

HNCO

Fixed-budget analysis

January 6, 2023

Contents

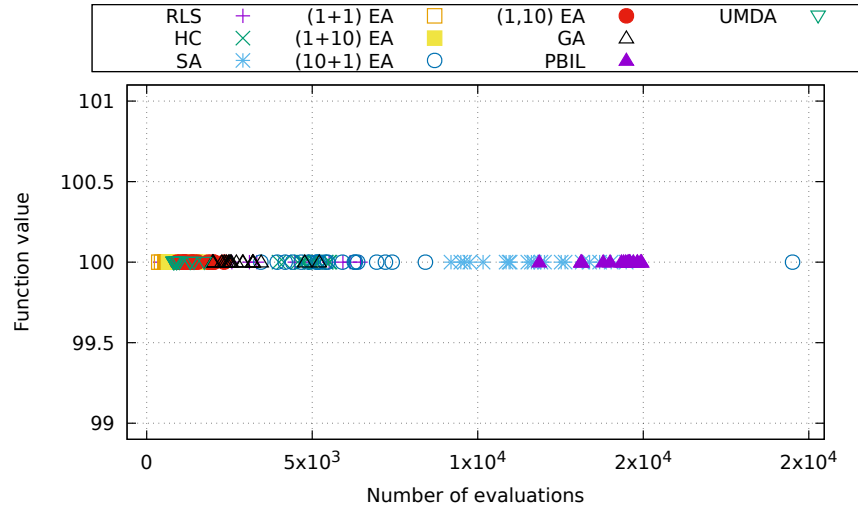
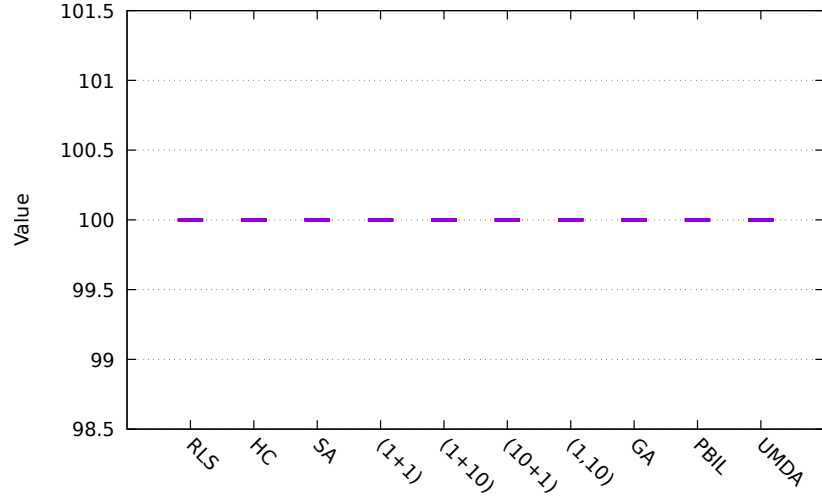
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1 Global results

Algorithm	Rank				
	min	Q_1	med.	Q_3	max
PBIL	1	1.00	1.0	7.00	10
SA	1	1.00	2.0	3.50	10
RLS	1	2.00	2.0	5.00	10
GA	1	1.50	3.0	4.00	10
HC	1	1.00	4.0	5.50	10
(1 + 1) EA	1	1.00	4.0	7.50	9
UMDA	1	1.00	4.0	7.50	10
(10 + 1) EA	1	1.50	4.0	4.50	6
(1, 10) EA	1	2.00	4.0	4.50	8
(1 + 10) EA	1	2.00	4.0	8.00	9

2 Function one-max

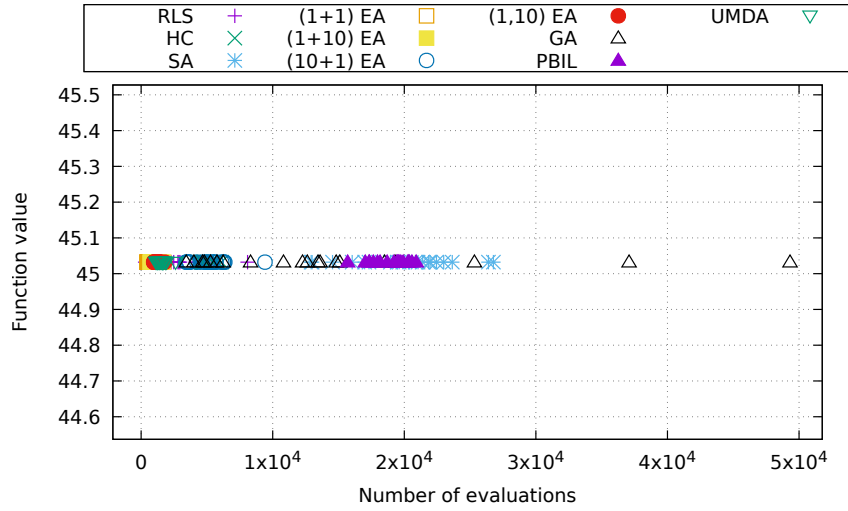
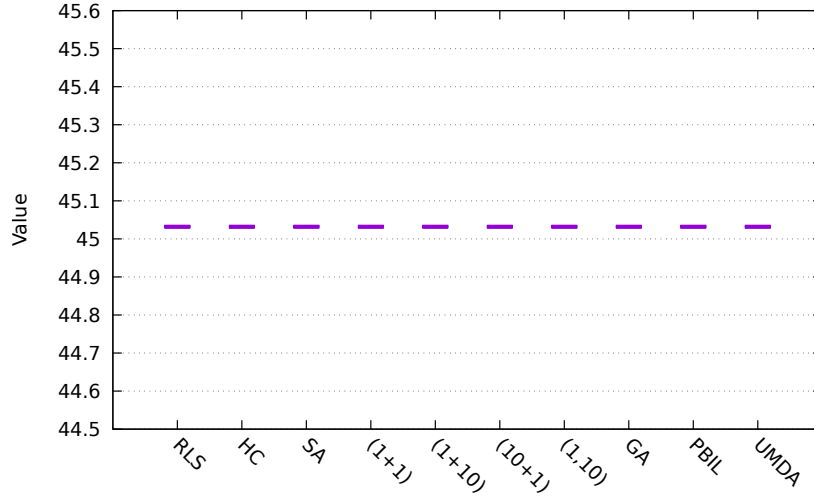
Algorithm	Value				
	min	Q_1	med.	Q_3	max
RLS	100	100	100	100	100
HC	100	100	100	100	100
SA	100	100	100	100	100
(1 + 1) EA	100	100	100	100	100
(1 + 10) EA	100	100	100	100	100
(10 + 1) EA	100	100	100	100	100
(1, 10) EA	100	100	100	100	100
GA	100	100	100	100	100
PBIL	100	100	100	100	100
UMDA	100	100	100	100	100



Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
(1 + 1) EA	0.00	0.00	0.00	0.00	0.00	0.00
(1 + 10) EA	0.00	0.00	0.00	0.00	0.00	0.00
(1, 10) EA	0.00	0.00	0.00	0.00	0.00	0.00
RLS	0.00	0.00	0.00	0.00	0.00	0.00
HC	0.00	0.00	0.00	0.00	0.00	0.00
UMDA	0.00	0.00	0.00	0.00	0.00	0.00
(10 + 1) EA	0.00	0.00	0.00	0.00	0.01	0.00
SA	0.00	0.00	0.00	0.00	0.01	0.00
GA	0.01	0.00	0.00	0.00	0.01	0.00
PBIL	0.04	0.00	0.01	0.00	0.04	0.00

3 Function lin

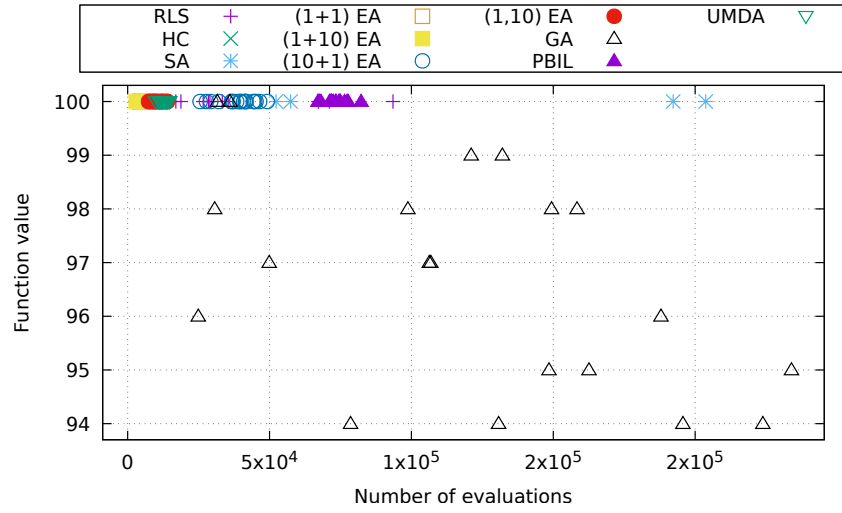
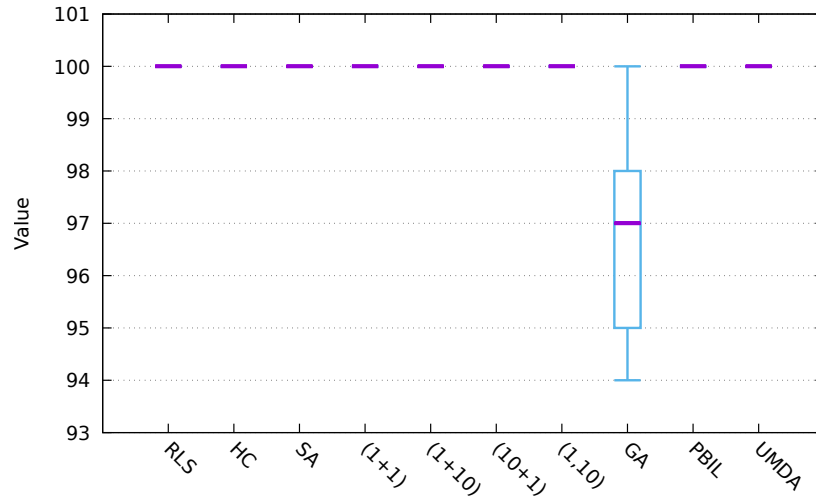
Algorithm	Value				
	min	Q_1	med.	Q_3	max
RLS	45.03	45.03	45.03	45.03	45.03
HC	45.03	45.03	45.03	45.03	45.03
SA	45.03	45.03	45.03	45.03	45.03
(1 + 1) EA	45.03	45.03	45.03	45.03	45.03
(1 + 10) EA	45.03	45.03	45.03	45.03	45.03
(10 + 1) EA	45.03	45.03	45.03	45.03	45.03
(1, 10) EA	45.03	45.03	45.03	45.03	45.03
GA	45.03	45.03	45.03	45.03	45.03
PBIL	45.03	45.03	45.03	45.03	45.03
UMDA	45.03	45.03	45.03	45.03	45.03



Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
(1 + 1) EA	0.00	0.00	0.00	0.00	0.00	0.00
(1 + 10) EA	0.00	0.00	0.00	0.00	0.00	0.00
(1, 10) EA	0.00	0.00	0.00	0.00	0.00	0.00
RLS	0.00	0.00	0.00	0.00	0.00	0.00
HC	0.00	0.00	0.00	0.00	0.00	0.00
(10 + 1) EA	0.00	0.00	0.00	0.00	0.01	0.00
UMDA	0.00	0.00	0.00	0.00	0.00	0.00
SA	0.01	0.00	0.01	0.00	0.02	0.00
GA	0.03	0.02	0.01	0.01	0.04	0.03
PBIL	0.05	0.00	0.01	0.00	0.06	0.00

4 Function leading-ones

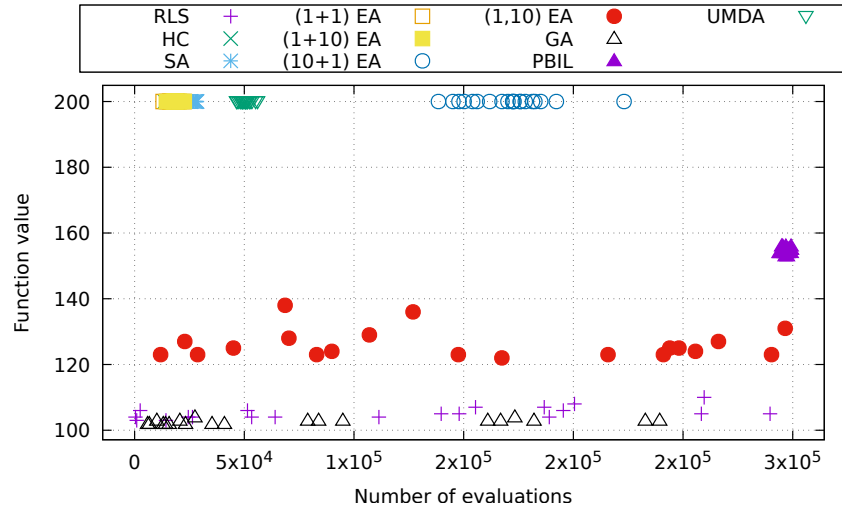
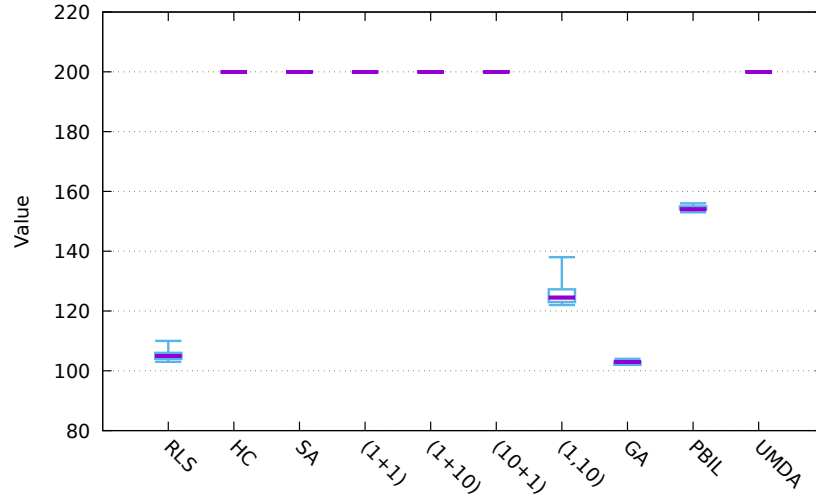
Algorithm	Value				
	min	Q_1	med.	Q_3	max
RLS	100	100	100	100	100
HC	100	100	100	100	100
SA	100	100	100	100	100
(1 + 1) EA	100	100	100	100	100
(1 + 10) EA	100	100	100	100	100
(10 + 1) EA	100	100	100	100	100
(1, 10) EA	100	100	100	100	100
PBIL	100	100	100	100	100
UMDA	100	100	100	100	100
GA	94	95	97	98	100



Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
HC	0.00	0.00	0.00	0.00	0.00	0.00
(1 + 10) EA	0.00	0.00	0.00	0.00	0.01	0.00
(1 + 1) EA	0.00	0.00	0.00	0.00	0.01	0.00
(1, 10) EA	0.00	0.00	0.00	0.00	0.01	0.00
RLS	0.01	0.01	0.01	0.01	0.02	0.02
SA	0.01	0.02	0.01	0.02	0.02	0.04
(10 + 1) EA	0.02	0.00	0.02	0.00	0.04	0.01
UMDA	0.03	0.00	0.00	0.00	0.03	0.00
PBIL	0.18	0.01	0.03	0.00	0.21	0.01
GA	0.55	0.17	0.11	0.03	0.66	0.20

5 Function ridge

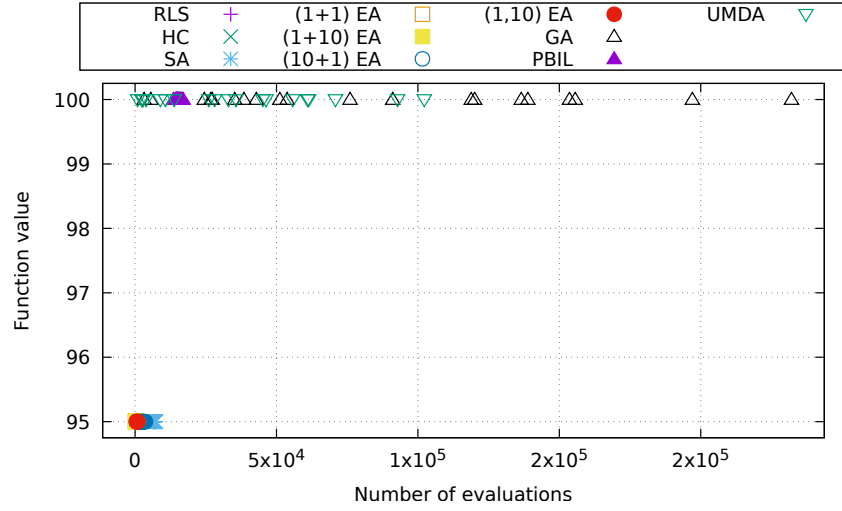
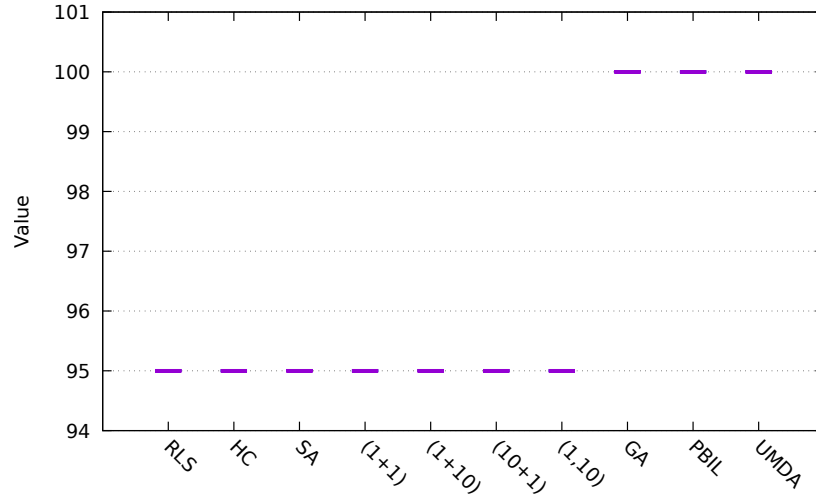
Algorithm	Value				
	min	Q_1	med.	Q_3	max
HC	200	200	200	200	200
SA	200	200	200	200	200
(1 + 1) EA	200	200	200	200	200
(1 + 10) EA	200	200	200	200	200
(10 + 1) EA	200	200	200	200	200
UMDA	200	200	200	200	200
PBIL	153	154	154	155	156
(1, 10) EA	122	123	125	127	138
RLS	103	104	105	106	110
GA	102	102	103	103	104



Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
HC	0.00	0.00	0.01	0.00	0.01	0.00
SA	0.01	0.00	0.01	0.00	0.02	0.00
(1 + 1) EA	0.01	0.00	0.01	0.00	0.02	0.00
(1 + 10) EA	0.01	0.00	0.01	0.00	0.02	0.00
RLS	0.09	0.00	0.11	0.00	0.21	0.00
(10 + 1) EA	0.10	0.01	0.07	0.01	0.17	0.02
UMDA	0.11	0.01	0.02	0.00	0.13	0.01
(1, 10) EA	0.13	0.00	0.12	0.00	0.25	0.01
GA	0.61	0.01	0.12	0.00	0.73	0.01
PBIL	0.66	0.01	0.13	0.00	0.79	0.01

6 Function jmp-5

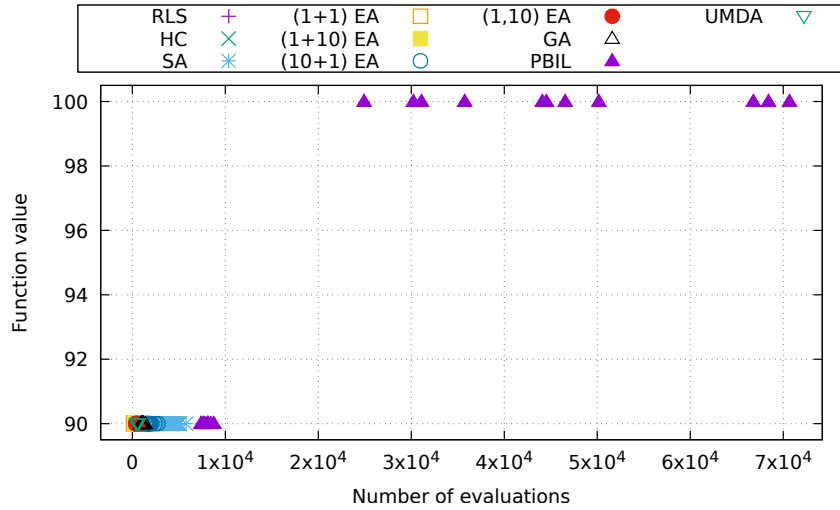
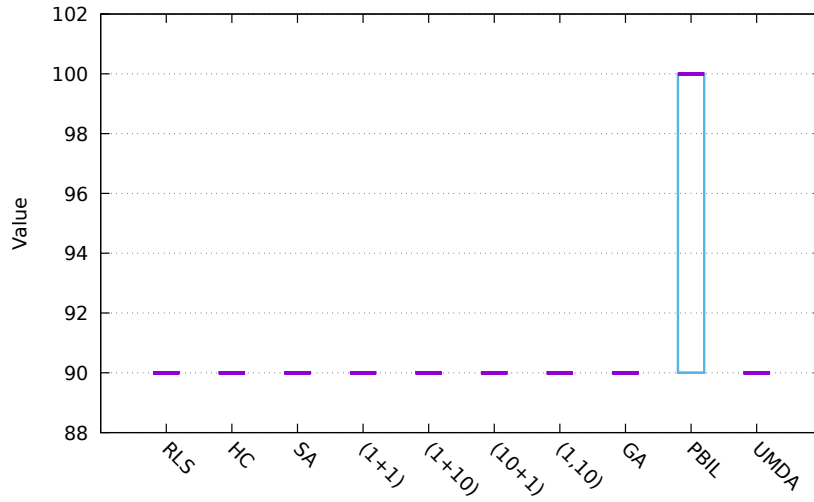
Algorithm	Value				
	min	Q_1	med.	Q_3	max
GA	100	100	100	100	100
PBIL	100	100	100	100	100
UMDA	100	100	100	100	100
RLS	95	95	95	95	95
HC	95	95	95	95	95
SA	95	95	95	95	95
(1 + 1) EA	95	95	95	95	95
(1 + 10) EA	95	95	95	95	95
(10 + 1) EA	95	95	95	95	95
(1, 10) EA	95	95	95	95	95



Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
PBIL	0.04	0.00	0.01	0.00	0.05	0.00
UMDA	0.08	0.07	0.01	0.01	0.09	0.08
HC	0.08	0.00	0.11	0.00	0.19	0.00
RLS	0.09	0.00	0.11	0.00	0.20	0.00
SA	0.10	0.00	0.11	0.00	0.21	0.00
(1, 10) EA	0.13	0.00	0.11	0.00	0.24	0.00
(1 + 1) EA	0.14	0.00	0.11	0.00	0.25	0.01
(1 + 10) EA	0.15	0.00	0.11	0.00	0.26	0.01
(10 + 1) EA	0.17	0.00	0.11	0.00	0.29	0.01
GA	0.18	0.14	0.03	0.03	0.21	0.16

7 Function jmp-10

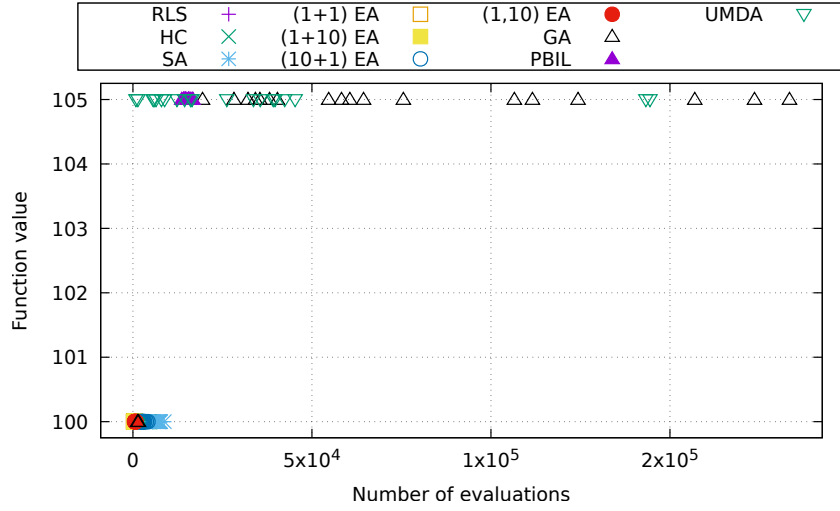
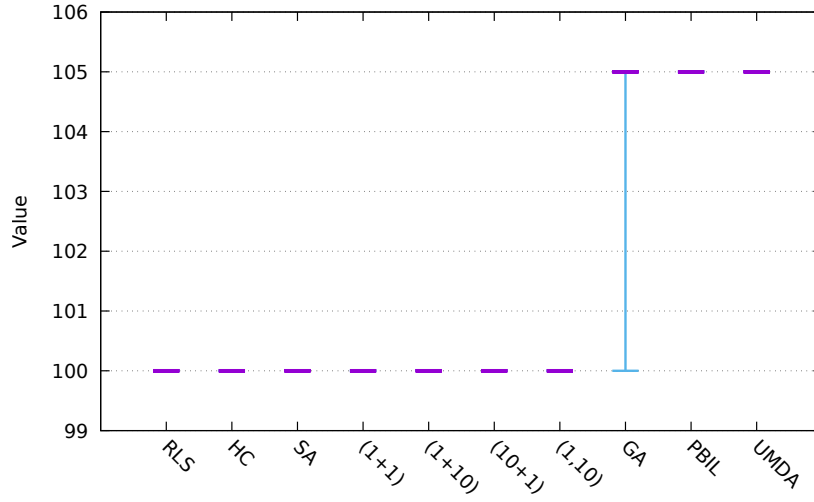
Algorithm	Value				
	min	Q_1	med.	Q_3	max
PBIL	90	90	100	100	100
RLS	90	90	90	90	90
HC	90	90	90	90	90
SA	90	90	90	90	90
(1 + 1) EA	90	90	90	90	90
(1 + 10) EA	90	90	90	90	90
(10 + 1) EA	90	90	90	90	90
(1, 10) EA	90	90	90	90	90
GA	90	90	90	90	90
UMDA	90	90	90	90	90



Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
HC	0.08	0.00	0.11	0.00	0.19	0.00
RLS	0.09	0.00	0.11	0.00	0.20	0.00
SA	0.10	0.00	0.11	0.00	0.21	0.00
(1, 10) EA	0.13	0.00	0.11	0.00	0.24	0.01
(1 + 1) EA	0.14	0.00	0.11	0.00	0.25	0.01
(1 + 10) EA	0.15	0.00	0.11	0.00	0.26	0.00
(10 + 1) EA	0.17	0.00	0.11	0.00	0.29	0.01
PBIL	0.38	0.30	0.06	0.05	0.44	0.34
GA	0.61	0.01	0.11	0.00	0.72	0.01
UMDA	0.68	0.01	0.11	0.00	0.79	0.01

8 Function djmp-5

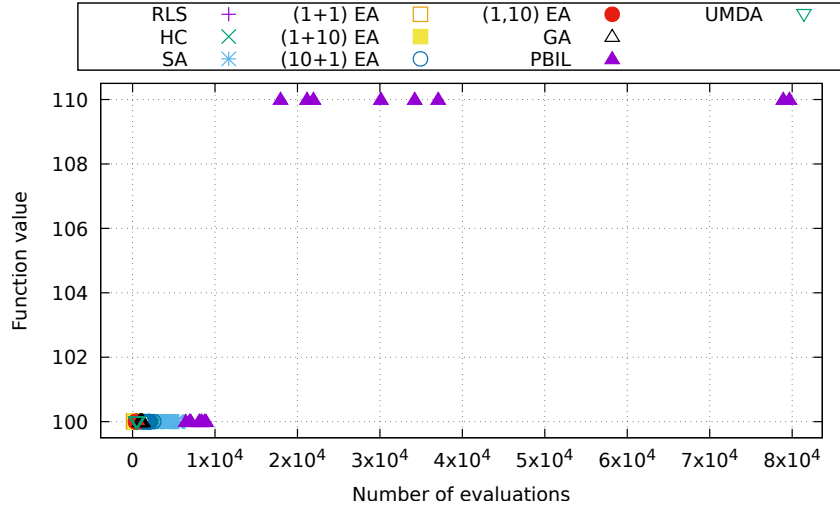
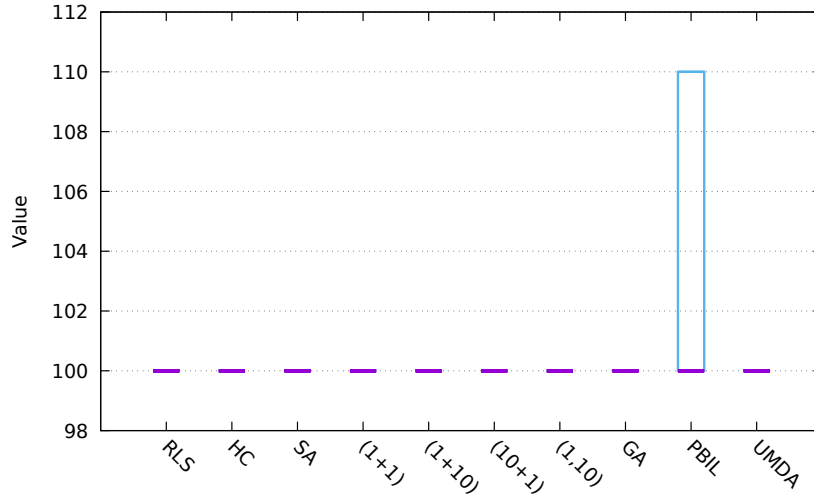
Algorithm	Value				
	min	Q_1	med.	Q_3	max
PBIL	105	105	105	105	105
UMDA	105	105	105	105	105
GA	100	105	105	105	105
RLS	100	100	100	100	100
HC	100	100	100	100	100
SA	100	100	100	100	100
(1 + 1) EA	100	100	100	100	100
(1 + 10) EA	100	100	100	100	100
(10 + 1) EA	100	100	100	100	100
(1, 10) EA	100	100	100	100	100



Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
PBIL	0.04	0.00	0.01	0.00	0.05	0.00
UMDA	0.07	0.09	0.01	0.02	0.08	0.11
HC	0.08	0.00	0.11	0.00	0.19	0.00
RLS	0.09	0.00	0.11	0.00	0.21	0.01
SA	0.10	0.00	0.11	0.00	0.21	0.01
(1, 10) EA	0.13	0.00	0.11	0.00	0.24	0.00
(1 + 1) EA	0.14	0.00	0.11	0.00	0.25	0.01
(1 + 10) EA	0.15	0.00	0.11	0.00	0.26	0.01
(10 + 1) EA	0.17	0.00	0.11	0.00	0.29	0.01
GA	0.20	0.17	0.04	0.03	0.24	0.20

9 Function djmp-10

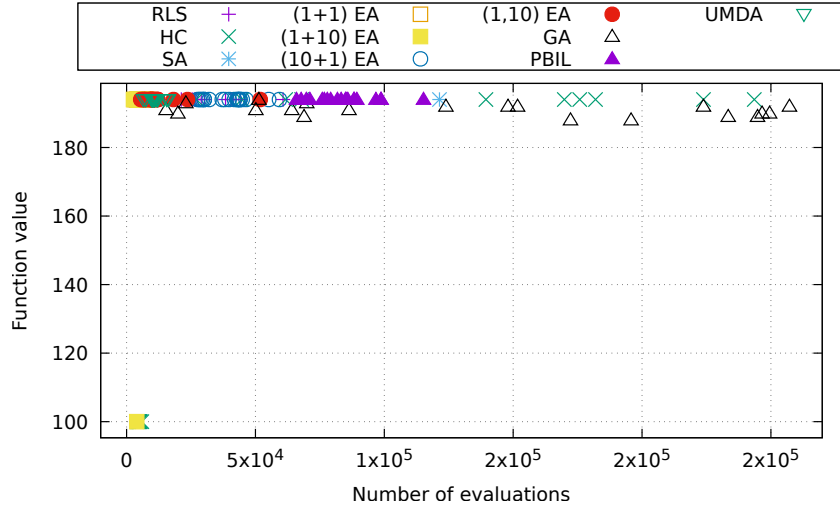
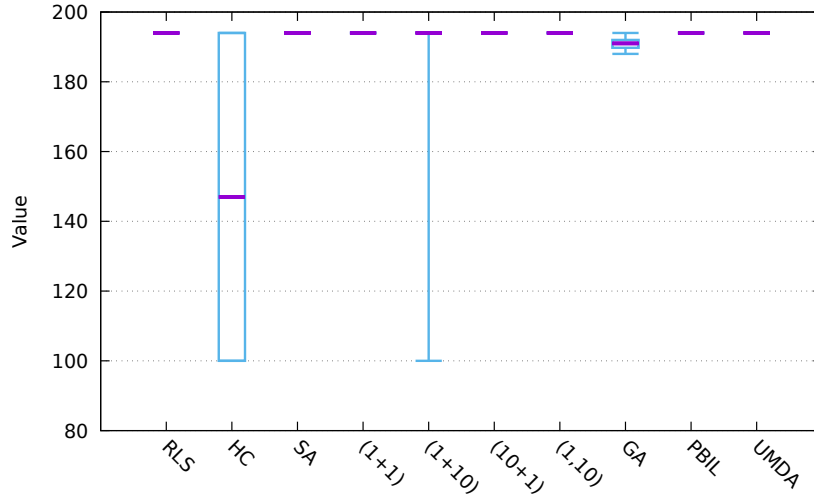
Algorithm	Value				
	min	Q_1	med.	Q_3	max
PBIL	100	100	100	110	110
RLS	100	100	100	100	100
HC	100	100	100	100	100
SA	100	100	100	100	100
(1 + 1) EA	100	100	100	100	100
(1 + 10) EA	100	100	100	100	100
(10 + 1) EA	100	100	100	100	100
(1, 10) EA	100	100	100	100	100
GA	100	100	100	100	100
UMDA	100	100	100	100	100



Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
HC	0.08	0.00	0.11	0.00	0.20	0.00
RLS	0.09	0.00	0.11	0.00	0.21	0.01
SA	0.10	0.00	0.11	0.00	0.21	0.01
(1, 10) EA	0.13	0.00	0.11	0.00	0.24	0.01
(1 + 1) EA	0.14	0.00	0.11	0.00	0.25	0.01
(1 + 10) EA	0.15	0.00	0.11	0.00	0.26	0.01
(10 + 1) EA	0.17	0.00	0.11	0.00	0.29	0.01
PBIL	0.46	0.30	0.08	0.05	0.54	0.35
GA	0.61	0.01	0.11	0.00	0.72	0.01
UMDA	0.68	0.01	0.11	0.00	0.79	0.01

10 Function fp-5

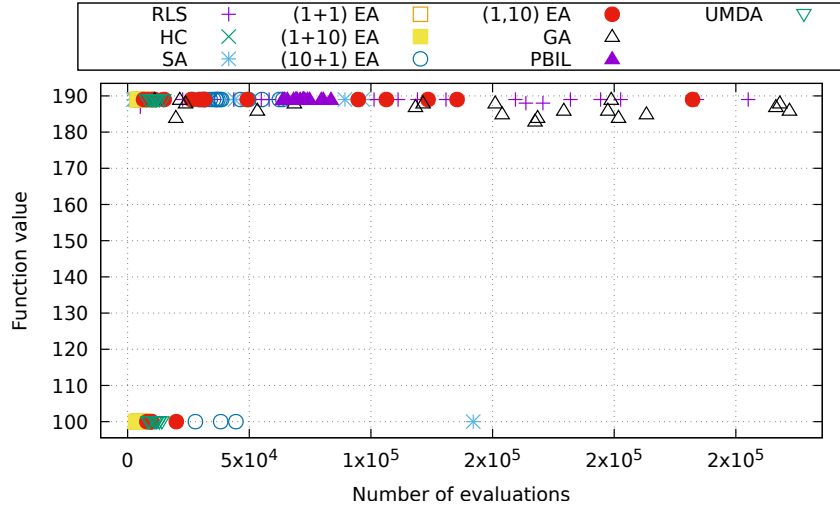
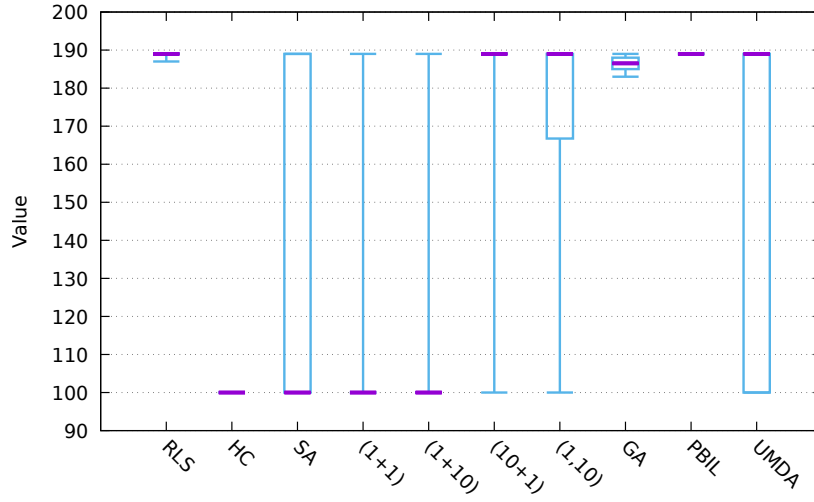
Algorithm	Value				
	min	Q_1	med.	Q_3	max
RLS	194	194	194	194	194
SA	194	194	194	194	194
(1 + 1) EA	194	194	194	194	194
(10 + 1) EA	194	194	194	194	194
(1, 10) EA	194	194	194	194	194
PBIL	194	194	194	194	194
UMDA	194	194	194	194	194
(1 + 10) EA	100	194	194	194	194
GA	188	190	191	192	194
HC	100	100	147	194	194



Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
(1 + 1) EA	0.00	0.00	0.00	0.00	0.01	0.00
SA	0.00	0.01	0.00	0.01	0.01	0.02
(1, 10) EA	0.01	0.00	0.01	0.00	0.01	0.01
RLS	0.01	0.00	0.01	0.01	0.02	0.01
(1 + 10) EA	0.01	0.03	0.01	0.03	0.02	0.06
(10 + 1) EA	0.02	0.00	0.02	0.00	0.04	0.01
UMDA	0.03	0.01	0.00	0.00	0.03	0.01
HC	0.06	0.03	0.09	0.04	0.15	0.07
PBIL	0.20	0.03	0.04	0.01	0.24	0.03
GA	0.59	0.11	0.12	0.02	0.71	0.14

11 Function fp-10

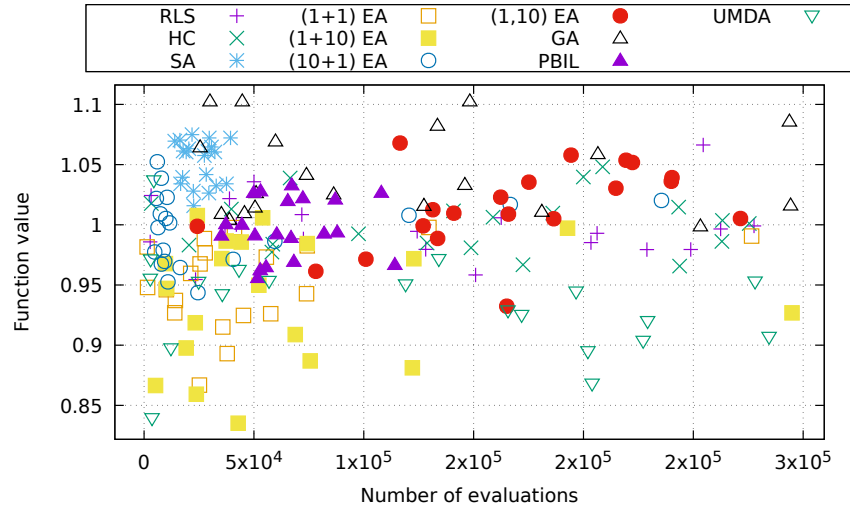
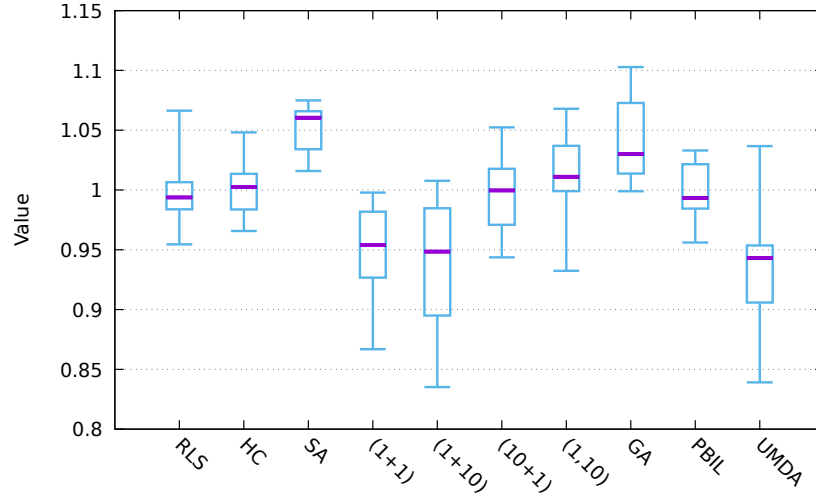
Algorithm	Value				
	min	Q_1	med.	Q_3	max
PBIL	189	189	189	189	189
RLS	187	189	189	189	189
(10 + 1) EA	100	189	189	189	189
(1, 10) EA	100	167	189	189	189
UMDA	100	100	189	189	189
GA	183	185	187	188	189
SA	100	100	100	189	189
(1 + 1) EA	100	100	100	100	189
(1 + 10) EA	100	100	100	100	189
HC	100	100	100	100	100



Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
RLS	0.04	0.03	0.06	0.04	0.10	0.07
(10 + 1) EA	0.05	0.06	0.03	0.04	0.08	0.10
(1, 10) EA	0.05	0.05	0.05	0.05	0.10	0.10
SA	0.07	0.04	0.09	0.05	0.16	0.09
HC	0.08	0.00	0.12	0.00	0.20	0.01
(1 + 10) EA	0.12	0.06	0.10	0.05	0.21	0.11
(1 + 1) EA	0.12	0.05	0.10	0.04	0.22	0.10
PBIL	0.18	0.01	0.03	0.00	0.21	0.01
UMDA	0.28	0.31	0.05	0.06	0.33	0.38
GA	0.54	0.18	0.11	0.04	0.66	0.22

12 Function nk

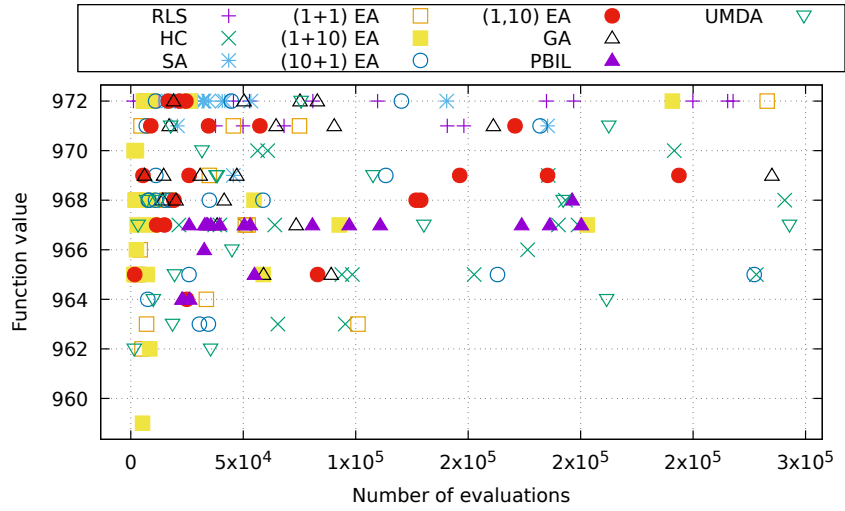
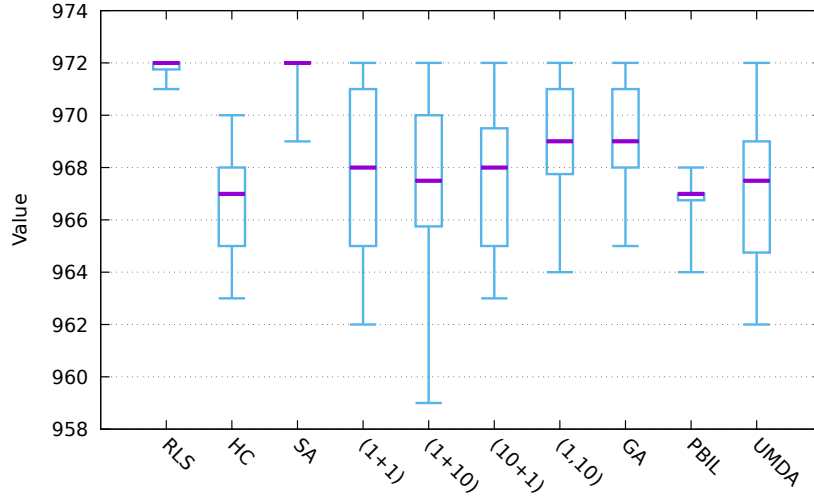
Algorithm	Value				
	min	Q_1	med.	Q_3	max
SA	1.02	1.03	1.06	1.07	1.07
GA	1.00	1.01	1.03	1.07	1.10
(1, 10) EA	0.93	1.00	1.01	1.04	1.07
HC	0.97	0.98	1.00	1.01	1.05
(10 + 1) EA	0.94	0.97	1.00	1.02	1.05
RLS	0.95	0.98	0.99	1.01	1.07
PBIL	0.96	0.98	0.99	1.02	1.03
(1 + 1) EA	0.87	0.93	0.95	0.98	1.00
(1 + 10) EA	0.84	0.90	0.95	0.98	1.01
UMDA	0.84	0.91	0.94	0.95	1.04



Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
HC	0.08	0.00	0.48	0.01	0.57	0.01
RLS	0.10	0.00	0.50	0.01	0.60	0.01
SA	0.10	0.00	0.46	0.01	0.56	0.01
(1, 10) EA	0.13	0.00	0.46	0.01	0.60	0.01
(1 + 1) EA	0.15	0.00	0.48	0.01	0.63	0.01
(1 + 10) EA	0.15	0.00	0.49	0.01	0.64	0.01
(10 + 1) EA	0.18	0.00	0.51	0.02	0.69	0.02
GA	0.61	0.01	0.58	0.01	1.19	0.01
UMDA	0.65	0.01	0.47	0.01	1.12	0.01
PBIL	0.67	0.01	0.52	0.01	1.19	0.01

13 Function max-sat

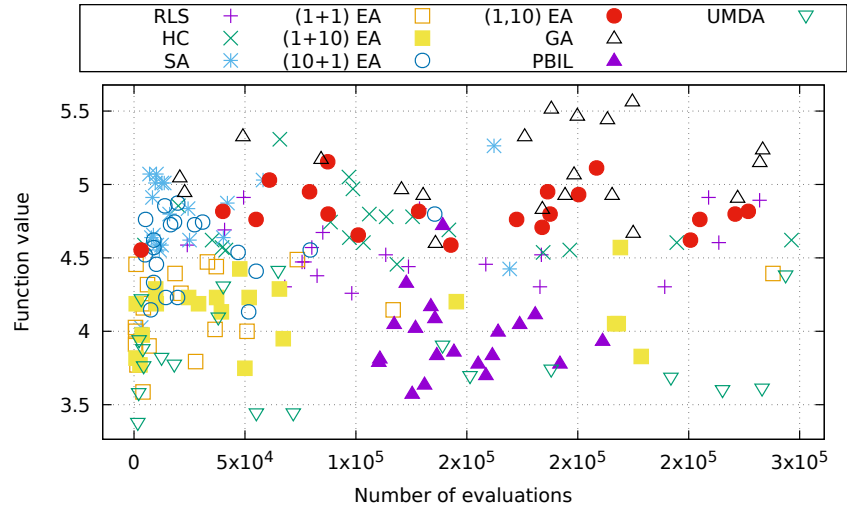
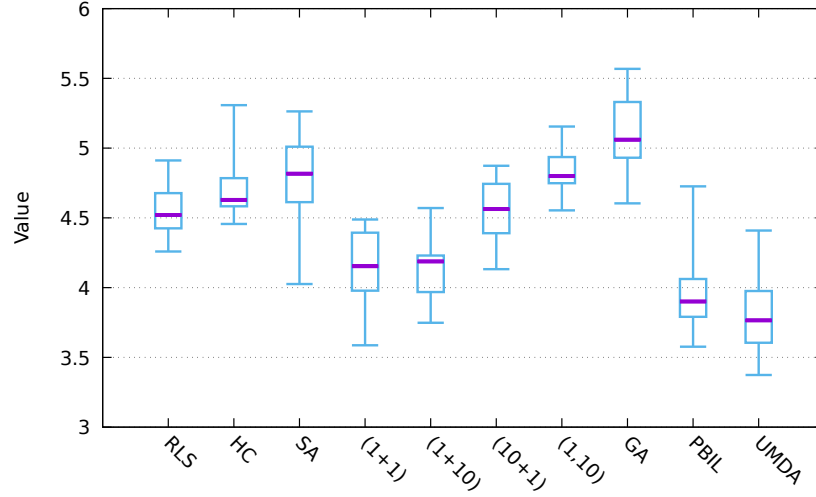
Algorithm	Value				
	min	Q_1	med.	Q_3	max
SA	969	972	972	972	972
RLS	971	972	972	972	972
GA	965	968	969	971	972
(1, 10) EA	964	968	969	971	972
(1 + 1) EA	962	965	968	971	972
(10 + 1) EA	963	965	968	970	972
(1 + 10) EA	959	966	968	970	972
UMDA	962	965	968	969	972
HC	963	965	967	968	970
PBIL	964	967	967	967	968



Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
HC	0.09	0.00	1.88	0.04	1.97	0.04
RLS	0.10	0.00	1.90	0.05	2.00	0.05
SA	0.10	0.00	1.75	0.04	1.86	0.04
(1, 10) EA	0.13	0.00	1.72	0.04	1.86	0.04
(1 + 1) EA	0.15	0.00	1.91	0.04	2.06	0.04
(1 + 10) EA	0.15	0.01	1.89	0.07	2.04	0.07
(10 + 1) EA	0.19	0.00	2.18	0.06	2.36	0.06
GA	0.62	0.01	2.34	0.06	2.95	0.06
UMDA	0.66	0.01	1.75	0.04	2.41	0.04
PBIL	0.68	0.04	1.93	0.10	2.61	0.14

14 Function labs

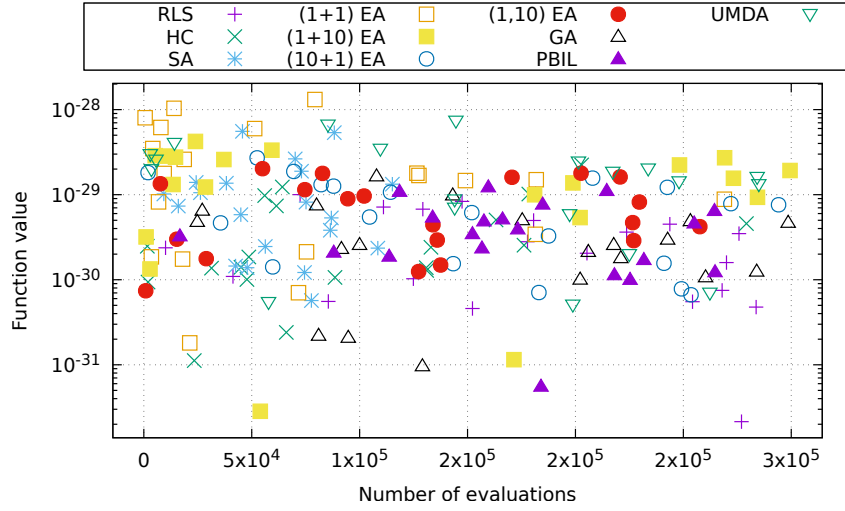
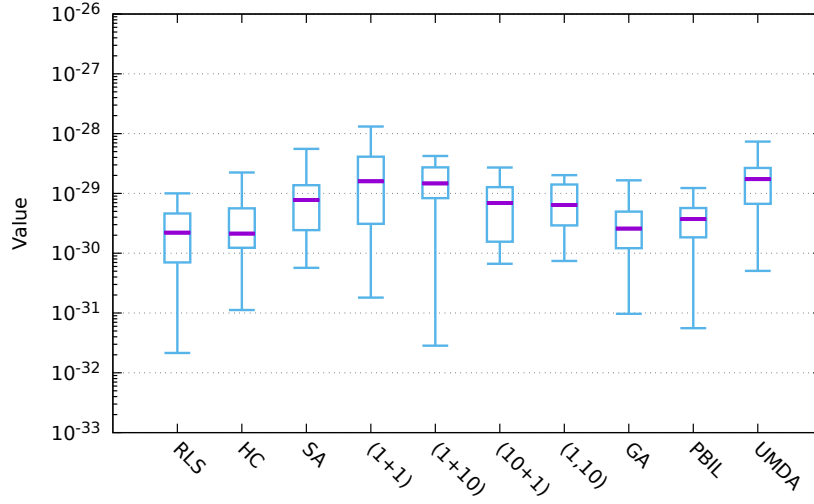
Algorithm	Value				
	min	Q_1	med.	Q_3	max
GA	4.60	4.93	5.06	5.33	5.57
SA	4.03	4.61	4.82	5.01	5.26
(1, 10) EA	4.55	4.75	4.80	4.94	5.15
HC	4.46	4.58	4.63	4.78	5.31
(10 + 1) EA	4.13	4.39	4.56	4.74	4.87
RLS	4.26	4.42	4.52	4.68	4.91
(1 + 10) EA	3.75	3.97	4.19	4.23	4.57
(1 + 1) EA	3.59	3.98	4.15	4.39	4.49
PBIL	3.58	3.79	3.90	4.06	4.73
UMDA	3.37	3.60	3.77	3.98	4.41



Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
HC	0.08	0.00	1.39	0.05	1.47	0.05
RLS	0.10	0.00	1.38	0.04	1.47	0.04
SA	0.10	0.00	1.39	0.06	1.49	0.06
(1, 10) EA	0.13	0.00	1.39	0.06	1.52	0.06
(1 + 1) EA	0.14	0.00	1.39	0.06	1.53	0.07
(1 + 10) EA	0.15	0.00	1.38	0.03	1.52	0.03
(10 + 1) EA	0.18	0.00	1.41	0.07	1.59	0.07
GA	0.61	0.01	1.38	0.05	2.00	0.05
UMDA	0.65	0.01	1.39	0.07	2.04	0.07
PBIL	0.71	0.01	1.37	0.05	2.08	0.05

15 Function ep

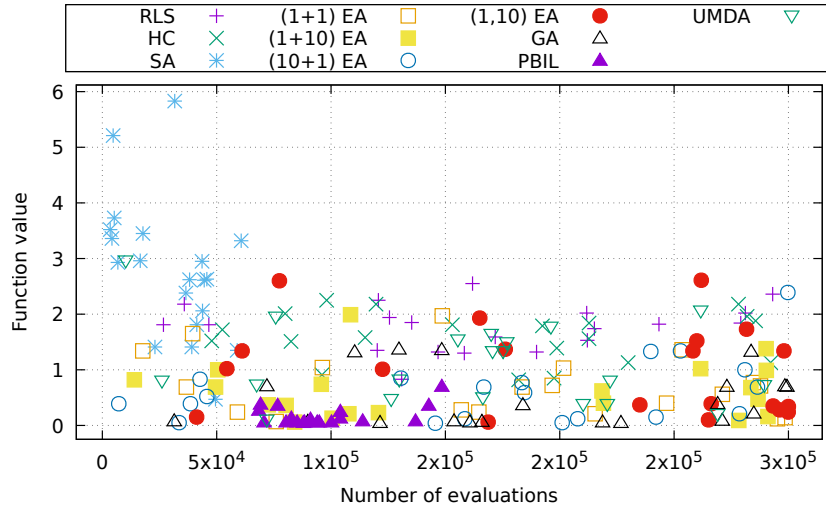
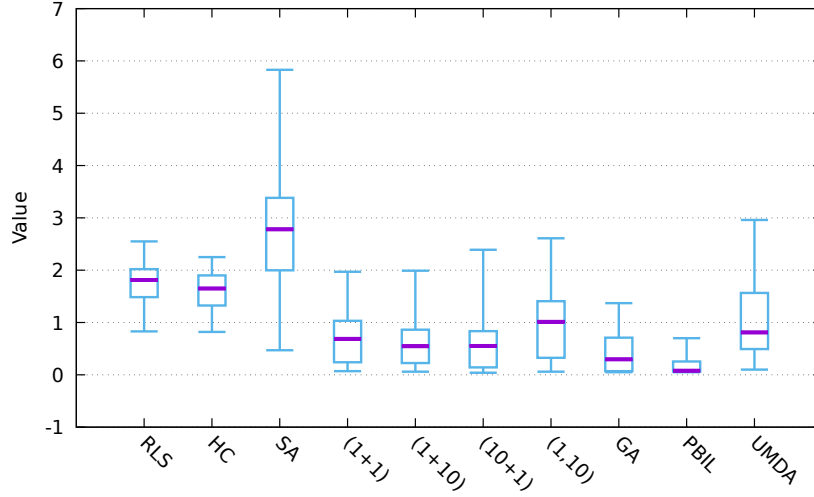
Algorithm	Value				
	min	Q_1	med.	Q_3	max
HC	1.1×10^{-31}	1.2×10^{-30}	2.1×10^{-30}	5.6×10^{-30}	2.2×10^{-29}
RLS	2.1×10^{-32}	7.0×10^{-31}	2.2×10^{-30}	4.6×10^{-30}	1.0×10^{-29}
GA	9.7×10^{-32}	1.2×10^{-30}	2.6×10^{-30}	5.0×10^{-30}	1.7×10^{-29}
PBIL	5.6×10^{-32}	1.8×10^{-30}	3.7×10^{-30}	5.7×10^{-30}	1.2×10^{-29}
(1, 10) EA	7.4×10^{-31}	2.9×10^{-30}	6.4×10^{-30}	1.4×10^{-29}	2.0×10^{-29}
(10 + 1) EA	6.7×10^{-31}	1.6×10^{-30}	6.9×10^{-30}	1.3×10^{-29}	2.7×10^{-29}
SA	5.7×10^{-31}	2.4×10^{-30}	7.8×10^{-30}	1.4×10^{-29}	5.6×10^{-29}
(1 + 10) EA	2.8×10^{-32}	8.3×10^{-30}	1.5×10^{-29}	2.7×10^{-29}	4.2×10^{-29}
(1 + 1) EA	1.8×10^{-31}	3.1×10^{-30}	1.6×10^{-29}	4.1×10^{-29}	1.3×10^{-28}
UMDA	5.1×10^{-31}	6.7×10^{-30}	1.7×10^{-29}	2.7×10^{-29}	7.4×10^{-29}



Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
HC	0.08	0.00	0.15	0.00	0.23	0.00
RLS	0.10	0.00	0.16	0.00	0.25	0.00
SA	0.10	0.00	0.15	0.00	0.25	0.00
(1, 10) EA	0.13	0.00	0.15	0.00	0.28	0.00
(1 + 1) EA	0.14	0.00	0.15	0.00	0.29	0.00
(1 + 10) EA	0.14	0.00	0.15	0.00	0.29	0.00
(10 + 1) EA	0.17	0.00	0.16	0.00	0.34	0.00
GA	0.61	0.01	0.20	0.00	0.81	0.01
UMDA	0.65	0.01	0.15	0.00	0.80	0.01
PBIL	0.76	0.01	0.21	0.00	0.97	0.01

16 Function cancel

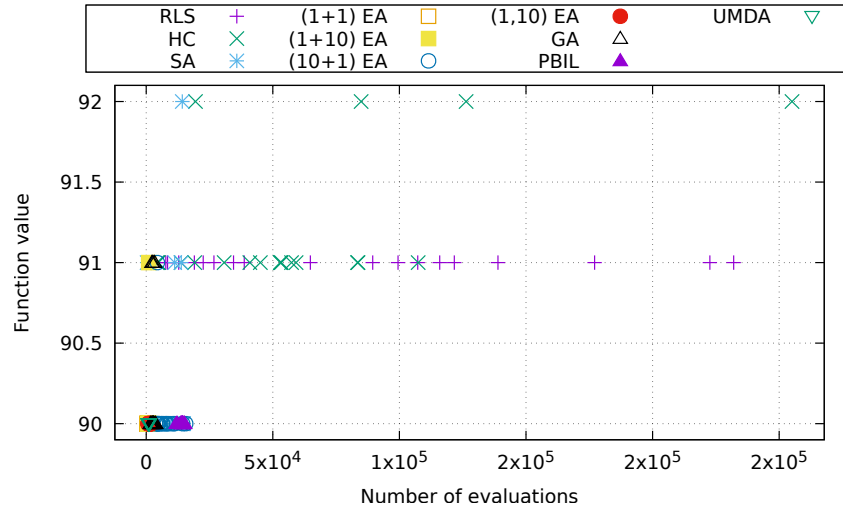
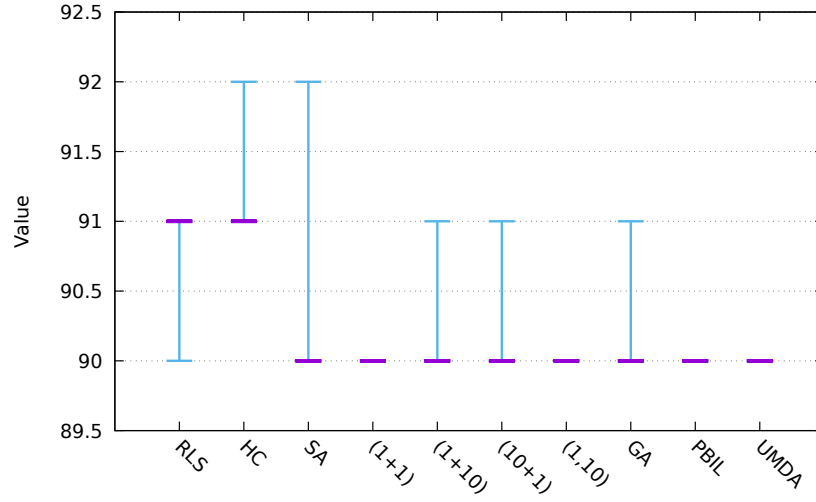
Algorithm	Value				
	min	Q_1	med.	Q_3	max
PBIL	0.05	0.06	0.08	0.26	0.70
GA	0.05	0.07	0.30	0.71	1.37
(1 + 10) EA	0.06	0.23	0.55	0.86	1.99
(10 + 1) EA	0.04	0.14	0.56	0.84	2.39
(1 + 1) EA	0.07	0.24	0.69	1.03	1.97
UMDA	0.10	0.49	0.81	1.57	2.96
(1, 10) EA	0.06	0.33	1.02	1.41	2.61
HC	0.82	1.33	1.65	1.90	2.25
RLS	0.83	1.49	1.82	2.02	2.55
SA	0.47	2.00	2.78	3.38	5.83



Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
HC	0.08	0.00	0.14	0.00	0.22	0.01
RLS	0.09	0.00	0.14	0.00	0.23	0.01
SA	0.10	0.00	0.14	0.00	0.23	0.01
(1, 10) EA	0.13	0.00	0.14	0.00	0.26	0.01
(1 + 1) EA	0.14	0.00	0.14	0.00	0.28	0.00
(1 + 10) EA	0.14	0.00	0.14	0.00	0.28	0.00
(10 + 1) EA	0.17	0.00	0.14	0.00	0.31	0.01
GA	0.61	0.01	0.14	0.00	0.75	0.01
UMDA	0.65	0.01	0.14	0.00	0.78	0.02
PBIL	0.68	0.01	0.15	0.00	0.83	0.01

17 Function trap

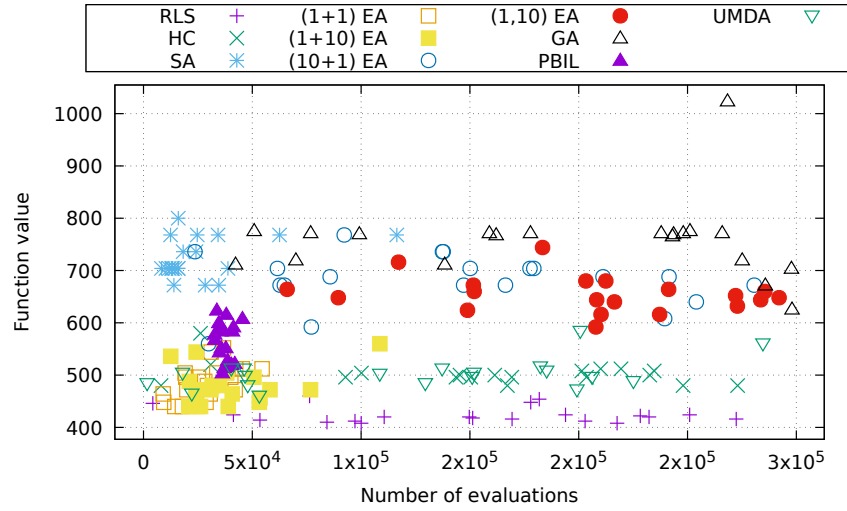
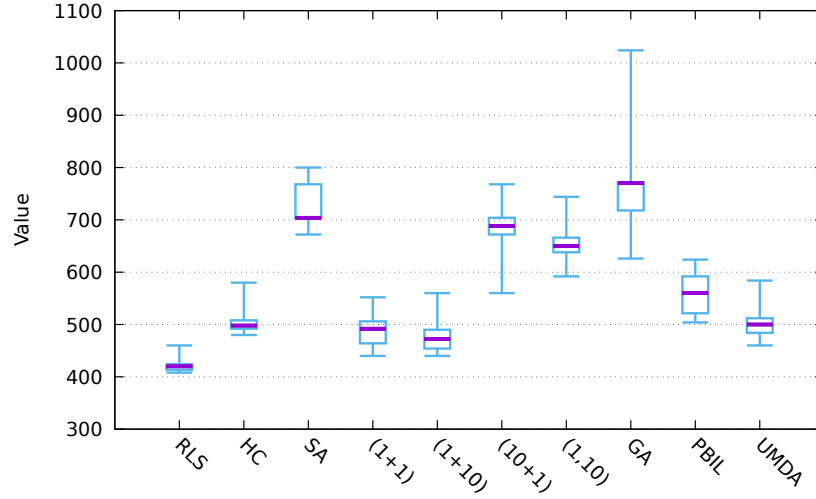
Algorithm	Value				
	min	Q_1	med.	Q_3	max
HC	91	91	91	91	92
RLS	90	91	91	91	91
SA	90	90	90	90	92
(1 + 10) EA	90	90	90	90	91
(10 + 1) EA	90	90	90	90	91
GA	90	90	90	90	91
(1 + 1) EA	90	90	90	90	90
(1, 10) EA	90	90	90	90	90
PBIL	90	90	90	90	90
UMDA	90	90	90	90	90



Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
HC	0.08	0.00	0.13	0.00	0.21	0.01
RLS	0.09	0.00	0.13	0.00	0.22	0.01
SA	0.10	0.00	0.13	0.00	0.23	0.01
(1, 10) EA	0.13	0.00	0.13	0.00	0.26	0.01
(1 + 1) EA	0.14	0.00	0.13	0.00	0.27	0.01
(1 + 10) EA	0.15	0.00	0.13	0.00	0.28	0.00
(10 + 1) EA	0.17	0.00	0.13	0.00	0.30	0.01
GA	0.61	0.01	0.13	0.00	0.74	0.01
UMDA	0.65	0.01	0.13	0.00	0.77	0.01
PBIL	0.66	0.01	0.13	0.00	0.79	0.01

18 Function hiff

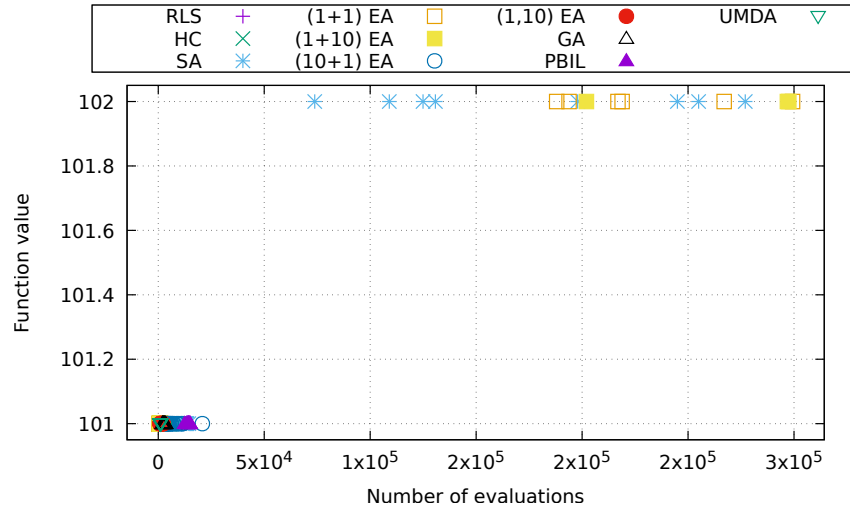
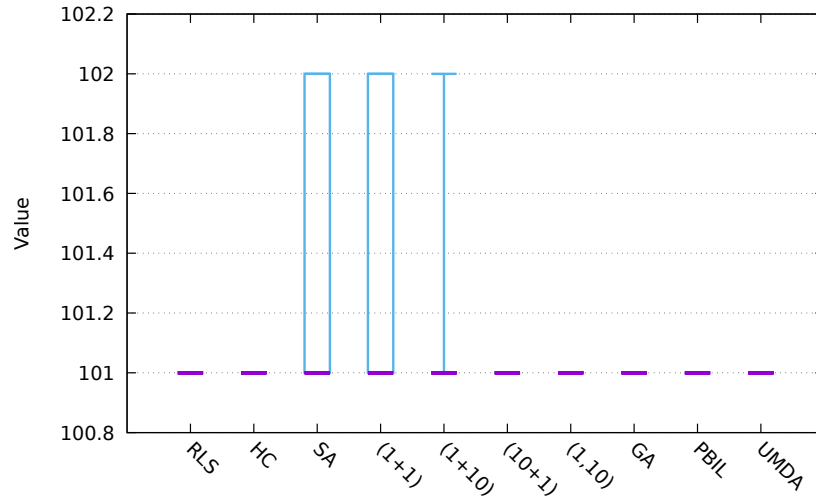
Algorithm	Value				
	min	Q_1	med.	Q_3	max
GA	626	718	770	772	1,024
SA	672	704	704	768	800
(10 + 1) EA	560	672	688	704	768
(1, 10) EA	592	638	650	666	744
PBIL	504	522	560	592	624
UMDA	460	484	500	512	584
HC	480	492	498	508	580
(1 + 1) EA	440	464	492	506	552
(1 + 10) EA	440	454	472	490	560
RLS	408	414	420	424	460



Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
HC	0.08	0.00	0.33	0.01	0.41	0.01
RLS	0.09	0.00	0.32	0.01	0.42	0.01
SA	0.10	0.00	0.37	0.01	0.47	0.01
(1, 10) EA	0.13	0.00	0.36	0.01	0.49	0.01
(1 + 1) EA	0.14	0.00	0.34	0.01	0.49	0.01
(1 + 10) EA	0.15	0.00	0.34	0.01	0.49	0.01
(10 + 1) EA	0.18	0.00	0.38	0.01	0.55	0.01
GA	0.71	0.02	0.40	0.01	1.11	0.03
UMDA	0.80	0.01	0.35	0.01	1.15	0.02
PBIL	0.84	0.01	0.37	0.01	1.20	0.02

19 Function plateau

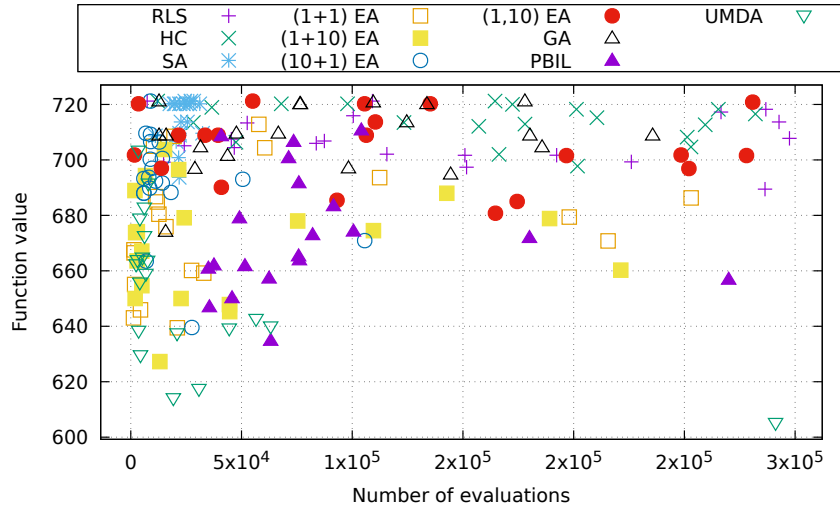
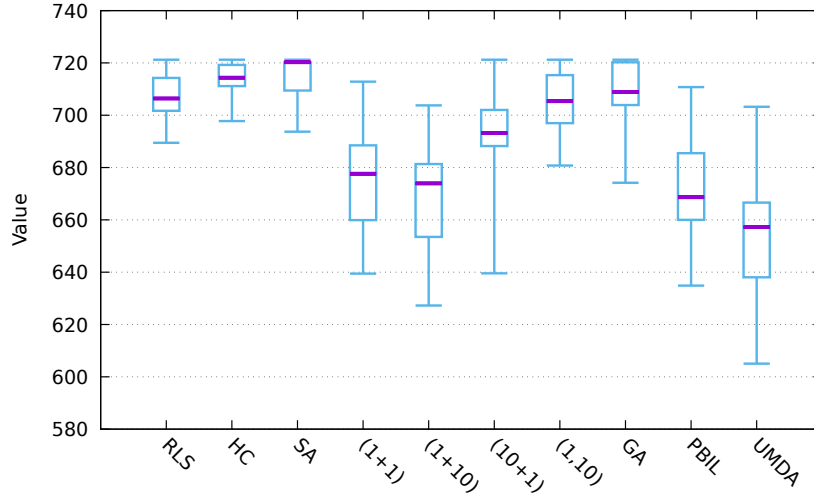
Algorithm	Value				
	min	Q_1	med.	Q_3	max
SA	101	101	101	102	102
(1 + 1) EA	101	101	101	102	102
(1 + 10) EA	101	101	101	101	102
RLS	101	101	101	101	101
HC	101	101	101	101	101
(10 + 1) EA	101	101	101	101	101
(1, 10) EA	101	101	101	101	101
GA	101	101	101	101	101
PBIL	101	101	101	101	101
UMDA	101	101	101	101	101



Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
SA	0.08	0.03	0.10	0.03	0.18	0.06
HC	0.08	0.00	0.11	0.00	0.20	0.00
RLS	0.09	0.00	0.11	0.00	0.21	0.00
(1, 10) EA	0.13	0.00	0.12	0.00	0.25	0.01
(1 + 1) EA	0.13	0.02	0.11	0.02	0.24	0.03
(1 + 10) EA	0.14	0.01	0.12	0.01	0.26	0.02
(10 + 1) EA	0.17	0.00	0.12	0.00	0.29	0.01
GA	0.61	0.01	0.12	0.00	0.73	0.01
UMDA	0.65	0.01	0.12	0.00	0.77	0.01
PBIL	0.66	0.01	0.12	0.00	0.78	0.01

20 Function walsh2

Algorithm	Value				
	min	Q_1	med.	Q_3	max
SA	693.71	709.44	720.24	720.24	721.22
HC	697.77	711.14	714.36	719.22	721.22
GA	674.19	703.90	708.91	720.24	721.22
RLS	689.46	701.69	706.40	714.25	721.22
(1, 10) EA	680.78	696.97	705.34	715.33	721.22
(10 + 1) EA	639.56	688.22	693.15	702.01	721.22
(1 + 1) EA	639.46	659.90	677.65	688.48	712.83
(1 + 10) EA	627.27	653.48	673.94	681.34	703.76
PBIL	634.87	660.01	668.64	685.49	710.76
UMDA	605.04	638.05	657.25	666.60	703.23



Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
HC	0.09	0.00	2.08	0.04	2.17	0.04
RLS	0.10	0.00	2.11	0.04	2.21	0.04
SA	0.10	0.00	2.07	0.05	2.17	0.05
(1,10) EA	0.13	0.00	2.05	0.04	2.18	0.04
(1 + 1) EA	0.15	0.00	2.15	0.06	2.30	0.06
(1 + 10) EA	0.15	0.00	2.15	0.04	2.31	0.04
(10 + 1) EA	0.18	0.01	2.26	0.11	2.44	0.11
GA	0.62	0.01	2.43	0.05	3.05	0.05
UMDA	0.66	0.01	2.05	0.03	2.71	0.03
PBIL	0.68	0.01	2.15	0.05	2.83	0.05

A Plan

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            "gnuplot": "HC"
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        "gnuplot": "(1+10) EA"
    }
},
{
    "id": "ea-10p1",
    "opt": "-A 310 --ea-mu 10 --ea-lambda 1",
    "labels": {
        "latex": "$\{(10+1)\}$ EA",
        "gnuplot": "(10+1) EA"
    }
},
{
    "id": "ea-1c10",
    "opt": "-A 320 --ea-mu 1 --ea-lambda 10 --ea-allow-no-mutation",
    "labels": {
        "latex": "$\{(1,10)\}$ EA",
        "gnuplot": "(1,10) EA"
    }
},
{
    "id": "ga",
    "opt": "-A 400 --ea-mu 100",
    "labels": {
        "latex": "GA",
        "gnuplot": "GA"
    }
},
{
    "id": "pbil",
    "opt": "-A 500 -l 5e-3",
    "labels": {
        "latex": "PBIL",
        "gnuplot": "PBIL"
    }
},
{
    "id": "umda",
    "opt": "-A 600 -x 100 -y 10",
    "labels": {
        "latex": "UMDA",
        "gnuplot": "UMDA"
    }
}
]
}

```

B Default parameters

```

# algorithm = 100
# bm_mc_reset_strategy = 1
# bm_num_gs_cycles = 1

```

```

# bm_num_gs_steps = 100
# bm_sampling = 1
# budget = 10000
# bv_size = 100
# description_path = description.txt
# ea_lambda = 100
# ea_mu = 10
# expression = x
# fn_name = noname
# fn_num_traps = 10
# fn_prefix_length = 2
# fn_threshold = 10
# fp_expression = (1-x)^2+100*(y-x^2)^2
# fp_lower_bound = -2
# fp_num_bits = 8
# fp_precision = 0.01
# fp_upper_bound = 2
# function = 0
# ga_crossover_bias = 0.5
# ga_crossover_probability = 0.5
# ga_tournament_size = 10
# hea_bit_herding = 0
# hea_num_seq_updates = 100
# hea_reset_period = 0
# hea_sampling_method = 0
# hea_weight = 1
# learning_rate = 0.001
# map = 0
# map_input_size = 100
# map_path = map.txt
# map_ts_length = 10
# map_ts_sampling_mode = 0
# mutation_rate = 1
# neighborhood = 0
# neighborhood_iterator = 0
# noise_stddev = 1
# num_iterations = 0
# num_threads = 1
# path = function.txt
# pn_mutation_rate = 1
# pn_neighborhood = 0
# pn_radius = 2
# population_size = 10
# pv_log_num_components = 5
# radius = 2
# rep_categorical_representation = 0
# results_path = results.json
# rls_patience = 50
# sa_beta_ratio = 1.2
# sa_initial_acceptance_probability = 0.6
# sa_num_transitions = 50
# sa_num_trials = 100
# seed = 0
# selection_size = 1
# solution_path = solution.txt
# target = 100
# print_defaults
# last_parameter
# exec_name = hnco
# version = 0.18
# Generated from hnco.json

```