TABLE SIV

COMPARISON RESULTS OF THE COMPARED ALGORITHMS ON 1000-D CEC'2010 FUNCTIONS WITH 3×10^6 FITNESS EVALUATIONS.

Function	Quality	DHLSO	CSO	SL-PSO	MOS	MA-SW-Chains	DMS-L-PSO	CCPSO2	DECC-G	MLCC	DECC-DG
F_1	Median	2.93E-22	4.40E-12	7.90E-18	0.00E+00	8.23E-21	1.61E+07	7.80E-01	3.53E-07	1.66E-14	1.42E+02
	Mean	3.13E-22	4.50E-12	8.73E-18	1.94E-15	9.75E-20	1.63E+07	2.96E+00	3.54E-07	8.65E-13	1.88E+04
	Std	8.03E-23	5.94E-13	3.30E-18	1.06E-14	6.68E-20	1.41E+06	6.68E+00	1.44E-07	2.97E-12	4.66E+04
	p-value	-	3.02E-11+	3.02E-11+	3.43E-08+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+
F_2	Median	9.85E+02	7.33E+03	1.93E+03	1.95E-14	5.06E+02	5.53E+03	4.25E+00	1.32E+03	2.43E+00	4.46E+03
	Mean	9.82E+02	7.42E+03	1.93E+03	2.87E-02	5.74E+02	5.45E+03	4.30E+00	1.33E+03	2.89E+00	4.43E+03
	Std	4.39E+01	2.86E+02	1.12E+02	1.18E-01	1.41E+02	5.38E+02	1.11E+00	2.55E+01	1.52E+00	1.87E+02
	p-value	-	3.02E-11+	3.02E-11+	2.98E-11-	3.02E-11-	3.02E-11+	3.02E-11-	3.02E-11+	3.02E-11-	3.02E-11+
F_3	Median	2.89E-14	2.53E-09	1.85E+00	1.46E-13	9.42E-13	1.56E+01	4.16E-03	1.14E+00	6.24E-10	1.66E+01
	Mean	2.76E-14	2.60E-09	1.88E+00	1.49E-13	1.12E-12	1.56E+01	4.51E-03	1.10E+00	2.10E-07	1.66E+01
	Std	2.38E-15	2.62E-10	3.30E-01	8.35E-15	5.73E-13	1.08E-01	1.66E-03	3.35E-01	1.12E-06	3.02E-01
	p-value	-	9.25E-12+	9.25E-12+	7.03E-12+	9.23E-12+	9.25E-12+	9.25E-12+	9.21E-12+	9.25E-12+	9.25E-12+
F_4	Median	4.37E+11	7.26E+11	3.04E+11	8.42E+11	2.73E+11	4.32E+11	1.45E+12	2.46E+13	1.78E+13	5.08E+12
	Mean	4.40E+11	7.25E+11	2.99E+11	8.53E+11	2.74E+11	4.42E+11	1.70E+12	2.59E+13	1.71E+13	5.22E+12
	Std	1.10E+11	1.23E+11	7.16E+10	1.30E+11	7.24E+10	8.05E+10	1.04E+12	8.14E+12	5.47E+12	1.89E+12
	p-value	-	3.20E-09+	1.49E-06-	5.00E-09+	9.83E-08-	9.59E-01=	6.07E-11+	3.02E-11+	3.02E-11+	3.02E-11+
F_5	Median	1.19E+07	2.00E+06	3.29E+07	4.91E+08	3.54E+07	9.35E+07	3.76E+08	2.50E+08	5.11E+08	1.52E+08
	Mean	1.22E+07	2.86E+06	3.17E+07	4.86E+08	3.42E+07	9.25E+07	4.14E+08	2.69E+08	4.99E+08	1.55E+08
	Std	3.43E+06	1.79E+06	6.21E+06	5.52E+07	6.69E+06	9.04E+06	1.38E+08	6.84E+07	1.07E+08	2.15E+07
	p-value	-	8.11E-11-	3.00E-11+	3.00E-11+	3.00E-11+	3.00E-11+	3.00E-11+	3.00E-11+	3.00E-11+	3.00E-11+
F_6	Median	4.00E-09	8.23E-07	2.15E+01	1.97E+07	7.58E-09	3.66E+01	1.97E+07	4.71E+06	1.97E+07	1.64E+01
	Mean	5.20E-01	8.21E-07	2.08E+01	1.97E+07	1.41E+05	3.78E+01	1.71E+07	5.00E+06	1.78E+07	1.63E+01
	Std	7.46E-01	2.68E-08	2.63E+00	1.44E+05	3.67E+05	1.21E+01	5.20E+06	1.03E+06	4.37E+06	3.45E-01
	p-value	-	7.39E-02=	1.79E-11+	1.79E-11+	1.45E-02+	1.79E-11+	1.79E-11+	1.79E-11+	1.79E-11+	1.79E-11+
F_7	Median	1.22E+01	2.04E+04	4.06E+04	2.83E+08	1.02E+01	3.47E+06	2.67E+06	6.57E+08	1.15E+08	9.20E+03
	Mean	7.19E+02	2.01E+04	6.49E+04	3.71E+08	1.04E+01	3.47E+06	2.06E+08	8.14E+08	1.51E+08	1.41E+04
	Std	2.59E+03	3.86E+03	5.60E+04	2.47E+08	4.02E+00	1.16E+05	4.31E+08	5.40E+08	1.45E+08	1.26E+04
	p-value	-	4.50E-11+	9.92E-11+	3.02E-11+	3.95E-01=	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+	3.16E-10+
F_8	Median	2.34E+07	3.87E+07	7.43E+06	4.40E+06	4.06E+06	2.02E+07	2.00E+07	9.06E+07	8.82E+07	1.62E+07
	Mean	2.34E+07	3.87E+07	7.81E+06	6.08E+06	1.15E+07	2.03E+07	4.13E+07	8.56E+07	6.59E+07	2.75E+07
	Std	2.46E+05	6.81E+04	1.56E+06	6.22E+06	2.04E+07	1.88E+06	3.84E+07	2.64E+07	3.40E+07	2.63E+07
	p-value	-	3.02E-11+	3.02E-11-	1.33E-10-	3.99E-04-	2.44E-09-	1.86E-01=	8.48E-09+	6.77E-05+	3.99E-04+
F_9	Median	4.33E+07	7.05E+07	3.22E+07	2.11E+07	3.02E+07	2.08E+07	1.14E+08	4.35E+08	2.48E+08	5.52E+07
	Mean	4.36E+07	7.03E+07	3.30E+07	2.09E+07	3.07E+07	2.08E+07	1.02E+08	4.40E+08	2.43E+08	5.59E+07
	Std	4.28E+06	5.73E+06	4.46E+06	3.69E+06	3.19E+06	1.58E+06	3.30E+07	4.87E+07	2.16E+07	6.45E+06
	p-value	-	3.02E-11+	3.50E-09-	3.02E-11-	8.99E-11-	3.02E-11-	3.34E-11+	3.02E-11+	3.02E-11+	7.38E-10+
F_{10}	Median	8.89E+02	9.59E+03	2.60E+03	6.06E+03	1.33E+03	5.09E+03	5.14E+03	1.02E+04	3.97E+03	4.47E+03
	Mean	8.91E+02	9.60E+03	2.56E+03	6.06E+03	1.33E+03	5.24E+03	5.09E+03	1.03E+04	4.24E+03	4.49E+03
	Std	3.66E+01	7.67E+01	2.17E+02	2.11E+02	5.67E+01	4.26E+02	7.81E+02	3.13E+02	1.45E+03	1.29E+02
	p-value	-	3.01E-11+	3.01E-11+	3.01E-11+	3.00E-11+	3.01E-11+	3.01E-11+	3.01E-11+	3.01E-11+	3.01E-11+
F_{11}	Median	2.75E+00	3.80E-08	2.30E+01	1.99E+02	8.94E+00	1.68E+02	1.98E+02	2.59E+01	1.98E+02	1.02E+01
	Mean	5.80E+00	4.02E-08	2.32E+01	1.98E+02	8.66E+00	1.68E+02	1.98E+02	2.59E+01	1.98E+02	1.02E+01
	Std	5.40E+00	5.12E-09	2.10E+00	2.89E+00	3.25E+00	1.90E+00	2.12E+00	1.73E+00	1.12E+00	8.71E-01
	p-value	-	3.02E-11-	3.02E-11+	3.02E-11+	7.96E-03+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+	5.57E-03+
F_{12}	Median	1.24E+04	4.23E+05	1.31E+04	2.12E+04	6.22E+04	2.83E+01	2.78E+04	9.69E+04	1.01E+05	2.58E+03
	Mean	1.25E+04	4.37E+05	1.75E+04	2.41E+04	6.34E+04	2.39E+01	3.39E+04	9.55E+04	1.03E+05	2.84E+03
	Std	1.46E+03	6.22E+04	9.07E+03	1.09E+04	1.00E+04	9.88E+00	1.19E+04	9.55E+03	1.57E+04	1.08E+03
	p-value	-	3.02E-11+	2.12E-01=	1.96E-10+	3.02E-11+	3.02E-11-	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11-
F_{13}	Median	7.28E+02	5.47E+02	8.48E+02	4.94E+02	8.44E+02	1.03E+05	1.36E+03	4.59E+03	2.12E+03	5.06E+03
	Mean	7.35E+02	6.29E+02	9.59E+02	5.24E+02	9.89E+02	1.05E+05	1.34E+03	5.96E+03	4.22E+03	6.27E+03
	Std	1.93E+02	2.32E+02	3.74E+02	1.54E+02	4.52E+02	6.18E+04	1.72E+02	4.16E+03	4.70E+03	3.65E+03
	p-value	-	1.17E-02-	2.51E-02+	1.34E-05-	1.22E-02+	3.02E-11+	7.39E-11+	3.02E-11+	3.02E-11+	3.02E-11+
F_{14}	Median	1.25E+08	2.52E+08	8.45E+07	5.10E+07	1.68E+08	1.25E+07	3.42E+08	9.72E+08	5.71E+08	3.46E+08
	Mean	1.24E+08	2.49E+08	8.41E+07	5.36E+07	1.70E+08	1.19E+07	3.06E+08	9.78E+08	5.70E+08	3.42E+08
	Std	7.38E+06	1.53E+07	6.31E+06	1.23E+07	1.29E+07	1.62E+06	1.19E+08	7.52E+07	5.50E+07	2.42E+07
	p-value	-	3.02E-11+	3.02E-11-	3.02E-11-	3.02E-11+	3.02E-11-	4.50E-11+	3.02E-11+	3.02E-11+	3.02E-11+
F_{15}	Median	8.40E+02	1.01E+04	1.12E+04	1.28E+04	2.68E+03	5.48E+03	1.04E+04	1.24E+04	8.67E+03	5.86E+03
	Mean	8.33E+02	1.01E+04	1.12E+04	1.29E+04	2.66E+03	5.54E+03	1.08E+04	1.23E+04	8.90E+03	5.86E+03
	Std	4.31E+01	5.23E+01	8.65E+01	4.85E+02	1.50E+02	3.46E+02	1.35E+03	8.24E+02	2.07E+03	1.05E+02
	p-value	-	3.01E-11+	3.01E-11+	3.01E-11+	3.01E-11+	3.01E-11+	3.01E-11+	3.01E-11+	3.01E-11+	3.01E-11+
F_{16}	Median	3.70E+00	5.75E-08	2.21E+01	3.97E+02	6.11E+01	3.18E+02	3.97E+02	6.92E+01	3.96E+02	7.50E-13
	Mean	4.25E+00	5.89E-08	2.51E+01	3.97E+02	5.94E+01	3.17E+02	3.96E+02	6.96E+01	3.81E+02	7.53E-13
	Std	2.41E+00	5.61E-09	1.16E+01	3.95E-01	1.37E+01	2.04E+00	5.73E-01	6.43E+00	5.76E+01	6.25E-14
	p-value	-	3.02E-11-	3.69E-11+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+	3.00E-11-
F_{17}	Median	9.02E+04	2.22E+06	8.92E+04	3.51E+05	8.66E+04	4.75E+01	8.99E+04	3.11E+05	3.47E+05	4.02E+04
	Mean	9.05E+04	2.20E+06	9.00E+04	6.52E+05	1.07E+05	4.29E+01	1.25E+05	3.11E+05	3.49E+05	4.03E+04
	Std	3.53E+03	1.55E+05	1.58E+04	6.22E+05	6.75E+04	1.15E+01	5.25E+04	2.24E+04	3.11E+04	2.29E+03
	p-value	-	3.02E-11+	5.49E-01=	9.26E-09+	7.48E-02=	3.02E-11-	9.23E-01=	3.02E-11+	3.02E-11+	3.02E-11-
F_{18}	Median	2.29E+03	1.76E+03	2.66E+03	1.40E+03	2.41E+03	2.50E+04	3.10E+03	3.54E+04	1.59E+04	1.47E+10
	Mean	2.55E+03	1.73E+03	2.77E+03	1.52E+03	2.53E+03	2.43E+04	3.07E+03	3.83E+04	1.81E+04	1.47E+10
	Std	8.32E+02	5.22E+02	8.33E+02	7.70E+02	6.86E+02	1.10E+04	2.45E+02	1.53E+04	9.48E+03	2.03E+09
	p-value	-	6.77E-05-	1.67E-01=	6.72E-10-	8.77E-01=	3.02E-11+	2.13E-04+	3.02E-11+	8.15E-11+	3.02E-11+
F_{19}	Median	1.79E+06	1.00E+07	5.11E+06	1.57E+06	5.53E+05	2.03E+06	1.51E+06	1.14E+06	2.04E+06	1.75E+06
	Mean	1.80E+06	1.01E+07	5.10E+06	1.59E+06	5.46E+05	2.02E+06	1.52E+06	1.14E+06	2.04E+06	1.75E+06
	Std	9.96E+04	5.64E+05	7.05E+05	2.24E+05	2.80E+04	1.41E+05	7.10E+04	6.23E+04	1.42E+05	1.10E+05
	p-value	-	3.02E-11+	3.02E-11+	3.83E-06-	3.02E-11-	2.60E-08+	4.50E-11-	3.02E-11-	7.09E-08+	1.02E-01=
F_{20}	Median	1.85E+03	9.85E+02	1.79E+03	1.41E+03	1.36E+03	9.82E+02	2.10E+03	4.34E+03	2.27E+03	6.53E+10
	Mean	1.88E+03	1.05E+03	1.85E+03	1.41E+03	1.39E+03	9.87E+02	2.11E+03	4.58E+03	2.30E+03	6.41E+10
	Std	1.90E+02	1.49E+02	2.59E+02	1.37E+02	1.47E+02	1.40E+01	1.79E+02	8.25E+02	2.26E+02	6.97E+09
	p-value	-	4.50E-11-	1.91E-01=	8.15E-11-	9.92E-11-	3.02E-11-	1.64E-05+	3.02E-11+	1.56E-08+	3.02E-11+
w/l/t		-	13/6/1	12/4/4	12/8/0	11/6/3	13/6/1	16/2/2	19/1/0	19/1/0	16/3/1

TABLE SV

COMPARISON RESULTS OF THE COMPARED ALGORITHMS ON 1000-D CEC'2013 FUNCTIONS WITH 3×10^6 FITNESS EVALUATIONS.

Function	Quality	DHLSO	CSO	SL-PSO	MA-SW-Chains	DMS-L-PSO	CCPSO2	DECC-G	MLCC	DECC-DG
F_1	Median	3.86E-22	7.78E-12	1.04E-17	7.90E-21	1.97E+09	2.79E+01	2.06E-06	9.07E-14	6.03E+02
	Mean	3.99E-22	7.71E-12	1.09E-17	1.19E-20	1.98E+09	4.11E+01	3.14E-06	8.60E-10	6.42E+03
	Std	1.32E-22	1.31E-12	2.50E-18	1.11E-20	1.27E+08	3.14E+01	4.27E-06	4.38E-09	1.81E+04
	p-value	-	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**
F_2	Median	1.14E+03	8.55E+03	2.13E+03	6.85E+02	8.61E+03	3.48E+01	1.30E+03	3.57E+00	1.28E+04
	Mean	1.14E+03	8.55E+03	2.13E+03	6.97E+02	8.65E+03	3.50E+01	1.31E+03	3.82E+00	1.27E+04
	Std	5.78E+01	2.65E+02	1.36E+02	5.51E+01	4.88E+02	4.85E+00	3.63E+01	1.73E+00	7.20E+02
	p-value	-	**3.02E-11⁺**	**3.02E-11⁺**	3.02E-11⁻	**3.02E-11⁺**	3.02E-11⁻	**7.38E-11⁺**	3.02E-11⁻	**3.02E-11⁺**
F_3	Median	2.16E+01	2.16E+01	2.16E+01	2.03E+01	2.08E+01	2.00E+01	2.02E+01	2.00E+01	2.14E+01
	Mean	2.16E+01	2.16E+01	2.16E+01	2.03E+01	2.08E+01	2.00E+01	2.02E+01	2.00E+01	2.14E+01
	Std	4.07E-03	6.15E-03	1.45E-02	4.36E-02	1.66E-01	1.25E-04	6.18E-03	2.76E-04	1.45E-02
	p-value	-	3.67E-01=	**3.08E-08⁺**	3.02E-11⁻	3.02E-11⁻	2.19E-11⁻	3.02E-11⁻	3.02E-11⁻	3.02E-11⁻
F_4	Median	6.34E+09	1.28E+10	4.54E+09	5.19E+09	2.97E+11	3.20E+10	2.00E+11	1.99E+11	7.33E+10
	Mean	6.68E+09	1.32E+10	4.35E+09	5.13E+09	2.93E+11	3.49E+10	2.35E+11	2.34E+11	7.70E+10
	Std	1.68E+09	2.54E+09	9.48E+08	1.33E+09	7.25E+10	2.17E+10	1.22E+11	1.26E+11	2.82E+10
	p-value	-	**1.09E-10⁺**	2.02E-08⁻	5.56E-04⁻	**3.02E-11⁺**	**1.01E-08⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**
F_5	Median	6.60E+05	6.04E+05	8.23E+05	1.74E+06	3.92E+06	1.30E+07	8.44E+06	1.17E+07	5.81E+06
	Mean	7.00E+05	5.91E+05	8.41E+05	1.76E+06	3.95E+06	1.40E+07	8.26E+06	1.27E+07	5.78E+06
	Std	1.28E+05	1.07E+05	1.75E+05	3.26E+05	5.82E+05	4.81E+06	1.14E+06	3.46E+06	3.83E+05
	p-value	-	1.95E-03⁻	**4.46E-04⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**
F_6	Median	1.06E+06	1.06E+06	1.06E+06	1.05E+06	9.98E+05	1.05E+06	1.06E+06	1.05E+06	1.06E+06
	Mean	1.06E+06	1.06E+06	1.06E+06	1.05E+06	1.00E+06	1.05E+06	1.06E+06	1.05E+06	1.06E+06
	Std	8.28E+02	1.10E+03	1.48E+03	7.00E+03	5.20E+03	5.24E+03	1.84E+03	4.13E+03	1.07E+03
	p-value	-	1.10E-01=	3.01E-01=	3.01E-11⁻	3.01E-11⁻	3.01E-11⁻	**1.32E-04⁺**	3.01E-11⁻	**9.26E-04⁺**
F_7	Median	1.33E+06	5.26E+06	1.40E+06	2.98E+06	1.22E+09	1.29E+08	1.04E+09	1.15E+09	4.25E+08
	Mean	1.60E+06	5.88E+06	1.63E+06	2.91E+06	1.37E+09	4.15E+08	1.04E+09	1.43E+09	4.78E+08
	Std	8.38E+05	2.58E+06	7.05E+05	1.30E+06	7.64E+08	9.38E+08	4.48E+08	1.07E+09	1.92E+08
	p-value	-	**8.99E-11⁺**	**5.11E-01⁺**	**3.83E-05⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**
F_8	Median	1.16E+14	2.85E+14	9.97E+13	1.26E+14	1.68E+14	8.16E+14	7.90E+15	8.18E+15	2.89E+15
	Mean	1.20E+14	2.60E+14	1.03E+14	1.28E+14	2.79E+14	1.18E+15	7.50E+15	9.59E+15	3.57E+15
	Std	3.35E+13	5.87E+13	3.62E+13	3.44E+13	5.09E+14	9.99E+14	3.18E+15	6.18E+15	1.85E+15
	p-value	-	**2.37E-10⁺**	3.78E-02⁻	4.04E-01=	**3.83E-06⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**
F_9	Median	1.26E+08	5.79E+07	7.94E+07	1.07E+08	3.50E+08	3.63E+09	5.86E+08	8.85E+08	4.95E+08
	Mean	1.30E+08	6.06E+07	8.25E+07	1.09E+08	3.60E+08	3.76E+09	5.96E+08	9.55E+08	4.90E+08
	Std	3.97E+07	1.60E+07	2.03E+07	1.96E+07	4.61E+07	1.02E+09	9.76E+07	2.92E+08	3.18E+07
	p-value	-	3.16E-10⁻	7.60E-07⁻	2.32E-02⁻	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**
F_{10}	Median	9.40E+07	9.40E+07	9.36E+07	9.34E+07	9.11E+07	9.29E+07	9.30E+07	9.27E+07	9.45E+07
	Mean	9.40E+07	9.40E+07	9.25E+07	9.34E+07	9.17E+07	9.30E+07	9.29E+07	9.27E+07	9.45E+07
	Std	2.11E+05	1.51E+05	1.67E+06	3.55E+05	1.06E+06	7.01E+05	6.16E+05	6.07E+05	2.46E+05
	p-value	-	3.40E-01=	3.77E-04⁻	1.61E-10⁻	3.02E-11⁻	3.01E-07⁻	3.82E-10⁻	7.39E-11⁻	**2.39E-08⁺**
F_{11}	Median	9.29E+11	9.35E+11	9.35E+11	4.79E+08	9.44E+10	9.38E+11	1.26E+11	1.90E+11	3.81E+10
	Mean	9.30E+11	9.30E+11	9.33E+11	9.59E+08	1.05E+11	9.37E+11	1.28E+11	2.28E+11	4.83E+10
	Std	9.50E+09	1.03E+10	1.46E+10	1.68E+09	7.53E+10	1.53E+10	7.15E+10	1.53E+11	4.33E+10
	p-value	-	8.88E-01=	8.30E-01=	3.02E-11⁻	3.02E-11⁻	**2.71E-02⁺**	3.02E-11⁻	3.02E-11⁻	3.02E-11⁻
F_{12}	Median	1.79E+03	1.04E+03	1.75E+03	1.34E+03	5.22E+04	2.10E+03	4.19E+03	2.36E+03	1.68E+11
	Mean	1.79E+03	1.07E+03	1.78E+03	1.33E+03	6.99E+04	2.10E+03	4.35E+03	2.49E+03	1.71E+11
	Std	1.39E+02	7.78E+01	1.74E+02	1.00E+02	5.52E+04	1.78E+02	7.83E+02	7.51E+02	2.24E+10
	p-value	-	3.02E-11⁻	5.30E-01=	5.49E-11⁻	**3.02E-11⁺**	**2.83E-08⁺**	**3.02E-11⁺**	**6.70E-11⁺**	**3.02E-11⁺**
F_{13}	Median	2.70E+08	6.28E+08	4.59E+08	9.72E+08	1.32E+10	3.21E+09	8.67E+09	9.94E+09	2.08E+10
	Mean	3.35E+08	6.67E+08	4.65E+08	1.04E+09	1.34E+10	4.02E+09	9.35E+09	1.06E+10	2.05E+10
	Std	1.71E+08	2.45E+08	2.35E+08	3.28E+08	6.58E+09	2.31E+09	2.78E+09	3.73E+09	5.53E+09
	p-value	-	**1.73E-07⁺**	**2.15E-02⁺**	**9.92E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**
F_{14}	Median	1.03E+08	3.15E+09	1.50E+08	5.11E+09	2.21E+11	5.98E+10	1.28E+11	2.06E+11	1.56E+10
	Mean	1.72E+08	3.62E+09	3.28E+08	6.53E+09	2.46E+11	9.10E+10	1.42E+11	2.21E+11	1.92E+10
	Std	1.38E+08	1.44E+09	5.17E+08	5.70E+09	1.26E+11	8.53E+10	5.86E+10	8.54E+10	1.44E+10
	p-value	-	**3.02E-11⁺**	1.15E-01=	**3.69E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**
F_{15}	Median	4.45E+06	7.72E+07	5.88E+07	7.95E+06	1.54E+07	2.72E+06	1.13E+07	1.57E+07	9.52E+06
	Mean	4.48E+06	7.87E+07	5.86E+07	8.48E+06	1.57E+07	4.75E+06	1.16E+07	1.61E+07	9.90E+06
	Std	3.32E+05	6.50E+06	6.11E+06	2.25E+06	3.45E+06	5.07E+06	1.26E+06	1.90E+06	2.30E+06
	p-value	-	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**2.38E-03⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**
w/l/t		-	8/3/4	7/4/4	6/8/1	11/4/0	11/4/0	12/3/0	10/5/0	13/2/0

TABLE SVI

COMPARISON RESULTS OF THE COMPARED ALGORITHMS ON 200-*D* CEC'2010 FUNCTIONS WITH 6×10^5 FITNESS EVALUATIONS.

Function	Quality	DHLSO	CSO	SL-PSO	MOS	MA-SW-Chains	DMS-L-PSO	CCPSO2	DECC-G	MLCC	DECC-DG
F_1	Median	0.00E+00	6.33E-17	2.40E-21	0.00E+00	4.25E-22	4.80E+05	6.34E+01	9.73E-13	3.31E-19	2.14E-21
	Mean	0.00E+00	6.45E-17	2.41E-21	0.00E+00	6.73E-22	4.67E+05	2.44E+02	1.02E-12	3.88E-18	2.43E-21
	Std	0.00E+00	2.18E-17	2.07E-22	0.00E+00	5.11E-22	5.88E+04	4.58E+02	4.32E-13	9.37E-18	1.73E-21
	p-value	-	**1.21E-12**$^+$	**1.21E-12**$^+$	NaN$^=$	**1.21E-12**$^+$	**1.21E-12**$^+$	**1.21E-12**$^+$	**1.21E-12**$^+$	**1.21E-12**$^+$	**1.21E-12**$^+$
F_2	Median	1.02E+02	9.81E+02	3.43E+02	0.00E+00	4.97E+00	5.93E+02	1.45E+00	3.15E+01	7.35E-12	2.12E+02
	Mean	1.00E+02	9.70E+02	3.29E+02	9.56E-03	7.56E+00	5.96E+02	1.86E+00	3.22E+01	1.08E-11	2.11E+02
	Std	1.13E+01	1.10E+02	3.73E+01	5.24E-02	6.40E+00	5.03E+01	1.10E+00	5.29E+00	7.75E-12	1.53E+01
	p-value	-	**3.00E-11**$^+$	**3.00E-11**$^+$	4.08E-12$^-$	2.89E-11$^-$	**3.00E-11**$^+$	3.00E-11$^-$	3.00E-11$^-$	3.00E-11$^-$	**3.00E-11**$^+$
F_3	Median	1.47E-14	1.91E-11	5.02E-14	3.24E-14	2.18E-14	4.13E+00	9.70E-03	1.38E-07	5.33E-14	2.33E+00
	Mean	1.45E-14	1.89E-11	4.99E-14	3.62E-14	2.40E-14	4.13E+00	1.12E-02	1.37E-07	3.04E-13	2.38E+00
	Std	6.49E-16	2.75E-12	1.30E-15	6.32E-15	3.43E-15	2.94E-01	6.71E-03	5.71E-08	7.68E-13	3.29E-01
	p-value	-	**1.72E-12**$^+$	**4.29E-14**$^+$	**8.40E-13**$^+$	**5.44E-13**$^+$	**1.72E-12**$^+$	**1.72E-12**$^+$	**1.72E-12**$^+$	**1.66E-12**$^+$	**1.72E-12**$^+$
F_4	Median	1.59E+12	2.05E+12	1.37E+12	1.20E+12	1.61E+12	2.85E+11	3.59E+12	9.25E+12	5.51E+12	4.16E+13
	Mean	1.72E+12	1.99E+12	1.46E+12	1.21E+12	1.57E+12	2.79E+11	4.05E+12	9.76E+12	5.66E+12	4.31E+13
	Std	4.08E+11	3.67E+11	4.04E+11	4.25E+11	3.53E+11	5.94E+10	1.62E+12	3.31E+12	1.65E+12	9.55E+12
	p-value	-	**5.08E-03**$^+$	3.67E-03$^-$	2.60E-05$^-$	3.33E-01$^=$	3.02E-11$^-$	**2.03E-09**$^+$	**3.02E-11**$^+$	**4.98E-11**$^+$	**3.02E-11**$^+$
F_5	Median	1.59E+07	3.05E+08	3.25E+08	4.86E+08	1.16E+08	8.86E+07	4.34E+08	2.83E+08	2.74E+08	2.51E+08
	Mean	2.39E+07	3.03E+08	3.23E+08	4.72E+08	1.09E+08	9.00E+07	4.36E+08	2.80E+08	3.06E+08	2.50E+08
	Std	4.46E+07	8.87E+06	1.37E+07	6.44E+07	3.78E+07	8.72E+06	1.33E+08	3.78E+07	1.31E+08	2.40E+07
	p-value	-	**3.01E-11**$^+$	**3.01E-11**$^+$	**3.01E-11**$^+$	**5.56E-10**$^+$	**5.56E-10**$^+$	**4.96E-11**$^+$	**5.48E-11**$^+$	**1.20E-10**$^+$	**1.46E-10**$^+$
F_6	Median	4.14E-09	1.67E-07	2.11E+01	1.98E+07	7.55E-09	2.18E+01	1.98E+07	2.29E+06	4.70E+06	1.42E+00
	Mean	2.00E+00	1.67E-07	2.10E+01	1.97E+07	2.31E+05	2.18E+01	1.80E+07	2.32E+06	9.34E+06	1.43E+00
	Std	5.29E+00	6.55E-09	1.51E-01	1.29E+05	4.98E+05	9.16E-02	4.83E+06	3.33E+05	8.10E+06	2.37E-01
	p-value	-	1.95E-03$^-$	**3.02E-11**$^+$	**3.02E-11**$^+$	**1.06E-02**$^+$	**3.02E-11**$^+$	**3.02E-11**$^+$	**3.02E-11**$^+$	**3.02E-11**$^+$	4.60E-05$^-$
F_7	Median	4.13E+04	3.23E+05	3.57E+05	4.65E+08	5.00E+04	6.03E+05	1.69E+07	9.59E+07	1.22E+05	1.27E+10
	Mean	4.29E+04	3.33E+05	3.71E+05	5.48E+08	4.92E+04	6.08E+05	4.30E+08	1.41E+08	1.45E+05	1.19E+10
	Std	3.01E+04	1.09E+05	8.21E+04	4.43E+08	2.17E+04	4.28E+04	1.01E+09	1.50E+08	1.15E+05	2.02E+09
	p-value	-	**3.02E-11**$^+$	**3.02E-11**$^+$	**3.02E-11**$^+$	1.96E-01$^=$	**3.02E-11**$^+$	**3.02E-11**$^+$	**3.02E-11**$^+$	**1.73E-07**$^+$	**3.02E-11**$^+$
F_8	Median	3.73E+07	4.25E+07	3.17E+07	2.73E+06	4.27E+07	1.63E+07	7.68E+07	3.71E+07	4.87E+06	1.04E+08
	Mean	4.15E+07	4.25E+07	4.38E+07	8.95E+06	6.92E+07	1.67E+07	7.34E+07	4.07E+07	1.18E+07	1.10E+08
	Std	1.62E+07	9.50E+04	3.35E+07	1.47E+07	8.93E+07	2.18E+06	5.46E+07	4.74E+07	1.36E+07	2.02E+07
	p-value	-	**8.48E-09**$^+$	**6.28E-06**$^+$	6.53E-08$^-$	8.88E-01$^=$	3.02E-11$^-$	**4.84E-02**$^+$	4.83E-01$^=$	3.02E-11$^-$	**2.61E-10**$^+$
F_9	Median	6.72E+06	8.13E+06	6.84E+06	3.10E+06	5.99E+06	2.78E+06	1.55E+07	3.76E+07	1.71E+07	1.57E+07
	Mean	6.74E+06	8.49E+06	6.71E+06	3.07E+06	5.86E+06	2.87E+06	1.59E+07	3.83E+07	1.69E+07	1.71E+07
	Std	1.20E+06	1.57E+06	1.48E+06	5.86E+05	1.04E+06	3.96E+05	2.78E+06	1.03E+07	4.31E+06	4.76E+06
	p-value	-	**2.13E-05**$^+$	7.51E-01$^=$	3.02E-11$^-$	6.67E-03$^-$	3.02E-11$^-$	**3.02E-11**$^+$	**3.02E-11**$^+$	**3.02E-11**$^+$	**3.02E-11**$^+$
F_{10}	Median	9.25E+01	1.53E+03	1.68E+03	1.03E+03	1.48E+02	6.58E+02	8.03E+02	1.29E+03	4.73E+02	6.38E+02
	Mean	9.36E+01	1.52E+03	1.64E+03	1.03E+03	1.50E+02	6.46E+02	8.18E+02	1.29E+03	4.99E+02	6.41E+02
	Std	8.40E+00	4.16E+01	2.45E+02	1.09E+02	2.34E+01	5.98E+01	1.84E+02	5.96E+01	1.29E+02	2.38E+01
	p-value	-	**3.01E-11**$^+$	**3.01E-11**$^+$	**3.01E-11**$^+$	**9.88E-11**$^+$	**3.01E-11**$^+$	**3.01E-11**$^+$	**3.01E-11**$^+$	**3.01E-11**$^+$	**3.01E-11**$^+$
F_{11}	Median	2.26E-14	7.86E-11	6.60E+00	3.95E+01	1.16E+00	2.29E+01	3.94E+01	3.28E+00	4.56E+00	8.02E-11
	Mean	2.25E-14	8.17E-11	9.29E+00	3.89E+01	1.20E+00	2.28E+01	3.27E+01	3.35E+00	7.22E+00	2.27E-01
	Std	1.14E-15	1.06E-11	7.87E+00	1.79E+00	1.09E+00	7.28E-01	7.61E-01	7.61E-01	8.43E+00	4.21E-01
	p-value	-	**3.16E-12**$^+$	**3.16E-12**$^+$	**3.16E-12**$^+$	**2.95E-12**$^+$	**3.16E-12**$^+$	**3.16E-12**$^+$	**3.16E-12**$^+$	**3.15E-12**$^+$	**3.15E-12**$^+$
F_{12}	Median	9.97E+01	3.23E+03	4.25E+03	1.70E+03	7.85E+02	7.49E-01	7.28E+03	1.81E+03	9.34E+02	1.25E+03
	Mean	1.02E+02	3.22E+03	7.58E+03	1.88E+03	9.29E+02	9.51E-01	8.25E+03	2.08E+03	9.77E+02	1.28E+03
	Std	3.45E+01	6.93E+02	1.04E+04	1.06E+03	4.55E+02	4.83E-01	3.84E+03	9.57E+02	3.63E+02	2.52E+02
	p-value	-	**3.02E-11**$^+$	**3.02E-11**$^+$	**3.34E-11**$^+$	**3.02E-11**$^+$	3.02E-11$^-$	**3.02E-11**$^+$	**3.02E-11**$^+$	**3.02E-11**$^+$	**3.02E-11**$^+$
F_{13}	Median	8.39E+01	8.91E+01	8.46E+01	4.40E+01	1.37E+02	7.32E+01	2.81E+02	4.31E+02	2.90E+02	9.79E+03
	Mean	9.30E+01	9.53E+01	1.37E+02	4.52E+01	1.69E+02	1.31E+02	2.84E+02	6.85E+02	3.52E+02	9.85E+03
	Std	2.20E+01	1.82E+01	1.04E+02	2.23E+01	1.17E+02	6.83E+01	1.01E+03	2.21E+02	1.57E+03
	p-value	-	**9.79E-05**$^+$	7.73E-01$^=$	2.92E-09$^-$	**2.68E-06**$^+$	1.54E-01$^=$	**3.34E-11**$^+$	**6.72E-10**$^+$	**6.72E-10**$^+$	**3.02E-11**$^+$
F_{14}	Median	2.02E+07	3.52E+07	2.04E+07	4.98E+06	2.10E+07	1.49E+06	3.51E+07	9.94E+07	4.00E+07	5.73E+07
	Mean	2.03E+07	3.51E+07	2.01E+07	5.01E+06	2.06E+07	1.54E+06	3.52E+07	9.93E+07	3.91E+07	5.73E+07
	Std	2.60E+06	4.81E+06	3.23E+06	8.33E+05	2.12E+06	2.68E+05	6.13E+06	1.80E+07	7.05E+06	1.07E+07
	p-value	-	**3.02E-11**$^+$	8.77E-01$^=$	3.02E-11$^-$	3.95E-01$^=$	3.02E-11$^-$	**6.70E-11**$^+$	**3.02E-11**$^+$	**3.34E-11**$^+$	**3.02E-11**$^+$
F_{15}	Median	1.70E+03	1.76E+03	1.93E+03	2.36E+03	3.38E+02	6.74E+02	1.79E+03	2.00E+03	1.01E+03	1.17E+03
	Mean	1.69E+03	1.75E+03	1.92E+03	2.33E+03	3.37E+02	6.70E+02	1.87E+03	2.02E+03	1.05E+03	1.17E+03
	Std	6.70E+01	2.44E+01	3.61E+01	1.42E+02	2.62E+01	5.44E+01	3.82E+02	9.96E+01	2.17E+02	4.02E+01
	p-value	-	**1.70E-08**$^+$	**3.02E-11**$^+$	**3.02E-11**$^+$	3.02E-11$^-$	3.02E-11$^-$	2.01E-01$^=$	**3.02E-11**$^+$	3.69E-11$^-$	3.02E-11$^-$
F_{16}	Median	3.02E-14	7.52E-11	9.53E-01	7.92E+01	4.26E+02	3.26E+01	7.90E+01	9.20E+00	8.93E+00	3.52E-11
	Mean	2.94E-14	7.89E-11	1.97E+00	7.92E+01	4.26E+02	3.26E+01	7.65E+01	1.01E+01	1.58E+01	3.64E-11
	Std	1.53E-15	1.05E-11	3.37E+00	2.04E-01	5.04E-01	2.63E+00	6.08E+00	3.57E+00	2.14E+01	7.93E-12
	p-value	-	**7.57E-12**$^+$	**7.42E-12**$^+$	**7.57E-12**$^+$	**7.57E-12**$^+$	**7.57E-12**$^+$	**7.57E-12**$^+$	**7.57E-12**$^+$	**7.57E-12**$^+$	**7.57E-12**$^+$
F_{17}	Median	4.80E+03	1.11E+05	5.10E+04	1.74E+03	2.73E+04	4.38E+00	1.95E+04	1.29E+04	1.23E+04	7.88E+03
	Mean	4.81E+03	1.14E+05	5.31E+04	1.89E+03	2.86E+04	4.15E+00	2.07E+04	1.35E+04	1.23E+04	7.87E+03
	Std	8.69E+02	1.70E+04	1.12E+04	8.75E+02	8.02E+03	1.61E+00	5.90E+03	2.41E+03	2.07E+03	1.04E+03
	p-value	-	**3.02E-11**$^+$	**3.02E-11**$^+$	1.33E-10$^-$	**3.02E-11**$^+$	3.02E-11$^-$	**3.02E-11**$^+$	**3.02E-11**$^+$	**3.02E-11**$^+$	**4.98E-11**$^+$
F_{18}	Median	1.77E+02	1.82E+02	3.09E+02	9.88E+01	2.99E+02	1.10E+02	5.66E+02	1.28E+03	4.06E+02	6.46E+02
	Mean	1.87E+02	1.94E+02	3.46E+02	1.01E+02	3.28E+02	1.44E+02	6.09E+02	1.68E+03	4.90E+02	6.44E+02
	Std	3.00E+01	2.48E+01	1.45E+02	4.12E+01	1.64E+02	8.11E+01	1.55E+02	1.64E+03	2.09E+02	8.92E+01
	p-value	-	**4.35E-05**$^+$	**1.25E-07**$^+$	5.00E-06$^-$	**8.84E-07**$^+$	3.37E-05$^-$	**3.02E-11**$^+$	**3.02E-11**$^+$	**3.69E-11**$^+$	**3.02E-11**$^+$
F_{19}	Median	4.04E+04	3.62E+05	3.38E+05	2.10E+03	1.04E+04	1.89E+04	9.53E+04	3.54E+04	4.86E+04	9.37E+04
	Mean	4.11E+04	3.58E+05	3.43E+05	2.30E+03	1.07E+04	1.77E+04	9.67E+04	3.58E+04	4.83E+04	9.50E+04
	Std	5.09E+03	2.82E+04	5.34E+04	9.74E+02	1.99E+03	5.24E+03	1.92E+04	6.63E+03	5.12E+03	9.49E+03
	p-value	-	**3.02E-11**$^+$	**3.02E-11**$^+$	3.02E-11$^-$	3.02E-11$^-$	3.02E-11$^-$	**3.02E-11**$^+$	7.70E-02$^=$	**5.09E-06**$^+$	**3.02E-11**$^+$
F_{20}	Median	1.88E+02	1.92E+02	2.86E+02	1.06E+01	3.15E+02	1.65E+02	5.17E+02	5.81E+02	3.66E+02	3.63E+02
	Mean	2.82E+02	2.39E+02	3.62E+02	3.09E+01	3.44E+02	1.65E+02	5.23E+02	6.37E+02	3.52E+02	3.57E+02
	Std	1.98E+02	1.58E+02	2.32E+02	3.93E+01	1.20E+02	1.72E+00	1.11E+02	1.99E+02	8.24E+01	6.32E+01
	p-value	-	2.71E-02$^-$	**6.10E-03**$^+$	3.02E-11$^-$	**1.78E-04**$^+$	3.02E-11$^-$	**1.47E-07**$^+$	**4.31E-08**$^+$	**9.21E-05**$^+$	**1.34E-05**$^+$
w/l/t		-	18/2/0	16/1/3	9/10/1	12/4/4	9/10/1	18/1/1	17/2/1	17/3/0	18/2/0

TABLE SVII

COMPARISON RESULTS OF THE COMPARED ALGORITHMS ON 500-*D* CEC'2010 FUNCTIONS WITH $1.5×10^6$ FITNESS EVALUATIONS.

Function	Quality	DHLSO	CSO	SL-PSO	MOS	MA-SW-Chains	DMS-L-PSO	CCPSO2	DECC-G	MLCC	DECC-DG
F_1	Median	0.00E+00	2.41E-17	4.63E-19	0.00E+00	1.92E-21	4.72E+06	4.09E+00	1.52E-17	2.62E-19	1.22E-07
	Mean	0.00E+00	2.52E-17	4.61E-19	0.00E+00	2.79E-21	4.70E+06	7.24E+00	1.68E-17	5.98E-17	2.37E-07
	Std	0.00E+00	7.46E-18	2.99E-20	0.00E+00	3.71E-21	5.87E+05	1.12E+01	9.42E-18	2.19E-16	3.33E-07
	p-value	-	**1.21E-12⁺**	**1.21E-12⁺**	NaN=	**1.21E-12⁺**	**1.21E-12⁺**	**1.21E-12⁺**	**1.21E-12⁺**	**4.57E-12⁺**	**1.21E-12⁺**
F_2	Median	4.01E+02	2.78E+03	1.09E+03	8.63E-11	3.23E+01	2.24E+03	9.19E-01	1.16E-02	2.53E-11	1.32E+03
	Mean	4.05E+02	2.77E+03	1.08E+03	6.29E-01	4.39E+01	2.25E+03	1.04E+00	8.03E-02	3.17E-11	1.32E+03
	Std	2.80E+01	3.40E+02	9.01E+01	2.22E+00	3.64E+01	1.80E+02	4.92E-01	2.52E-01	2.22E-11	7.65E+01
	p-value	-	**3.02E-11⁻**	**3.02E-11⁻**	2.63E-11⁻	3.02E-11⁻	**3.02E-11⁺**	3.02E-11⁻	3.02E-11⁻	3.02E-11⁻	**3.02E-11⁺**
F_3	Median	2.18E-14	8.42E-12	1.20E+00	7.86E-14	5.02E-14	1.02E+01	1.69E-03	9.40E-10	1.78E-13	1.04E+01
	Mean	2.16E-14	8.37E-12	1.06E+00	7.77E-14	5.20E-14	1.02E+01	2.08E-03	9.00E-10	1.98E-12	1.03E+01
	Std	6.49E-16	1.34E-12	5.54E-01	6.65E-15	1.78E-01	1.78E-01	1.52E-03	3.21E-10	6.50E-12	8.63E-01
	p-value	-	**1.72E-12⁺**	**1.71E-12⁺**	8.79E-13⁺	**1.15E-12⁺**	**1.72E-12⁺**	**1.72E-12⁺**	**1.72E-12⁺**	**1.69E-12⁺**	**1.72E-12⁺**
F_4	Median	1.35E+12	1.67E+12	1.12E+12	1.49E+12	1.05E+12	2.93E+11	4.00E+12	2.55E+13	1.06E+13	1.86E+13
	Mean	1.29E+12	1.73E+12	1.13E+12	1.52E+12	1.10E+12	3.00E+11	4.40E+12	2.58E+13	1.08E+13	1.83E+13
	Std	3.64E+11	3.68E+11	2.94E+11	2.30E+11	6.47E+10	2.09E+12	6.54E+12	3.91E+12	3.91E+12	
	p-value	-	**1.41E-04⁺**	4.84E-02⁻	**3.39E-02⁺**	3.92E-02⁻	3.02E-11⁻	**4.08E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**
F_5	Median	1.75E+07	2.90E+08	6.25E+07	5.02E+08	4.63E+07	7.96E+07	4.87E+08	2.26E+08	4.42E+08	1.95E+08
	Mean	1.71E+07	2.88E+08	1.54E+08	5.18E+08	4.57E+07	7.95E+07	5.00E+08	2.45E+08	4.30E+08	1.93E+08
	Std	2.92E+06	8.87E+06	1.34E+08	7.89E+07	7.60E+06	1.11E+07	1.59E+08	8.05E+07	1.04E+08	2.49E+07
	p-value	-	**3.01E-11⁺**	**6.05E-11⁺**	**3.01E-11⁺**	**3.01E-11⁺**	**3.01E-11⁺**	**3.01E-11⁺**	**3.01E-11⁺**	**3.01E-11⁺**	**3.01E-11⁺**
F_6	Median	2.04E+00	2.38E-07	2.14E+01	1.98E+07	1.11E-08	2.15E+01	1.98E+07	5.13E+06	1.98E+07	9.01E+00
	Mean	1.74E+00	2.38E-07	2.13E+01	1.98E+07	3.42E+05	2.15E+01	1.88E+07	5.18E+06	1.84E+07	9.07E+00
	Std	9.85E-01	1.15E-08	1.19E-01	1.14E+05	5.49E+05	1.16E-01	3.18E+06	9.99E+05	4.16E+06	8.73E-01
	p-value	-	9.50E-06⁻	**3.01E-11⁺**	**3.01E-11⁺**	4.37E-01=	**3.01E-11⁺**	**3.01E-11⁺**	**3.01E-11⁺**	**3.01E-11⁺**	**3.01E-11⁺**
F_7	Median	7.04E+03	4.95E+03	9.54E+04	1.15E+08	3.64E+01	1.70E+06	2.77E+07	6.09E+08	8.46E+05	2.64E+08
	Mean	1.48E+04	5.16E+03	1.03E+05	1.43E+08	4.11E+01	1.71E+06	7.18E+08	7.23E+08	1.73E+06	2.61E+08
	Std	1.66E+04	1.37E+03	4.53E+04	9.42E+07	1.85E+01	5.19E+04	1.02E+09	3.69E+08	2.38E+06	9.95E+07
	p-value	-	3.79E-01=	**1.33E-10⁺**	**3.02E-11⁺**	6.52E-09⁻	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**
F_8	Median	2.66E+07	3.89E+07	2.22E+07	3.04E+06	6.77E+06	1.68E+07	2.10E+07	7.57E+07	6.36E+07	3.88E+07
	Mean	2.66E+07	3.89E+07	2.59E+07	6.45E+06	2.15E+07	1.75E+07	4.80E+07	9.03E+07	5.41E+07	4.97E+07
	Std	2.59E+05	1.03E+05	1.22E+07	7.70E+06	2.79E+07	2.16E+06	4.34E+07	1.53E+08	2.40E+07	2.10E+07
	p-value	-	**3.02E-11⁺**	1.07E-07⁻	3.02E-11⁻	7.96E-03⁻	3.02E-11⁻	3.79E-01=	**9.51E-06⁺**	**6.77E-05⁺**	**5.49E-11⁺**
F_9	Median	1.57E+07	2.52E+07	1.67E+07	7.41E+06	1.28E+07	5.73E+06	3.92E+07	1.93E+08	5.65E+07	2.16E+07
	Mean	1.55E+07	2.55E+07	1.76E+07	8.00E+06	1.28E+07	5.70E+06	4.38E+07	2.00E+08	5.57E+07	2.21E+07
	Std	2.26E+06	3.53E+06	3.66E+06	1.56E+06	1.33E+06	7.76E+05	1.47E+07	2.94E+07	8.36E+06	3.88E+06
	p-value	-	**3.69E-11⁺**	**4.51E-02⁺**	4.98E-11⁻	2.00E-06⁻	3.02E-11⁻	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**1.29E-09⁺**
F_{10}	Median	3.78E+02	4.56E+03	4.99E+03	2.93E+03	4.82E+02	2.07E+03	2.34E+03	3.57E+03	1.97E+03	1.84E+03
	Mean	3.79E+02	4.56E+03	4.25E+03	2.96E+03	4.88E+02	2.12E+03	2.37E+03	3.47E+03	2.10E+03	1.85E+03
	Std	2.27E+01	5.29E+01	1.55E+03	1.88E+02	6.31E+01	2.15E+02	4.48E+02	4.88E+02	5.26E+02	6.03E+01
	p-value	-	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**5.07E-10⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**
F_{11}	Median	7.02E-14	9.72E-11	2.16E+01	9.91E+01	4.35E+00	6.38E+01	9.90E+01	1.41E+01	9.89E+01	3.74E+00
	Mean	1.29E+00	1.02E-10	2.23E+01	9.86E+01	4.58E+00	6.38E+01	9.89E+01	1.43E+01	9.81E+01	3.66E+00
	Std	3.85E+00	2.43E-11	5.33E+00	2.73E+00	1.59E+00	2.52E+00	3.44E-01	8.11E-01	2.85E+00	5.08E-01
	p-value	-	1.91E-03⁻	**3.36E-11⁺**	**2.75E-11⁺**	**7.90E-09⁺**	**2.75E-11⁺**	**2.75E-11⁺**	**5.13E-10⁺**	**2.75E-11⁺**	**7.90E-09⁺**
F_{12}	Median	1.25E+03	7.26E+04	4.38E+04	5.28E+03	1.67E+04	1.27E+01	1.83E+04	1.80E+04	1.21E+04	1.21E+03
	Mean	1.26E+03	7.10E+04	5.62E+04	5.40E+03	1.71E+04	1.13E+01	1.84E+04	1.87E+04	1.19E+04	1.26E+03
	Std	2.64E+02	1.25E+04	2.87E+04	1.56E+03	4.73E+03	3.89E+00	3.45E+03	3.41E+03	2.40E+03	2.47E+02
	p-value	-	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	3.02E-11⁻	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	8.88E-01=
F_{13}	Median	2.63E+02	2.30E+02	3.71E+02	1.99E+02	4.39E+02	1.50E+03	7.31E+02	8.14E+02	7.40E+02	4.66E+05
	Mean	2.92E+02	3.17E+02	6.61E+02	1.98E+02	4.69E+02	2.52E+03	7.14E+02	3.12E+03	1.62E+03	4.62E+05
	Std	1.05E+02	1.79E+02	1.22E+03	8.80E+01	2.27E+02	3.11E+03	1.29E+02	4.98E+03	2.09E+03	4.92E+04
	p-value	-	9.59E-01=	**3.18E-03⁺**	9.51E-06⁻	**2.60E-05⁺**	**3.69E-11⁺**	**1.33E-10⁺**	**1.21E-10⁺**	**1.21E-10⁺**	**3.02E-11⁺**
F_{14}	Median	4.34E+07	9.85E+07	4.82E+07	1.46E+07	7.04E+07	4.30E+06	1.12E+08	4.13E+08	1.48E+08	1.70E+08
	Mean	4.41E+07	1.00E+08	4.92E+07	1.45E+07	6.97E+07	4.22E+06	1.24E+08	4.19E+08	1.51E+08	1.71E+08
	Std	4.35E+06	1.06E+07	5.53E+06	1.95E+06	5.44E+06	7.25E+05	4.69E+07	4.52E+07	1.88E+07	1.70E+07
	p-value	-	**3.02E-11⁺**	**3.99E-04⁺**	3.02E-11⁻	**3.02E-11⁺**	3.02E-11⁻	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**
F_{15}	Median	4.77E+03	4.92E+03	5.42E+03	6.58E+03	1.11E+03	2.26E+03	4.92E+03	4.63E+03	4.22E+03	2.94E+03
	Mean	4.78E+03	4.91E+03	5.42E+03	6.47E+03	1.11E+03	2.28E+03	5.06E+03	4.42E+03	4.18E+03	2.94E+03
	Std	5.84E+01	4.55E+01	5.37E+01	3.38E+02	7.39E+01	1.60E+02	6.37E+02	1.51E+03	9.95E+02	4.90E+01
	p-value	-	**2.61E-10⁺**	**3.02E-11⁺**	**3.02E-11⁺**	3.02E-11⁻	3.02E-11⁻	7.73E-02=	1.00E+00=	1.33E-02⁻	3.02E-11⁻
F_{16}	Median	8.62E-14	1.09E-10	2.03E-01	1.99E+02	1.38E+01	1.19E+02	1.98E+02	2.57E+01	1.98E+02	1.28E-13
	Mean	6.71E-01	1.06E-10	2.30E+01	1.98E+02	1.33E+01	1.19E+02	1.98E+02	2.54E+01	1.73E+02	1.28E-13
	Std	9.83E-01	2.25E-11	1.53E+01	1.92E+00	5.96E+00	3.37E+00	2.10E+00	1.76E+00	5.63E+01	7.88E-15
	p-value	-	7.68E-02=	**1.25E-10⁺**	**2.82E-11⁺**	**7.64E-11⁺**	**2.82E-11⁺**	**2.82E-11⁺**	**2.82E-11⁺**	**2.82E-11⁺**	7.63E-02=
F_{17}	Median	2.26E+04	7.38E+05	1.14E+05	1.37E+04	4.37E+04	2.12E+01	6.62E+04	6.67E+04	6.76E+04	2.09E+04
	Mean	2.26E+04	7.45E+05	1.21E+05	1.41E+04	4.53E+04	2.04E+01	6.74E+04	6.88E+04	6.73E+04	2.15E+04
	Std	2.30E+03	7.55E+04	3.26E+04	4.58E+03	6.11E+03	3.02E+00	1.77E+04	8.25E+03	9.33E+03	2.21E+03
	p-value	-	**3.02E-11⁺**	**3.02E-11⁺**	3.20E-09⁻	**3.02E-11⁺**	3.02E-11⁻	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	8.24E-02=
F_{18}	Median	6.98E+02	6.74E+02	1.10E+03	4.45E+02	9.23E+02	3.37E+03	1.44E+03	1.61E+04	1.31E+03	1.10E+06
	Mean	7.78E+02	8.45E+02	1.41E+03	4.37E+02	1.14E+03	4.06E+03	1.42E+03	1.59E+04	2.57E+03	1.20E+06
	Std	2.78E+02	4.32E+02	1.20E+03	1.39E+02	5.14E+02	2.94E+03	1.42E+02	9.70E+03	3.17E+03	4.63E+05
	p-value	-	9.47E-01=	**1.64E-05⁺**	1.31E-08⁻	**7.70E-04⁺**	**3.65E-08⁺**	**1.29E-09⁺**	**3.02E-11⁺**	**7.77E-09⁺**	**3.02E-11⁺**
F_{19}	Median	5.81E+05	2.86E+06	1.67E+06	1.52E+05	1.20E+05	4.45E+05	4.75E+05	2.17E+05	3.96E+05	5.51E+05
	Mean	5.85E+05	2.89E+06	1.68E+06	1.61E+05	1.21E+05	4.39E+05	4.77E+05	2.19E+05	3.97E+05	5.56E+05
	Std	5.00E+04	2.28E+05	2.58E+05	2.79E+04	1.10E+04	4.02E+04	4.39E+04	2.08E+04	3.41E+04	3.23E+04
	p-value	-	**3.02E-11⁺**	**3.02E-11⁺**	3.02E-11⁻	3.02E-11⁻	3.02E-11⁻	2.23E-09⁻	3.02E-11⁻	3.02E-11⁻	1.76E-02⁻
F_{20}	Median	7.51E+02	4.91E+02	7.19E+02	7.40E+01	7.18E+02	4.63E+02	1.09E+03	1.36E+03	9.70E+02	1.62E+10
	Mean	7.63E+02	5.49E+02	7.38E+02	1.04E+02	7.11E+02	4.65E+02	1.09E+03	1.63E+03	9.53E+02	1.60E+10
	Std	1.42E+02	8.90E+01	1.19E+02	1.44E+02	8.47E+01	3.66E+00	1.55E+02	1.00E+03	1.32E+02	2.92E+09
	p-value	-	1.70E-08⁻	4.20E-01=	6.07E-11⁻	1.96E-01=	3.02E-11⁻	**1.01E-08⁺**	**7.39E-11⁺**	**4.12E-06⁺**	**3.02E-11⁺**
w/l/t		-	13/3/4	17/2/1	10/9/1	11/7/2	11/9/0	16/2/2	17/2/1	17/3/0	15/2/3

TABLE SVIII

COMPARISON RESULTS OF THE COMPARED ALGORITHMS ON 800-*D* CEC'2010 FUNCTIONS WITH 2.4×10⁶ FITNESS EVALUATIONS.

Function	Quality	DHLSO	CSO	SL-PSO	MOS	MA-SW-Chains	DMS-L-PSO	CCPSO2	DECC-G	MLCC	DECC-DG
F_1	Median	1.84E-23	6.87E-12	3.60E-18	0.00E+00	4.83E-21	1.12E+07	1.41E+00	7.37E-07	5.11E-14	9.44E-01
	Mean	2.36E-23	6.93E-12	3.71E-18	7.89E-21	8.61E-21	1.11E+07	3.93E+00	8.28E-07	1.92E-11	3.60E+00
	Std	1.43E-23	1.06E-12	4.96E-19	4.32E-20	1.44E-20	1.09E+06	7.27E+00	4.10E-07	8.61E-11	5.68E+00
	p-value	-	**3.02E-11⁺**	**3.02E-11⁺**	**4.56E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**
F_2	Median	6.91E+02	5.97E+03	1.67E+03	2.66E-14	2.50E+02	4.36E+03	2.21E+00	1.14E+03	2.26E+00	3.06E+03
	Mean	6.96E+02	5.95E+03	1.69E+03	3.61E-01	2.69E+02	4.31E+03	2.38E+00	1.15E+03	2.65E+00	3.08E+03
	Std	3.66E+01	1.99E+02	1.28E+02	1.01E+00	8.74E+01	2.75E+02	7.74E-01	2.04E+01	1.08E+00	1.46E+02
	p-value	-	**3.01E-11⁺**	**3.01E-11⁺**	2.92E-11⁻	3.01E-11⁻	**3.01E-11⁺**	3.01E-11⁻	**3.01E-11⁺**	3.01E-11⁻	**3.01E-11⁺**
F_3	Median	2.18E-14	3.42E-09	1.50E+00	1.18E-13	9.46E-14	1.37E+01	3.35E-03	1.12E+00	5.64E-10	1.51E+01
	Mean	2.29E-14	3.46E-09	1.59E+00	1.18E-13	1.54E-13	1.37E+01	3.17E-03	9.78E-01	2.70E-07	1.51E+01
	Std	2.53E-15	2.59E-10	2.56E-01	1.40E-13	1.49E-01	9.17E-04	4.05E-01	1.36E-06	4.37E-01	
	p-value	-	**6.43E-12⁺**	**6.42E-12⁺**	**3.73E-12⁺**	**6.26E-12⁺**	**6.43E-12⁺**	**6.43E-12⁺**	**6.35E-12⁺**	**6.43E-12⁺**	**6.43E-12⁺**
F_4	Median	6.89E+11	9.43E+11	4.13E+11	7.43E+11	3.96E+11	4.87E+11	1.70E+12	2.11E+13	1.21E+13	2.47E+12
	Mean	7.12E+11	9.73E+11	4.29E+11	8.16E+11	4.06E+11	5.00E+11	2.02E+12	2.24E+13	1.28E+13	2.64E+12
	Std	1.71E+11	1.79E+11	1.89E+11	3.17E+11	8.77E+10	8.04E+10	1.01E+12	8.98E+12	3.64E+12	8.93E+11
	p-value	-	**2.32E-06⁺**	7.60E-07⁻	1.81E-01=	2.03E-09⁻	1.19E-06⁻	**7.38E-10⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**
F_5	Median	1.39E+07	3.49E+06	3.54E+07	5.00E+08	3.58E+07	7.56E+07	3.70E+08	1.81E+08	4.36E+08	1.56E+08
	Mean	1.28E+07	3.36E+06	5.96E+07	5.05E+08	3.58E+07	7.48E+07	4.06E+08	1.88E+08	4.17E+08	1.60E+08
	Std	3.10E+06	1.56E+06	7.84E+07	6.34E+07	6.49E+06	9.98E+06	1.45E+08	4.58E+07	9.27E+07	1.83E+07
	p-value	-	2.98E-11⁻	**2.98E-11⁺**	**2.98E-11⁺**	**2.98E-11⁺**	**2.98E-11⁺**	**2.98E-11⁺**	**2.98E-11⁺**	**2.98E-11⁺**	**2.98E-11⁺**
F_6	Median	4.00E-09	8.28E-07	2.14E+01	1.98E+07	1.11E-08	2.13E+01	1.98E+07	3.56E+06	1.98E+07	1.44E+01
	Mean	1.55E-01	8.26E-07	2.14E+01	1.97E+07	2.55E+05	2.13E+01	1.84E+07	3.74E+06	1.90E+07	1.44E+01
	Std	4.17E-01	2.10E-08	1.46E-01	1.48E+05	5.93E+05	4.23E-02	4.02E+06	7.50E+05	2.48E+06	5.14E-01
	p-value	-	4.24E-07⁻	**5.21E-12⁺**	**5.22E-12⁺**	**5.72E-08⁺**	**5.22E-12⁺**	**5.22E-12⁺**	**5.21E-12⁺**	**5.22E-12⁺**	**5.22E-12⁺**
F_7	Median	3.38E+01	2.55E+04	4.77E+04	1.64E+08	4.20E+00	2.71E+06	1.92E+07	4.91E+08	4.04E+07	1.32E+08
	Mean	7.04E+02	2.64E+04	5.15E+04	2.14E+08	4.44E+00	2.71E+06	3.70E+08	6.46E+08	7.63E+07	1.40E+08
	Std	3.51E+03	8.03E+03	1.73E+04	2.20E+08	1.94E+00	8.43E+04	4.96E+08	4.93E+08	7.88E+07	5.48E+07
	p-value	-	**5.49E-11⁺**	**6.07E-11⁺**	**3.02E-11⁺**	3.02E-11⁻	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**
F_8	Median	2.77E+07	3.97E+07	1.52E+07	7.74E+07	2.48E+08	1.93E+07	1.33E+08	3.93E+07	4.26E+07	9.08E+07
	Mean	5.84E+07	6.41E+07	3.57E+07	1.21E+09	3.86E+08	1.97E+07	1.34E+08	3.71E+08	7.01E+08	9.87E+07
	Std	5.16E+07	3.59E+07	5.85E+07	4.21E+09	3.52E+08	2.64E+06	6.14E+07	1.85E+09	2.58E+09	6.35E+07
	p-value	-	**1.44E-03⁺**	1.49E-06⁻	1.12E-01=	**5.19E-07⁺**	3.02E-11⁻	**2.60E-05⁺**	1.71E-01=	7.62E-01=	**2.27E-03⁺**
F_9	Median	3.54E+07	5.62E+07	2.48E+07	1.28E+07	2.17E+07	1.30E+07	7.84E+07	3.06E+08	1.82E+08	4.91E+07
	Mean	3.56E+07	5.67E+07	2.53E+07	1.30E+07	2.18E+07	1.31E+07	7.29E+07	3.05E+08	1.84E+08	4.99E+07
	Std	3.19E+06	4.87E+06	2.73E+06	2.73E+06	1.83E+06	1.43E+06	2.44E+07	3.54E+07	2.19E+07	7.25E+06
	p-value	-	**3.02E-11⁺**	5.49E-11⁻	3.02E-11⁻	3.02E-11⁻	3.02E-11⁻	**6.12E-10⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**7.39E-11⁺**
F_{10}	Median	6.20E+02	7.50E+03	2.25E+03	4.83E+03	9.31E+02	3.67E+03	3.91E+03	8.03E+03	2.75E+03	3.39E+03
	Mean	6.19E+02	7.50E+03	4.54E+03	4.83E+03	9.43E+02	3.82E+03	4.06E+03	8.04E+03	2.99E+03	3.39E+03
	Std	2.91E+01	5.26E+01	3.13E+03	2.49E+02	8.00E+01	4.09E+02	6.10E+02	2.38E+02	1.07E+03	1.16E+02
	p-value	-	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**
F_{11}	Median	1.37E-13	4.63E-08	2.25E+01	1.59E+02	7.29E+00	1.15E+02	1.59E+02	1.94E+01	1.59E+02	7.80E+00
	Mean	5.72E-01	4.59E-08	2.32E+01	1.59E+02	7.64E+00	1.14E+02	1.58E+02	1.92E+01	1.50E+02	7.73E+00
	Std	7.00E-01	3.62E-09	2.27E+00	1.89E+00	2.50E+00	2.63E+00	4.81E-01	1.47E+00	3.19E+01	1.12E+00
	p-value	-	3.78E-01=	**2.85E-11⁺**	**2.85E-11⁺**	**2.85E-11⁺**	**2.85E-11⁺**	**2.85E-11⁺**	**2.85E-11⁺**	**2.85E-11⁺**	**2.85E-11⁺**
F_{12}	Median	8.85E+03	2.50E+05	3.05E+04	1.23E+04	4.22E+04	2.07E+01	3.31E+04	6.83E+04	6.84E+04	1.59E+03
	Mean	8.97E+03	2.51E+05	3.08E+04	1.41E+04	4.46E+04	1.80E+01	3.07E+04	6.87E+04	7.06E+04	1.61E+03
	Std	1.01E+03	3.01E+04	1.47E+04	7.01E+03	1.02E+04	6.53E+00	8.46E+03	9.01E+03	1.16E+04	1.79E+02
	p-value	-	**3.02E-11⁺**	**1.46E-10⁺**	**1.60E-07⁺**	**3.02E-11⁺**	3.02E-11⁻	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	3.02E-11⁻
F_{13}	Median	5.78E+02	5.71E+02	6.83E+02	4.53E+02	8.54E+02	1.13E+04	1.12E+03	3.22E+03	2.30E+03	7.71E+04
	Mean	6.73E+02	7.15E+02	1.91E+03	4.19E+02	9.62E+02	1.32E+04	1.11E+03	5.02E+03	3.68E+03	8.25E+04
	Std	3.00E+02	4.02E+02	4.53E+03	1.20E+02	4.17E+02	9.98E+03	1.70E+02	4.57E+03	3.59E+03	4.81E+04
	p-value	-	8.88E-01=	1.91E-01⁻	1.41E-04⁻	**1.00E-03⁺**	**3.02E-11⁺**	**1.60E-07⁺**	**4.50E-11⁺**	**1.46E-10⁺**	**3.02E-11⁺**
F_{14}	Median	1.01E+08	2.02E+08	6.82E+07	2.42E+07	1.43E+08	7.63E+06	2.46E+08	7.68E+08	4.41E+08	2.69E+08
	Mean	1.01E+08	2.04E+08	6.90E+07	2.55E+07	1.44E+08	7.35E+06	2.18E+08	7.69E+08	4.43E+08	2.69E+08
	Std	6.21E+06	1.27E+07	7.80E+06	5.55E+06	1.09E+07	1.49E+06	7.36E+07	7.01E+07	3.53E+07	2.24E+07
	p-value	-	**3.02E-11⁺**	3.02E-11⁻	3.02E-11⁻	**3.02E-11⁺**	3.02E-11⁻	**6.52E-09⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**
F_{15}	Median	6.03E+02	7.93E+03	8.94E+03	1.03E+04	1.98E+03	4.09E+03	8.38E+03	9.93E+03	7.64E+03	4.69E+03
	Mean	6.08E+02	7.92E+03	8.95E+03	1.03E+04	1.97E+03	4.17E+03	8.48E+03	9.87E+03	7.33E+03	4.67E+03
	Std	3.30E+01	5.39E+01	9.01E+01	3.80E+02	1.08E+02	3.58E+02	1.10E+03	6.28E+02	1.85E+03	7.07E+01
	p-value	-	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.01E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**	**3.02E-11⁺**
F_{16}	Median	1.65E-13	6.05E-08	2.54E+01	3.18E+02	3.15E+01	2.38E+02	3.17E+02	5.24E+01	3.17E+02	5.76E-12
	Mean	8.40E-01	6.10E-08	2.45E+01	3.18E+02	3.10E+01	2.38E+02	3.17E+02	5.32E+01	2.93E+02	5.81E-12
	Std	1.13E+00	5.18E-09	1.13E+01	3.27E-01	1.34E+01	3.57E+00	5.18E-01	5.77E+00	7.01E+01	6.70E-13
	p-value	-	3.79E-01=	**2.94E-11⁺**	**2.94E-11⁺**	**2.94E-11⁺**	**2.94E-11⁺**	**2.94E-11⁺**	**2.94E-11⁺**	**2.94E-11⁺**	3.79E-01=
F_{17}	Median	6.74E+04	1.66E+06	9.18E+04	7.99E+04	6.49E+04	3.62E+01	1.10E+05	2.17E+05	2.53E+05	3.04E+04
	Mean	6.79E+04	1.67E+06	9.63E+04	1.30E+05	6.64E+04	3.37E+01	1.07E+05	2.16E+05	2.58E+05	3.05E+04
	Std	3.93E+03	1.00E+05	2.00E+04	2.30E+05	7.78E+03	7.84E+00	3.77E+04	1.81E+04	2.76E+04	2.61E+03
	p-value	-	**3.02E-11⁺**	**2.23E-09⁺**	**1.70E-02⁺**	1.41E-01=	3.02E-11⁻	**2.25E-04⁺**	**3.02E-11⁺**	**3.02E-11⁺**	3.02E-11⁻
F_{18}	Median	1.81E+03	1.16E+03	1.90E+03	1.25E+03	2.01E+03	1.05E+04	2.51E+03	1.58E+04	5.25E+03	1.06E+09
	Mean	2.10E+03	1.37E+03	1.99E+03	2.52E+03	2.04E+03	1.01E+04	2.51E+03	1.90E+04	7.46E+03	1.05E+09
	Std	6.09E+02	4.92E+02	6.62E+02	3.44E+03	5.07E+02	4.06E+03	2.66E+02	1.15E+04	4.95E+03	3.00E+08
	p-value	-	8.15E-05⁻	2.64E-01=	**1.49E-04⁺**	9.12E-01=	**6.70E-11⁺**	**5.57E-03⁺**	**3.02E-11⁺**	**7.38E-10⁺**	**3.02E-11⁺**
F_{19}	Median	1.17E+06	6.36E+06	3.74E+06	8.10E+05	3.26E+05	1.30E+06	1.06E+06	7.94E+05	1.38E+06	1.24E+06
	Mean	1.17E+06	6.31E+06	3.76E+06	8.13E+05	3.29E+05	1.28E+06	1.06E+06	7.97E+05	1.39E+06	1.24E+06
	Std	5.63E+04	4.06E+05	6.28E+05	1.45E+05	2.38E+04	1.08E+05	6.75E+04	4.49E+04	8.96E+04	6.76E+04
	p-value	-	**3.02E-11⁺**	**3.02E-11⁺**	1.61E-10⁻	3.02E-11⁻	**1.56E-08⁺**	1.36E-07⁻	3.02E-11⁻	**1.46E-10⁺**	**3.01E-04⁺**
F_{20}	Median	1.32E+03	7.87E+02	1.35E+03	1.03E+03	1.09E+03	7.72E+02	1.75E+03	3.52E+03	1.88E+03	5.05E+09
	Mean	1.36E+03	8.46E+02	1.35E+03	1.03E+03	1.10E+03	7.90E+02	1.70E+03	3.56E+03	2.05E+03	5.05E+09
	Std	2.49E+02	1.82E+02	2.04E+02	1.76E+02	1.19E+02	3.30E+01	2.19E+02	4.78E+02	5.32E+02	1.12E+09
	p-value	-	8.10E-10⁻	8.07E-01=	1.07E-07⁻	4.44E-07⁻	3.02E-11⁻	**4.12E-06⁺**	**3.02E-11⁺**	**3.50E-09⁺**	**3.02E-11⁺**
w/l/t		-	13/4/3	13/4/3	12/6/2	12/6/2	13/7/0	18/2/0	18/1/1	18/1/1	17/2/1

TABLE SIX

COMPARISON RESULTS OF THE COMPARED ALGORITHMS ON 2000-D CEC'2010 FUNCTIONS WITH $6×10^6$ FITNESS EVALUATIONS.

Function	Quality	DHLSO	CSO	SL-PSO	MOS	MA-SW-Chains	DMS-L-PSO	CCPSO2	DECC-G	MLCC	DECC-DG
F_1	Median	1.73E-20	2.57E-11	1.43E+08	0.00E+00	7.19E-20	2.03E+07	4.11E+00	2.38E-09	3.01E-16	3.28E+07
	Mean	1.75E-20	2.63E-11	1.40E+08	3.09E-16	1.01E-19	2.16E+07	2.81E+01	2.39E-09	2.04E-15	5.48E+07
	Std	8.86E-22	2.53E-12	2.89E+07	1.68E-15	8.20E-20	3.00E+06	5.09E+01	4.62E-10	8.41E-15	5.59E+07
	p-value	-	3.02E-11+	3.02E-11+	7.50E-06+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+
F_2	Median	1.38E+03	5.20E+03	4.13E+03	3.72E-09	1.79E+03	1.36E+04	2.59E+01	2.30E+03	6.73E+00	1.22E+04
	Mean	1.40E+03	5.31E+03	4.15E+03	1.79E+00	1.90E+03	1.37E+04	2.80E+01	2.30E+03	7.08E+00	1.22E+04
	Std	5.17E+01	8.14E+02	1.75E+02	7.53E+00	3.20E+02	1.22E+03	8.99E+00	5.66E+01	3.32E+00	3.19E+02
	p-value	-	3.02E-11+	3.02E-11+	3.01E-11-	3.02E-11+	3.02E-11+	3.02E-11-	3.02E-11+	3.02E-11-	3.02E-11+
F_3	Median	3.95E-14	3.46E-09	6.30E+00	4.21E-13	1.38E-08	1.94E+01	1.80E-02	1.23E+00	9.24E-13	1.90E+01
	Mean	3.94E-14	3.46E-09	6.34E+00	5.84E-12	2.80E-08	1.95E+01	1.78E-02	1.23E+00	7.94E-02	1.90E+01
	Std	6.49E-16	1.83E-10	3.24E-01	2.87E-11	6.45E-08	1.13E-01	7.77E-03	1.11E-01	3.02E-01	8.24E-02
	p-value	-	1.72E-12+	1.72E-12+	1.71E-12+	1.72E-12+	1.72E-12+	1.72E-12+	1.72E-12+	1.72E-12+	1.72E-12+
F_4	Median	3.80E+11	6.25E+11	2.32E+12	8.77E+11	2.91E+11	7.31E+11	1.88E+12	1.79E+13	1.89E+13	1.34E+12
	Mean	3.62E+11	6.29E+11	2.32E+12	8.90E+11	2.97E+11	7.34E+11	2.00E+12	1.94E+13	1.95E+13	1.35E+12
	Std	7.02E+10	8.73E+10	3.97E+11	2.34E+11	8.19E+10	8.13E+10	9.79E+11	6.32E+12	6.50E+12	3.34E+11
	p-value	-	3.34E-11+	3.02E-11+	3.02E-11+	1.95E-03-	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+
F_5	Median	6.97E+06	4.98E+06	1.89E+07	4.62E+08	3.36E+07	9.85E+07	4.71E+08	2.27E+08	4.51E+08	1.49E+08
	Mean	6.00E+06	4.62E+06	2.02E+07	4.69E+08	3.36E+07	9.64E+07	4.43E+08	2.73E+08	4.34E+08	1.51E+08
	Std	1.74E+06	1.54E+06	5.90E+06	6.20E+07	5.01E+06	1.19E+07	1.15E+08	1.08E+08	8.06E+07	2.62E+07
	p-value	-	3.14E-02-	3.00E-11+	3.01E-11+	3.01E-11+	3.01E-11+	3.01E-11+	3.01E-11+	3.01E-11+	3.01E-11+
F_6	Median	4.00E-09	2.16E-06	1.99E+01	1.97E+07	7.78E-06	1.94E+07	1.97E+07	8.85E+06	1.97E+07	1.94E+01
	Mean	4.00E-09	2.15E-06	1.99E+01	1.96E+07	1.88E+05	1.93E+07	1.62E+07	9.30E+06	1.96E+07	1.94E+01
	Std	8.24E-14	4.66E-08	2.33E-02	3.41E+05	5.10E+05	2.29E+05	5.87E+06	3.84E+06	4.34E+05	1.41E-01
	p-value	-	3.00E-11+	3.00E-11+	3.00E-11+	3.00E-11+	3.00E-11+	3.00E-11+	3.00E-11+	3.00E-11+	3.00E-11+
F_7	Median	1.29E+01	3.39E+04	2.22E+08	4.40E+08	3.29E+01	6.93E+06	2.95E+06	1.29E+09	2.33E+08	1.64E+02
	Mean	1.17E+01	3.64E+04	2.45E+08	5.48E+08	3.67E+01	6.95E+06	1.20E+08	1.43E+09	3.09E+08	1.96E+02
	Std	5.74E+00	1.07E+04	1.05E+08	4.43E+08	1.56E+01	1.75E+05	3.20E+08	8.79E+08	2.32E+08	1.69E+02
	p-value	-	3.02E-11+	3.02E-11+	3.02E-11+	2.15E-10+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+
F_8	Median	2.61E+07	3.78E+07	4.81E+07	4.33E+07	2.37E+07	4.02E+07	1.23E+08	3.23E+07	3.65E+07	6.91E+07
	Mean	3.15E+07	3.78E+07	6.82E+07	4.18E+07	7.25E+08	5.07E+07	1.11E+08	2.45E+07	3.04E+07	4.83E+07
	Std	2.11E+07	6.02E+04	3.49E+07	3.33E+07	2.61E+07	5.27E+07	1.43E+07	1.19E+07	3.13E+07	
	p-value	-	8.48E-09+	3.20E-09+	4.12E-01=	8.65E-01=	5.46E-09+	5.60E-07+	4.29E-01=	1.06E-03-	9.47E-01=
F_9	Median	1.05E+08	1.66E+08	1.61E+09	7.79E+07	7.49E+07	4.66E+07	1.56E+08	9.57E+08	5.07E+08	2.69E+08
	Mean	1.06E+08	1.67E+08	1.60E+09	7.40E+07	7.43E+07	4.33E+07	2.11E+08	9.68E+08	5.05E+08	2.76E+08
	Std	6.93E+06	7.57E+06	1.10E+08	2.31E+07	4.33E+06	1.04E+07	1.09E+08	6.63E+07	3.21E+07	5.02E+07
	p-value	-	3.02E-11+	3.02E-11+	5.57E-10-	3.02E-11-	3.02E-11-	7.39E-11+	3.02E-11+	3.02E-11+	3.02E-11+
F_{10}	Median	1.16E+03	1.85E+04	4.15E+03	1.26E+04	3.78E+03	1.36E+04	1.04E+04	6.61E+03	9.06E+03	1.16E+04
	Mean	1.16E+03	1.85E+04	4.27E+03	1.25E+04	3.75E+03	1.43E+04	1.06E+04	6.58E+03	8.71E+03	1.16E+04
	Std	5.00E+01	1.61E+02	3.62E+02	2.88E+02	8.77E+01	1.78E+03	1.43E+03	1.87E+02	2.48E+03	2.91E+02
	p-value	-	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+
F_{11}	Median	5.69E-13	1.21E-07	1.05E+02	3.97E+02	1.86E+01	3.82E+02	3.97E+02	6.83E+01	3.96E+02	1.78E+01
	Mean	5.72E-13	1.19E-07	1.06E+02	3.94E+02	1.81E+01	3.79E+02	3.97E+02	6.81E+01	3.96E+02	1.78E+01
	Std	2.10E-14	7.22E-09	9.55E+00	5.65E+00	5.58E+00	6.06E+00	4.67E-01	3.05E+00	8.02E-01	3.34E-01
	p-value	-	2.98E-11+	2.98E-11+	2.98E-11+	2.98E-11+	2.98E-11+	2.98E-11+	2.98E-11+	2.98E-11+	2.98E-11+
F_{12}	Median	1.13E+05	4.41E+05	1.37E+06	1.16E+06	2.46E+05	1.33E+02	6.31E+04	3.28E+05	1.95E+05	1.25E+05
	Mean	1.12E+05	4.39E+05	1.38E+06	1.00E+06	2.43E+05	1.20E+02	8.01E+04	3.29E+05	1.94E+05	1.26E+05
	Std	5.91E+03	1.21E+04	7.82E+04	4.88E+05	2.72E+04	3.78E+01	3.91E+04	2.11E+04	1.31E+04	1.80E+04
	p-value	-	3.02E-11+	3.02E-11+	8.89E-10+	3.02E-11+	3.02E-11-	5.55E-02=	3.02E-11+	3.02E-11+	8.15E-05+
F_{13}	Median	1.43E+03	1.53E+03	1.07E+07	1.60E+03	2.91E+03	3.11E+06	2.97E+03	1.95E+04	6.14E+03	1.87E+09
	Mean	1.48E+03	1.79E+03	1.07E+07	3.35E+03	2.99E+03	3.10E+06	3.19E+03	2.12E+04	8.82E+03	1.92E+09
	Std	3.13E+02	7.28E+02	2.53E+06	4.27E+03	8.43E+02	7.98E+04	8.37E+02	1.11E+04	6.44E+03	6.06E+08
	p-value	-	1.33E-01=	3.02E-11+	6.97E-03+	1.78E-10+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+
F_{14}	Median	2.89E+08	5.19E+08	3.21E+09	3.31E+08	6.83E+08	2.73E+07	6.44E+08	1.99E+09	1.06E+09	6.38E+08
	Mean	2.88E+08	5.19E+08	3.35E+09	5.87E+08	6.87E+08	2.70E+07	6.54E+08	2.00E+09	1.06E+09	6.42E+08
	Std	9.71E+06	1.53E+07	5.69E+08	6.82E+08	3.32E+07	3.72E+06	3.24E+08	9.91E+07	5.07E+07	3.13E+07
	p-value	-	3.02E-11+	3.02E-11+	1.58E-04+	3.02E-11+	3.02E-11-	4.80E-07+	3.02E-11+	3.02E-11+	3.02E-11+
F_{15}	Median	2.06E+04	2.02E+04	4.67E+03	2.63E+04	6.30E+03	1.42E+04	2.13E+04	1.16E+04	1.88E+04	1.17E+04
	Mean	2.06E+04	2.02E+04	4.86E+03	2.64E+04	6.31E+03	1.48E+04	2.19E+04	1.36E+04	1.84E+04	1.17E+04
	Std	7.63E+01	8.04E+01	5.25E+02	3.92E+02	1.64E+02	1.73E+03	2.51E+03	5.20E+03	4.84E+03	1.25E+02
	p-value	-	3.02E-11-	3.02E-11-	3.02E-11+	3.02E-11-	3.02E-11-	3.78E-02+	1.11E-06-	1.30E-01=	3.02E-11-
F_{16}	Median	8.79E-01	1.66E-07	3.15E+02	7.94E+02	1.82E+01	7.62E+02	7.93E+02	1.59E+02	7.92E+02	9.65E-13
	Mean	8.51E-01	1.66E-07	3.17E+02	7.94E+02	1.85E+01	7.61E+02	7.93E+02	1.58E+02	7.88E+02	9.70E-13
	Std	9.79E-01	8.99E-09	1.32E+01	8.15E-01	2.59E+01	1.49E+01	6.70E-01	1.33E+01	2.14E+01	4.50E-14
	p-value	-	6.63E-01=	2.99E-11+	2.99E-11+	2.99E-11+	2.99E-11+	2.99E-11+	2.99E-11+	2.99E-11+	6.63E-01=
F_{17}	Median	5.86E+05	2.60E+06	2.56E+06	3.56E+06	1.79E+05	2.71E+02	2.50E+05	8.77E+05	7.03E+05	8.57E+04
	Mean	5.83E+05	2.62E+06	2.62E+06	3.50E+06	2.95E+05	1.83E+02	2.61E+05	8.79E+05	7.03E+05	8.61E+04
	Std	1.54E+04	1.04E+05	2.49E+05	1.41E+05	2.29E+05	1.23E+02	1.34E+05	3.91E+04	3.58E+04	3.58E+03
	p-value	-	3.02E-11+	3.02E-11+	3.02E-11+	6.77E-05-	3.02E-11-	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11-
F_{18}	Median	5.04E+03	4.77E+03	2.14E+09	4.15E+03	6.66E+03	6.78E+04	6.46E+03	5.55E+04	1.74E+04	7.02E+10
	Mean	5.31E+03	5.22E+03	2.23E+09	7.16E+03	6.64E+03	6.99E+04	7.02E+03	5.48E+04	1.92E+04	6.79E+10
	Std	1.42E+03	2.34E+03	3.59E+08	6.56E+03	1.14E+03	1.45E+04	2.72E+03	1.43E+04	8.81E+03	9.67E+09
	p-value	-	2.46E-01=	3.02E-11+	2.17E-01=	9.03E-04+	3.02E-11+	6.20E-04+	3.02E-11+	3.34E-11+	3.02E-11+
F_{19}	Median	2.77E+07	3.01E+07	1.04E+07	1.08E+07	2.03E+06	8.97E+06	4.41E+06	3.61E+06	6.08E+06	5.30E+06
	Mean	2.78E+07	2.98E+07	1.05E+07	1.07E+07	2.02E+06	8.90E+06	4.51E+06	3.60E+06	6.02E+06	5.28E+06
	Std	1.53E+06	1.70E+06	5.27E+05	1.02E+06	7.88E+04	7.84E+05	3.40E+05	1.24E+05	3.12E+05	2.10E+05
	p-value	-	5.61E-05+	3.02E-11-	3.02E-11-	3.02E-11-	3.02E-11-	3.02E-11-	3.02E-11-	3.02E-11-	3.02E-11-
F_{20}	Median	2.78E+03	2.09E+03	2.41E+09	2.95E+03	2.67E+03	3.26E+03	4.41E+03	8.16E+03	4.98E+03	1.65E+11
	Mean	2.79E+03	2.19E+03	2.54E+09	2.95E+03	2.73E+03	3.39E+03	4.50E+03	8.36E+03	4.94E+03	1.65E+11
	Std	2.45E+02	2.51E+02	5.03E+08	1.55E+02	1.89E+02	4.80E+02	5.25E+02	6.49E+02	4.86E+02	1.37E+10
	p-value	-	7.12E-09-	3.02E-11+	4.23E-03+	3.33E-01=	1.47E-07+	3.02E-11+	3.02E-11+	3.02E-11+	3.02E-11+
w/l/t		-	14/3/3	18/2/0	15/3/2	13/5/2	14/6/0	16/3/1	17/2/1	16/3/1	15/3/2