms b6e6rl, CoDE, EPSDE, jSO, dimension D100, f1-f15

fun	alg	DE	LDE	dDE	jDE	LjDE	djDE	IDE	LIDE	dIDE	SHADE	LSHADE	dSHADE
16	mean	46.6712	46.7623	46.5341	39.4937	41.2411	38.7135	39.6863	43.383	40.2426	40.7881	40.6346	39.4121
	std	0.240021	0.237536	0.267908	0.602379	0.365842	0.731579	1.01032	0.528471	0.909363	0.496723	0.445877	0.841174
17	mean	2.21E+08	2.85E+08	4138040	113287	311056	329526	192828	3113360	637250	23947.3	4552.24	15491.8
	std	37294100	49416600	3020020	38461.1	104653	167594	69550.2	718323	219819	8762.17	721.306	6921.77
18	mean	483328	384502	2418.71	892.926	136.39	839.089	864.161	629.329	566.381	1512	234.042	819.464
	std	407188	859716	3485.74	977.48	69.063	754.36	861.81	82.6057	694.986	1647.04	23.7499	940.608
19	mean	133.401	131.842	95.9617	94.271	94.3868	91.2745	73.2521	97.9326	75.3587	95.1911	95.1841	94.9491
	std	1.74989	6.41987	2.84173	6.98135	3.09449	1.54699	25.935	24.6362	30.5292	28.2546	2.31997	15.4165
20	mean	109286	212790	5316.73	453.067	312.49	130.482	400.893	5616.01	915.301	583.219	143.265	329.384
	std	18216.3	39353.2	2316.78	293.768	61.3058	26.7117	144.628	1590.57	484.789	156.558	31.5149	114.351
21	mean	92225700	1.22E+08	7489690	38788.9	49403.7	84207.8	99785.7	1314810	154506	11834.4	2365.46	2017.82
	std	18262000	25201500	9642410	17071.2	24301.1	53820.2	42150.4	316084	94173.7	10522.4	499.986	580.908
22	mean	4319.56	4477.74	4198.3	1736.07	2176.9	1420.51	1443.98	1356.03	1070.25	1414.45	1350.25	1138.43
	std	197.116	263.75	204.535	241.168	240.285	254.612	350.936	260.694	258.269	249.032	261.744	293.128
23	mean	368.449	386.908	348.235	348.235	348.235	348.235	348.235	348.804	348.235	348.235	348.235	348.235
	std	1.90689	12.2113	0.000196	2.30E-13	2.30E-13	2.30E-13	2.30E-13	0.057266	0.000415	2.30E-13	2.30E-13	2.30E-13
24	mean	532.123	495.627	377.929	384.535	360.509	365.051	344.913	368.072	357.341	422.991	392.821	387.792
	std	6.55891	11.209	4.90535	4.89994	1.49816	3.10237	14.2493	1.71199	2.1821	9.46007	2.82712	5.40167
25	mean	651.076	711.926	237.877	271.013	237.158	228.777	254.392	206.305	217.9	284.521	210.904	252.668
	std	32.2198	33.0391	5.87325	12.6786	9.66388	4.93476	6.46937	0.727913	21.3048	9.528	19.6305	18.2365
26	mean	245.085	140.068	169.965	186.503	102.481	182.81	200.146	200.711	200.547	200.089	198.045	200.094
	std	196.604	117.763	61.2868	34.6438	13.9625	38.4964	0.021562	0.11415	0.100447	0.005182	13.9598	0.006011
27	mean	3738.53	3909.53	736.368	1237.73	1219.94	569.013	1060.57	742.824	455.907	1930.71	338.063	744.013
	std	54.8263	52.9235	250.182	187.628	477.584	238.26	97.8285	24.2789	47.3215	142.02	34.334	116.217
28	mean	3365.63	3764.93	2188.9	2311.66	2115.16	2138.44	3014.45	3253.83	2361.92	3576.46	2247.36	3011.83
	std	154.083	161.848	119.161	158.781	50.448	87.4968	463.779	711.855	583.198	747.494	49.5551	573.104
29	mean	300917	618138	2793.04	1539.97	2000.56	1867.26	1499.69	9608.57	1616.62	1399.68	970.438	4424930
	std	93332.4	485119	778.592	204.27	117.177	131.149	206.852	1014.24	195.21	183.169	213.783	22170100
30	mean	759738	2374870	8439.16	9344.99	7744.9	7808.28	7699.86	15085.3	4786.46	9326.82	9458.31	7324.2
	std	176883	1360710	952.88	852.491	703.054	866.492	1159.43	856.582	789.471	1874.81	889.453	1476.18

Table S15: Results' means and standard deviations of all tested version of algorithms DE, jDE, IDE, and SHADE, dimension D100, f16-f30

fun	alg	b6e6rl	Lb6e6rl	db6e6rl	CoDE	LCoDE	dCoDE	EPSDE	LEPSDE	dEPSDE	jSO	djSO
16	mean	39.7639	41.3251	39.0331	45.3957	45.9482	44.721	45.5491	46.175	45.1335	38.612	38.9435
	std	0.488396	0.334429	0.794255	0.276499	0.248232	0.424552	0.304324	0.261322	0.35434	0.553004	0.860781
17	mean	170545	148585	49375.7	388578	26994000	321996	84683.2	4347.78	5723.23	3637.63	3893.32
	std	61488.4	61659	33603.3	180963	29409600	131559	25404.7	1338.18	2837.3	610.002	745.146
18	mean	1579.83	1026.59	259.409	849.805	131494	1465.33	1010.89	258.108	134.44	231.82	228.427
	std	1645.82	1167.31	180.819	469.302	169163	1102.83	978.052	89.0271	53.4955	23.8828	54.4273
19	mean	93.0937	107.992	103.396	118.695	154.335	109.44	97.7934	93.3687	91.1719	91.1917	92.9087
	std	9.66571	1.39616	3.45456	1.37768	12.1507	3.29263	16.2571	1.01623	5.95098	1.3171	3.54116
20	mean	7706.49	371.051	134.43	861.856	77690	922.046	338.335	284.412	168.494	54.198	134.576
	std	3907.34	97.411	29.1207	228.541	36246.8	389.135	112.896	29.9522	89.1249	15.5662	38.9226
21	mean	83399.8	11059.9	3818.21	165633	2944050	129827	48450.1	4918.38	2473.27	1105.37	1157.97
	std	37442.2	3456.8	1345.57	82837.4	3623410	74895.5	21972	1014.25	910.908	330.332	339.811
22	mean	1937.04	2662.42	1743.42	2433.82	3546.96	1898.74	2529.5	3476.35	2041.61	1002.09	1246.98
	std	279.293	293.752	279.83	232.862	281.826	243.749	250.404	252.946	283.65	286.187	314.555
23	mean	348.235	348.242	348.277	348.661	378.506	348.235	348.235	348.235	348.235	348.235	348.235
	std	2.30E-13	0.006323	0.015524	0.079798	8.81097	0.000272	2.30E-13	2.30E-13	2.30E-13	2.30E-13	2.30E-13
24	mean	366.573	362.193	361.222	418.205	555.868	373.363	390.35	370.008	371.369	387.221	377.326
	std	4.56608	1.37693	1.46394	3.10993	10.09	5.37925	5.69927	3.49124	3.39863	2.13236	4.59499
25	mean	258.451	232.746	223.761	229.225	390.491	227.714	242.183	215.025	200	216.385	206.992
	std	14.7532	3.68172	2.51161	9.39477	78.9642	3.28124	24.2074	11.324	0	1.10915	9.62139
26	mean	200.209	118.177	205.273	190.459	101.005	182.726	200.094	198.096	200.208	200	200.106
	std	0.049288	38.4008	35.0051	29.8593	0.094798	38.261	0.018408	13.9305	0.038992	0	0.017749
27	mean	2055.85	2331.97	1899.94	3316.05	3533.57	2998.69	1050.93	340.4	365.527	313.092	731.965
	std	104.297	56.6368	79.1533	63.2604	71.7486	75.7674	110.894	29.2888	40.0802	19.6023	158.1
28	mean	3150.29	2565.37	2443.08	3393.34	4269.29	3250.35	2335.94	2337.64	2219.99	2182.23	3686.18
	std	723.058	37.3893	297.591	525.591	151.364	135.818	281.318	684.921	508.675	59.421	578.224
29	mean	1595.84	2763.45	1997.21	3007.24	507282	2268.37	1358.41	1283.77	939.561	799.576	60148600
	std	151.63	489.104	185.486	509.58	222944	102.334	151.456	258.214	192.525	111.393	71247800
30	mean	8799.98	8403.48	6865	17262.1	331954	9676.33	7734.24	4798.56	3440.31	8039.86	4594.7
	std	996.391	742.843	733.3	1304.32	179488	1404.12	1442.64	1814.24	549.01	641.771	1324.22

Table S16: Results' means and standard deviations of all tested version of algorithms b6e6rl, CoDE, EPSDE, jSO, dimension D100, f16-f30

fun/alg	DE	LDE	dDE	jDE	LjDE	djDE	IDE	LIDE	dIDE	SHADE	LSHADE	dSHADE
1	39644.3	16098.6	260.548	**0**	**0**	**0**	**0**	2.49932	**0**	**0**	**0**	**0**
2	7.31E-06	6.09E-08	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
3	1.98E-08	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4	0.265583	0.270377	0.226706	**0**	**0**	34.7803	34.7803	4.66E-08	4.33541	34.7803	34.7803	34.7803
5	20.1839	20.1653	20.1324	20.0488	20.0387	20.0295	20.0398	20.0506	20.0025	20.0167	20.0043	**20**
6	0.00051	2.76E-05	**0**	**0**	**0**	**0**	**0**	1.22E-06	**0**	**0**	**0**	**0**
7	0.297777	0.283127	0.26102	0.00343	**0**	8.33E-05	0.007396	0.00092	0.009857	**0**	**0**	**0**
8	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
9	18.1607	16.3691	12.3442	3.93288	3.14653	3.01988	2.98488	2.98599	2.98488	2.98488	2.98521	2.98488
10	0.634016	0.249818	0.249818	**0**	**0**	**0**	0.160907	0.2486	0.187363	**0**	**0**	**0**
11	744.304	660.672	347.693	170.958	75.2869	42.0012	50.0502	133.558	46.8851	134.432	27.902	36.8859
12	0.543346	0.519216	0.429151	0.289354	0.274827	0.214573	0.10412	0.20708	0.029154	0.088034	0.059762	**0.025793**
13	0.218352	0.207223	0.183149	0.135562	0.111531	0.113894	0.079508	0.105982	0.069872	0.0787	0.076305	0.06398
14	0.155411	0.158656	0.142068	0.160609	0.128453	0.127004	0.085582	0.107762	0.078851	0.147113	0.08439	0.137401
15	1.85799	1.88749	1.81047	0.784592	0.737343	0.652472	0.488199	0.665918	0.462026	0.419891	0.407539	0.432854
fun/alg	b6e6rl	Lb6e6rl	db6e6rl	CoDE	LCoDE	dCoDE	EPSDE	LEPSDE	dEPSDE	jSO	djSO	
1	**0**	**0**	**0**	0.037901	0.007554	0.000986	**0**	**0**	**0**	**0**	**0**	
2	**0**	**0**	**0**	1.14E-08	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
3	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
4	34.7803	**0**	34.7803	4.04E-07	**0**	**0**	34.7803	4.33541	4.33541	34.7803	34.7803	
5	20.0511	20.0461	20.0458	20.0761	20.0735	20.031	20.1108	20.0957	20.0604	20.0322	20.0015	
6	**0**	**0**	**0**	1.57643	0.456514	0.00024	**0**	**0**	**0**	**0**	**0**	
7	0.019081	0.009857	0.010321	0.136237	0.104302	0.065069	0.106387	0.088606	0.065684	**0**	**0**	
8	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
9	4.84432	3.38186	3.14847	8.64576	6.95423	3.97984	9.30998	8.46248	4.63963	**1.98992**	2.98488	
10	**0**	**0**	**0**	**0**	**0**	**0**	0.062454	0.124909	0.062454	**0**	0.062454	
11	185.264	103.234	80.4944	401.674	315.279	138.963	395.156	404.845	111.673	**13.5349**	128.558	
12	0.315788	0.263536	0.239847	0.376987	0.350038	0.213105	0.426108	0.445262	0.283414	0.100346	0.063185	
13	0.11325	0.117546	0.120559	0.222937	0.215604	0.187678	0.15409	0.158279	0.134074	**0.057129**	0.065477	
14	0.124161	0.104658	0.092227	0.15586	0.134331	0.138052	0.128521	0.127468	0.107201	**0.050488**	0.073445	
15	0.805301	0.783221	0.721765	1.29953	1.23362	1.09174	1.21404	1.22533	1.05068	**0.378705**	0.407559	

Table S17: Medians of algorithms' results D10, f1-f15

fun/alg	DE	LDE	dDE	jDE	LjDE	djDE	IDE	LIDE	dIDE	SHADE	LSHADE	dSHADE
16	2.67197	2.522	2.05968	1.81457	1.49688	1.46241	1.12691	1.21379	1.27021	1.65609	1.54123	1.48479
17	109.745	69.3473	6.58491	1.98992	1.20331	1.61939	0.923439	4.51856	0.416376	11.5892	1.41125	11.173
18	3.61478	3.40648	1.61926	0.995985	0.20721	0.998066	**0.008328**	0.128353	0.008754	0.082443	0.097898	0.026718
19	0.628955	0.49516	0.164723	0.15433	0.103113	0.0491	0.036544	0.093354	**0.029895**	0.064521	0.058736	0.036544
20	0.798084	0.316007	0.066729	0.064098	0.015832	0.004232	0.05378	0.1381	0.040336	0.068657	0.053746	0.059217
21	1.73218	0.89016	0.319035	0.312348	0.017675	**0.007434**	0.023856	0.325061	0.012934	0.334995	0.267916	0.315034
22	0.100624	0.036001	0.00792	0.013438	**0.002735**	0.008416	0.04523	0.438727	0.095943	0.012007	0.013016	0.00816
23	**329.457**	**329.457**	**329.457**	**329.457**	**329.457**	**329.457**	**329.457**	**329.457**	**329.457**	**329.457**	**329.457**	**329.457**
24	124.844	124.38	119.667	111.593	109.904	109.977	109.43	108.623	109.277	109.456	109.929	109.417
25	163.144	143.507	128.063	117.459	115.073	116.709	115.58	116.387	115.58	**114.379**	115.664	114.937
26	100.237	100.237	100.212	100.132	100.117	100.119	100.081	100.098	100.079	100.086	100.077	**100.053**
27	3.20711	3.04131	2.75418	2.4177	1.64491	2.15541	1.98999	1.75457	**1.4593**	300	2.03556	300
28	**356.827**	**356.827**	**356.827**	360.061	**356.827**	369.371	447.621	**356.827**	371.455	372.114	369.371	372.114
29	330.221	268.624	231.399	223.125	221.984	223.113	221.802	222.203	221.777	222.479	**221.761**	221.765
30	539.341	513.916	493.171	466.16	462.973	466.62	463.695	497.716	462.843	476.227	**462.318**	475.128

fun/alg	b6e6rl	Lb6e6rl	db6e6rl	CoDE	LCoDE	dCoDE	EPSDE	LEPSDE	dEPSDE	jSO	djSO
16	1.83005	1.67331	1.59184	2.39643	2.29009	1.9428	2.22991	2.09855	1.69921	**0.951889**	1.1627
17	**0.416286**	0.416534	**0.416286**	41.7427	19.8664	0.624429	6.55854	2.01356	0.624433	1.41125	2.19806
18	0.404523	0.307779	0.182119	2.1594	1.59175	0.081476	0.107582	0.175205	0.109033	0.025756	0.062114
19	0.130222	0.090669	0.047646	0.448328	0.40257	0.084165	0.21956	0.241061	0.098407	0.036544	0.09156
20	0.006486	0.009435	**0.003486**	0.752549	0.476454	0.156283	0.089394	0.088287	0.006307	0.05644	0.132194
21	0.72224	0.330412	0.496893	1.76829	0.854782	0.026112	0.357681	0.315497	0.312627	0.321114	0.023075
22	0.02482	0.007548	0.029716	0.456529	0.249276	0.037337	0.144218	0.069128	0.004164	0.298277	0.278967
23	**329.457**	**329.457**	**329.457**	**329.457**	**329.457**	**329.457**	**329.457**	**329.457**	**329.457**	**329.457**	**329.457**
24	112.048	110.484	111.833	118.301	115.555	112.582	116.007	115.197	111.414	**107.976**	109.769
25	187.065	115.751	201.129	124.309	121.265	116.979	122.442	119.01	115.624	115.58	124.966
26	100.13	100.125	100.114	100.213	100.204	100.193	100.154	100.155	100.136	100.062	100.064
27	300	1.82552	2.11699	3.34676	2.94933	2.83191	2.45381	2.04543	1.72852	1.52919	300
28	369.371	**356.827**	369.371	**356.827**	**356.827**	**356.827**	368.85	**356.827**	360.061	372.114	380.627
29	221.777	**221.761**	221.825	222.126	221.946	221.866	**221.761**	221.762	**221.761**	**221.761**	222.709
30	462.821	462.391	462.791	490.521	474.028	464.367	462.773	462.814	462.77	462.322	462.342

Table S18: Medians of algorithms' results D10, f16-f30

fun/alg	DE	LDE	dDE	jDE	LjDE	djDE	IDE	LIDE	dIDE	SHADE	LSHADE	dSHADE
1	93132400	1.17E+08	7520360	47436.3	58318.1	61675	39051.4	902366	70689.9	771.101	**0**	0.001574
2	85.3	30308.5	**0**	**0**	**0**	**0**	**0**	0.906874	**0**	**0**	**0**	**0**
3	4.83668	60.4403	0.013871	**0**	**0**	**0**	**0**	0.053049	**0**	**0**	**0**	**0**
4	122.743	121.712	70.9679	0.03358	69.6653	4.38412	0.544255	70.1062	0.003065	**0**	**0**	**0**
5	20.8922	20.9166	20.8817	20.2578	20.316	20.1615	20.2217	20.4355	**20**	20.0671	20.1743	**20**
6	31.5119	32.3136	5.57731	3.57269	9.30822	2.05491	0.260226	2.61774	**0**	8.92064	10.5004	0.983956
7	0.031156	0.05406	5.37E-06	**0**	**0**	**0**	**0**	2.93E-08	**0**	**0**	**0**	**0**
8	108.532	125.431	12.9345	**0**	**0**	**0**	**0**	1.27061	0.001184	**0**	**0**	**0**
9	203.965	208.805	190.771	34.9264	38.2167	28.5946	29.8488	38.03	22.8841	28.9438	27.415	21.8891
10	3421.69	3878.31	20.6992	0.020819	**0**	**0**	6.83366	47.7347	4.71527	0.041639	1.67E-06	**0**
11	6500.47	6614.52	6282.41	1849.55	2265.34	1586.26	1795.28	2189.65	1892.89	1718.94	1414.39	1472.24
12	1.92993	1.97479	1.76498	0.332272	0.404902	0.191757	0.092755	0.527174	0.067072	0.148951	0.193956	**0.048519**
13	0.533097	0.565147	0.494661	0.273028	0.291836	0.264631	0.189022	0.236002	0.189095	0.24607	0.228148	0.188994
14	0.316317	0.330812	0.298168	0.288418	0.27499	0.266081	0.202389	0.213989	0.204474	0.248766	0.214688	0.205091
15	19.7014	22.5938	18.7651	4.36826	5.37382	4.25968	2.74223	6.97614	3.09925	2.92452	2.65174	2.51413
fun/alg	b6e6rl	Lb6e6rl	db6e6rl	CoDE	LCoDE	dCoDE	EPSDE	LEPSDE	dEPSDE	jSO	djSO	
1	29106.7	301.751	7873.8	41190.7	1090280	78025.9	16436.3	1.39981	36.5887	**0**	**0**	
2	**0**	**0**	8.57E-08	0.362879	30470	0.006664	**0**	**0**	**0**	**0**	**0**	
3	**0**	**0**	**0**	9.48E-05	0.511527	0.164641	**0**	**0**	**0**	**0**	**0**	
4	0.171841	1.09838	0.001033	77.4436	127.523	71.599	5.81E-07	0.102538	1.53E-07	**0**	**0**	
5	20.2733	20.3099	20.2171	20.487	20.531	20.3678	20.5693	20.645	20.4351	20.2091	**20**	
6	12.5564	13.6574	10.7674	19.3429	21.7589	14.3219	0.459282	22.1397	0.031284	**0**	**0**	
7	**0**	**0**	**0**	0.015991	0.323748	0.65796	**0**	**0**	**0**	**0**	**0**	
8	**0**	**0**	**0**	2.96E-07	5.19253	**0**	14.5003	46.8822	0.994959	**0**	**0**	
9	43.4891	50.0705	37.4662	117.98	137.464	81.6843	110.529	132.068	85.0631	**11.9395**	13.9294	
10	0.041639	0.020819	3.62E-07	39.1796	342.516	0.208192	418.937	1560.83	6.3867	1.22262	1.30493	
11	1963.38	2340.68	1793.34	4022.7	4306.6	2670.5	4477.59	5133.88	3189.45	**1162.93**	1861.35	
12	0.345354	0.414409	0.256323	0.737817	0.814822	0.477732	0.890587	1.12597	0.614012	0.198513	0.112057	
13	0.340826	0.342654	0.337788	0.48421	0.474821	0.444778	0.313117	0.360487	0.325457	**0.157953**	0.161069	
14	0.245058	0.215559	0.218174	0.272716	0.304941	0.27572	0.276072	0.257871	0.260987	**0.143396**	0.187187	
15	5.62552	6.83051	5.52392	14.0967	17.717	13.9222	10.6685	12.5665	10.5826	2.20326	**2.03646**	

Table S19: Medians of algorithms' results D30, f1-f15

fun/alg	DE	LDE	dDE	jDE	LjDE	djDE	IDE	LIDE	dIDE	SHADE	LSHADE	dSHADE
16	12.5636	12.6596	12.2423	9.32165	9.69773	8.69742	9.09356	10.2241	8.99466	9.73842	9.41523	8.78669
17	2448180	2936180	213284	3594.88	487.691	666.654	558.776	1368.83	611.671	1385.22	303.748	531.253
18	16052.7	21383.6	158.234	33.2505	10.5386	11.4151	15.9894	36.994	15.1681	149.365	7.75302	14.169
19	10.3714	11.0876	5.89658	4.46709	4.9077	4.27424	3.18045	4.22119	3.10301	5.11123	3.99187	3.31813
20	263.893	712.57	76.6479	15.7347	8.0001	9.30983	11.3217	17.7215	9.10747	78.9889	4.31058	6.53175
21	166795	241849	8594.91	428.372	124.731	184.618	169.125	513.88	272.612	523.085	146.6	153.311
22	167.501	178.762	88.6161	153.219	55.9715	38.5009	145.505	81.1162	26.5147	148.529	25.8409	40.3057
23	**315.244**	315.245	**315.244**	**315.244**	**315.244**	**315.244**	**315.244**	**315.244**	**315.244**	**315.244**	**315.244**	**315.244**
24	205.584	219.873	202.454	225.994	223.377	224.036	224.298	223.513	223.4	227.319	223.819	223.449
25	225.42	226.747	206.04	203.812	202.919	203.027	203.001	203.996	202.845	203.775	202.597	202.875
26	100.509	100.541	100.463	100.247	100.276	100.255	100.189	100.224	100.18	100.246	100.222	100.201
27	495.455	454.963	301.042	400.597	400.877	400.71	374.215	401.589	**300**	400.897	**300**	337.241
28	1000.15	1028.14	827.82	796.157	**766.4**	778.526	866.208	876.879	832.782	829.554	805.678	830.092
29	10786	14531.6	2134.95	829.079	798.564	793.933	581.705	1059.32	416.373	753.213	715.101	717.728
30	4816.7	6981.89	1723.56	2155.57	1060.14	1156.1	533.676	667.054	**449.355**	1545.47	2091.63	1055.72

fun/alg	b6e6rl	Lb6e6rl	db6e6rl	CoDE	LCoDE	dCoDE	EPSDE	LEPSDE	dEPSDE	jSO	djSO
16	9.67447	9.73962	8.89024	11.0851	11.2841	10.2506	11.3388	11.7025	10.3913	**8.2428**	8.49409
17	1744.41	956.93	589.695	1604.38	2236.86	828.55	566.976	1122.53	81.6442	**54.9065**	169.791
18	20.6824	25.5148	14.9793	58.2601	96.836	37.296	31.6461	39.4661	20.6582	**1.66136**	5.41976
19	4.33573	4.90111	3.7539	8.05771	9.47202	6.91355	4.60298	4.60659	3.75697	**2.21094**	2.66184
20	15.3075	19.2683	13.6669	43.0586	74.1663	31.7335	22.6195	27.8509	17.7945	**2.583**	4.00846
21	208.37	367.282	207.321	762.82	1198.1	402.796	309.445	611.511	96.9424	**15.9215**	38.8744
22	42.7159	44.5765	31.8891	95.8548	155.367	141.885	74.2656	90.4071	29.502	**23.4918**	47.2096
23	**315.244**	**315.244**	**315.244**	**315.244**	315.245	**315.244**	**315.244**	**315.244**	**315.244**	**315.244**	**315.244**
24	223.417	222.972	223.035	227.117	229.978	226.965	223.561	200.209	221.815	**200**	221.554
25	203.63	202.565	202.64	203.445	205.937	202.719	203.691	202.598	202.664	**202.549**	202.611
26	100.339	100.333	100.325	100.465	100.45	100.415	100.309	100.356	100.33	**100.144**	100.148
27	337.237	400	400	400.732	403.297	400.787	343.953	400	300.002	**300**	**300**
28	827.966	816.77	817.332	921.895	968.755	874.161	803.185	878.333	806.92	838.286	897.782
29	775.882	714.544	714.719	722.421	1018.36	901.612	738.95	**226.163**	714.876	715.084	716.628
30	1106.98	761.686	643.428	1405.87	2512.97	889.747	935.174	770.943	498.751	1451.19	1027.08

Table S20: Medians of algorithms' results D30, f16-f30

fun/alg	DE	LDE	dDE	jDE	LjDE	djDE	IDE	LIDE	dIDE	SHADE	LSHADE	dSHADE
1	4.15E+08	5.29E+08	9875410	291655	553043	688463	529476	4215780	1113430	10437	1502.82	44310.2
2	92186400	53173900	3630.45	**0**	1884.9	2.28537	871.287	2826.62	7.00133	**0**	**0**	**0**
3	68467.5	100542	1280.85	**0**	0.006066	4.27E-05	9.71E-08	418.168	3.44206	**0**	**0**	**0**
4	148.708	143.836	98.1031	83.1395	98.1034	98.1031	76.1307	96.0334	82.9074	**5.74E-07**	98.1031	0.677965
5	21.117	21.124	21.1092	20.3551	20.4638	20.2136	20.3654	20.6621	20.0009	20.0975	20.3325	**20**
6	63.0833	64.8471	8.68525	16.3162	26.0548	8.20132	5.85398	3.06625	0.002738	19.6271	24.9413	0.459826
7	0.84484	1.12994	**0**	**0**	**0**	**0**	0.007396	0.002931	**0**	**0**	**0**	**0**
8	285.036	316.2	32.5614	**0**	**0**	**0**	**0**	15.8253	0.012237	**0**	**0**	1.12E-08
9	433.632	461.658	390.684	72.9313	104.15	63.01	75.6167	111.578	57.7079	79.5966	51.5742	47.758
10	8970.87	9759.22	262.038	0.037475	**5.95E-05**	0.012492	130.699	295.08	11.0812	0.087442	0.332951	0.049967
11	12931.5	13086.7	12929.7	4259.73	5570.46	3691.04	4313.41	5953.06	4120.67	3922.28	3920.62	3536.42
12	3.07746	3.15834	3.0308	0.335978	0.503687	0.189114	0.114813	0.78616	0.111486	0.147232	0.269097	**0.046994**
13	0.729307	0.811724	0.727451	0.358468	0.372181	0.357325	0.343525	0.348561	0.317442	0.405078	0.286613	0.259109
14	0.386671	0.645391	0.38244	0.329437	0.311746	0.291463	0.284205	0.292358	0.290985	0.303803	0.286666	0.256283
15	52.5217	50.154	36.4694	9.50076	13.1704	9.62953	6.9569	19.1912	8.84479	10.9152	6.78816	6.19362

fun/alg	b6e6rl	Lb6e6rl	db6e6rl	CoDE	LCoDE	dCoDE	EPSDE	LEPSDE	dEPSDE	jSO	djSO
1	302322	242080	262930	940229	16736500	887107	117709	66398.1	260173	**10.6223**	37868.6
2	2366.86	3379.76	1030.31	1032000	1.15E+08	5444.09	0.207763	2.42807	0.000147	**0**	**0**
3	79.3038	0.247174	0.001772	23.4234	886.453	258.135	7.96E-06	2.12E-06	**0**	**0**	**0**
4	19.0806	98.1033	98.1032	124.939	294.178	98.1031	7.95888	82.5247	16.8986	98.1031	16.2483
5	20.3725	20.4631	20.2918	20.7537	20.8275	20.6277	20.8259	20.9316	20.7169	20.3072	**20**
6	27.5928	30.5749	24.6824	46.5606	50.8227	37.0555	2.57796	50.4753	1.63346	**2.82E-05**	0.028968
7	**0**	1.81E-06	3.06E-05	0.17646	1.48709	4.25596	**0**	**0**	**0**	**0**	**0**
8	**0**	**0**	7.66E-05	5.69886	91.4078	1.98992	95.7017	170.6	5.97	**0**	**0**
9	106.993	136.251	86.5615	310.441	361.9	254.195	263.644	313.909	240.348	**20.9763**	27.8589
10	0.049967	0.25857	0.012513	1046.33	3786.6	2.95699	2849.9	5953.95	13.258	8.93916	119.954
11	4408.95	5843.6	3889.83	9444.66	10305	7815.28	10164.4	11089.9	8562.27	**3130.17**	4173.05
12	0.35708	0.536855	0.247713	1.18879	1.4633	0.86356	1.43772	1.80729	0.983088	0.229175	0.092877
13	0.457889	0.456715	0.437895	0.641123	0.663249	0.597287	0.424339	0.48361	0.446061	**0.217707**	0.233281
14	0.279018	0.230617	0.23071	0.32987	0.417265	0.359621	0.318707	0.312359	0.30314	**0.169372**	0.21808
15	12.6735	19.1777	13.5637	37.9691	83.2639	32.3913	25.2167	28.3906	26.151	5.159	**4.11214**

Table S21: Medians of algorithms' results D50, f1-f15

fun/alg	DE	LDE	dDE	jDE	LjDE	djDE	IDE	LIDE	dIDE	SHADE	LSHADE	dSHADE
16	22.3268	22.4905	22.2925	17.5943	18.4468	16.8946	17.5058	19.4818	17.0385	18.0413	18.0599	16.8174
17	18312500	25566900	2222330	17440.1	5560.18	9951.46	14796.2	71225.3	10107.8	2614.96	1756.41	1643.4
18	36965.6	42017.2	878.195	538.708	61.6351	176.904	97.6832	247.106	54.9562	268.177	111.578	105.806
19	27.3749	29.9214	13.3756	12.2809	12.0077	11.6682	9.67462	14.2829	10.1133	14.6015	11.3561	10.0552
20	21083.3	39978.2	367.398	73.6285	25.472	26.7681	53.42	111.298	47.5471	317.148	19.9174	29.5171
21	6975260	9160480	918423	10590.6	894.069	1275.45	5143.12	11644.1	1572.54	1396.29	622.438	659.052
22	1165.56	1350.9	882.019	508.427	511.444	402.255	414.75	299.001	268.328	526.208	208.211	276.33
23	344.007	344.051	**344.005**	**344.005**	**344.005**	**344.005**	**344.005**	**344.005**	**344.005**	**344.005**	**344.005**	**344.005**
24	273.757	280.308	266.902	270.913	265.178	265.178	258.458	258.424	**256.11**	279.973	274.73	272.901
25	285.261	301.655	208.731	209.759	206.306	206.741	208.533	209.808	206.878	210.805	205.253	205.864
26	100.707	100.792	100.674	100.361	100.391	100.368	100.367	100.291	100.271	100.512	100.297	100.289
27	1694.62	1762.19	372.247	532.279	409.885	368.067	475.12	359.186	**301.967**	716.325	345.324	415.157
28	1538.73	1675.91	1101.31	1149.9	**1055.56**	1086.26	1355.06	1412.29	1238.1	1268.7	1100.63	1265.96
29	135579	288469	3637.54	976.821	1365.74	1113.34	934.432	1649.8	857.672	911.54	800.076	806.257
30	31069.4	53605.6	8457.52	8935.33	8067.18	8044.49	9541.47	13044.1	9205.69	10625	8689.39	8895.67

fun/alg	b6e6rl	Lb6e6rl	db6e6rl	CoDE	LCoDE	dCoDE	EPSDE	LEPSDE	dEPSDE	jSO	djSO
16	17.7913	18.4068	17.3047	20.7134	21.0308	19.6907	20.9317	21.427	20.1135	16.7882	**16.7725**
17	20198.8	2438.38	1603.61	4267.07	129622	5867.28	13943.7	2914.75	1081.28	**344.318**	688.715
18	422.406	71.8366	38.5515	164.306	557.895	125.68	371.819	117.928	28.5611	**18.2822**	29.1519
19	11.3285	15.6291	11.4346	19.1731	25.2369	14.6702	12.782	11.9373	10.6803	9.8787	**5.80839**
20	403.768	63.3991	41.1344	137.748	227.597	93.5793	98.5972	82.0727	56.1569	**6.64495**	14.0139
21	17123.7	1666.11	1072.27	2335.39	6299.63	1364.67	2323.51	1878.58	626.385	**289.828**	406.855
22	515.343	698.687	442.758	637.282	845.982	514.215	586.346	852.779	461.15	**53.5719**	258.966
23	**344.005**	**344.005**	**344.005**	**344.005**	344.159	**344.005**	**344.005**	**344.005**	**344.005**	**344.005**	**344.005**
24	266.396	257.269	256.679	260.738	288.783	266.181	272.181	265.178	266.875	271.95	269.052
25	207.843	205.784	205.118	207.984	225.142	205.829	209.994	205.643	205.512	**204.891**	205.387
26	100.47	100.473	100.445	100.614	100.626	100.577	100.456	100.472	100.449	**100.234**	100.25
27	986.034	1048.34	906.945	1409.95	1545.51	1204.16	426.749	334.077	346.362	338.505	421.81
28	1215.58	1220.47	1174.77	1487.83	1661.91	1401.95	1105.34	1373.52	1130.3	1120.4	1512.19
29	1239.23	870.499	771.847	836.808	6550.84	1534.53	944.583	759.665	**739.937**	793.742	789.369
30	9362.97	7957.95	**7949.6**	8882.09	14966.3	8167.07	9396.97	8053.08	8034.12	8301.71	8757.05

Table S22: Medians of algorithms' results D50, f16-f30

fun/alg	DE	LDE	dDE	jDE	LjDE	djDE	IDE	LIDE	dIDE	SHADE	LSHADE	dSHADE
1	2.97E+09	3.79E+09	23904200	1256780	6661750	8766620	1390050	57388700	10985100	**129886**	228471	527547
2	1.21E+10	7.38E+09	2515.27	**0**	9440.12	5133.94	10500.1	5222340	12031.2	**0**	**0**	**0**
3	243138	371155	11205.3	1.71E-06	13.4649	0.922427	0.024182	5654.38	443.11	9.78E-05	**0**	**0**
4	2208.13	1197.86	210.796	152.941	225.33	209.028	174.77	400.776	239.969	**93.2857**	151.976	132.523
5	21.3166	21.3171	21.3154	20.5733	20.7542	20.3543	20.6018	20.9765	20.0092	20.1419	20.6343	**20**
6	146.937	151.298	27.5683	58.4226	81.261	30.9733	36.667	33.2841	9.32477	66.7048	76.3578	8.51685
7	67.0237	51.5192	0.000756	**0**	8.19E-06	7.99E-07	**0**	0.985655	6.46E-06	**0**	**0**	**0**
8	821.748	926.092	104.741	**0**	4.30E-06	5.32E-05	3.80E-08	88.1792	40.3345	**0**	0.080346	**0**
9	1093.98	1166.59	923.607	197.528	355.079	177.761	268.638	417.512	163.349	269.191	148.815	134.319
10	24095.2	25521.2	1482.13	0.056213	4.47544	0.056213	1082.69	2049.2	1196.97	0.193623	66.1805	2.31145
11	30335.6	30323.4	30019.1	11333.4	16000.5	10276.5	11854.1	19113.7	11199.4	10476.4	12615.6	**9810.96**
12	4.05234	4.0251	3.95085	0.47278	0.864132	0.271712	0.20501	1.39152	0.255345	0.218863	0.532833	**0.087428**
13	0.977726	1.12248	0.799531	0.450163	0.521979	0.482181	0.407249	0.401689	0.394022	0.478439	0.336787	0.382731
14	143.336	67.3191	0.35115	0.232642	0.24401	0.227328	0.22965	0.250058	0.241678	0.216179	0.209557	0.206466
15	65707	16923.3	83.1989	30.9108	38.9629	30.9876	28.9309	59.559	32.4028	57.4047	22.7742	28.88

fun/alg	b6e6rl	Lb6e6rl	db6e6rl	CoDE	LCoDE	dCoDE	EPSDE	LEPSDE	dEPSDE	jSO	djSO
1	1216330	10382100	5902940	7752150	1.32E+09	8778530	446974	4323750	6822310	133787	790885
2	10090.5	14895.1	13847100	7.92E+08	2.11E+10	18668.5	11698.5	11573.6	1030.51	**0**	1.63E-07
3	431.469	429.15	114.98	557.052	96992.8	1391.53	1.13466	0.466716	0.026165	**0**	1.42E-08
4	170.111	237.888	240.406	1061.97	3078.79	249.065	133.566	145.508	144.403	212.514	154.246
5	20.5958	20.7683	20.4871	21.1557	21.2009	21.0935	21.1885	21.2407	21.1377	20.5569	**20**
6	73.8286	85.7874	69.2687	125.236	133.198	114.503	30.5149	85.9937	6.37848	**1.61523**	7.02147
7	**0**	0.034334	1.06758	1.64561	136.033	1.22951	**0**	3.51E-08	1.26E-07	**0**	**0**
8	**0**	0.638205	0.020618	239.315	563.288	29.0829	408.793	604.103	295.855	0.002116	1.98992
9	325.225	516.278	264.758	957.853	1076.48	872.328	770.45	816.2	736.81	**45.0174**	72.632
10	0.049967	151.599	**0.031243**	11134.3	16946.5	59.9062	13655	19648.8	4183.76	66.4763	5027.34
11	11823.6	16609.9	10749	26375.7	27463.4	24787.5	27000.2	28423.3	25548.6	9870.54	11580.4
12	0.501233	0.907592	0.364532	2.41595	2.71121	2.04073	2.69289	3.18976	2.29504	0.397436	0.185392
13	0.512586	0.581471	0.515213	0.811116	0.982229	0.864423	0.511905	0.570859	0.554653	0.313527	0.361003
14	0.136668	0.255528	0.214421	0.34092	40.0473	0.357405	0.242557	0.293678	0.273176	0.186766	0.182576
15	39.6727	73.5303	47.8555	2066.7	121517	119.052	71.8174	73.8951	71.2107	15.6117	**15.3928**

Table S23: Medians of algorithms' results D100, f1-f15

fun/alg	DE	LDE	dDE	jDE	LjDE	djDE	IDE	LIDE	dIDE	SHADE	LSHADE	dSHADE
16	46.7006	46.8203	46.5436	39.5539	41.2263	38.933	39.792	43.5275	40.3555	40.8633	40.7251	39.5733
17	2.28E+08	2.96E+08	2983280	105258	292472	281545	185815	2993340	650877	23454.1	4570.56	13220.8
18	438131	105590	1492.68	500.192	**119.106**	617.962	585.403	618.756	264.966	768.891	235.367	467.21
19	133.298	132.428	94.8787	94.8984	93.653	90.8983	**81.469**	113.71	82.7385	106.125	94.7012	96.1481
20	110160	209830	4824.74	389.324	306.708	129.091	365.59	5356.37	770.719	540.686	143.49	312.803
21	92659200	1.23E+08	4465740	35261.8	43164.4	71697.7	95366.1	1229880	120999	8496.35	2408.1	2040.74
22	4326.48	4512.25	4263.04	1760.18	2238.21	1443.09	1518.66	1343.91	1093.65	1461.85	1390.39	1167.06
23	368.345	383.703	**348.235**	**348.235**	**348.235**	**348.235**	**348.235**	348.81	**348.235**	**348.235**	**348.235**	**348.235**
24	532.771	494.034	376.796	384.424	360.59	365.064	**353.043**	367.758	357.491	421.09	393.032	387.754
25	653.781	714.691	237.205	274.003	234.335	228.188	254.164	206.318	200.005	283.801	**200**	257.68
26	101.162	101.097	201.252	200.171	**100.526**	200.429	200.147	200.702	200.53	200.089	200	200.093
27	3733.34	3902.55	685.563	1192.08	1140.94	526.117	1068.35	736.002	461.968	1912.29	323.741	748.675
28	3345.76	3749.95	2195.09	2290.46	2115.54	2148.57	2949.76	3494.29	**1997.67**	3646.85	2244.87	2984.61
29	290977	482790	2505.07	1506.48	2015.27	1897.77	1499.15	9624.12	1600.6	1432.53	906.476	**788.695**
30	739955	1963780	8644.06	9407.53	7709.9	7815.47	7811.53	14903.4	4777.81	9180.51	9331.73	7615.04

fun/alg	b6e6rl	Lb6e6rl	db6e6rl	CoDE	LCoDE	dCoDE	EPSDE	LEPSDE	dEPSDE	jSO	djSO
16	39.7706	41.4175	39.1769	45.4093	45.9516	44.6665	45.6137	46.1758	45.1264	**38.6273**	38.9309
17	160563	150348	39816.9	342436	13251100	314733	80508.3	3821	5107.35	**3679.94**	3874.55
18	857.612	615.446	196.707	661.484	82243.4	1147.14	474.29	229.597	123.395	227.486	225.617
19	94.4528	108.392	104.53	118.737	155.182	109.999	97.4976	93.0395	91.5417	91.0452	92.6691
20	6538.5	360.809	132.102	860.245	86315.8	819.629	312.339	289.855	129.411	**51.3087**	130.752
21	80212.6	10176.5	3512.06	129659	2245110	121086	48763.7	5148.08	2318.77	**1077.16**	1140.68
22	1955.3	2676.14	1763.99	2441.02	3607.5	1917.09	2571.98	3494.06	2058.09	**988.746**	1243.53
23	**348.235**	348.24	348.277	348.676	381.721	**348.235**	**348.235**	**348.235**	**348.235**	**348.235**	**348.235**
24	365.418	362.664	361.282	418.345	555.101	373.55	389.376	369.41	371.954	387.28	377.82
25	259.423	232.787	222.983	227.867	439.71	227.265	248.455	221.526	**200**	216.319	**200**
26	200.204	100.587	200.368	200.203	101.025	200.201	200.094	200.047	200.204	200	200.105
27	2080.62	2332.14	1897.09	3314.77	3551.24	2997.96	1032.37	334.049	361.067	**301.046**	725.656
28	3031.17	2567.91	2356.76	3317.77	4276.24	3239.74	2221.38	2633.84	2280.27	2171.22	3601.77
29	1563.44	2703.89	1985.95	2864.61	557620	2252.07	1396.63	1302.3	894.413	789.834	837.472
30	8960.72	8361.31	6938.41	17275.7	398582	9409.72	7905.78	3832.55	**3382.81**	8049.79	4135.28

Table S24: Medians of algorithms' results D100, f16-f30

	DE			jDE			IDE			SHADE			b6e6rl			CoDE			EPSDE			jSO	
fun/alg	orig	L	d	orig	L	d	orig	L	d	orig	L	d	orig	L	d	orig	L	d	orig	L	d	orig	d
1	23	22	21	8.5	8.5	8.5	8.5	20	8.5	8.5	8.5	8.5	8.5	8.5	8.5	19	18	17	8.5	8.5	8.5	8.5	8.5
2	23	22	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	21	10.5	10.5	10.5	10.5	10.5	10.5	10.5
3	23	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
4	**9**	**10**	**8**	**3**	**3**	18.5	18.5	**6**	**12**	18.5	18.5	18.5	18.5	**3**	18.5	**7**	**3**	**3**	18.5	**12**	**12**	18.5	18.5
5	23	22	21	13	9	**6**	10	14	**3**	**5**	**4**	**1**	15	12	11	18	17	**7**	20	19	16	8	**2**
6	21	19	9	9	9	9	9	18	9	9	9	9	9	9	9	23	22	20	9	9	9	9	9
7	23	22	21	9	3.5	7	10	8	11.5	3.5	3.5	3.5	14	11.5	13	20	18	15	19	17	16	3.5	3.5
8	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
9	23	22	21	13	10	9	4	8	4	4	7	4	16	12	11	19	17	14	20	18	15	1	4
10	23	21.5	21.5	7	7	7	18	20	19	7	7	7	7	7	7	7	7	7	15	17	15	7	15
11	23	22	18	15	7	4	6	12	5	13	2	3	16	9	8	20	17	14	19	21	10	1	11
12	23	22	20	15	13	10	7	8	**2**	**5**	**3**	**1**	16	12	11	18	17	9	19	21	14	6	**4**
13	22	20	18	15	9	11	7	8	4	6	5	2	10	12	13	23	21	19	16	17	14	1	3
14	20	22	18	23	13	11	5	9	3	19	4	16	10	7	6	21	15	17	14	12	8	1	2
15	22	23	21	13	11	8	7	9	6	4	2	5	14	12	10	20	19	16	17	18	15	1	3
16	23	22	17	14	8	6	2	4	5	11	9	7	15	12	10	21	20	16	19	18	13	1	3
17	23	22	17	12	**8**	11	**7**	15	**3**	19	9.5	18	**1.5**	**4**	**1.5**	21	20	**5**	16	13	**6**	9.5	14
18	23	22	20	17	14	18	**1**	11	**2**	7	8	4	16	15	13	21	19	6	9	12	10	3	5
19	23	22	17	16	14	6	**2.5**	12	**1**	8	7	**2.5**	15	10	5	21	20	9	18	19	13	4	11
20	23	20	13	12	**6**	**2**	**9**	18	**7**	14	**8**	11	**4**	**5**	**1**	22	21	19	16	15	**3**	10	17
21	22	21	**12**	**8**	**3**	**1**	**5**	14	**2**	16	**7**	**10**	19	15	18	23	20	**6**	17	**11**	**9**	13	**4**
22	**17**	**12**	**4**	**9**	**1**	**6**	**14**	22	**16**	**7**	**8**	**5**	**10**	**3**	**11**	23	**19**	**13**	**18**	**15**	**2**	21	**20**
23	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
24	23	22	21	13	8	10	5	2	3	6	9	4	15	11	14	20	18	16	19	17	12	1	7
25	21	20	19	13	**3**	11	5	10	5	**1**	8	**2**	22	9	23	17	15	12	16	14	7	5	18
26	22.5	22.5	20	14	10	11	6	8	5	7	4	**1**	13	12	9	21	19	18	16	17	15	2	3
27	18	17	14	12	3	11	7	5	**1**	21.5	8	21.5	21.5	6	10	19	16	15	13	9	4	2	21.5
28	**5.5**	**5.5**	**5.5**	**11.5**	**5.5**	**15.5**	23	**5.5**	**18**	20	**15.5**	20	**15.5**	**5.5**	**15.5**	**5.5**	**5.5**	**5.5**	**13**	**5.5**	**11.5**	20	22
29	23	22	21	20	14	19	10	16	8.5	17	3	7	8.5	3	11	15	13	12	3	6	3	3	18
30	23	22	20	14	11	15	12	21	10	18	**1**	17	9	4	7	19	16	13	6	8	5	2	3

Table S25: Ranks of algorithms' medians D10

	DE			jDE			IDE			SHADE			b6e6rl			CoDE			EPSDE			jSO	
fun/alg	orig	L	d	orig	L	d	orig	L	d	orig	L	d	orig	L	d	orig	L	d	orig	L	d	orig	d
1	22	23	21	14	15	16	12	19	17	8	2	4	11	7	9	13	20	18	10	5	6	2	2
2	21	22	8.5	8.5	8.5	8.5	8.5	20	8.5	8.5	8.5	8.5	8.5	8.5	17	19	23	18	8.5	8.5	8.5	8.5	8.5
3	22	23	18	8.5	8.5	8.5	8.5	19	8.5	8.5	8.5	8.5	8.5	8.5	8.5	17	21	20	8.5	8.5	8.5	8.5	8.5
4	22	21	18	10	16	15	13	17	9	3	3	3	12	14	8	20	23	19	7	11	6	3	3
5	22	23	21	10	13	**5**	9	16	**2**	**4**	**6**	**2**	11	12	8	17	18	14	19	20	15	7	**2**
6	22	23	11	10	13	8	5	9	2	12	14	7	16	17	15	19	20	18	6	21	4	2	2
7	20	21	18	8.5	8.5	8.5	8.5	17	8.5	8.5	8.5	8.5	8.5	8.5	8.5	19	22	23	8.5	8.5	8.5	8.5	8.5
8	22	23	19	7	7	7	7	17	15	7	7	7	7	7	7	14	18	7	20	21	16	7	7
9	22	23	21	9	12	6	8	11	4	7	5	3	13	14	10	18	20	15	17	19	16	1	2
10	22	23	16	**6**	**2**	**2**	15	18	13	**8.5**	**5**	**2**	**8.5**	**7**	**4**	17	19	**10**	20	21	14	11	12
11	22	23	21	8	13	4	7	12	10	5	2	3	11	14	6	17	18	15	19	20	16	1	9
12	22	23	21	10	12	**6**	**3**	15	**2**	**5**	**7**	**1**	11	13	9	17	18	14	19	20	16	8	**4**
13	22	23	21	10	11	9	4	7	5	8	6	3	15	16	14	20	19	18	12	17	13	1	2
14	22	23	20	19	16	14	3	6	4	11	7	5	10	8	9	15	21	17	18	12	13	1	2
15	22	23	21	9	10	8	5	14	7	6	4	3	12	13	11	19	20	18	16	17	15	2	**1**
16	22	23	21	8	11	3	7	14	6	12	9	4	10	13	5	17	18	15	19	20	16	1	2
17	22	23	21	20	5	11	7	15	10	16	4	6	18	13	9	17	19	12	8	14	2	1	3
18	22	23	21	14	4	5	9	15	8	20	3	6	11	12	7	18	19	16	13	17	10	1	2
19	22	23	18	12	16	10	4	9	3	17	8	5	11	15	6	20	21	19	13	14	7	1	2
20	22	23	20	11	5	7	8	12	6	21	3	4	10	14	9	18	19	17	15	16	13	1	2
21	22	23	21	15	4	8	7	16	11	17	5	6	10	13	9	19	20	14	12	18	3	1	2
22	22	23	14	20	11	6	18	13	3	19	2	7	8	9	5	16	21	17	12	15	4	1	10
23	11	22.5	11	11	11	11	11	11	11	11	11	11	11	11	11	11	22.5	11	11	11	11	11	11
24	4	5	3	19	10	17	18	14	11	22	16	13	12	8	9	21	23	20	15	2	7	1	6
25	22	23	21	18	11	13	12	19	9	17	3	10	15	2	6	14	20	8	16	4	7	1	5
26	22	23	20	9	11	10	4	7	3	8	6	5	16	15	13	21	19	18	12	17	14	1	2
27	23	22	6	14	18	15	10	20	2.5	19	2.5	8	7	12	12	16	21	17	9	12	5	2.5	2.5
28	22	23	**9**	**3**	**1**	**2**	15	17	**13**	**11**	**5**	**12**	**10**	**7**	**8**	20	21	16	**4**	18	**6**	14	19
29	22	23	21	17	16	15	**3**	20	**2**	13	8	10	14	**4**	**5**	11	19	18	12	**1**	**6**	7	9
30	22	23	18	20	**12**	**14**	**3**	**5**	**1**	17	19	**11**	**13**	**6**	**4**	**15**	21	**8**	**9**	**7**	**2**	16	**10**

Table S26: Ranks of algorithms' medians D30

	DE			jDE			IDE			SHADE			b6e6rl			CoDE			EPSDE			jSO	
fun/alg	orig	L	d	orig	L	d	orig	L	d	orig	L	d	orig	L	d	orig	L	d	orig	L	d	orig	d
1	22	23	20	11	14	15	13	19	18	3	2	5	12	8	10	17	21	16	7	6	9	1	4
2	22	21	18	3.5	14	9	12	16	11	3.5	3.5	3.5	15	17	13	20	23	19	8	10	7	3.5	3.5
3	22	23	21	4	13	11	8	19	15	4	4	4	17	14	12	16	20	18	10	9	4	4	4
4	22	21	14	**10**	19	14	**7**	**11**	**9**	**1**	14	**2**	**6**	18	17	20	23	14	**3**	**8**	**5**	14	**4**
5	22	23	21	9	13	**5**	10	15	**3**	**4**	8	**1.5**	11	12	**6**	17	19	14	18	20	16	7	**1.5**
6	22	23	10	11	15	9	8	7	2	12	14	4	16	17	13	19	21	18	6	20	5	1	3
7	20	21	7.5	7.5	7.5	7.5	18	17	7.5	7.5	7.5	7.5	7.5	15	16	19	22	23	7.5	7.5	7.5	7.5	7.5
8	22	23	18	5.5	5.5	5.5	5.5	17	13	5.5	5.5	11	5.5	5.5	12	15	19	14	20	21	16	5.5	5.5
9	22	23	21	7	11	6	8	13	5	9	4	3	12	14	10	18	20	16	17	19	15	1	2
10	22	23	16	**4**	**1**	**2**	15	17	12	**7**	**9**	**5.5**	**5.5**	**8**	**3**	18	20	**10**	19	21	13	11	14
11	22	23	21	9	12	3	10	14	7	6	5	2	11	13	4	17	19	15	18	20	16	1	8
12	22	23	21	10	12	**6**	**4**	14	**3**	**5**	9	**1**	11	13	8	17	19	15	18	20	16	7	**2**
13	22	23	21	9	10	8	6	7	5	11	4	3	16	15	13	19	20	18	12	17	14	1	2
14	21	23	20	17	14	10	7	11	9	13	8	5	6	3	4	18	22	19	16	15	12	1	2
15	22	21	19	7	11	8	5	14	6	9	4	3	10	13	12	20	23	18	15	17	16	2	**1**
16	22	23	21	8	13	4	7	14	5	10	11	3	9	12	6	17	19	15	18	20	16	2	**1**
17	22	23	21	17	11	13	16	19	14	8	6	5	18	7	4	10	20	12	15	9	3	1	2
18	22	23	21	19	6	14	8	15	5	16	10	9	18	7	4	13	20	12	17	11	2	1	3
19	22	23	15	13	12	10	**2**	16	5	17	8	4	7	19	9	20	21	18	14	11	6	3	**1**
20	22	23	20	12	4	5	9	16	8	19	3	6	21	11	7	17	18	14	15	13	10	1	2
21	22	23	21	18	6	8	16	19	11	10	3	5	20	12	7	15	17	9	14	13	4	1	2
22	22	23	21	11	12	7	8	6	4	15	2	5	14	18	9	17	19	13	16	20	10	1	3
23	21	22	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	23	10.5	10.5	10.5	10.5	10.5	10.5
24	19	22	**13**	**15**	**8**	**8**	**5**	**4**	**1**	21	20	18	**11**	**3**	**2**	**6**	23	**10**	17	**8**	**12**	16	**14**
25	22	23	16	17	10	11	15	18	12	20	3	9	13	7	2	14	21	8	19	6	5	1	4
26	22	23	21	7	10	9	8	5	3	17	6	4	14	16	11	19	20	18	13	15	12	1	2
27	22	23	8	14	9	7	13	6	**1**	15	4	10	17	18	16	20	21	19	12	**2**	5	3	11
28	21	23	**4**	8	**1**	**2**	15	18	12	14	**3**	13	10	11	9	19	22	17	**5**	16	7	6	20
29	22	23	20	14	17	15	12	19	9	11	6	7	16	10	**3**	8	21	18	13	**2**	**1**	5	**4**
30	22	23	9	14	**6**	**4**	18	20	15	19	10	13	16	**2**	**1**	12	21	**7**	17	**5**	**3**	8	11

Table S27: Ranks of algorithms' medians D50

	DE			jDE			IDE			SHADE			b6e6rl			CoDE			EPSDE			jSO	
fun/alg	orig	L	d	orig	L	d	orig	L	d	orig	L	d	orig	L	d	orig	L	d	orig	L	d	orig	d
1	22	23	19	8	12	15	9	20	18	**1**	3	5	7	17	11	14	21	16	4	10	13	2	6
2	22	21	8	3	10	9	12	18	15	3	3	3	11	16	19	20	23	17	14	13	7	3	6
3	22	23	20	5	12	10	7	19	16	6	2	2	15	14	13	17	21	18	11	9	8	2	4
4	22	21	**12**	**7**	14	**11**	**10**	19	16	**1**	**6**	**2**	**9**	15	17	20	23	18	**3**	**5**	**4**	13	**8**
5	22	23	21	8	12	**5**	10	14	**3**	**4**	11	**1.5**	9	13	**6**	17	19	15	18	20	16	7	**1.5**
6	22	23	6	11	16	8	10	9	5	12	15	4	14	17	13	20	21	19	7	18	2	1	3
7	22	21	15	5	14	12	5	17	13	5	5	5	5	16	18	20	23	19	5	10	11	5	5
8	22	23	16	**2.5**	**6**	**7**	**5**	15	14	**2.5**	10	**2.5**	**2.5**	11	9	17	20	13	19	21	18	8	12
9	22	23	19	7	12	6	9	13	5	10	4	3	11	14	8	20	21	18	16	17	15	1	2
10	22	23	14	**3**	**7**	**4**	12	15	13	**5**	**9**	**6**	**2**	11	**1**	18	20	**8**	19	21	16	10	17
11	23	22	21	7	12	3	10	14	6	4	11	**1**	9	13	5	17	19	15	18	20	16	2	8
12	23	22	21	9	12	**6**	**3**	14	**5**	**4**	11	**1**	10	13	**7**	17	19	15	18	20	16	8	**2**
13	21	23	18	8	14	10	7	6	5	9	2	4	12	17	13	19	22	20	11	16	15	1	3
14	23	22	19	10	13	8	9	14	11	7	5	4	**1**	15	6	18	21	20	12	17	16	3	**2**
15	22	21	18	6	9	7	5	13	8	12	3	4	10	16	11	20	23	19	15	17	14	2	**1**
16	22	23	21	5	12	3	8	14	9	11	10	6	7	13	4	17	19	15	18	20	16	1	2
17	22	23	19	10	15	14	13	20	18	7	4	6	12	11	8	17	21	16	9	2	5	1	3
18	23	22	20	11	**1**	14	12	15	8	17	7	9	18	13	**3**	16	21	19	10	6	**2**	5	**4**
19	22	21	11	12	8	**3**	**1**	19	**2**	16	10	13	9	17	15	20	23	18	14	7	5	4	6
20	22	23	18	13	8	2	12	19	15	14	6	10	20	11	5	17	21	16	9	7	3	1	4
21	22	23	21	10	11	13	15	19	16	8	5	3	14	9	6	18	20	17	12	7	4	1	2
22	22	23	21	10	15	7	9	5	2	8	6	3	13	18	11	16	20	12	17	19	14	1	4
23	21	23	8.5	8.5	8.5	8.5	8.5	20	8.5	8.5	8.5	8.5	8.5	17	18	19	22	8.5	8.5	8.5	8.5	8.5	8.5
24	22	21	**12**	**14**	**3**	**6**	**1**	**8**	**2**	20	18	16	**7**	**5**	**4**	19	23	**11**	17	**9**	**10**	15	**13**
25	22	23	14	19	13	11	16	**5**	**4**	20	**2**	17	18	12	8	10	21	9	15	7	**2**	6	**2**
26	**5**	**4**	23	14	**1**	20	13	22	21	9	6.5	10	17.5	**2**	19	16	**3**	15	11	8	17.5	6.5	12
27	22	23	7	14	13	6	12	9	5	16	2	10	17	18	15	20	21	19	11	3	4	1	8
28	18	22	5	9	**2**	**3**	13	19	**1**	21	7	14	15	11	10	17	23	16	6	12	8	4	20
29	21	22	17	10	15	13	9	20	12	8	5	**1**	11	18	14	19	23	16	7	6	4	2	3
30	22	23	13	17	**7**	**9**	**8**	19	**4**	15	16	**6**	14	12	**5**	20	21	18	**10**	**2**	**1**	11	**3**

Table S28: Ranks of algorithms' medians D100

alg	DE				jDE				IDE				SHADE				b6e6rl				CoDE				EPSDE			
f/D	10	30	50	100	10	30	50	100	10	30	50	100	10	30	50	100	10	30	50	100	10	30	50	100	10	30	50	100
1	+	+	+	+	0	−	−	−	0	−	−	−	0	+	−	−	0	+	0	−	+	−	0	−	0	+	−	−
2	+	+	+	+	0	0	−	−	0	0	+	0	0	0	0	+	0	−	0	−	+	+	+	+	0	0	+	+
3	+	+	+	+	0	0	−	−	0	0	−	−	0	0	0	+	0	0	+	+	0	−	−	−	0	0	+	+
4	+	+	+	+	−	−	−	−	0	+	0	−	0	0	−	−	0	+	−	−	+	+	+	+	0	0	−	−
5	+	0	0	0	+	+	+	+	+	+	+	+	+	+	+	+	0	+	+	+	+	+	+	+	+	+	+	+
6	+	+	+	+	0	+	+	+	0	+	+	+	0	+	+	+	0	+	+	+	+	+	+	+	0	0	+	+
7	+	+	+	+	0	+	+	−	0	+	+	−	0	+	+	+	+	0	−	−	+	−	−	+	+	0	+	−
8	0	+	+	+	0	0	0	−	0	−	−	−	0	0	−	−	0	0	−	−	0	+	+	+	0	+	+	+
9	+	+	+	+	+	+	+	+	0	+	+	+	0	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
10	+	+	+	+	0	+	+	0	0	+	+	0	0	+	+	−	0	+	+	+	0	+	+	+	0	+	+	+
11	+	+	0	+	+	+	+	+	0	0	0	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
12	+	+	0	0	+	+	+	+	+	+	0	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
13	+	+	0	+	+	0	0	−	+	0	+	+	+	+	+	+	0	0	0	0	+	+	+	−	+	−	−	−
14	+	0	0	+	+	+	+	0	0	0	0	−	0	+	+	+	+	+	+	−	+	0	−	0	+	+	+	−
15	0	+	+	+	+	0	0	0	0	−	−	−	0	+	+	+	+	0	−	−	+	0	+	+	+	0	−	+
16	+	+	0	+	+	+	+	+	0	0	0	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
17	+	+	+	+	0	+	+	−	+	0	+	−	0	+	+	+	0	+	+	+	+	+	0	0	+	+	+	+
18	+	+	+	+	0	+	+	0	0	0	+	+	0	+	+	+	+	+	+	+	+	+	+	−	0	+	+	+
19	+	+	+	+	+	0	+	+	+	0	0	0	+	+	+	0	+	+	0	−	+	+	+	+	+	+	+	+
20	+	+	+	+	+	+	+	+	0	+	0	−	0	+	+	+	0	+	+	0	+	+	+	+	+	+	+	+
21	+	+	+	+	+	+	+	−	0	−	+	−	0	+	+	+	0	0	+	+	+	+	+	+	+	+	+	+
22	+	+	+	+	+	+	+	+	−	+	+	+	0	+	+	+	0	0	0	+	+	0	+	+	+	+	+	+
23	0	0	+	+	0	0	0	0	0	0	0	−	0	0	0	0	0	0	0	−	0	0	0	+	0	0	0	0
24	+	+	+	+	+	+	+	+	0	+	+	−	0	+	+	+	0	+	+	+	+	0	−	+	+	+	+	+
25	+	+	+	+	0	+	+	+	0	+	+	+	0	+	+	+	0	+	+	+	+	+	+	0	+	+	+	+
26	+	+	+	0	0	0	0	−	0	+	+	−	+	+	+	−	0	0	+	−	+	+	+	0	+	−	0	−
27	+	+	+	+	0	0	+	+	0	0	+	+	0	+	+	+	0	0	+	+	+	0	+	+	+	0	+	+
28	0	+	+	+	0	+	+	+	0	+	+	+	0	0	0	+	0	+	+	+	0	+	+	+	0	0	0	0
29	+	+	+	+	0	0	−	−	0	0	0	−	0	+	+	+	0	+	+	−	+	−	−	+	0	+	+	+
30	+	+	+	+	0	+	+	+	0	+	+	+	0	+	+	+	0	+	+	+	+	+	+	+	0	+	+	+

Table S29: Detailed results of Wilcoxon rank-sum tests, comparison d-mechanism vs. original algorithms - algorithms

alg	DE				jDE				IDE				SHADE				b6e6rl				CoDE				EPSDE				jSO			
f/D	10	30	50	100	10	30	50	100	10	30	50	100	10	30	50	100	10	30	50	100	10	30	50	100	10	30	50	100	10	30	50	100
1	+	+	+	+	+	0	−	−	+	+	+	+	0	−	−	−	0	−	0	+	+	+	+	+	0	−	−	−	0	0	−	−
2	+	+	+	+	0	0	+	+	0	+	+	+	0	0	0	+	0	−	+	−	+	+	+	+	0	0	+	+	0	0	0	−
3	0	+	+	+	0	0	+	+	0	+	+	+	0	0	0	0	0	0	+	+	0	+	+	+	0	0	+	+	0	0	0	−
4	0	+	+	+	−	+	+	+	0	+	+	+	0	0	+	+	0	+	+	0	+	+	+	+	0	+	+	0	0	0	+	+
5	+	+	0	0	+	+	+	+	+	+	+	+	+	+	+	+	0	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
6	+	+	+	+	0	+	+	+	+	+	+	+	+	+	+	+	0	+	+	+	+	+	+	+	0	+	+	+	0	0	−	−
7	+	+	+	+	−	0	0	+	−	+	+	+	−	0	0	0	0	0	−	−	+	−	−	+	+	0	0	−	−	0	0	0
8	0	+	+	+	0	0	0	−	0	+	+	+	0	0	−	+	0	0	−	+	0	+	+	+	0	+	+	+	0	0	−	−
9	+	+	+	+	+	+	+	+	0	+	+	+	+	+	+	+	0	+	+	+	+	+	+	+	+	+	+	+	−	−	−	−
10	+	+	+	+	−	0	−	+	+	+	+	+	−	+	+	+	−	+	+	+	0	+	+	+	+	+	+	+	−	0	0	−
11	+	+	+	+	+	+	+	+	0	+	+	+	−	0	+	+	0	+	+	+	+	+	+	+	+	+	+	+	−	−	−	−
12	+	+	+	0	+	+	+	+	+	+	+	+	+	+	+	+	0	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
13	+	+	+	+	0	+	0	+	+	+	+	0	+	+	+	−	0	0	0	+	+	+	+	+	+	+	+	+	−	0	−	−
14	+	+	+	+	0	0	+	+	+	0	0	+	−	+	+	0	0	0	0	+	0	+	+	+	+	0	0	+	−	−	−	0
15	0	+	+	+	+	+	+	+	+	+	+	+	−	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	0	+	+	0
16	+	+	+	+	0	+	+	+	0	+	+	+	0	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	−	0	−
17	+	+	+	+	−	−	−	0	+	+	+	+	−	−	0	−	0	+	+	+	+	+	+	+	+	+	+	−	−	−	−	0
18	+	+	+	+	0	0	−	−	+	+	+	+	0	−	0	−	0	+	+	+	+	+	+	+	+	+	+	+	−	−	−	0
19	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	0	+	+	+	+	+	+	+	+	+	+	+	+	−	−	+	−
20	+	+	+	+	+	−	0	+	+	+	+	+	0	−	−	−	0	+	+	+	+	+	+	+	+	+	+	+	−	−	−	−
21	+	+	+	+	0	−	−	−	+	+	+	+	0	0	0	+	−	+	+	+	+	+	+	+	0	+	+	+	+	−	−	0
22	+	+	+	+	−	0	+	+	+	+	+	+	0	0	0	+	−	+	+	+	+	+	+	+	+	+	+	+	0	−	−	−
23	0	+	+	+	0	0	0	0	0	0	0	+	0	0	0	0	0	0	0	−	0	+	+	+	0	0	0	0	0	0	0	0
24	+	+	+	+	0	−	−	−	0	0	+	+	0	0	+	+	−	0	+	+	+	+	+	+	+	0	−	0	−	−	+	+
25	+	+	+	+	−	0	0	+	0	+	+	0	0	−	−	−	−	−	+	+	+	+	+	+	0	−	0	+	−	−	−	+
26	+	+	+	0	0	+	+	−	+	+	+	+	+	+	0	−	0	0	+	−	0	+	+	−	+	+	0	−	0	0	−	−
27	0	+	+	+	−	+	+	+	0	+	+	+	−	−	−	−	−	0	+	+	0	+	+	+	+	+	+	0	−	−	−	−	−
28	−	+	+	+	−	−	−	−	−	+	+	+	0	−	−	−	−	0	+	+	0	+	+	+	0	+	+	+	0	−	−	−	−
29	+	+	+	+	−	0	+	+	+	+	+	+	0	−	0	+	−	0	+	+	+	+	+	+	0	0	+	+	−	0	0	−
30	+	+	+	+	−	−	0	0	+	+	+	+	−	+	−	+	−	+	0	+	+	+	+	+	+	+	0	+	0	+	−	+

Table S30: Detailed results of Wilcoxon rank-sum tests, comparison *d*-mechanism vs. L-versions - algorithms

	D=10							D=30							D=50							D=100						
f/alg	DE	jDE	IDE	SHADE	b6e6rl	CoDE	EPSDE	DE	jDE	IDE	SHADE	b6e6rl	CoDE	EPSDE	DE	jDE	IDE	SHADE	b6e6rl	CoDE	EPSDE	DE	jDE	IDE	SHADE	b6e6rl	CoDE	EPSDE
1	+	0	0	0	0	+	0	+	−	−	+	+	−	+	+	−	−	−	0	0	−	+	−	−	−	−	−	−
2	+	0	0	0	0	+	0	+	0	0	0	−	+	0	+	−	+	0	0	+	+	+	−	0	+	−	+	+
3	+	0	0	0	0	0	0	+	0	0	0	0	−	0	+	−	−	0	+	−	+	+	−	−	+	+	−	+
4	+	−	0	0	0	+	0	+	−	+	0	+	+	0	+	−	0	−	−	+	−	+	−	−	−	−	+	−
5	+	+	+	+	0	+	+	0	+	+	+	+	+	+	0	+	+	+	+	+	+	0	+	+	+	+	+	+
6	+	0	0	0	0	+	0	+	+	+	+	+	+	0	+	+	+	+	+	+	+	+	+	+	+	+	+	+
7	+	0	0	0	+	+	+	+	+	+	+	0	−	0	+	+	+	+	−	−	+	+	−	−	+	−	+	−
8	0	0	0	0	0	0	0	+	0	−	0	0	+	+	+	0	−	−	−	−	+	+	−	−	−	−	+	+
9	+	+	0	0	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
10	+	0	0	0	0	0	0	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	0	0	−	+	+	+
11	+	+	0	+	+	+	+	+	+	0	+	+	+	+	0	+	0	+	+	+	+	+	+	+	+	+	+	+
12	+	+	+	+	+	+	+	+	+	+	+	+	+	+	0	+	0	+	+	+	+	0	+	−	+	+	+	+
13	+	+	+	+	0	+	+	+	0	0	+	0	+	−	0	0	+	+	0	+	−	+	−	+	+	0	−	−
14	+	+	0	0	+	+	+	0	+	0	+	+	0	+	0	+	0	+	+	−	+	+	0	−	+	−	0	−
15	0	+	0	0	+	+	+	+	0	−	+	0	0	0	+	0	−	+	−	+	−	+	0	−	+	−	+	+
16	+	+	0	+	+	+	+	+	+	0	+	+	+	+	0	+	0	+	+	+	+	+	+	−	+	+	+	+
17	+	0	+	0	0	+	+	+	+	0	+	+	+	+	+	+	+	+	+	0	+	+	−	−	+	+	0	+
18	+	0	0	0	+	+	0	+	+	0	+	+	+	+	+	+	+	+	+	+	+	+	0	+	+	+	−	+
19	+	+	+	+	+	+	+	+	0	0	+	+	+	+	+	+	0	+	0	+	+	+	+	0	0	−	+	+
20	+	+	0	0	0	+	+	+	+	+	+	+	+	+	+	+	0	+	+	+	+	+	+	−	+	+	0	+
21	+	+	0	0	0	+	+	+	+	−	+	0	+	+	+	+	+	+	+	+	+	+	−	−	+	+	+	+
22	+	+	−	0	0	+	+	+	+	+	+	0	0	+	+	+	+	+	0	+	+	+	+	+	+	+	+	+
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	+	0	0	0	0	0	0	+	0	−	0	−	+	0
24	+	+	0	0	0	+	+	+	+	+	+	+	0	+	+	+	+	+	+	−	+	+	+	−	+	+	+	+
25	+	0	0	0	0	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	0	+
26	+	0	0	+	0	+	+	+	0	+	+	0	+	−	+	0	+	+	+	+	0	0	−	−	−	−	0	−
27	+	0	0	0	0	+	+	+	0	0	+	0	0	0	+	+	+	+	+	+	+	+	+	+	+	+	+	+
28	0	0	0	0	0	0	0	+	+	+	0	+	+	0	+	+	+	0	+	+	0	+	+	+	+	+	+	0
29	+	0	0	0	0	+	0	+	0	0	+	+	−	+	+	−	0	+	+	−	+	+	−	−	+	−	+	+
30	+	0	0	0	0	+	0	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Table S31: Detailed results of Wilcoxon rank-sum tests, comparison d-mechanism vs. original algorithms - dimensions

	D=10								D=30								D=50								D=100							
f/alg	DE	jDE	IDE	SHADE	b6e6rl	CoDE	EPSDE	jSO	DE	jDE	IDE	SHADE	b6e6rl	CoDE	EPSDE	jSO	DE	jDE	IDE	SHADE	b6e6rl	CoDE	EPSDE	jSO	DE	jDE	IDE	SHADE	b6e6rl	CoDE	EPSDE	jSO
1	+	+	+	0	0	+	0	0	+	0	+	−	−	+	−	0	+	−	+	−	0	+	−	−	+	−	+	−	+	+	−	−
2	+	0	0	0	0	+	0	0	+	0	+	0	−	+	0	0	+	+	+	0	+	+	+	0	+	+	+	+	−	+	+	−
3	0	0	0	0	0	0	0	0	+	0	+	0	0	+	0	0	+	+	+	0	+	+	+	0	+	+	+	0	+	+	+	−
4	0	−	0	0	0	+	0	0	+	+	+	0	+	+	+	0	+	+	+	+	+	+	+	+	+	+	+	+	0	+	0	+
5	+	+	+	+	0	+	+	+	+	+	+	+	+	+	+	+	0	+	+	+	+	+	+	+	0	+	+	+	+	+	+	+
6	+	0	+	+	0	+	0	0	+	+	+	+	+	+	+	0	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	−
7	+	−	−	−	0	+	+	−	+	0	+	0	0	−	0	0	+	0	+	0	−	−	0	0	+	+	+	0	−	+	−	0
8	0	0	0	0	0	0	0	0	+	0	+	0	0	+	+	0	+	0	+	−	−	+	+	−	+	−	+	+	+	+	+	−
9	+	+	0	+	0	+	+	−	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	−
10	+	−	+	−	−	0	+	−	+	0	+	+	+	+	+	0	+	−	+	+	+	+	+	0	+	+	+	+	+	+	+	−
11	+	+	0	−	0	+	+	−	+	+	+	0	+	+	+	−	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	−
12	+	+	+	+	0	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	0	+	+	+	+	+	+	+
13	+	0	+	+	0	+	+	−	+	+	+	+	0	+	+	0	+	0	+	+	0	+	+	−	+	+	0	−	+	+	+	−
14	+	0	+	−	0	0	+	−	+	0	0	+	0	+	0	−	+	+	0	+	0	+	0	+	+	+	+	+	0	+	+	+	0
15	0	+	+	−	+	+	+	0	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	−	+	+	+	0
16	+	0	0	0	+	+	+	−	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	0	+	+	+	+	+	+	+	−
17	+	−	+	−	0	+	+	−	+	−	+	−	+	+	+	−	+	−	+	0	+	+	+	−	+	0	+	−	+	+	−	0
18	+	0	+	0	0	+	+	−	+	0	+	−	+	+	+	−	+	−	+	0	+	+	+	−	+	−	+	−	+	+	+	0
19	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	0	+	+	+	−
20	+	+	+	0	0	+	+	−	+	−	+	−	+	+	+	−	+	0	+	−	+	+	+	−	+	+	+	−	+	+	+	−
21	+	0	+	0	−	+	0	+	+	−	+	0	+	+	+	−	+	−	+	0	+	+	+	−	+	−	+	+	+	+	+	0
22	+	−	+	0	−	+	+	0	+	0	+	0	+	+	+	−	+	+	+	0	+	+	+	−	+	+	+	+	+	+	+	−
23	0	0	0	0	0	0	0	0	+	0	0	0	0	+	0	0	+	0	0	0	0	+	0	0	+	0	+	0	−	+	0	0
24	+	0	0	0	−	+	+	−	+	−	0	0	0	+	0	−	+	−	+	+	+	+	−	+	+	−	+	+	−	+	+	0	+
25	+	−	0	0	−	+	0	−	+	0	+	−	−	+	−	−	+	0	+	−	+	+	0	+	+	+	+	0	−	+	+	+	+
26	+	0	+	+	0	0	+	0	+	+	+	+	0	+	+	0	+	+	+	0	+	+	0	−	0	−	−	+	−	−	−	−	−
27	0	−	0	−	−	0	+	−	+	+	+	−	0	+	+	−	+	+	+	−	+	+	0	−	+	+	+	+	−	+	+	−	−
28	−	−	−	0	−	0	0	−	+	−	+	−	0	+	+	−	+	−	+	−	+	+	+	−	+	−	+	+	−	+	+	0	−
29	+	−	+	0	−	+	0	−	+	0	+	−	0	+	0	0	+	+	+	0	+	+	+	0	+	+	+	+	−	+	+	+	−
30	+	−	+	−	−	+	+	0	+	−	+	+	+	+	+	+	+	0	+	−	0	+	0	−	+	0	+	+	+	+	+	+	+

Table S32: Detailed results of Wilcoxon rank-sum tests, comparison d-mechanism vs. L-versions - dimensions