Comparison tables: BBOB 2012 noisy testbed in 2-D

The BBOBies

August 16, 2012

Abstract

This document provides tabular results of the workshop for Black-Box Optimization Benchmarking at GECCO 2012, see `http://coco.gforge.inria.fr/doku.php?id=bbob-2012`. 4 algorithms have been tested on 24 benchmark functions in dimensions between 2 and 40. A description of the used objective functions can be found in [4, 2]. The experimental set-up is described in [3].

The performance measure provided in the following tables is the expected number of objective function evaluations to reach a given target function value (ERT, expected running time), divided by the respective value for the best algorithm in BBOB-2009 (see [1]) if an algorithm from BBOB-2009 reached the given target function value. The ERT value is given otherwise ($\mathrm{ERT}_{\mathrm{best}}$ is noted as infinite). See [3] for details on how ERT is obtained. Bold entries in the table correspond to values below 3 or the top-three best values. Table 1 gives an overview on all algorithms submitted to the noise-free testbed in 2012.

Table 1: Names and references of all algorithms submitted for the noise-free testbed

algorithm short name	paper	reference
IPOPsaACM	Black-box Optimization Benchmarking of IPOP-saACM-ES on the BBOB-2012 Noisy Testbed (Page 261)	[8]
SNES	Benchmarking Separable Natural Evolution Strategies on the Noiseless and Noisy Black-Box Optimization Testbeds (Page 205)	[7]
xNES	Benchmarking Exponential Natural Evolution Strategies on the Noiseless and Noisy Black-Box Optimization Testbeds (Page 213)	[5]
xNESas	Benchmarking Natural Evolution Strategies with Adaptation Sampling on the Noiseless and Noisy Black-Box Optimization Testbeds (Page 229)	[6]
SNES, xNES, xNESas	Comparing Natural Evolution Strategies to BIPOP-CMA-ES on Noiseless and Noisy Black-Box Optimization Testbeds (Page 237)	[9]

Table 2: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{101}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f101	1.8	8.0	10	14	20	23	15/15
IPOPsaACM	**3.4**(4)	**1.8**(2)	4.1(1)	**4.0**(1)*	**3.9**(0.6)$^{\star 4}$	**4.1**(0.6)$^{\star 4}$	15/15
SNES	4.4(4)	2.0(2)	**3.2**(2)	7.2(3)	11(2)	14(2)	15/15
xNES	8.4(7)	5.1(3)	6.8(3)	9.3(4)	12(3)	13(3)	15/15
xNESas	6.7(7)	3.4(2)	5.4(3)	8.0(4)	10(2)	12(2)	15/15

Table 3: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{102}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f102	1.8	7.1	11	19	25	31	15/15
IPOPsaACM	**3.1**(3)	**2.8**(2)	**3.1**(2)	**3.2**(0.8)$^{\star 2}$	**3.3**(0.6)$^{\star 3}$	**3.1**(0.6)$^{\star 4}$	15/15
SNES	6.6(8)	3.8(2)	4.3(2)	7.0(1)	8.6(1)	10(1)	15/15
xNES	5.1(6)	3.4(4)	4.4(5)	6.4(2)	8.0(3)	8.8(2)	15/15
xNESas	7.0(7)	42(4)	29(3)	20(7)	29(80)	26(65)	15/15

Table 4: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{103}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f103	1.8	7.9	9.4	9.4	10	14	15/15
IPOPsaACM	4.4(4)	2.9(3)	**3.8**(2)	**6.6**(1)$^{\star 2}$	**8.9**(3)$^{\star 3}$	**8.7**(2)$^{\star 4}$	15/15
SNES	4.3(5)	**2.6**(1)	4.2(2)	14(5)	35(23)	71(58)	15/15
xNES	**4.2**(4)	3.1(2)	5.2(3)	14(4)	25(10)	25(5)	15/15
xNESas	4.3(5)	4.4(5)	7.2(4)	14(5)	27(19)	28(15)	15/15

Table 5: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{104}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f104	5.4	15	194	248	256	263	15/15
IPOPsaACM	4.4(3)	**4.9**(4)	**1.5**(0.8)	**1.5**(0.6)	**1.5**(0.6)	**1.5**(0.6)*	15/15
SNES	12(7)	9.2(12)	3.7(4)	125(158)	∞	∞ *2e4*	0/15
xNES	4.7(6)	18(6)	5.7(7)	5.5(6)	7.5(16)	7.6(15)	15/15
xNESas	**3.4**(3)	32(5)	4.9(12)	4.9(10)	6.2(10)	6.3(10)	15/15

Table 6: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{105}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f105	5.4	15	357	381	397	410	15/15
IPOPsaACM	4.5(4)	11(4)	**0.90**(1)	**1.4**(2)	**1.4**(2)	**1.5**(2)	15/15
SNES	**4.3**(5)	**6.4**(8)	3.0(5)	52(53)	348(405)	∞ *2e4*	0/15
xNES	5.8(5)	37(8)	4.3(7)	5.7(10)	5.7(9)	5.7(9)	15/15
xNESas	54(6)	69(137)	7.2(12)	9.2(16)	11(16)	11(15)	15/15

Table 7: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{106}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

∞

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f106	5.4	15	139	352	490	650	15/15
IPOPsaACM	**2.7**(2)	**4.2**(4)	**1.1**(0.7)	**0.72**(0.5)	**0.63**(0.4)	**0.58**(0.4)*	15/15
SNES	5.3(5)	4.5(4)	8.0(11)	48(46)	296(328)	∞ *2e4*	0/15
xNES	5.6(6)	5.8(5)	2.3(3)	3.0(3)	3.2(5)	2.8(4)	15/15
xNESas	5.1(5)	11(11)	6.1(5)	4.5(4)	3.6(3)	2.9(2)	15/15

Table 8: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{107}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f107	1.8	13	28	158	255	421	15/15
IPOPsaACM	**5.2**(6)	**1.8**(2)	**2.1**(2)	1.2(0.7)	1.4(0.6)	1.1(0.4)	15/15
SNES	15(21)	3.9(4)	2.7(3)	**1.1**(0.6)	**1.3**(0.4)	**1.0**(0.2)	15/15
xNES	27(19)	33(114)	18(55)	5.2(10)	3.6(6)	2.9(4)	13/15
xNESas	154(9)	90(171)	44(81)	10(15)	7.7(9)	5.6(6)	15/15

Table 9: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{108}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f108	1.8	30	202	3422	7369	15979	15/15
IPOPsaACM	**15**(14)	**10**(13)	4.8(7)	**1.0**(0.6)	**1.2**(1)$^{\star 3}$	**0.88**(0.5)$^{\star 3}$	15/15
SNES	53(74)	10(15)	**2.8**(3)	2.5(2)	∞	∞ *2e4*	0/15
xNES	170(558)	49(66)	11(13)	10(13)	287(327)	∞ *1e5*	0/15
xNESas	502(1112)	100(123)	31(31)	34(30)	406(434)	∞ *2e5*	0/15

Table 10: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{109}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f109	1.8	10	13	68	96	96	15/15
IPOPsaACM	4.3(6)	**2.2**(2)	4.3(4)	**2.3**(2)	**3.3**(2)	**5.5**(3)	15/15
SNES	**3.9**(2)	2.4(1)	**3.6**(2)	2.6(1)	11(10)	336(417)	1/15
xNES	5.8(5)	3.6(4)	5.5(4)	5.8(3)	5.3(3)	8.7(12)	15/15
xNESas	5.4(6)	5.7(12)	11(10)	5.7(4)	9.1(17)	11(22)	15/15

Table 11: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{110}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f110	7.1	34	623	2319	8407	9154	14/15
IPOPsaACM	**4.1**(3)	5.8(2)	2.6(2)	**2.9**(3)	**1.1**(0.9)	**1.0**(0.8)	15/15
SNES	5.9(7)	**2.9**(4)	**1.2**(1)	8.4(9)	34(38)	∞ *2e4*	0/15
xNES	11(7)	26(30)	4.2(7)	4.2(4)	1.4(1)	1.3(1)	14/15
xNESas	7.1(8)	53(118)	8.8(10)	5.4(6)	2.2(2)	2.3(3)	15/15

Table 12: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{111}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f111	24	119	718	12718	61860	1.7e5	15/15
IPOPsaACM	5.9(3)	3.6(7)	4.1(3)	7.9(11)	**2.7**(3)	**1.0**(1)	15/15
SNES	**4.7**(5)	**2.9**(3)	**1.9**(2)	**4.9**(6)	∞	∞ *2e4*	0/15
xNES	29(83)	13(21)	12(12)	7.0(7)	∞	∞ *2e5*	0/15
xNESas	50(90)	23(41)	17(21)	10(12)	∞	∞ *2e5*	0/15

Table 13: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{112}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f112	5.4	15	625	1154	1373	1531	15/15
IPOPsaACM	4.8(6)	4.9(3)	**0.51**(0.6)	**0.73**(0.5)	**0.97**(0.7)	**1.1**(0.6)	15/15
SNES	4.7(4)	**4.1**(2)	2.1(2)	42(45)	∞	∞ *2e4*	0/15
xNES	**3.1**(3)	12(10)	2.5(4)	3.6(4)	4.3(4)	4.2(4)	15/15
xNESas	4.1(4)	23(14)	2.7(5)	4.1(4)	6.0(6)	5.5(5)	15/15

Table 14: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{113}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f113	4.7	31	87	174	174	876	15/15
IPOPsaACM	**4.3**(5)	**3.0**(5)	11(20)	9.4(11)	9.4(11)	**2.0**(2)	15/15
SNES	8.8(11)	3.5(5)	**5.9**(8)	**6.5**(8)	**6.5**(8)	3.3(4)	14/15
xNES	7.6(9)	20(32)	14(29)	18(26)	18(26)	3.6(5)	15/15
xNESas	6.1(5)	25(75)	26(31)	30(57)	30(57)	6.0(11)	15/15

Table 15: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{114}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f114	8.9	43	698	5343	5343	8680	15/15
IPOPsaACM	18(20)	9.5(13)	3.2(3)	**1.3**(1)	**1.3**(1)	**1.1**(0.6)	15/15
SNES	**5.7**(5)	**5.0**(5)	**1.3**(1.0)	2.4(3)	2.4(3)	4.6(5)	0/15
xNES	37(114)	33(50)	11(12)	5.7(6)	5.7(6)	8.9(7)	5/15
xNESas	141(229)	162(261)	21(34)	17(20)	17(20)	20(23)	5/15

Table 16: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{115}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f115	3.2	13	225	394	394	543	15/15
IPOPsaACM	**5.2**(4)	**4.4**(4)	2.0(3)	**2.0**(2)	**2.0**(2)	**1.8**(2)	15/15
SNES	5.2(5)	6.4(2)	**1.3**(2)	2.4(4)	2.4(4)	7.6(14)	11/15
xNES	6.4(7)	24(74)	6.3(9)	5.3(6)	5.3(6)	4.7(5)	15/15
xNESas	5.2(4)	24(5)	3.8(9)	6.2(13)	6.2(13)	4.9(11)	15/15

Table 17: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{116}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f116	49	101	155	275	1041	1788	15/15
IPOPsaACM	14(19)	18(20)	13(13)	7.8(8)	2.3(2)	1.5(1)	15/15
SNES	2.7(4)	12(10)	20(16)	229(264)	∞	∞ *2e4*	0/15
xNES	15(51)	**8.4**(25)	**9.1**(17)	**5.6**(9)	**1.6**(2)	**0.98**(1)	15/15
xNESas	**2.0**(2)	26(43)	21(29)	14(16)	3.8(4)	3.0(6)	15/15

Table 18: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{117}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f117	167	1346	6454	28223	36420	43231	15/15
IPOPsaACM	3.7(7)	3.4(6)	2.0(2)	**0.73**(0.6)	**0.70**(0.4)	**0.73**(0.3)	15/15
SNES	**2.2**(5)	**1.1**(2)	**1.0**(1)	∞	∞	∞ *2e4*	0/15
xNES	5.0(6)	3.0(5)	2.8(4)	6.6(7)	62(62)	∞ *2e5*	0/15
xNESas	23(26)	9.4(9)	3.4(4)	5.4(6)	80(88)	∞ *2e5*	0/15

Table 19: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{118}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f118	21	103	132	584	776	972	15/15
IPOPsaACM	3.7(2)	**1.4**(1)	**1.4**(1)	**0.58**(0.4)	**0.64**(0.4)	**0.77**(0.5)	15/15
SNES	7.3(10)	12(12)	27(33)	51(59)	∞	∞ *2e4*	0/15
xNES	**3.6**(3)	1.8(1)	2.6(3)	1.5(2)	1.9(2)	2.1(2)	15/15
xNESas	15(3)	4.4(5)	5.4(15)	1.5(4)	1.6(3)	2.3(4)	15/15

Table 20: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{119}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f119	1.4	11	71	1040	4767	10082	15/15
IPOPsaACM	**2.4**(2)	8.6(16)	1.9(2)	0.47(0.6)	**0.99**(0.7)	**0.82**(0.2)	15/15
SNES	5.2(4)	**5.2**(6)	**1.5**(1)	**0.44**(0.2)$_{\downarrow 3}$	4.4(5)	30(33)	1/15
xNES	5.3(8)	65(7)	10(1)	2.4(5)	1.6(1)	1.1(1)	14/15
xNESas	10(11)	61(218)	13(33)	2.9(4)	2.2(3)	1.8(2)	15/15

Table 21: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{120}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f120	1.4	11	374	5724	75406	1.9e5	15/15
IPOPsaACM	5.1(7)	**10**(12)	2.0(2)	**2.0**(2)*	**0.46**(0.4)$_{\downarrow}$	**0.51**(0.4)$_{\downarrow}$	15/15
SNES	**4.8**(9)	11(15)	**0.98**(1.0)	50(56)	∞	∞ *2e4*	0/15
xNES	107(33)	193(307)	12(20)	11(7)	∞	∞ *1e5*	0/15
xNESas	8.8(6)	160(375)	13(18)	23(24)	∞	∞ *2e5*	0/15

Table 22: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{121}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f121	1.4	7.1	42	327	1120	1702	15/15
IPOPsaACM	**2.5**(4)	**2.1**(2)	1.2(0.7)	**1.2**(0.7)	**1.0**(0.4)	**1.2**(0.4)	15/15
SNES	3.5(6)	4.7(5)	1.4(0.8)	1.9(2)	255(286)	∞ *2e4*	0/15
xNES	4.4(5)	4.4(4)	1.7(1)	1.3(0.9)	1.2(1.0)	1.7(2)	15/15
xNESas	3.0(5)	2.6(2)	**1.1**(0.7)	1.7(0.8)	1.6(3)	2.3(4)	15/15

Table 23: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{122}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f122	2.9	95	523	2244	4351	9561	15/15
IPOPsaACM	**3.9**(5)	**1.1**(0.7)	1.3(1)	**1.2**(1)	**1.2**(0.7)	**0.79**(0.4)$^{\star 3}$	15/15
SNES	18(13)	2.2(3)	**0.94**(1)	3.2(4)	65(75)	∞ *2e4*	0/15
xNES	116(343)	17(32)	4.9(7)	7.0(9)	13(13)	35(38)	4/15
xNESas	106(28)	28(32)	14(19)	12(14)	19(15)	53(52)	3/15

Table 24: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{123}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f123	3.1	211	6371	38734	1.0e5	2.2e5	15/15
IPOPsaACM	40(34)	3.7(5)	**0.90**(0.7)	**0.95**(0.4)	**0.68**(0.5)	**0.82**(0.5)	15/15
SNES	**8.0**(18)	**2.8**(4)	2.2(2)	∞	∞	∞ *2e4*	0/15
xNES	68(10)	20(19)	8.3(9)	∞	∞	∞ *1e5*	0/15
xNESas	172(527)	47(55)	12(16)	∞	∞	∞ *2e5*	0/15

Table 25: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{124}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f124	3.5	64	316	1991	5595	9019	15/15
IPOPsaACM	**2.3**(2)	3.4(1)	1.4(2)	**0.84**(0.7)	**1.1**(0.8)$^{\star 4}$	**2.4**(1)	15/15
SNES	4.0(3)	**1.9**(3)	**0.91**(0.9)	71(72)	∞	∞ *2e4*	0/15
xNES	4.0(5)	6.3(17)	2.7(5)	4.6(5)	23(22)	41(46)	5/15

Table 26: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{125}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f125	1	1	1	1150	3854	7556	15/15
IPOPsaACM	1.1(0)	**4.1**(4)	37(34)	1.9(3)	**1.4**(1)	**1.6**(2)	15/15
SNES	**1**(0)	6.3(9)	40(49)	**0.82**(1)	2.7(2)	12(13)	1/15
xNES	1.1(0)	6.8(9)	60(48)	4.6(5)	5.1(6)	3.1(3)	14/15
xNESas	1.3(1)	6.1(4)	**30**(32)	7.2(7)	7.1(8)	8.4(10)	14/15

Table 27: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{126}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f126	1	1	1	3417	11056	36387	15/15
IPOPsaACM	**1**(0)	9.2(10)	70(89)	**1.3**(1)	**1.3**(1)	**1.4**(1)	15/15
SNES	**1**(0)	5.5(8)	**66**(79)	1.5(2)	8.2(9)	∞ *2e4*	0/15
xNES	1.1(0)	6.1(6)	667(1505)	4.4(4)	7.3(8)	60(67)	0/15
xNESas	1.1(0)	**3.3**(2)	980(2133)	10(13)	12(5)	25(25)	1/15

Table 28: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{127}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f127	1	1	1	1185	6771	7277	13/15
IPOPsaACM	1.3(0)	5.5(6)	75(59)	2.5(2)	**0.94**(1)	**1.1**(1)	15/15
SNES	**1.1**(0.5)	4.9(5)	**37**(31)	**1.6**(1)	1.7(2)	19(21)	0/15
xNES	1.8(0.5)	5.7(6)	167(87)	7.4(10)	2.6(3)	5.0(6)	15/15
xNESas	1.3(0)	**4.3**(6)	67(77)	8.9(14)	3.5(4)	5.5(6)	15/15

Table 29: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{128}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f128	1.8	41	134	387	593	620	15/15
IPOPsaACM	1.5(1)	8.1(8)	22(23)	19(28)	83(23)	91(23)	15/15
SNES	1.6(1)	**5.1**(6)	**2.0**(3)	**1.2**(1)	**0.93**(0.8)	**1.3**(2)	15/15
xNES	1.4(0.8)	46(72)	22(23)	10(13)	6.9(8)	6.6(8)	15/15
xNESas	**1.2**(1)	32(61)	65(99)	32(39)	23(26)	22(25)	15/15

Table 30: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{129}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f129	1.8	65	220	1902	5944	10661	15/15
IPOPsaACM	1.4(2)	**3.3**(4)	11(9)	2.7(3)	**1.6**(1)	**1.2**(1)*	15/15
SNES	1.4(1)	3.5(4)	**3.0**(4)	**1.6**(2)	1.9(2)	13(14)	0/15
xNES	**0.85**(0.6)	25(32)	19(23)	5.0(6)	5.5(6)	11(10)	9/15
xNESas	1.1(0.8)	25(67)	35(36)	14(13)	18(13)	25(22)	6/15

Table 31: 02-D, running time excess ERT/ERT$_{\text{best 2009}}$ on f_{130}, in italics is given the median final function value and the median number of function evaluations to reach this value divided by dimension

Δf_{opt}	1e1	1e0	1e-1	1e-3	1e-5	1e-7	#succ
f130	1.5	45	198	797	1772	4442	15/15
IPOPsaACM	1.7(1)	4.8(5)	8.2(15)	6.8(4)	12(13)	26(49)	15/15
SNES	1.4(1.0)	**3.6**(4)	**2.6**(4)	**1.0**(1)	**0.62**(0.7)	**0.50**(0.4)	15/15
xNES	**1.3**(1)	20(24)	16(32)	4.2(8)	1.9(4)	0.81(1)	15/15
xNESas	1.7(2)	57(89)	35(54)	8.9(13)	4.9(7)	2.0(3)	15/15

References

[1] Anne Auger, Steffen Finck, Nikolaus Hansen, and Raymond Ros. BBOB 2009: Comparison tables of all algorithms on all noisy functions. Technical Report RT-0384, INRIA, 04 2010.

[2] S. Finck, N. Hansen, R. Ros, and A. Auger. Real-parameter black-box optimization benchmarking 2010: Presentation of the noisy functions. Technical Report 2009/21, Research Center PPE, 2010.

[3] N. Hansen, A. Auger, S. Finck, and R. Ros. Real-parameter black-box optimization benchmarking 2012: Experimental setup. Technical report, INRIA, 2012.

[4] N. Hansen, S. Finck, R. Ros, and A. Auger. Real-parameter black-box optimization benchmarking 2009: Noisy functions definitions. Technical Report RR-6869, INRIA, 2009. Updated February 2010.

[5] Terence Soule, editor. *Benchmarking Exponential Natural Evolution Strategies on the Noiseless and Noisy Black-Box Optimization Testbeds*. ACM, 2012.

[6] Terence Soule, editor. *Benchmarking Natural Evolution Strategies with Adaptation Sampling on the Noiseless and Noisy Black-Box Optimization Testbeds*. ACM, 2012.

[7] Terence Soule, editor. *Benchmarking Separable Natural Evolution Strategies on the Noiseless and Noisy Black-box Optimization Testbeds*. ACM, 2012.

[8] Terence Soule, editor. *Black-box Optimization Benchmarking of IPOP-saACM-ES on the BBOB-2012 Noisy Testbed*. ACM, 2012.

[9] Terence Soule, editor. *Comparing Natural Evolution Strategies to BIPOP-CMA-ES on Noiseless and Noisy Black-Box Optimization Testbeds*. ACM, 2012.