Comparison of optimization results for the CEC benchmark functions 2005 (Fix Dim)

Functions			ORCAS_1	ORCAS_2	ORCAS_3	ORCAS_4	GWO	PSO	GA
Unimodal Functions	F1	Mean	5.18E-04	1.65E-05	1.76E-09	**0.00E+00**	4.33E-31	4.98E+00	9.80E+01
		Std	3.99E-04	2.81E-05	1.83E-09	0.00E+00	3.69E-31	5.14E+00	4.28E+01
		CPU	0.302	0.250	0.490	0.443	0.313	0.229	0.406
	F2	Mean	5.85E-03	1.56E-03	7.49E-05	**4.55E-230**	1.21E-18	3.10E-01	3.28E+00
		Std	4.93E-03	1.67E-03	9.74E-05	0.00E+00	8.45E-19	3.52E-02	5.13E-01
		CPU	0.552	0.245	0.417	0.474	0.318	0.229	0.422
	F3	Mean	2.74E-01	3.34E-03	1.05E-07	**0.00E+00**	8.89E-05	8.04E+03	1.90E+04
		Std	3.27E-01	4.20E-03	1.43E-07	0.00E+00	1.42E-04	2.52E+03	6.35E+03
		CPU	0.667	0.328	0.807	0.870	0.464	0.464	0.620
	F4	Mean	2.03E-03	2.37E-03	8.70E-06	**1.09E-233**	2.79E-06	2.33E+01	2.35E+01
		Std	8.21E-04	3.56E-03	7.21E-06	0.00E+00	1.94E-06	2.62E+00	2.07E-01
		CPU	0.339	0.234	0.396	0.417	0.318	0.219	0.391
	F5	Mean	2.53E+00	4.42E+00	**2.27E+00**	2.87E+01	2.63E+01	8.47E+02	6.25E+03
		Std	3.89E+00	3.65E+00	2.53E+00	3.86E-04	7.39E-01	4.12E+02	9.49E+02
		CPU	0.552	0.250	0.438	0.438	0.443	0.307	0.474
	F6	Mean	**3.89E-02**	1.67E+00	5.74E-02	1.91E-01	7.48E-01	3.27E+00	9.50E+01
		Std	2.98E-02	2.22E+00	8.09E-02	1.54E-01	4.97E-01	1.78E+00	9.26E+00
		CPU	0.448	0.229	0.417	0.406	0.333	0.229	0.422
	F7	Mean	3.11E-04	**1.43E-04**	2.26E-04	3.77E-03	2.66E-03	1.50E-01	1.45E-01
		Std	1.35E-04	1.06E-04	1.66E-04	1.20E-03	1.37E-03	5.02E-02	5.10E-02
		CPU	0.604	0.313	0.625	0.688	0.406	0.438	0.563
Multimodal Functions	F8	Mean	-1.91E+03	-2.02E+03	-3.23E+03	-4.36E+03	-5.61E+03	-1.06E+04	**-1.23E+04**
		Std	5.56E+02	7.00E+02	1.41E+03	8.74E+02	5.78E+02	6.16E+02	1.08E+02
		CPU	0.370	0.250	0.458	0.589	0.396	0.313	0.604
	F9	Mean	4.73E-05	1.14E-05	3.61E-07	**0.00E+00**	4.87E+00	8.96E+01	1.81E+01
		Std	6.54E-05	8.64E-06	6.18E-07	0.00E+00	5.31E+00	1.48E+01	4.80E+00
		CPU	0.531	0.255	0.505	0.495	0.401	0.281	0.547
	F10	Mean	2.99E-03	8.19E-04	2.16E-05	**4.44E-16**	3.24E-14	1.58E+00	4.05E+00
		Std	1.49E-03	7.07E-04	3.60E-05	0.00E+00	0.00E+00	3.01E-01	3.36E-01
		CPU	0.521	0.266	0.484	0.474	0.365	0.297	0.536
	F11	Mean	6.88E+01	6.16E+00	4.30E-11	**0.00E+00**	1.08E-02	9.93E-01	2.23E+00
		Std	1.18E+02	7.58E+00	5.58E-11	0.00E+00	9.62E-03	2.57E-02	4.29E-01
		CPU	0.552	0.313	0.536	0.516	0.359	0.333	0.609
	F12	Mean	2.18E-03	5.62E-02	**1.94E-03**	4.50E-03	2.50E-02	5.11E+00	5.72E-01
		Std	5.61E-04	7.25E-02	1.64E-03	4.86E-03	2.55E-03	5.32E+00	1.63E-01
		CPU	0.750	0.443	1.271	1.193	0.615	0.703	0.786
	F13	Mean	1.86E-01	2.05E-01	**1.06E-02**	7.35E-01	5.92E-01	2.05E+01	4.47E+00
		Std	1.21E-01	1.18E-02	4.68E-03	6.38E-01	1.96E-01	1.72E+01	1.53E+00
		CPU	0.505	0.411	1.073	1.104	0.568	0.656	0.703
	F14	Mean	1.27E+01	9.44E+00	1.27E+01	1.17E+01	5.25E+00	**9.98E-01**	1.76E+00
		Std	6.45E-13	5.59E+00	2.45E-13	1.70E+00	4.80E+00	0.00E+00	3.01E-01
		CPU	0.693	0.568	1.740	1.750	0.635	0.880	0.896
	F15	Mean	8.09E-04	**3.47E-04**	4.10E-04	9.63E-04	6.99E-03	7.50E-03	1.06E-02
		Std	7.51E-04	3.32E-05	8.64E-05	2.30E-04	1.16E-02	1.14E-02	9.36E-03
		CPU	0.260	0.240	0.391	0.411	0.146	0.271	0.344
	F16	Mean	-8.82E-01	-1.02E+00	-1.03E+00	-9.06E-01	-1.03E+00	**-1.03E+00**	-1.02E+00
		Std	1.87E-01	1.57E-02	6.13E-06	1.51E-01	3.94E-09	0.00E+00	1.27E-02
		CPU	0.552	0.271	0.391	0.406	0.135	0.266	0.391

Fixed-Dim Multimodal Functions	F17	Mean	1.08E+00	1.25E+00	1.37E+00	5.48E-01	3.98E-01	**3.98E-01**	4.51E-01
		Std	5.69E-01	4.89E-01	5.52E-01	1.15E-01	8.45E-08	0.00E+00	6.77E-02
		CPU	0.495	0.328	0.453	0.464	0.135	0.307	0.359
	F18	Mean	2.48E+01	2.10E+01	1.84E+01	2.37E+01	3.00E+00	**3.00E+00**	1.37E+01
		Std	6.90E+00	1.35E+01	1.39E+01	1.63E+01	3.14E-05	2.72E-15	1.85E+01
		CPU	0.583	0.318	0.448	0.401	0.109	0.260	0.333
	F19	Mean	-1.02E+00	-1.38E+00	-1.80E+00	-3.54E+00	-3.86E+00	**-3.86E+00**	-3.85E+00
		Std	1.94E-01	7.11E-01	7.58E-02	7.20E-02	1.87E-03	4.44E-16	6.28E-03
		CPU	0.615	0.302	0.453	0.443	0.161	0.260	0.391
	F20	Mean	-1.67E+00	-1.38E+00	-1.63E+00	-2.04E+00	-3.28E+00	**-3.32E+00**	-3.28E+00
		Std	2.61E-01	7.21E-02	2.18E-01	3.77E-01	7.19E-02	0.00E+00	7.02E-02
		CPU	0.615	0.333	0.406	0.453	0.214	0.255	0.573
	F21	Mean	-7.92E+00	-7.90E+00	**-1.01E+01**	-9.89E+00	-6.75E+00	-7.66E+00	-5.32E+00
		Std	1.94E+00	1.47E+00	7.86E-02	1.53E-01	2.94E+00	4.31E+00	4.03E+00
		CPU	0.875	0.286	0.484	0.542	0.198	0.276	0.432
	F22	Mean	-4.84E+00	-5.81E+00	-1.02E+01	-9.91E+00	-6.86E+00	**-1.04E+01**	-7.38E+00
		Std	1.80E-01	1.86E+00	1.11E-01	4.05E-01	3.07E+00	0.00E+00	4.07E+00
		CPU	0.667	0.271	0.474	0.500	0.219	0.354	0.521
	F23	Mean	-7.46E+00	-5.01E+00	-1.04E+01	-1.03E+01	-6.93E+00	**-1.05E+01**	-5.82E+00
		Std	2.90E+00	7.02E-01	9.44E-02	1.43E-01	3.12E+00	0.00E+00	3.60E+00
		CPU	0.641	0.292	0.516	0.578	0.234	0.333	0.547
Total number of best answers			1	2	4	7	0	8	1
Rank by total number of best answers			5	4	3	2	7	1	5
Average rating in the set			4.65	4.48	2.96	3.17	3.30	4.13	5.30
Rank based on the average in the set			6	5	1	2	3	4	7