Table 2 List of examined functions.

No.	Function	Properties				
1	Ackley N.1	Continuous	Differentiable	Non-separable	Scalable	Multimodal
2	Ackley N.2	Continuous	Differentiable	Non-separable	Scalable	Unimodal
3	Ackley N.3	Continuous	Differentiable	Separable	Scalable	Unimodal
4	Ackley's Path	NA	NA	NA	NA	Multimodal
5	Ackley (Modified)	NA	NA	NA	NA	NA
6	Adjiman	Continuous	Differentiable	Separable	Non-scalable	Multimodal
7	Alpine N.1	Continuous	Differentiable	Separable	Non-scalable	Multimodal
8	Alpine N.2	Continuous	Differentiable	Separable	Scalable	Multimodal
9	Aluffi-Pentini	NA	NA	NA	NA	NA
10	Attractive Sector	NA	NA	NA	NA	Unimodal
11	Axis Parallel Hyper-Ellipsoid	NA	NA	NA	NA	Unimodal
12	Bartels Conn	Continuous	Non-differentiable	Separable	Scalable	Multimodal
13	Beale	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
14	Beale with Noise	NA	NA	NA	NA	NA
15	Becker Lago	NA	NA	NA	NA	Unimodal
16	Bent Cigar	NA	NA	Non-separable	NA	Unimodal
17	Bent Identity	NA	NA	NA	NA	NA
18	Biggs EXP2	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
19	Biggs EXP3	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
20	Biggs EXP4	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
21	Biggs EXP5	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
22	Bird	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
23	Bird with Noise	NA	NA	NA	NA	NA
24	Bohachevsky N.1	Continuous	Differentiable	Separable	Non-scalable	Multimodal
25	Bohachevsky N.2	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
26	Bohachevsky N.3	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
27	Booth	Continuous	Differentiable	Non-separable	Non-scalable	Unimodal
28	Boothby	NA	NA	NA	NA	Multimodal
29	Box Betts	NA	NA	NA	NA	Multimodal
30	Box Betts Quadratic Sum	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
31	Bradford	NA	NA	NA	NA	NA
32	Branin	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
33	Branin RCOS2	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
34	Brent	Continuous	Differentiable	Non-separable	Non-scalable	Unimodal
35	Brown	Continuous	Differentiable	Non-separable	Scalable	Unimodal
36	Brown Almost Linear	Continuous	Differentiable	Non-separable	Scalable	Unimodal
37	Bukin N.2	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
38	Bukin N.4	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
39	Bukin N.6	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
40	Camel Three Hump	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
41	Camel Six Hump	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
42	Carrom Table	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
43	Chameleon	NA	NA	NA	NA	NA
44	Chen Bird	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
45	Chen V	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
46	Chichinadze	Continuous	Differentiable	Separable	Non-scalable	Multimodal
47	Chung Reynolds	Continuous	Differentiable	Non-separable	Scalable	Unimodal
48	Chung Reynolds N.2	NA	NA	NA	NA	NA
49	Cigar	NA	NA	NA	NA	Multimodal
50	Clunar	NA	NA	NA	NA	NA
51	Cola	Continuous	Differentiable	Separable	Non-scalable	Multimodal
52	Colville	Continuous	Differentiable	Non-separable	Scalable	Multimodal
53	Composite Griewank Rosenbrock F8F2	NA	NA	NA	NA	Multimodal
54	Composition Function N.1	NA	NA	NA	NA	NA
55	Composition Function N.2	NA	NA	NA	NA	NA
56	Corana	NA	NA	NA	Scalable	Multimodal
57	Cosine Envelope Sine Wave	NA	NA	NA	NA	NA
58	Cosine Function	NA	NA	NA	NA	NA
59	Cosine Mixture	Non-continuous	Non-differentiable	Non-separable	Non-scalable	Multimodal
60	Cosine Root	NA	NA	NA	NA	NA

61	Cosinee Mixture	NA	NA	NA	NA	NA
62	Cross In Tray	Continuous	Non-differentiable	Non-separable	Scalable	Multimodal
63	Cross Leg	NA	NA	NA	NA	NA
64	Cross Leg Table	NA	NA	NA	NA	Multimodal
65	Crowned Cross	NA	NA	NA	NA	Multimodal
66	Csendes	Continuous	Differentiable	Separable	Scalable	Multimodal
67	Cube	Continuous	Differentiable	Non-separable	Non-scalable	Unimodal
68	Damavandi	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
69	Damavandi N.2	NA	NA	NA	NA	NA
70	De Jong	Continuous	NA	NA	NA	Unimodal
71	De Jong N.5	NA	NA	NA	NA	Multimodal
72	Deb N.1	Continuous	Differentiable	Separable	Scalable	Multimodal
73	Deb N.3	Continuous	Differentiable	Separable	Scalable	Multimodal
74	Deb N.4	NA	NA	NA	NA	NA
75	Deckkers Aarts	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
76	Deflected Corrugated Spring	NA	NA	NA	NA	NA
77	Devillers Glasser	NA	NA	NA	NA	NA
78	Devilliers Glasser N.1	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
79	Devilliers Glasser N.2	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
80	Discus	NA	NA	NA	NA	Unimodal
81	Dixon Coles	NA	NA	NA	NA	NA
82	Dixon Price	Continuous	Differentiable	Non-separable	Scalable	Unimodal
83	Dixon Price N.2	NA	NA	NA	NA	NA
84	Dixon Price N.3	NA	NA	NA	NA	NA
85	Dixon Price N.4	NA	NA	NA	NA	NA
86	Dixon Price N.5	NA	NA	NA	NA	NA
87	Dolan	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
88	Drop Wave	NA	NA	NA	NA	Multimodal
89	Drop Wave N.2	NA	NA	NA	NA	NA
90	Dynamic Deceptive Basin	NA	NA	NA	NA	NA
91	Complex Dynamic Deceptive Basin	NA	NA	NA	NA	NA
92	Easom	Continuous	Differentiable	Separable	Scalable	Multimodal
93	Easom with Noise	NA	NA	NA	NA	NA
94	Egg Box	NA	NA	NA	NA	NA
95	Egg Crate	NA	NA	NA	NA	Unimodal
96	Egg Holder	Continuous	Differentiable	Non-separable	Scalable	Multimodal
97	Eggholder with Noise	NA	NA	NA	NA	NA
98	El Attar Vidyasagar Dutta	Continuous	Differentiable	Non-separable	Non-scalable	Unimodal
99	Elliptic	NA	NA	NA	NA	NA
100	Elliptic N.2	NA	NA	NA	NA	NA
101	Exp 2	NA	NA	NA	NA	NA
102	Exponential	Continuous	Differentiable	Non-separable	Scalable	Multimodal
103	Exponential Noise	NA	NA	NA	NA	NA
104	Fletcher Powell	NA	NA	NA	NA	NA
105	Forrester	NA	NA	NA	NA	Multimodal
106	Fredrics Rcos	NA	NA	NA	NA	NA
107	Freudenstein Roth	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
108	Gaussian	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
109	Gaussian Perturbation	NA	NA	NA	NA	NA
110	Gear	NA	NA	NA	NA	NA
111	Gear N.2	NA	NA	NA	NA	NA
112	Giunta	Continuous	Differentiable	Separable	Scalable	Multimodal
113	Goldstein Price	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
114	Goldstein Price with Noise	NA	NA	NA	NA	NA
115	Gramacy Lee	NA	NA	NA	NA	NA
116	Griewank	NA	NA	NA	NA	NA
117	Griewank with Noise	NA	NA	NA	NA	NA
118	Gulf Research	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
119	Gulf Research and Development	NA	NA	NA	NA	NA
120	Hansen	Continuous	Differentiable	Separable	Non-scalable	Multimodal
121	Happy Cat	NA	NA	NA	NA	Multimodal
122	Hartman 3	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
123	Hartmann 3D	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal

124	Helical Valley	Continuous	Differentiable	Non-separable	Scalable	Multimodal
125	Himmelblau	Continuous	Differentiable	Separable	Non-scalable	Multimodal
126	Holder Table 1	Continuous	Differentiable	Separable	Non-scalable	Multimodal
127	Holder Table 2	Continuous	Differentiable	Separable	Non-scalable	Multimodal
128	Holder Table N.2	NA	NA	NA	NA	NA
129	Holzman	NA	NA	NA	NA	NA
130	Hosaki	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
131	Hosaki Exponential	NA	NA	NA	NA	NA
132	Hosaki Exponential with Noise	NA	NA	NA	NA	NA
133	Hqing	NA	NA	NA	NA	NA
134	Hump	NA	NA	NA	NA	NA
135	Infinity	NA	NA	NA	NA	NA
136	Jennrich Sampson	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
137	Judge	NA	NA	NA	NA	NA
138	Katsuura	NA	NA	NA	NA	NA
139	Keane	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
140	Keane N.2	NA	NA	NA	NA	NA
141	Kowalik	NA	NA	NA	NA	NA
142	Langermann	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
143	Langermann N.2	NA	NA	NA	NA	NA
144	Lennard Jones	NA	NA	NA	NA	NA
145	Lennard Jones Minimum	NA	NA	NA	NA	NA
146	Leon	NA	NA	NA	NA	NA
147	Levi	NA	NA	NA	NA	NA
148	Levy Function	NA	NA	NA	NA	NA
149	Levy N.5	NA	NA	NA	NA	NA
150	Levy N.8	NA	NA	NA	NA	NA
151	Levy N.9	NA	NA	NA	NA	NA
152	Levy N.13	NA	NA	NA	NA	NA
153	Ljeunard Jones Minimum Boundary	NA	NA	NA	NA	NA
154	Matyas	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
155	McCormick	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
156	McCormick with Noise	NA	NA	NA	NA	NA
157	Michalewicz	NA	NA	NA	NA	Multimodal
158	Michalewicz N.2	NA	NA	NA	NA	NA
159	Michalewicz with Noise	NA	NA	NA	NA	NA
160	Miele Cantrell	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
161	Mishra	Continuous	Differentiable	Non-separable	Scalable	Multimodal
162	Mishra N.2	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
163	Mishra N.3	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
164	Mishra N.4	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
165	Mishra N.5	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
166	Mishra N.6	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
167	Mishra N.7	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
168	Mishra N.8	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
169	Mishra N.9	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
170	Mishra N.10	Continuous	Differentiable	Non-separable	Scalable	Multimodal
171	Mishra N.11	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
172	Mishra's Bird	Continuous	Differentiable	Non-separable	Scalable	Multimodal
173	Muller Brown	NA	NA	NA	NA	NA
174	Nesterov Smooth Chebyshev Rosenbrock	NA	NA	NA	NA	NA
175	Parsopoulos	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
176	Pathological	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
177	Paviani	Continuous	Differentiable	Non-separable	Scalable	Multimodal
178	Pen Holder	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
179	Penalty	Continuous	Differentiable	Non-separable	NA	NA
180	Penalty N.2	Continuous	Differentiable	Non-separable	NA	NA
181	Perez Reche	NA	NA	NA	NA	NA
182	Periodic	Continuous	Differentiable	Non-separable	Scalable	Multimodal
183	Perm	NA	NA	NA	NA	Unimodal
184	Perm Function 0,d beta	NA	NA	NA	NA	Unimodal
185	Pinter	Continuous	Differentiable	Non-separable	Scalable	Multimodal
186	Plateau	NA	NA	NA	NA	NA

187	Powell	Continuous	Differentiable	Non-separable	Scalable	Unimodal
188	Powell Singular (aka. Powell's Quartic Function)	Continuous	Differentiable	Non-separable	Scalable	Unimodal
189	Powell Singular N.2	NA	NA	NA	NA	NA
190	Powell Sum	Continuous	Non-differentiable	Separable	Scalable	Multimodal
191	Power Sum	NA	NA	NA	NA	Unimodal
192	Price N.1	Continuous	Non-differentiable	Separable	Non-scalable	Multimodal
193	Price N.2	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
194	Price N.3	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
195	Price N.4	Continuous	Differentiable	Separable	Scalable	Multimodal
196	Prices	NA	NA	NA	NA	NA
197	Qing	Continuous	Differentiable	Separable	Scalable	Multimodal
198	Qing Variant	NA	NA	NA	NA	NA
199	Qing N.2	NA	NA	NA	NA	NA
200	Quadratic	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
201	Quartic	Continuous	Differentiable	Separable	Scalable	NA
202	Quintic	Continuous	Differentiable	Separable	Non-scalable	Multimodal
203	Rana	Continuous	Differentiable	Non-separable	Scalable	Multimodal
204	Rastrigin	NA	NA	Non-separable	NA	Multimodal
205	Rastrigin Modified	NA	NA	NA	NA	Multimodal
206	Rayleigh	NA	NA	NA	NA	NA
207	Ridge	NA	NA	NA	NA	NA
208	Ripple	NA	NA	Non-separable	NA	NA
209	Ripple N.25	NA	NA	Non-separable	NA	NA
210	Rosenbrock	Continuous	Differentiable	Non-separable	Scalable	Unimodal
211	Rosenbrock Modified	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
212	Rotated Ellipse	Continuous	Differentiable	Non-separable	Non-scalable	Unimodal
213	Rotated Ellipse N.2	Continuous	Differentiable	Non-separable	Non-scalable	Unimodal
214	Rotated Hyper Ellipsoid	NA	NA	NA	NA	NA
215	Rump	Continuous	Differentiable	Non-separable	Non-scalable	Unimodal
216	Salomon	Continuous	Differentiable	Non-separable	Scalable	Multimodal
217	Sargan	Continuous	Differentiable	Non-separable	Scalable	Multimodal
218	Sawtooth	NA	NA	NA	NA	NA
219	Schaffer N.1	Continuous	Differentiable	Non-separable	Non-scalable	Unimodal
220	Schaffer N.2	Continuous	Differentiable	Non-separable	Non-scalable	Unimodal
221	Schaffer N.3	Continuous	Differentiable	Non-separable	Non-scalable	Unimodal
222	Schaffer N.4	Continuous	Differentiable	Non-separable	Non-scalable	Unimodal
223	Schaffer F6	Continuous	Differentiable	Non-separable	Scalable	Multimodal
224	Schmidt Vetters	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
225	Schumer Steiglitz	NA	NA	NA	NA	NA
226	Schwefel	Continuous	Differentiable	Non-separable	Scalable	Unimodal
227	Schwefel 1.2	Continuous	Differentiable	Non-separable	Scalable	Multimodal
228	Schwefel 2.20	Continuous	Non-differentiable	Separable	Scalable	Unimodal
229	Schwefel 2.21	Continuous	NA	NA	NA	Unimodal
230	Schwefel 2.22	Continuous	NA	Separable	NA	Unimodal
231	Schwefel 2.23	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
232	Schwefel 2.23A	NA	NA	NA	NA	NA
233	Schwefel 2.25	Continuous	Differentiable	Separable	Non-scalable	Multimodal
234	Schwefel 2.26	Continuous	Differentiable	Separable	Non-scalable	Multimodal
235	Schwefel 2.36	Continuous	Differentiable	Separable	Scalable	Multimodal
236	Schwefel 2.40	Continuous	Differentiable	Separable	Non-scalable	Multimodal
237	Schwefel 2.60	Continuous	Non-differentiable	Separable	Scalable	Unimodal
238	Shekel N.10	Continuous	Differentiable	Non-separable	Scalable	Multimodal
239	Shekel N.5	Continuous	Differentiable	Non-separable	Scalable	Multimodal
240	Shekel N.7	Continuous	Differentiable	Non-separable	Scalable	Multimodal
241	Shubert	Continuous	Differentiable	Separable	Non-scalable	Multimodal
242	Shubert N.3	Continuous	Differentiable	Separable	Non-scalable	Multimodal
243	Shubert N.4	Continuous	Differentiable	Separable	Non-scalable	Multimodal
244	Sine Cosine Algorithm	NA	NA	NA	NA	NA
245	Sine Envelope Sine Wave	NA	NA	NA	NA	NA
246	SODP	NA	NA	NA	NA	NA
247	Sphere	Continuous	Differentiable	Separable	Scalable	Multimodal
248	Step N.2	Non-continuous	Non-differentiable	Separable	Scalable	Unimodal

249	Step N.3	Non-continuous	Non-differentiable	Separable	Scalable	Unimodal
250	Step 4,7	Non-continuous	Non-differentiable	Separable	Scalable	Multimodal
251	Stepint	Non-continuous	Non-differentiable	Separable	Scalable	Unimodal
252	Stochastic	NA	NA	NA	NA	NA
253	Stretched Cosine Wave	NA	NA	NA	NA	NA
254	Stretched V Sine Wave	Continuous	Differentiable	Non-separable	Scalable	Unimodal
255	Styblinski Tang	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
256	Sum of Different Powers	NA	NA	NA	NA	Unimodal
257	Sum Squares	Continuous	NA	NA	NA	Unimodal
258	Tablet	NA	NA	NA	NA	NA
259	Testtube Holder	Continuous	Differentiable	Separable	Scalable	Multimodal
260	Thurber	NA	NA	NA	NA	NA
261	Trec	NA	NA	NA	NA	NA
262	Trecanni	Continuous	Differentiable	Separable	Scalable	Unimodal
263	Trefethen	NA	NA	NA	NA	Multimodal
264	Trid	NA	NA	NA	NA	Unimodal
265	Trid N.6	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
266	Trid N.8	NA	NA	NA	NA	NA
267	Trid N.10	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
268	Trigonometric	Continuous	Differentiable	Non-separable	Scalable	Unimodal
269	Trigonometric N.2	Continuous	Differentiable	Non-separable	Scalable	Multimodal
270	Trimmed Sphere	Continuous	Non-differentiable	NA	NA	NA
271	Tripod	NA	NA	Non-separable	NA	Multimodal
272	Two Axis	NA	NA	NA	NA	NA
273	Urfun N.2	NA	NA	NA	NA	NA
274	Ursem	NA	NA	NA	Non-scalable	NA
275	Ursem N.3	NA	NA	NA	Non-scalable	NA
276	Ursem N.4	NA	NA	NA	Non-scalable	Unimodal
277	Ursem Waves	NA	NA	NA	NA	NA
278	Ursem Wavesfun N.2	NA	NA	NA	Non-scalable	Unimodal
279	Venter Sobiezcczanski Sobieski	Continuous	Differentiable	Separable	Non-scalable	NA
280	Vincent	NA	NA	NA	NA	NA
281	Watson	Continuous	Differentiable	Non-separable	Scalable	Unimodal
282	Wavy	Continuous	Differentiable	Separable	Scalable	Multimodal
283	Wayburn Seader	NA	NA	NA	NA	NA
284	Wayburn Seader N.2	Continuous	Differentiable	Non-separable	Scalable	Unimodal
285	Weierstrass	Continuous	Differentiable	NA	Scalable	Multimodal
286	Whitley	Continuous	Differentiable	Non-separable	Scalable	Multimodal
287	Wolfe	Continuous	Differentiable	Separable	Scalable	Multimodal
288	Xin She Yang N.1	NA	NA	Non-separable	NA	NA
289	Xin She Yang N.2	NA	NA	Separable	NA	NA
290	Xin She Yang N.3	NA	NA	Non-separable	NA	NA
291	Xin She Yang N.4	NA	NA	NA	Non-scalable	NA
292	Xin She Yang N.7	NA	NA	NA	NA	NA
293	Yao Liu N.4	NA	NA	NA	Non-scalable	NA
294	Yao Liu N.9	NA	NA	NA	NA	NA
295	Zakharov	Continuous	Differentiable	Non-separable	Scalable	Multimodal
296	Expanded Zakharov	NA	NA	NA	NA	NA
297	Zero Sum	NA	NA	NA	NA	NA
298	Zettl	Continuous	Differentiable	Non-separable	Non-scalable	Multimodal
299	Zettl Variant	NA	NA	NA	NA	NA
300	Zoom	NA	NA	NA	NA	NA