HNCO
Fixed-budget analysis

August 15, 2021

Contents

1 Global results

Algorithm	Rank				
	min	Q_1	med.	Q_3	max
pbil	1	1	1	6	9
sa	1	1	2	4	10
ea-10p1	1	1	3	4	7
ga	1	1	3	5	10
rls	1	2	3	5	10
hc	1	1	4	5	10
ea-1p10	1	1	4	7	9
ea-1p1	1	1	4	8	9
ea-1c10	1	2	4	4	8
umda	1	1	5	7	10

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**
ea-1p1	**100**	**100**	**100**	**100**	**100**
ea-1p10	**100**	**100**	**100**	**100**	**100**
ea-10p1	**100**	**100**	**100**	**100**	**100**
ea-1c10	**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.
ea-1p10	0.00	0.00	0.00	0.00	0.00	0.00
ea-1p1	0.00	0.00	0.00	0.00	0.00	0.00
ea-1c10	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
sa	0.00	0.00	0.00	0.00	0.01	0.00
ea-10p1	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
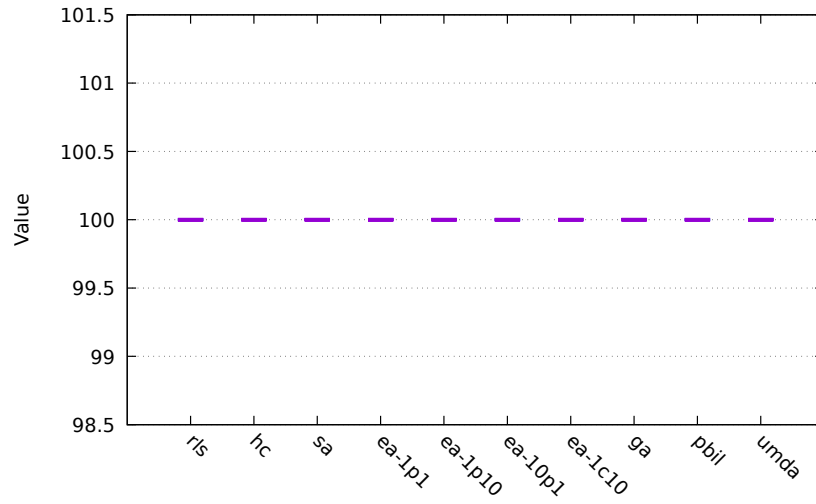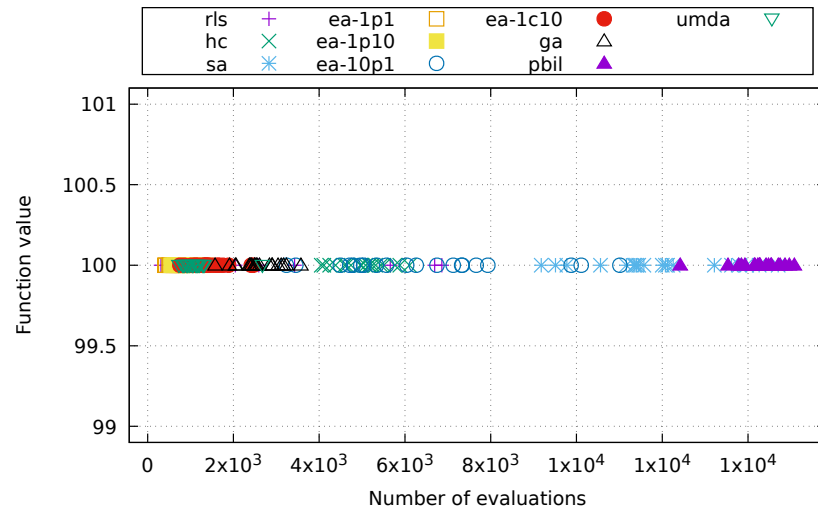
3   Function lin

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**
ea-1p1	**45.03**	**45.03**	**45.03**	**45.03**	**45.03**
ea-1p10	**45.03**	**45.03**	**45.03**	**45.03**	**45.03**
ea-10p1	**45.03**	**45.03**	**45.03**	**45.03**	**45.03**
ea-1c10	**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.
ea-1p1	0.00	0.00	0.00	0.00	0.00	0.00
ea-1p10	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
ea-1c10	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
ea-10p1	0.00	0.00	0.00	0.00	0.01	0.00
umda	0.00	0.00	0.00	0.00	0.01	0.00
sa	0.01	0.00	0.01	0.00	0.02	0.00
ga	0.03	0.03	0.01	0.01	0.04	0.04
pbil	0.05	0.00	0.01	0.00	0.06	0.00
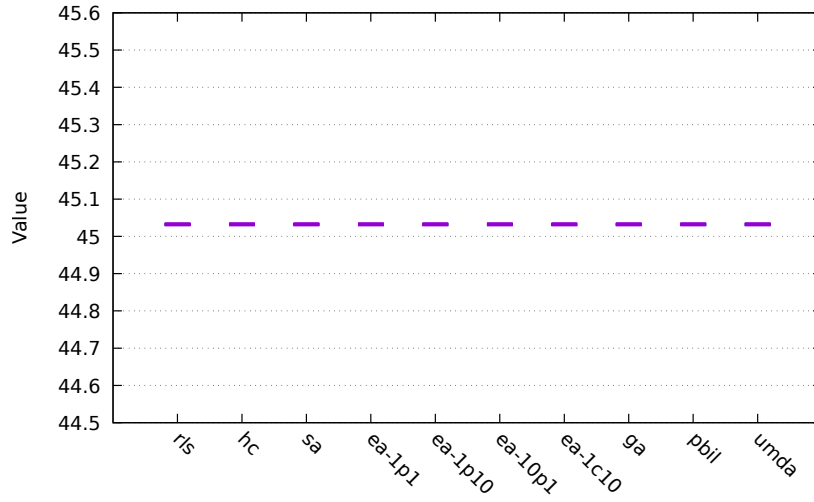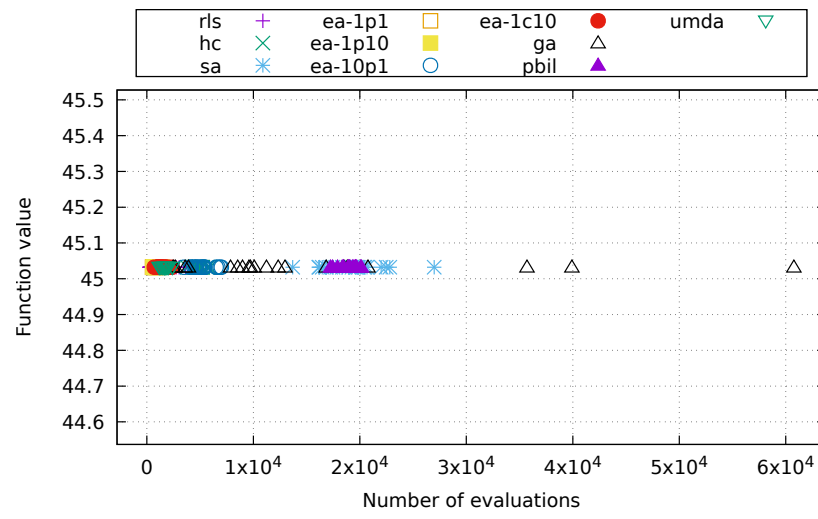
4 Function leading-ones

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**
ea-1p1	**100**	**100**	**100**	**100**	**100**
ea-1p10	**100**	**100**	**100**	**100**	**100**
ea-10p1	**100**	**100**	**100**	**100**	**100**
ea-1c10	**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
ea-1p10	0.00	0.00	0.00	0.00	0.00	0.00
ea-1p1	0.00	0.00	0.00	0.00	0.00	0.00
ea-1c10	0.00	0.00	0.00	0.00	0.01	0.00
sa	0.01	0.01	0.01	0.01	0.01	0.02
rls	0.01	0.01	0.01	0.01	0.02	0.02
ea-10p1	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	0.54	0.17	0.11	0.03	0.64	0.20
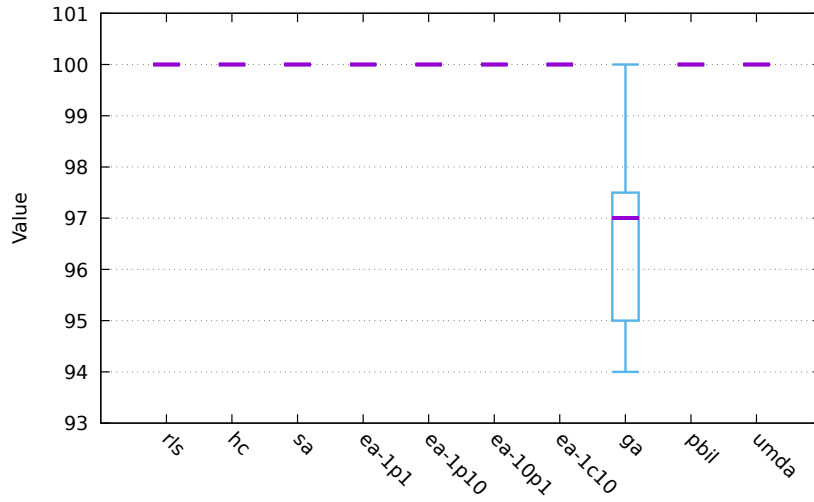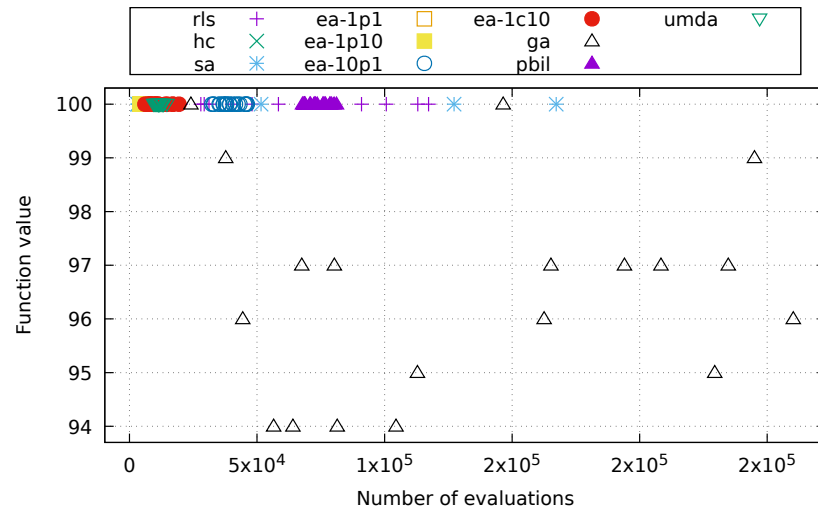
5 Function ridge

Algorithm	Value				
	min	Q_1	med.	Q_3	max
hc	**200**	**200**	**200**	**200**	**200**
sa	**200**	**200**	**200**	**200**	**200**
ea-1p1	**200**	**200**	**200**	**200**	**200**
ea-1p10	**200**	**200**	**200**	**200**	**200**
ea-10p1	**200**	**200**	**200**	**200**	**200**
umda	**200**	**200**	**200**	**200**	**200**
pbil	152	154	155	156	157
ea-1c10	121	125	129	130	142
rls	103	104	105	106	108
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
ea-1p10	0.01	0.00	0.01	0.00	0.02	0.00
ea-1p1	0.01	0.00	0.01	0.00	0.02	0.00
ea-10p1	0.10	0.01	0.07	0.01	0.17	0.01
rls	0.10	0.00	0.12	0.00	0.22	0.01
umda	0.11	0.00	0.02	0.00	0.13	0.01
ea-1c10	0.14	0.00	0.13	0.00	0.26	0.00
ga	0.61	0.00	0.12	0.00	0.73	0.00
pbil	0.66	0.00	0.13	0.00	0.79	0.00
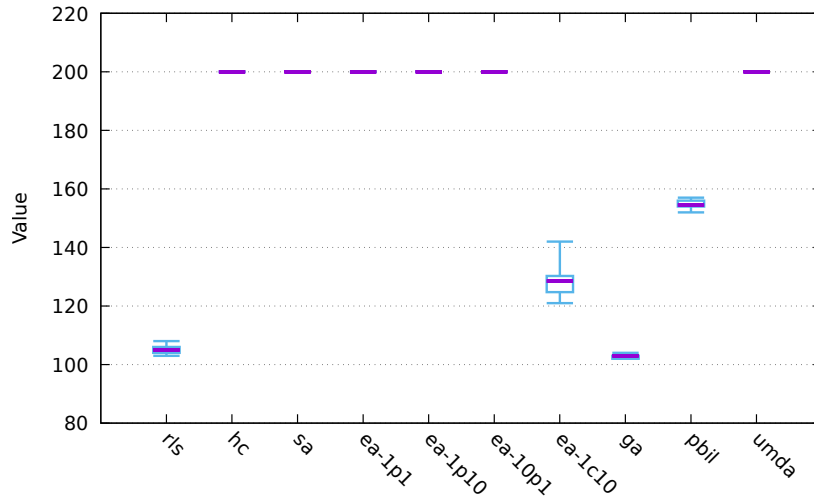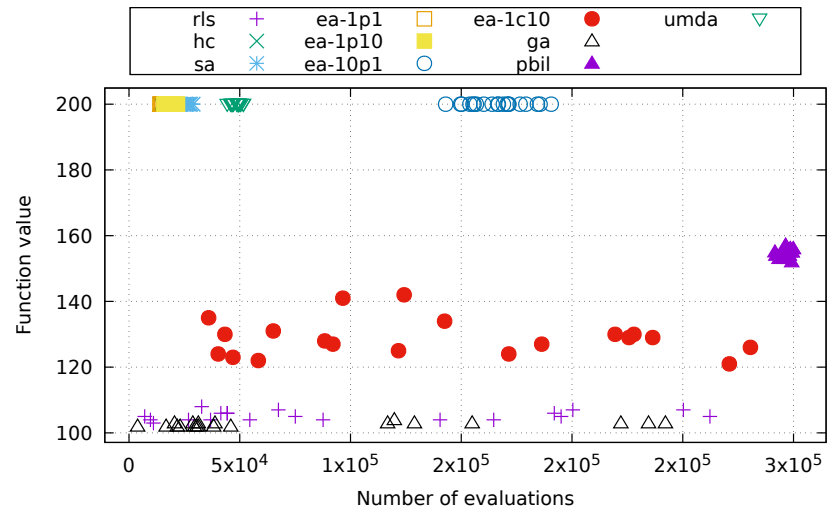
6 Function jmp-5

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
ea-1p1	95	95	95	95	95
ea-1p10	95	95	95	95	95
ea-10p1	95	95	95	95	95
ea-1c10	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	0.08	0.01	0.01	0.09	0.10
hc	0.09	0.00	0.12	0.00	0.21	0.00
rls	0.10	0.00	0.12	0.00	0.22	0.00
sa	0.11	0.00	0.12	0.00	0.22	0.00
ea-1c10	0.14	0.00	0.12	0.00	0.25	0.00
ea-1p1	0.15	0.00	0.12	0.00	0.26	0.00
ea-1p10	0.15	0.00	0.12	0.00	0.27	0.00
ga	0.15	0.09	0.03	0.02	0.18	0.10
ea-10p1	0.18	0.00	0.12	0.00	0.30	0.00
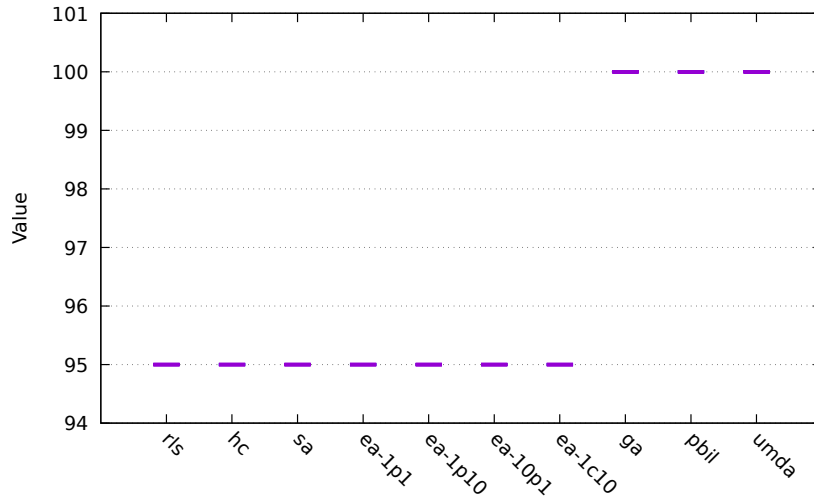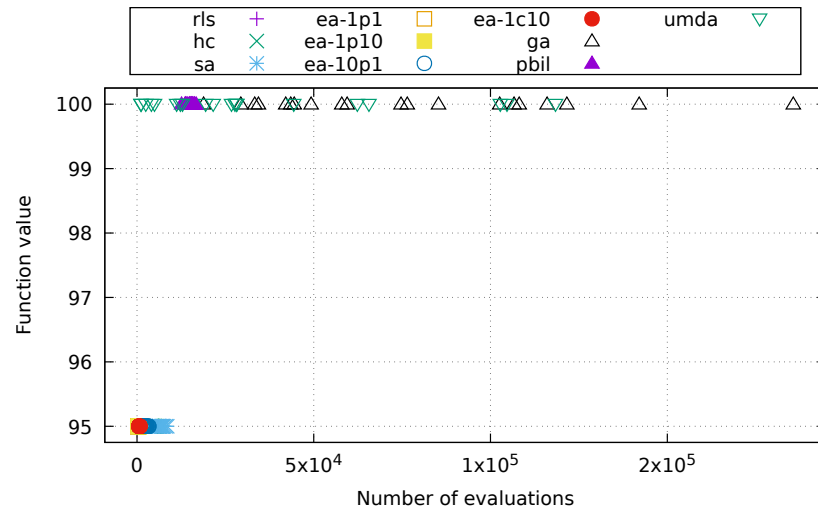
7 Function jmp-10

Algorithm	Value				
	min	Q_1	med.	Q_3	max
pbil	**90**	**90**	**90**	**100**	**100**
rls	**90**	**90**	**90**	90	90
hc	**90**	**90**	**90**	90	90
sa	**90**	**90**	**90**	90	90
ea-1p1	**90**	**90**	**90**	90	90
ea-1p10	**90**	**90**	**90**	90	90
ea-10p1	**90**	**90**	**90**	90	90
ea-1c10	**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	0.09	0.00	0.12	0.00	0.21	0.00
rls	0.11	0.00	0.12	0.00	0.22	0.00
sa	0.11	0.00	0.12	0.00	0.23	0.00
ea-1c10	0.14	0.00	0.12	0.00	0.25	0.01
ea-1p1	0.15	0.00	0.12	0.00	0.26	0.00
ea-1p10	0.15	0.00	0.12	0.00	0.27	0.00
ea-10p1	0.19	0.00	0.12	0.00	0.30	0.00
pbil	0.47	0.30	0.08	0.05	0.54	0.35
ga	0.61	0.00	0.12	0.00	0.72	0.00
umda	0.68	0.00	0.12	0.00	0.80	0.00
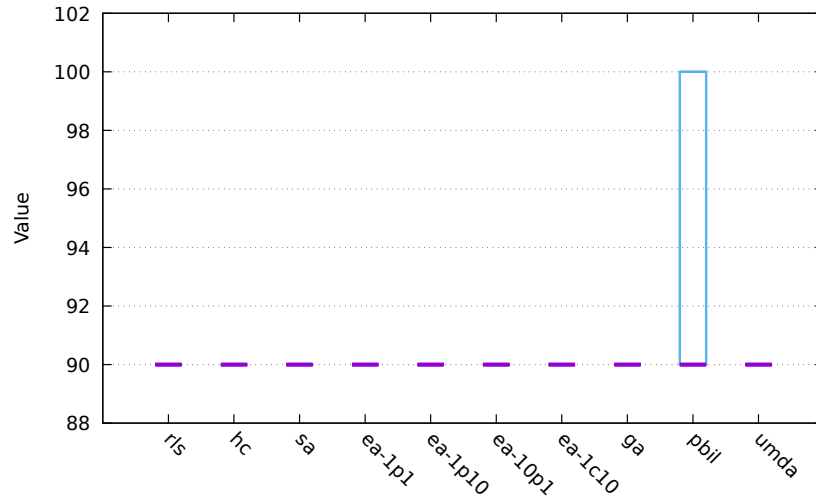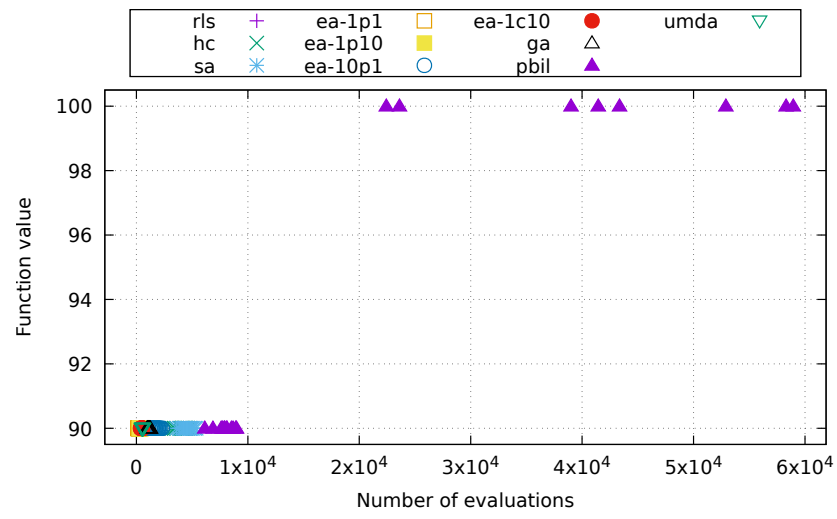
8 Function djmp-5

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
ea-1p1	100	100	100	100	100
ea-1p10	100	100	100	100	100
ea-10p1	100	100	100	100	100
ea-1c10	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	0.08	0.11	0.01	0.02	0.09	0.13
hc	0.09	0.00	0.12	0.00	0.21	0.00
rls	0.10	0.00	0.12	0.00	0.22	0.01
sa	0.11	0.00	0.12	0.00	0.23	0.00
ea-1c10	0.14	0.00	0.12	0.00	0.25	0.00
ea-1p1	0.15	0.00	0.12	0.00	0.26	0.00
ga	0.15	0.15	0.03	0.03	0.18	0.18
ea-1p10	0.15	0.00	0.12	0.00	0.27	0.00
ea-10p1	0.19	0.00	0.12	0.00	0.30	0.00
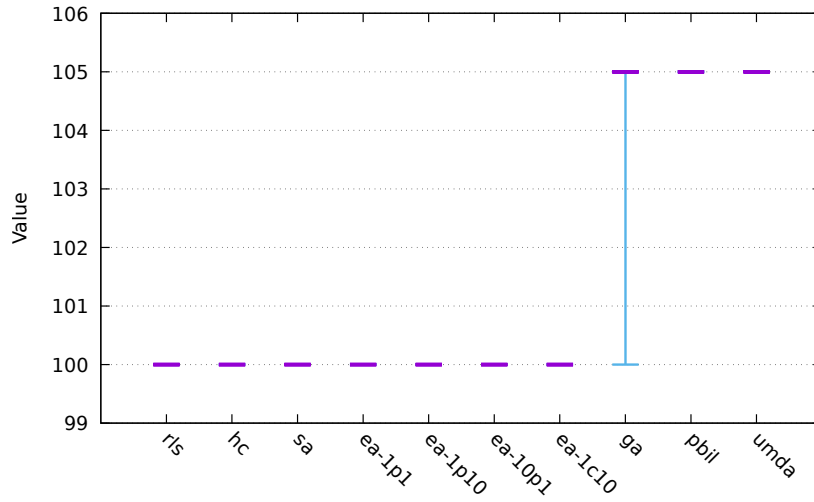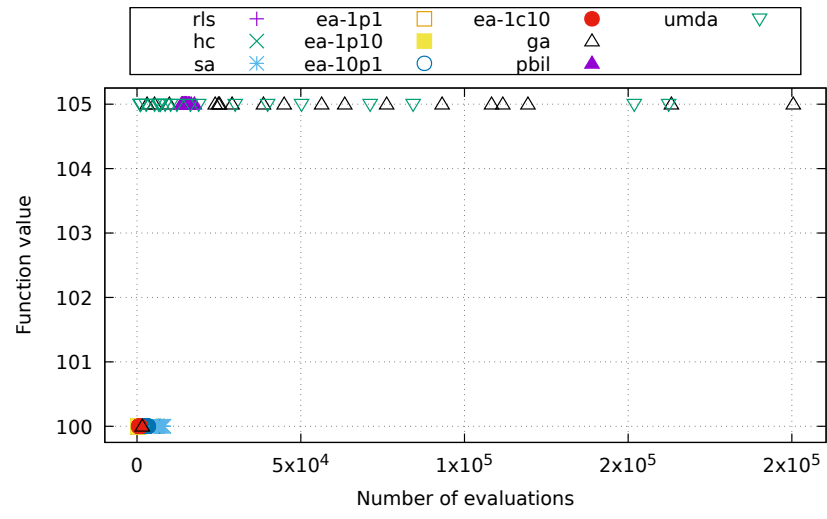
9 Function djmp-10

Algorithm	Value				
	min	Q_1	med.	Q_3	max
pbil	**100**	**100**	**110**	**110**	**110**
rls	**100**	**100**	100	100	100
hc	**100**	**100**	100	100	100
sa	**100**	**100**	100	100	100
ea-1p1	**100**	**100**	100	100	100
ea-1p10	**100**	**100**	100	100	100
ea-10p1	**100**	**100**	100	100	100
ea-1c10	**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	0.09	0.00	0.12	0.00	0.21	0.00
rls	0.11	0.00	0.12	0.00	0.22	0.00
sa	0.11	0.00	0.12	0.00	0.23	0.00
ea-1c10	0.14	0.00	0.12	0.00	0.25	0.00
ea-1p1	0.15	0.00	0.12	0.00	0.27	0.00
ea-1p10	0.15	0.00	0.12	0.00	0.27	0.00
ea-10p1	0.19	0.00	0.12	0.00	0.30	0.00
pbil	0.32	0.30	0.05	0.05	0.37	0.35
ga	0.61	0.00	0.12	0.00	0.72	0.00
umda	0.68	0.00	0.12	0.00	0.80	0.00
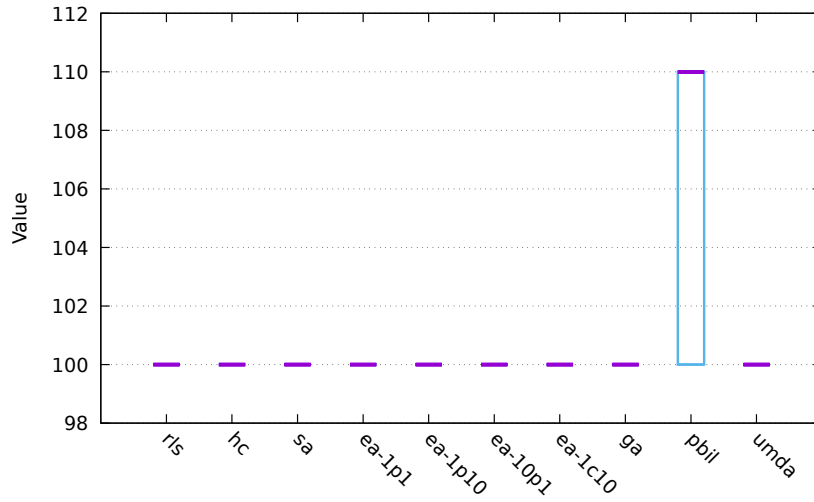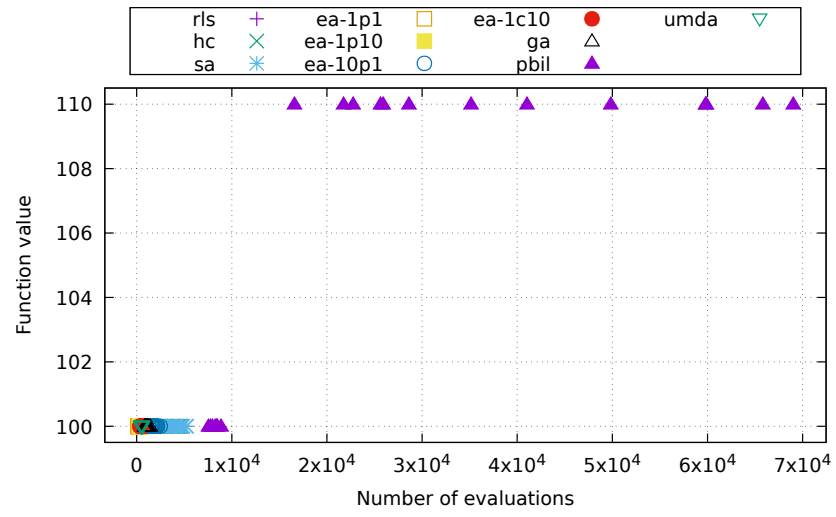
10 Function fp-5

Algorithm	Value				
	min	Q_1	med.	Q_3	max
rls	**194**	**194**	**194**	**194**	**194**
ea-1p1	**194**	**194**	**194**	**194**	**194**
ea-1p10	**194**	**194**	**194**	**194**	**194**
ea-10p1	**194**	**194**	**194**	**194**	**194**
ea-1c10	**194**	**194**	**194**	**194**	**194**
pbil	**194**	**194**	**194**	**194**	**194**
sa	100	**194**	**194**	**194**	**194**
umda	100	**194**	**194**	**194**	**194**
ga	189	190	190	192	**194**
hc	100	100	100	**194**	**194**

Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
ea-1p10	0.00	0.00	0.00	0.00	0.00	0.00
ea-1p1	0.00	0.00	0.00	0.00	0.00	0.00
ea-1c10	0.00	0.00	0.00	0.00	0.01	0.00
rls	0.01	0.00	0.01	0.00	0.01	0.01
sa	0.01	0.03	0.02	0.03	0.03	0.06
ea-10p1	0.02	0.00	0.02	0.00	0.04	0.01
umda	0.06	0.14	0.01	0.03	0.07	0.17
hc	0.07	0.03	0.09	0.04	0.16	0.07
pbil	0.20	0.02	0.03	0.00	0.24	0.02
ga	0.58	0.10	0.12	0.02	0.70	0.12
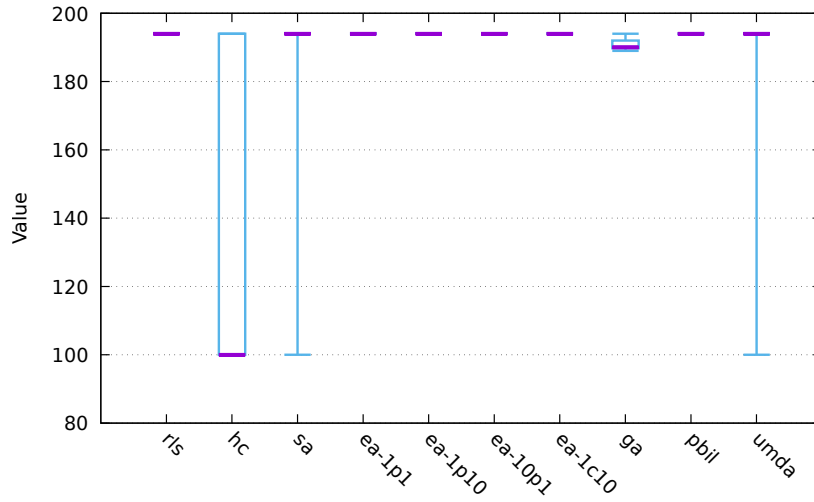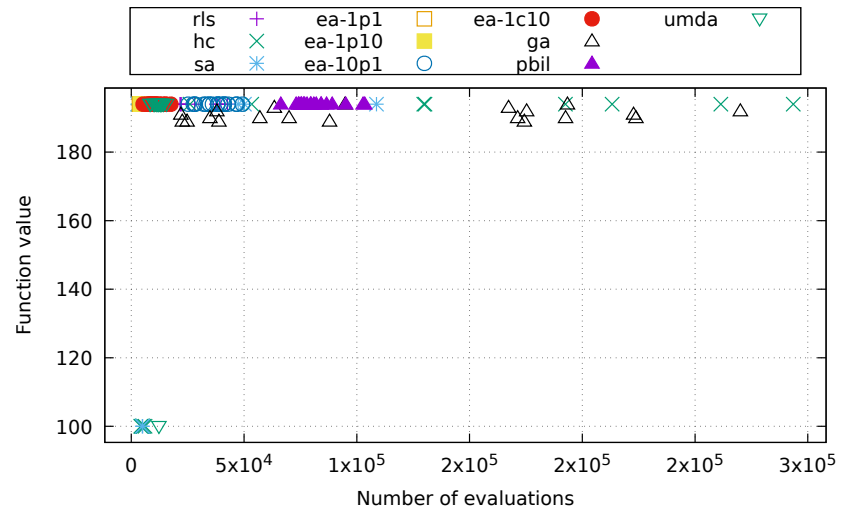
11 Function fp-10

Algorithm	Value				
	min	Q_1	med.	Q_3	max
ea-10p1	**189**	**189**	**189**	**189**	**189**
pbil	**189**	**189**	**189**	**189**	**189**
rls	187	**189**	**189**	**189**	**189**
ea-1c10	100	**189**	**189**	**189**	**189**
umda	100	100	**189**	**189**	**189**
ga	183	185	185	186	**189**
sa	100	100	100	**189**	**189**
ea-1p1	100	100	100	**189**	**189**
ea-1p10	100	100	100	100	**189**
hc	100	100	100	100	100

Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
ea-10p1	0.02	0.01	0.02	0.00	0.04	0.01
rls	0.04	0.03	0.05	0.04	0.08	0.07
ea-1c10	0.05	0.04	0.04	0.04	0.09	0.08
sa	0.07	0.05	0.09	0.06	0.16	0.10
hc	0.09	0.00	0.12	0.00	0.21	0.00
ea-1p1	0.10	0.07	0.08	0.06	0.18	0.13
ea-1p10	0.15	0.03	0.12	0.03	0.26	0.06
pbil	0.18	0.02	0.03	0.00	0.21	0.02
umda	0.25	0.31	0.05	0.06	0.29	0.37
ga	0.60	0.07	0.12	0.01	0.72	0.09
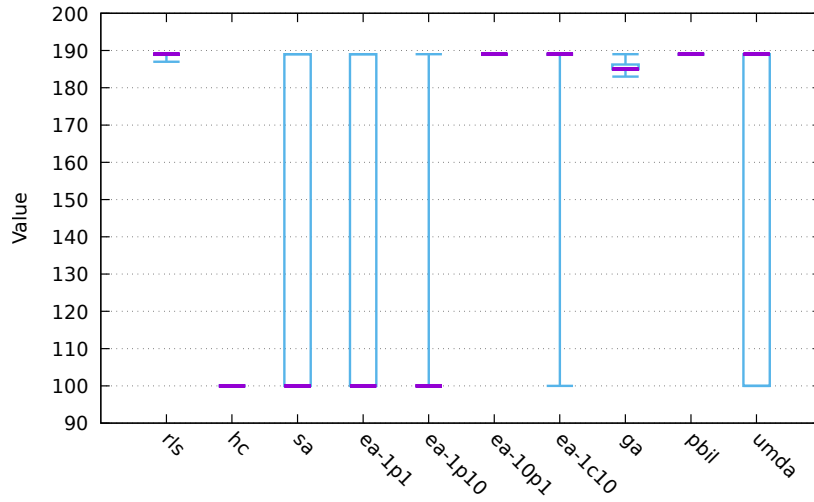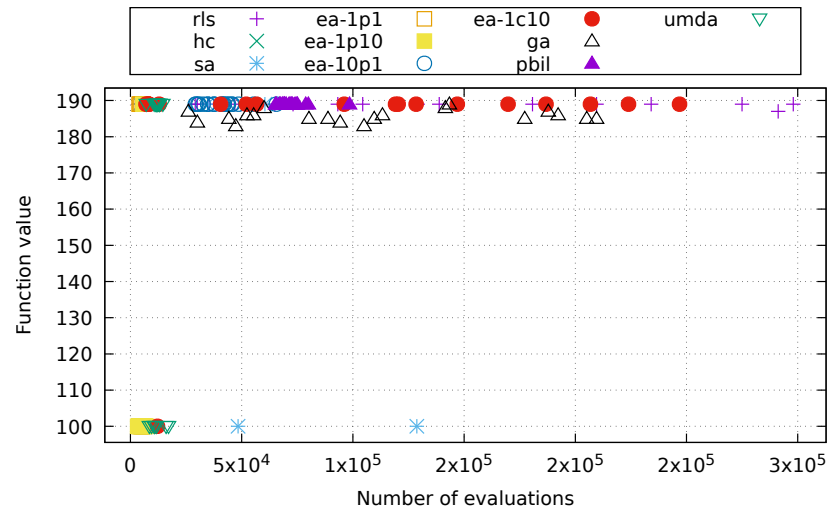
12 Function nk

Algorithm	Value				
	min	Q_1	med.	Q_3	max
sa	**0.99**	**1.04**	**1.06**	**1.07**	**1.10**
ga	0.97	1.01	1.02	1.05	1.09
ea-1c10	0.96	0.99	1.01	1.04	1.09
hc	0.96	0.99	1.01	1.03	1.05
pbil	0.93	0.96	1.00	1.03	1.05
ea-10p1	0.94	0.95	1.00	1.03	**1.10**
rls	0.96	0.97	0.98	0.99	1.05
ea-1p1	0.85	0.93	0.96	0.98	1.01
ea-1p10	0.86	0.91	0.94	0.98	1.01
umda	0.81	0.88	0.92	0.94	0.98

Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
hc	0.09	0.00	0.43	0.00	0.52	0.00
rls	0.10	0.00	0.44	0.00	0.54	0.01
sa	0.11	0.00	0.41	0.00	0.51	0.00
ea-1c10	0.13	0.00	0.41	0.00	0.54	0.00
ea-1p1	0.15	0.00	0.44	0.01	0.58	0.01
ea-1p10	0.15	0.00	0.44	0.01	0.59	0.01
ea-10p1	0.18	0.00	0.46	0.01	0.64	0.01
ga	0.60	0.00	0.51	0.01	1.12	0.01
umda	0.65	0.00	0.41	0.01	1.06	0.01
pbil	0.67	0.00	0.46	0.00	1.13	0.00
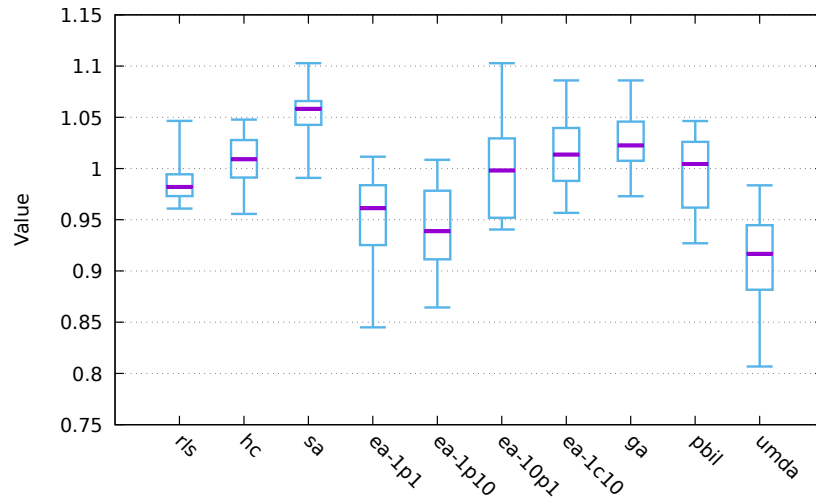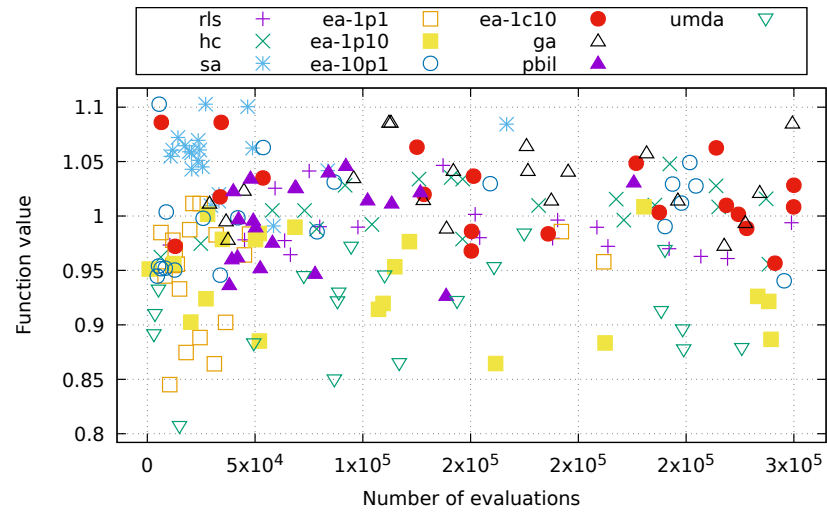
13 Function max-sat

Algorithm	Value				
	min	Q_1	med.	Q_3	max
sa	969	**972**	**972**	**972**	**972**
rls	**971**	972	**972**	**972**	**972**
ea-1c10	964	967	971	**972**	**972**
ea-10p1	964	968	969	971	**972**
ga	965	968	969	**972**	**972**
ea-1p10	961	967	968	971	**972**
umda	959	966	968	971	**972**
pbil	965	966	967	967	968
ea-1p1	961	964	966	971	**972**
hc	962	965	966	967	**972**

Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
hc	0.08	0.00	1.78	0.01	1.86	0.01
rls	0.10	0.00	1.82	0.01	1.92	0.01
sa	0.10	0.00	1.65	0.02	1.76	0.02
ea-1c10	0.13	0.00	1.64	0.03	1.77	0.03
ea-1p1	0.15	0.00	1.80	0.04	1.95	0.04
ea-1p10	0.15	0.00	1.79	0.04	1.94	0.04
ea-10p1	0.18	0.00	2.10	0.05	2.28	0.05
ga	0.59	0.01	2.27	0.04	2.86	0.04
umda	0.66	0.01	1.65	0.03	2.31	0.03
pbil	0.68	0.00	1.84	0.02	2.52	0.02
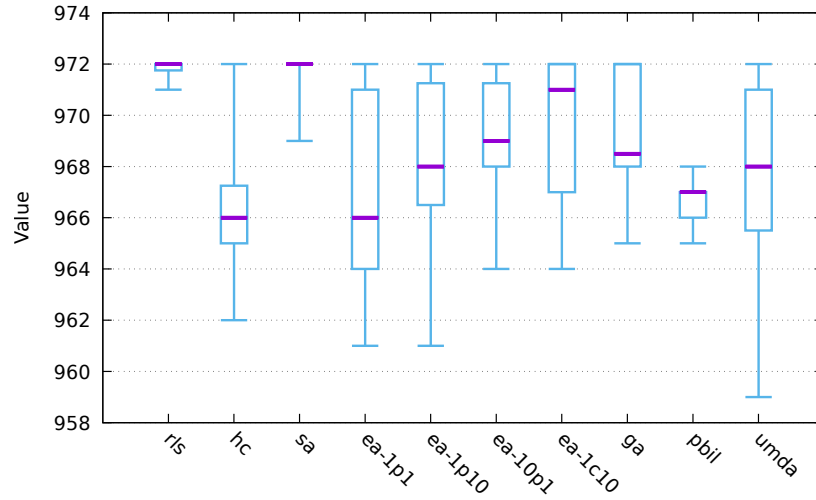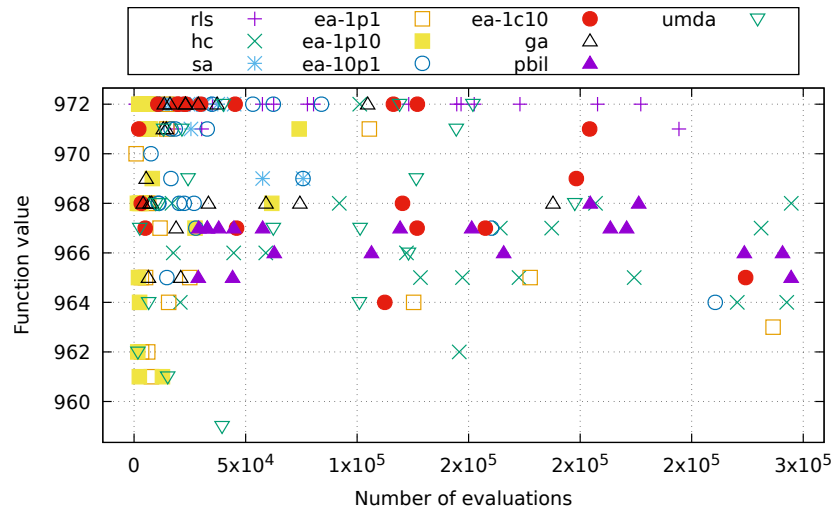
14 Function labs

Algorithm	Value				
	min	Q_1	med.	Q_3	max
ga	**4.78**	**4.98**	**5.07**	**5.20**	5.52
ea-1c10	4.54	4.68	4.77	4.96	5.13
sa	4.55	4.65	4.76	5.09	**5.62**
hc	4.55	4.63	4.73	4.88	5.29
ea-10p1	4.07	4.43	4.66	4.83	5.29
rls	4.15	4.38	4.49	4.56	4.74
ea-1p10	3.64	4.07	4.19	4.37	4.60
ea-1p1	3.75	3.86	4.09	4.24	4.55
pbil	3.68	3.84	3.99	4.12	4.38
umda	3.31	3.56	3.84	4.03	4.33

Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
hc	0.08	0.00	1.55	0.00	1.64	0.00
rls	0.10	0.00	1.52	0.06	1.62	0.06
sa	0.10	0.00	1.56	0.01	1.66	0.01
ea-1c10	0.13	0.00	1.54	0.01	1.67	0.01
ea-1p1	0.14	0.00	1.55	0.00	1.69	0.00
ea-1p10	0.15	0.00	1.55	0.00	1.70	0.00
ea-10p1	0.18	0.00	1.55	0.00	1.73	0.00
ga	0.62	0.00	1.52	0.01	2.14	0.01
umda	0.67	0.00	1.49	0.02	2.16	0.02
pbil	0.73	0.00	1.51	0.00	2.24	0.01
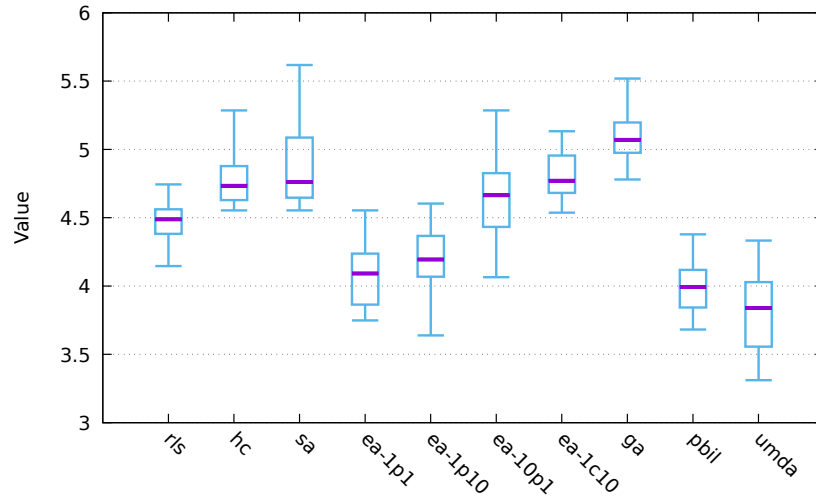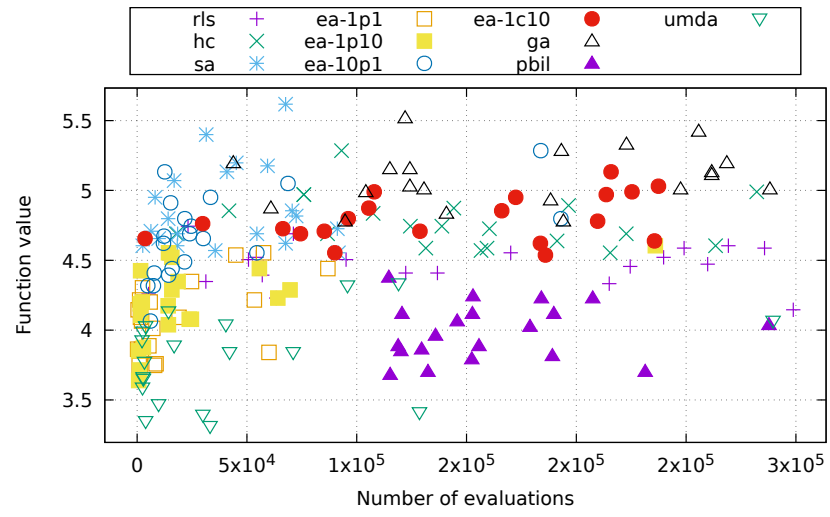
15 Function ep

Algorithm	Value				
	min	Q_1	med.	Q_3	max
ga	$\mathbf{2.8 \times 10^{-32}}$	1.2×10^{-30}	$\mathbf{2.5 \times 10^{-30}}$	4.8×10^{-30}	1.1×10^{-29}
hc	1.8×10^{-31}	1.5×10^{-30}	2.8×10^{-30}	$\mathbf{4.4 \times 10^{-30}}$	1.4×10^{-29}
rls	2.8×10^{-31}	1.9×10^{-30}	4.0×10^{-30}	5.0×10^{-30}	$\mathbf{9.0 \times 10^{-30}}$
ea-1c10	1.2×10^{-31}	2.4×10^{-30}	4.3×10^{-30}	1.3×10^{-29}	3.9×10^{-29}
sa	1.6×10^{-31}	$\mathbf{1.0 \times 10^{-30}}$	4.4×10^{-30}	9.6×10^{-30}	2.1×10^{-29}
pbil	1.3×10^{-30}	4.4×10^{-30}	6.2×10^{-30}	1.1×10^{-29}	1.9×10^{-29}
ea-10p1	9.9×10^{-31}	2.8×10^{-30}	8.7×10^{-30}	1.6×10^{-29}	5.3×10^{-29}
ea-1p1	6.2×10^{-32}	3.5×10^{-30}	1.6×10^{-29}	2.1×10^{-29}	6.0×10^{-29}
ea-1p10	5.5×10^{-31}	1.4×10^{-29}	2.4×10^{-29}	3.8×10^{-29}	1.1×10^{-28}
umda	8.9×10^{-30}	2.0×10^{-29}	2.9×10^{-29}	4.9×10^{-29}	2.1×10^{-28}

Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
hc	0.09	0.00	0.16	0.00	0.25	0.00
sa	0.10	0.00	0.16	0.00	0.26	0.00
rls	0.11	0.00	0.17	0.00	0.28	0.00
ea-1c10	0.13	0.00	0.16	0.00	0.29	0.00
ea-1p1	0.14	0.00	0.16	0.00	0.30	0.00
ea-1p10	0.15	0.00	0.16	0.00	0.31	0.00
ea-10p1	0.18	0.00	0.18	0.00	0.35	0.00
ga	0.61	0.00	0.20	0.00	0.81	0.00
umda	0.66	0.00	0.16	0.00	0.82	0.00
pbil	0.77	0.01	0.22	0.00	0.98	0.01
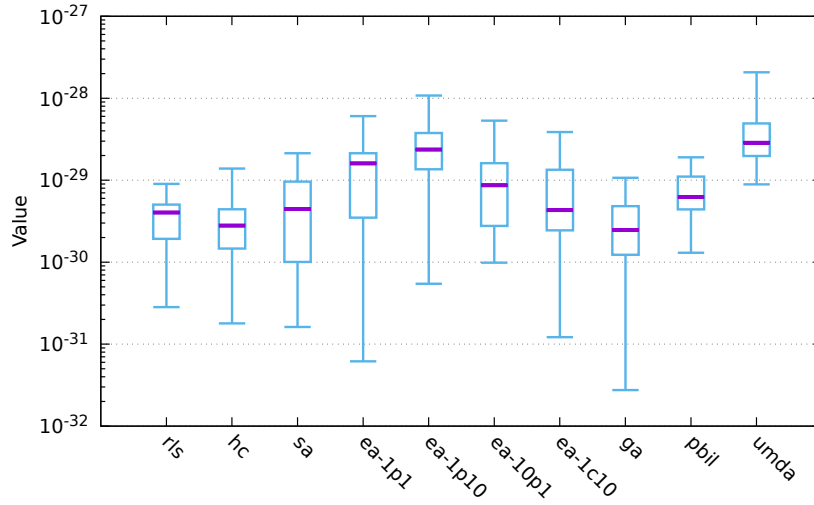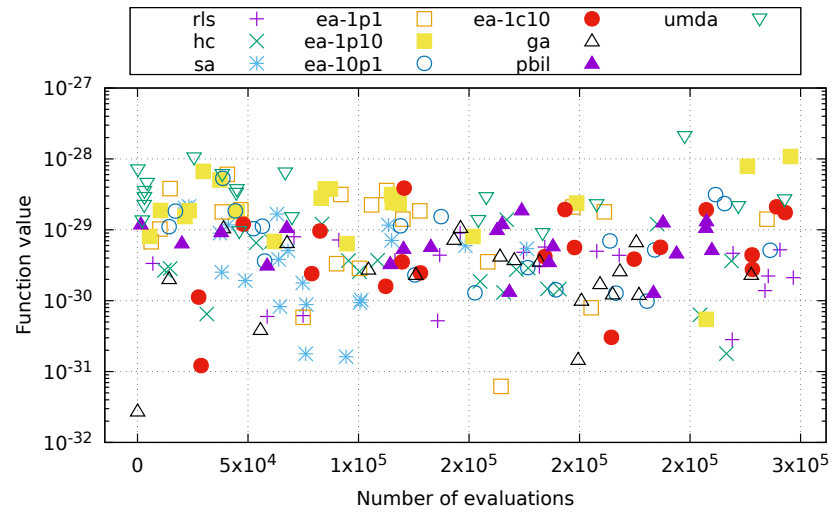
16 Function cancel

Algorithm	Value				
	min	Q_1	med.	Q_3	max
pbil	0.05	**0.07**	**0.08**	**0.10**	**1.34**
ea-1p10	0.05	0.16	0.48	1.32	1.83
ga	0.05	0.08	0.69	0.72	2.59
ea-10p1	**0.03**	0.45	0.75	1.33	2.03
ea-1c10	0.06	0.60	0.82	1.40	1.98
ea-1p1	0.27	0.43	1.03	1.42	2.60
umda	0.24	0.80	1.24	1.49	2.17
rls	0.43	1.36	1.60	1.84	2.47
hc	1.01	1.49	1.68	1.87	2.25
sa	0.43	1.54	2.21	2.79	4.20

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	0.15	0.00	0.24	0.01
sa	0.10	0.00	0.15	0.00	0.25	0.00
ea-1c10	0.13	0.00	0.15	0.00	0.28	0.00
ea-1p1	0.14	0.00	0.15	0.00	0.29	0.00
ea-1p10	0.15	0.00	0.15	0.00	0.30	0.00
ea-10p1	0.18	0.00	0.15	0.00	0.33	0.00
ga	0.61	0.00	0.15	0.00	0.76	0.00
umda	0.65	0.00	0.14	0.00	0.79	0.00
pbil	0.69	0.00	0.15	0.00	0.84	0.00
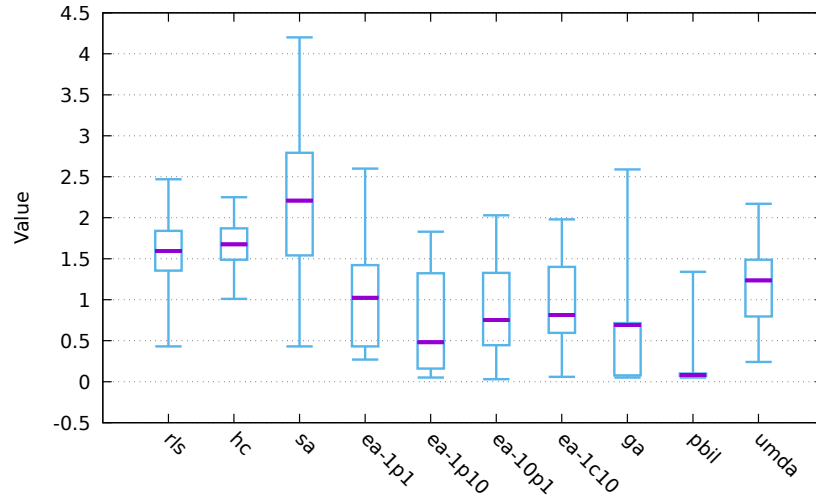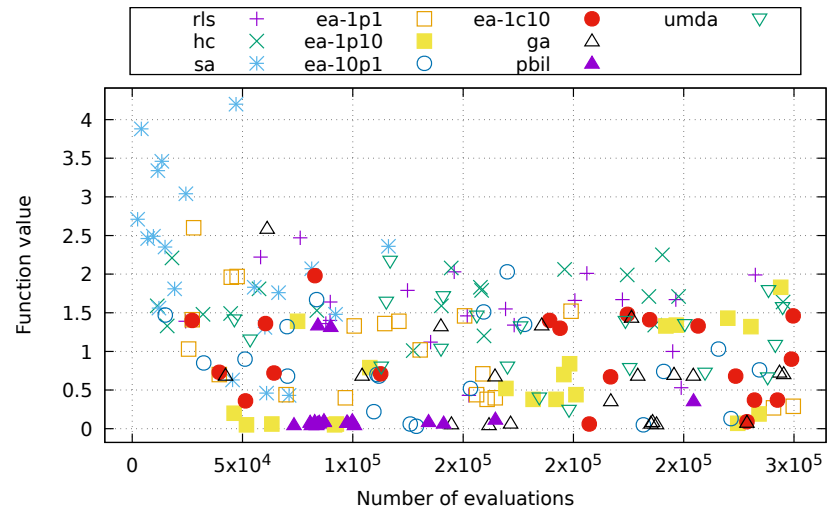
17 Function trap

Algorithm	Value				
	min	Q_1	med.	Q_3	max
hc	**91**	**91**	**91**	**91**	**92**
rls	90	**91**	**91**	**91**	91
ea-10p1	90	90	90	90	**92**
sa	90	90	90	90	91
ea-1p1	90	90	90	90	91
ea-1p10	90	90	90	90	91
ea-1c10	90	90	90	90	91
ga	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	0.09	0.00	0.14	0.00	0.24	0.00
rls	0.10	0.00	0.14	0.00	0.24	0.01
sa	0.11	0.00	0.14	0.00	0.25	0.00
ea-1c10	0.14	0.00	0.14	0.00	0.28	0.00
ea-1p1	0.15	0.00	0.14	0.00	0.29	0.00
ea-1p10	0.16	0.00	0.14	0.00	0.29	0.00
ea-10p1	0.19	0.00	0.14	0.00	0.33	0.00
ga	0.62	0.00	0.13	0.00	0.75	0.00
umda	0.66	0.01	0.13	0.00	0.80	0.01
pbil	0.67	0.00	0.13	0.00	0.81	0.00
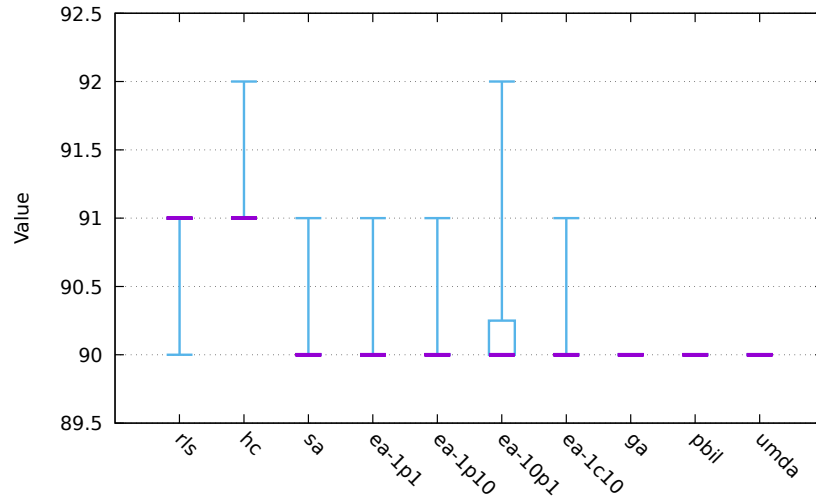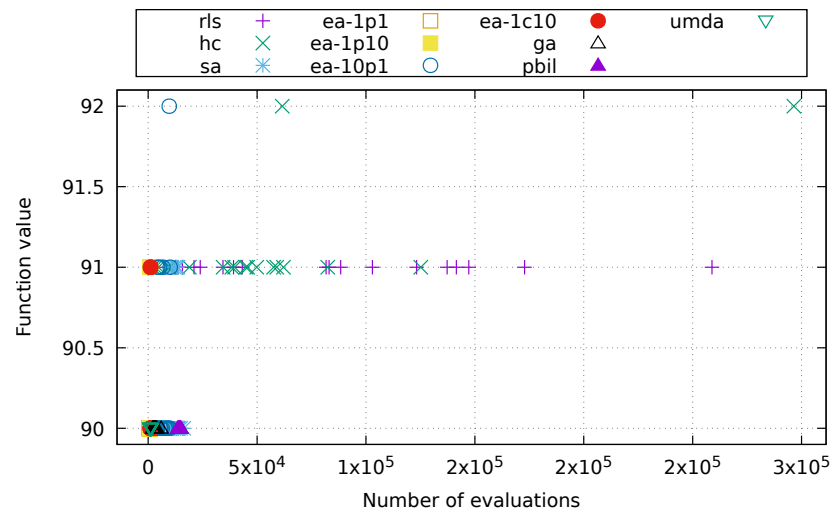
18 Function hiff

Algorithm	Value				
	min	Q_1	med.	Q_3	max
ga	**640**	**736**	**770**	**776**	**1,024**
ea-10p1	560	672	704	**776**	832
sa	**640**	704	704	736	**1,024**
ea-1c10	600	626	660	688	756
pbil	482	518	537	548	610
hc	488	500	514	532	576
umda	440	484	496	521	572
ea-1p1	440	478	492	520	568
ea-1p10	448	478	488	498	576
rls	400	408	416	425	478

Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
hc	0.09	0.00	0.32	0.00	0.41	0.00
sa	0.10	0.02	0.35	0.07	0.45	0.09
rls	0.11	0.00	0.33	0.01	0.43	0.01
ea-1c10	0.14	0.00	0.36	0.00	0.50	0.00
ea-1p1	0.15	0.00	0.35	0.01	0.50	0.01
ea-1p10	0.16	0.00	0.35	0.01	0.50	0.01
ea-10p1	0.19	0.00	0.39	0.01	0.58	0.01
ga	0.69	0.10	0.39	0.06	1.08	0.16
umda	0.82	0.00	0.35	0.01	1.16	0.01
pbil	0.84	0.00	0.37	0.00	1.21	0.01
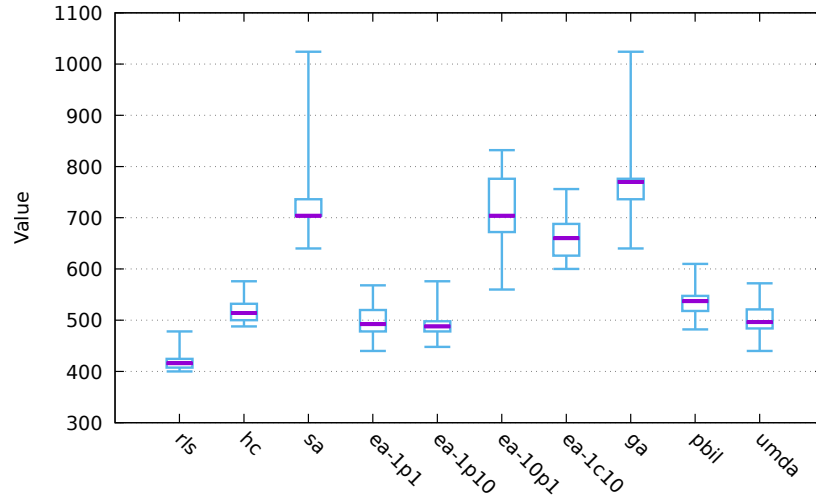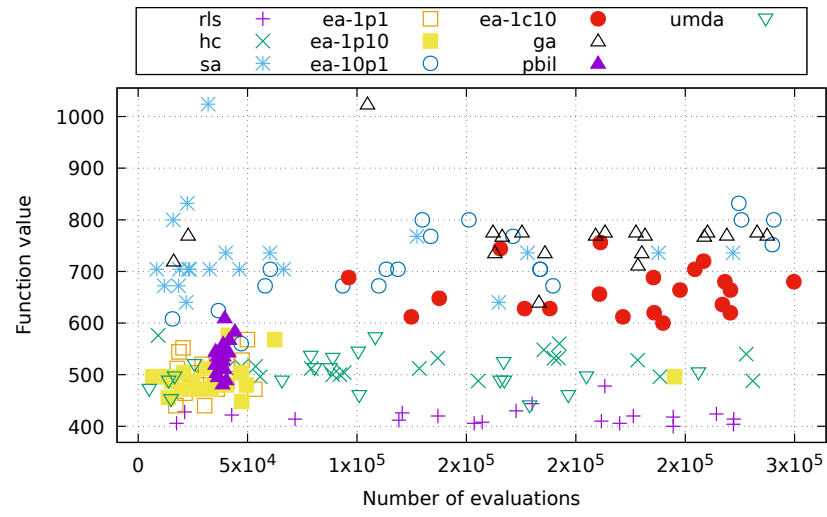
19 Function plateau

Algorithm	Value				
	min	Q_1	med.	Q_3	max
sa	**101**	**101**	**101**	**102**	**102**
ea-1p1	**101**	**101**	**101**	101	**102**
ea-1p10	**101**	**101**	**101**	101	**102**
rls	**101**	**101**	**101**	101	101
hc	**101**	**101**	**101**	101	101
ea-10p1	**101**	**101**	**101**	101	101
ea-1c10	**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.
hc	0.09	0.00	0.12	0.00	0.22	0.00
sa	0.10	0.02	0.12	0.02	0.22	0.03
rls	0.10	0.00	0.12	0.00	0.22	0.00
ea-1c10	0.14	0.00	0.13	0.00	0.27	0.00
ea-1p1	0.15	0.02	0.12	0.02	0.27	0.04
ea-1p10	0.15	0.02	0.12	0.02	0.27	0.04
ea-10p1	0.19	0.00	0.13	0.00	0.31	0.00
ga	0.62	0.00	0.12	0.00	0.74	0.00
umda	0.66	0.00	0.13	0.00	0.79	0.00
pbil	0.68	0.00	0.13	0.00	0.80	0.00
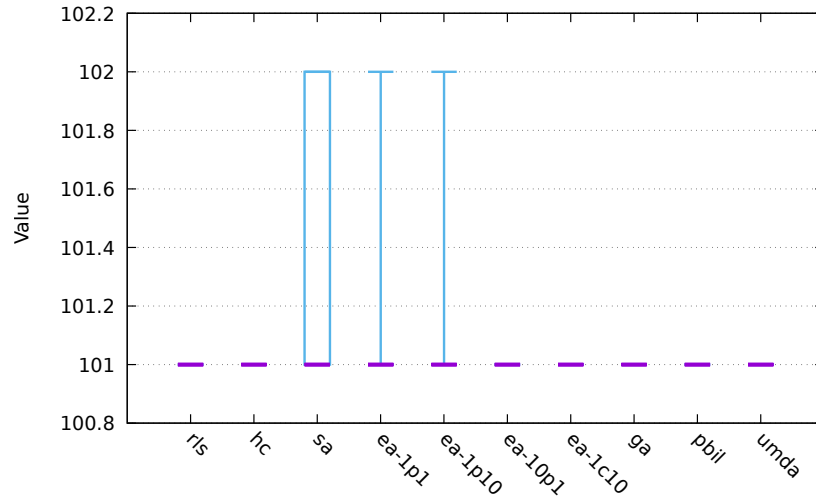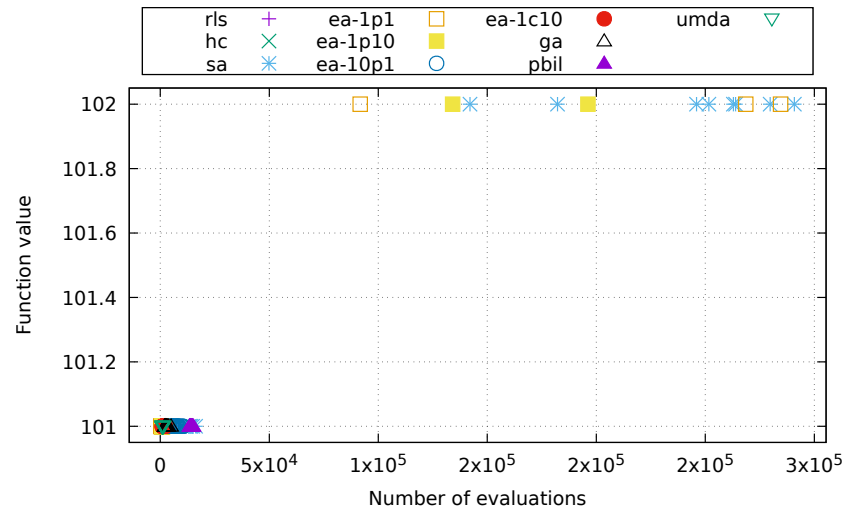
20 Function walsh2

Algorithm	Value				
	min	Q_1	med.	Q_3	max
sa	696.89	705.63	**713.69**	**720.24**	**721.22**
hc	**701.25**	**707.00**	712.88	715.74	**721.22**
ga	659.35	701.72	706.79	713.69	**721.22**
rls	689.74	697.57	702.39	707.76	712.22
ea-10p1	653.95	675.80	701.92	708.31	720.85
ea-1c10	662.07	684.98	698.86	717.49	**721.22**
pbil	650.95	673.16	684.71	695.53	712.56
ea-1p10	598.35	660.88	680.45	687.96	705.30
ea-1p1	637.68	665.99	672.47	685.36	714.52
umda	625.03	663.72	669.89	687.18	718.26

Algorithm	Time (s)					
	algorithm		evaluation		total	
	mean	dev.	mean	dev.	mean	dev.
hc	0.08	0.00	1.92	0.01	2.00	0.01
rls	0.10	0.00	1.94	0.01	2.05	0.01
sa	0.10	0.00	1.90	0.02	2.00	0.02
ea-1c10	0.13	0.00	1.89	0.02	2.02	0.02
ea-1p1	0.15	0.00	1.98	0.02	2.13	0.02
ea-1p10	0.15	0.00	1.99	0.04	2.14	0.04
ea-10p1	0.18	0.00	2.13	0.04	2.31	0.04
ga	0.60	0.00	2.28	0.03	2.88	0.03
umda	0.61	0.05	1.75	0.15	2.36	0.21
pbil	0.68	0.00	2.00	0.02	2.68	0.02
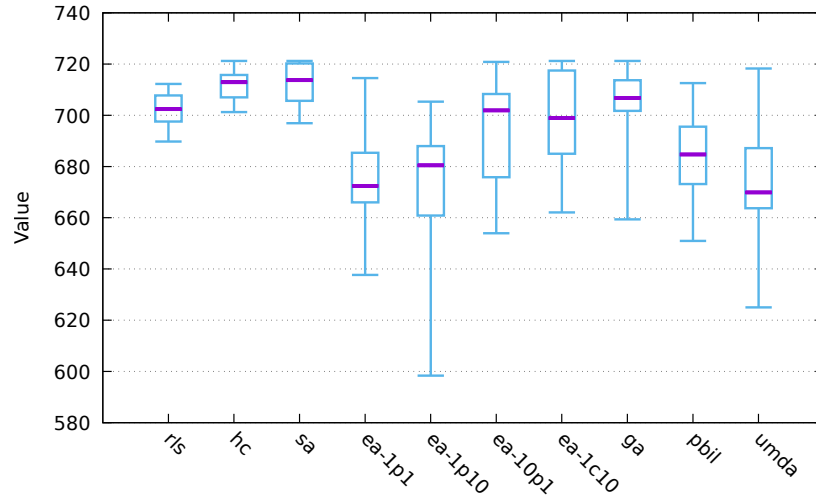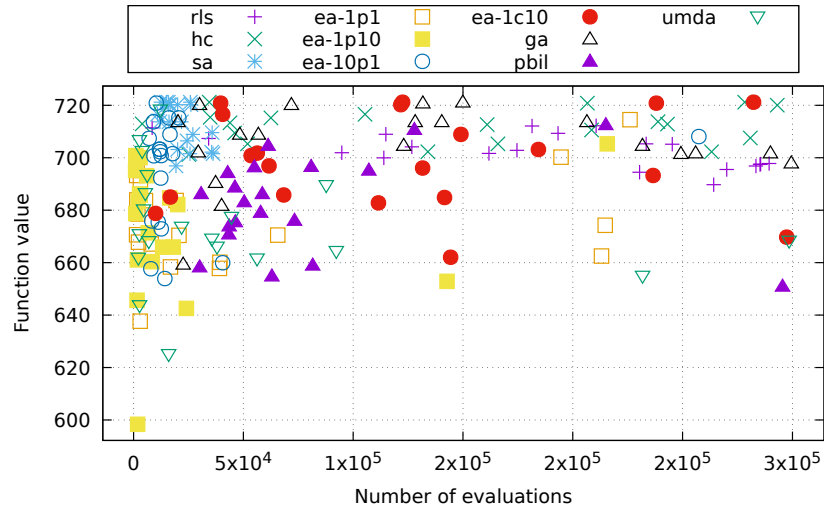
A Plan

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    "budget": 300000,
    "num_runs": 20,
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            "opt": "-F 1 --stop-on-maximum -p instances/lin.100",
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```

40

```json
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        "logscale": true,
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```
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        "opt": "-F 100 -s 99",
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        "rounding": {
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        "id": "plateau",
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        "rounding": {
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            "time": { "before": 1, "after": 2 } }
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        "id": "walsh2",
        "opt": "-F 162 -p instances/walsh2.100",
        "rounding": {
            "value": { "before": 3, "after": 2 },
            "time": { "before": 1, "after": 2 } }
    }
],
"algorithms": [
    {
        "id": "rls",
        "opt": "-A 100 --restart"
    },
    {
        "id": "hc",
        "opt": "-A 150 --restart"
    },
    {
        "id": "sa",
        "opt": "-A 200 --sa-beta-ratio 1.05 --sa-num-trials 10"
    },
    {
        "id": "ea-1p1",
        "opt": "-A 300"
    },
    {
        "id": "ea-1p10",
        "opt": "-A 310 --ea-mu 1 --ea-lambda 10"
    },
    {
        "id": "ea-10p1",
        "opt": "-A 310 --ea-mu 10 --ea-lambda 1"
    },
```

```
        {
            "id": "ea-1c10",
            "opt": "-A 320 --ea-mu 1 --ea-lambda 10 --allow-no-mutation"
        },
        {

            "id": "ga",
            "opt": "-A 400 --ea-mu 100"
        },
        {

            "id": "pbil",
            "opt": "-A 500 -l 5e-3"
        },
        {

            "id": "umda",
            "opt": "-A 600 -x 100 -y 10"
        }
    ]
}
```

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_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 = 0.16
# Generated from hnco.json
```