CEC 2014 Benchmark Functions

baseCSA and modifiedCSA comparison with seven other Meta-Heuristic Algorithms

Function	BestAlgorithm	BaseCSA_Mean	ModCSA_Mean	ABC_Mean	DE_Mean	GA_custom_Mean	GWO_Mean	PSO_Mean	SSA_Mean	WOA_Mean
F1	DE	902103873.4	762774204.5	279276320	27957.37438	404986.8096	145179002.9	28893836.53	10890281.97	372644509.2
F2	DE	98674890804	87358944511	357400.011	200	16140.98655	4323895083	3892514429	963.9072984	18944693941
F3	DE	139741.527	151357.9325	143346.4613	300.00002	2747.124581	38873.70733	2757.245692	7809.865096	79677.36973
F4	DE	19471.75112	9766.02139	481.6113259	400.3302418	496.405791	691.5768894	1046.310509	477.6331172	8628.949303
F5	SSA	520.960744	521.008961	520.8851735	520.9620908	520.0371446	520.9166595	520.1400688	520	520.5664126
F6	DE	639.5794934	640.7500426	640.1031942	603.0304036	636.4593053	613.5802995	625.0184987	622.5345155	638.9166491
F7	DE	1449.839258	1381.669451	700	700	701.0307771	706.7249115	914.7743449	700.0147725	856.1359015
F8	DE	1212.633157	1214.902889	1063.892534	812.1396205	962.2552571	869.6730363	900.6773794	853.7277236	1071.087597
F9	DE	1383.430973	1390.648757	1171.323397	921.4227549	1090.170502	1002.049303	1078.247342	1056.207599	1153.23918
F10	DE	8258.490683	7955.742927	8329.411548	1316.230325	3849.000496	2743.757942	4217.474214	3589.661377	6730.54962
F11	GWO	8842.123987	8618.266088	9021.679444	8277.1786	5538.881793	3251.398033	6282.852146	3540.133747	8186.93139
F12	PSO	1202.571261	1202.396231	1204.698779	1201.963833	1200.537504	1202.293303	1200.356539	1200.403971	1202.559533
F13	DE	1307.610483	1306.606296	1300.912918	1300.355094	1300.630179	1300.441423	1302.633106	1300.599736	1304.235862
F14	GA_custom	1688.619781	1689.46858	1400.501535	1400.328086	1400.197847	1415.593419	1441.370379	1400.2739	1562.526623
F15	PSO	3529017.096	2992402.392	1530.078562	1513.484394	1681.920181	1520.777972	1505.265592	1512.41597	34526.86803
F16	GWO	1613.498193	1613.562141	1613.365241	1612.008396	1613.397231	1610.862797	1611.508902	1611.266188	1612.983293
F17	DE	29421614.6	30421427.51	5768524.246	6287.644061	416698.612	454867.8085	658209.1362	321042.8177	3081551.711
F18	DE	1131754744	1575859313	6423.958859	1818.757614	1937.053286	56355.29615	1178333.036	5535.453377	9428852.912
F19	DE	2152.709943	2291.495172	1907.814004	1904.222448	1944.79774	1916.184468	1967.81553	1915.335246	2311.597358
F20	DE	82912.81369	87858.03824	153566.2518	2213.537832	7244.641844	31618.47304	58248.44986	2234.025071	107551.5306
F21	DE	4984452.152	9968182.617	4021808.812	3299.892175	101283.6299	115956.8476	105785.3986	40581.23078	4367726.696
F22	DE	3979.158063	3526.222815	3192.162548	2289.430011	2989.167369	2950.476342	2666.32443	2912.418448	3319.41621
F23	WOA	3185.870397	3069.545022	2615.244113	2615.244102	2500.447073	2627.691814	2695.470048	2627.875619	2500
F24	GWO	2825.048537	2811.051339	2625.352717	2627.457851	2608.805434	2600.000732	2643.623331	2638.553809	2600.011641
F25	WOA	2766.171893	2791.892132	2756.626171	2703.37521	2700.933947	2709.008609	2711.601934	2714.986028	2700
F26	DE	2707.645755	2707.3397	2700.85202	2700.226697	2800.013512	2800	2704.038062	2700.582461	2800
F27	WOA	3852.603394	3676.340138	3077.482785	3001.472129	2906.84472	3519.097769	3858.83571	3515.931659	2900
F28	WOA	5712.109337	5881.049681	3637.339785	3637.487399	3001.775089	3955.543329	5274.904845	3878.266924	3000
F29	WOA	26907715.22	65537841.23	4315.675711	3694.282009	8337.172017	8038.596932	56412909.98	11501538.72	3100
F30	GA_custom	812704.0263	684940.2087	18593.69	4347.843289	3540.648915	21842.97981	13682.53288	20603.41347	852901.1944

baseCSA and modifiedCSA comparison with other CSA Variants

Function	BestAlgorithm	BaseCSA_Mean	ModCSA_Mean	CSA_ADAPTIVE_Mean	CSA_CHAOTIC_Mean	CSA_LF_Mean	CSA_OB_Mean	CSA_PSO_Mean
F1	CSA_CHAOTIC	1218177344	1093465797	24247689.58	1574159.575	2565498.023	2664320.022	150378529.3
F2	CSA_CHAOTIC	87910045461	96936566805	6900.746584	3335.048604	31022.66145	10811061.55	72987955346
F3	CSA_CHAOTIC	178874.3183	138047.5968	145859.0288	2873.212105	8973.325835	4156.440012	275232.0317
F4	CSA_LF	19029.13276	15255.05107	530.4976509	472.0813754	470.7449811	474.2528443	7965.45233
F5	CSA_LF	520.9483229	520.9920369	520.0062823	520.0178646	520.0056291	520.987899	520.6714934
F6	CSA_OB	640.4611269	642.6180583	645.6592545	640.942159	629.326202	626.3320823	635.0995905
F7	CSA_CHAOTIC	1426.565084	1449.674092	700.0092954	700.0005705	700.0085045	701.1115585	1320.238547
F8	CSA_CHAOTIC	1210.997529	1218.902269	1065.653358	997.0008868	1031.825394	1053.670658	1187.565372
F9	CSA_OB	1353.849456	1366.50554	1236.2945	1163.661464	1269.154846	1155.468585	1381.648492
F10	CSA_LF	8403.454351	8074.571865	5414.853253	6133.218508	3907.008169	5730.961044	7288.250357
F11	CSA_ADAPTIVE	8480.437279	8795.181245	5645.929846	6459.098561	5882.789399	5744.384376	7409.633609
F12	CSA_CHAOTIC	1202.983466	1202.489725	1201.20784	1200.219245	1200.414816	1200.744116	1202.191156
F13	CSA_OB	1307.919208	1307.549597	1300.380155	1300.702839	1300.42794	1300.26128	1306.631428
F14	CSA_LF	1627.381158	1652.800255	1400.385119	1400.385119	1400.217447	1400.226243	1556.181356
F15	CSA_OB	707366.5932	2679222.705	1778.818318	1528.250081	1514.951443	1514.900037	13722675.38
F16	CSA_OB	1613.406658	1613.225438	1613.954225	1613.572488	1613.233886	1612.606187	1612.834268
F17	CSA_CHAOTIC	32927770.83	45702789.65	213657.8197	17043.05156	98288.03304	87551.1424	6477186.222
F18	CSA_CHAOTIC	2966493274	2295751314	11876.34877	2481.2723	5251.477446	104981.246	575259717.7
F19	CSA_OB	2130.794221	2271.394237	2061.66991	1915.373904	1914.06484	1913.562246	2219.29255
F20	CSA_CHAOTIC	138410.2877	255126.6805	16842.99501	3011.189425	7258.404105	4315.309771	157897.3604
F21	CSA_OB	3975946.057	15663846.14	57363.59131	37713.54205	116089.2839	22311.74164	1591852.11
F22	CSA_CHAOTIC	4003.086177	4039.974762	3336.110128	2736.645667	3280.289775	3217.256819	3456.101366
F23	CSA_LF	3186.276979	3248.201269	2617.276148	2615.276039	2615.273056	2615.354814	2977.179031
F24	CSA_OB	2813.620477	2823.953432	2691.058843	2664.99	2669.987418	2647.63645	2941.940539
F25	CSA_OB	2796.874533	2763.975525	2715.706101	2717.616101	2717.890938	2707.045981	2732.177771
F26	CSA_OB	2706.517627	2708.395461	2700.802334	2800.11488	2800.163449	2700.52584	2705.186727
F27	BaseCSA	3753.740008	3879.818862	4874.060925	4188.103319	3931.267136	3798.347621	3829.9444
F28	CSA_PSO	5638.855663	6485.553029	8021.714682	7229.743667	7393.661731	7383.540466	4173.886488
F29	CSA_LF	95143203.87	72947879.07	12008.21565	20751904.28	10963.74576	16345.11642	555606.7568
F30	CSA_OB	583905.6306	1044748.795	15179.70393	12872.40759	13821.34351	9368.507084	45649.46493