HNCO
Influence of a function parameter
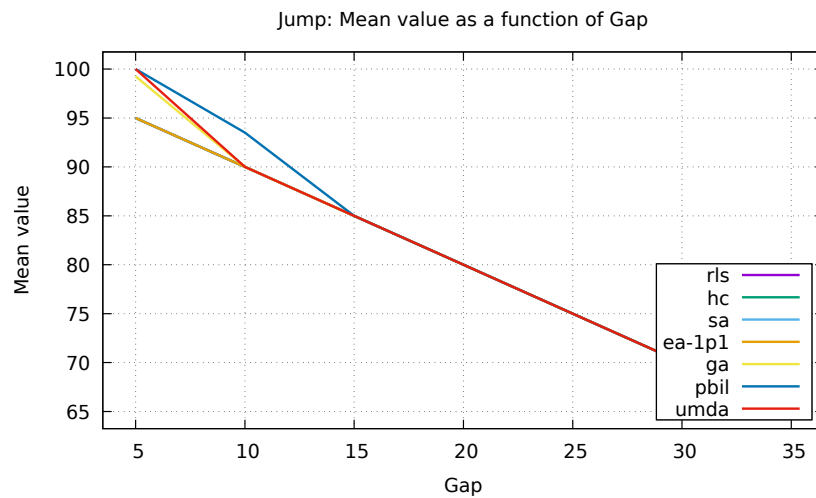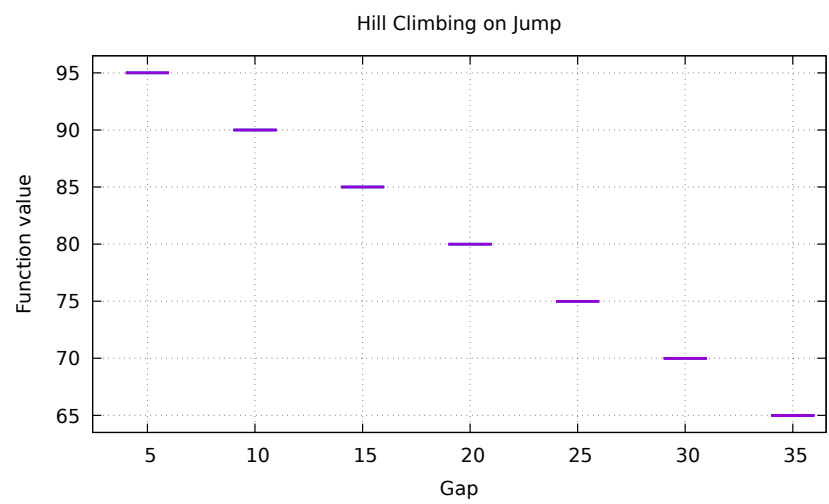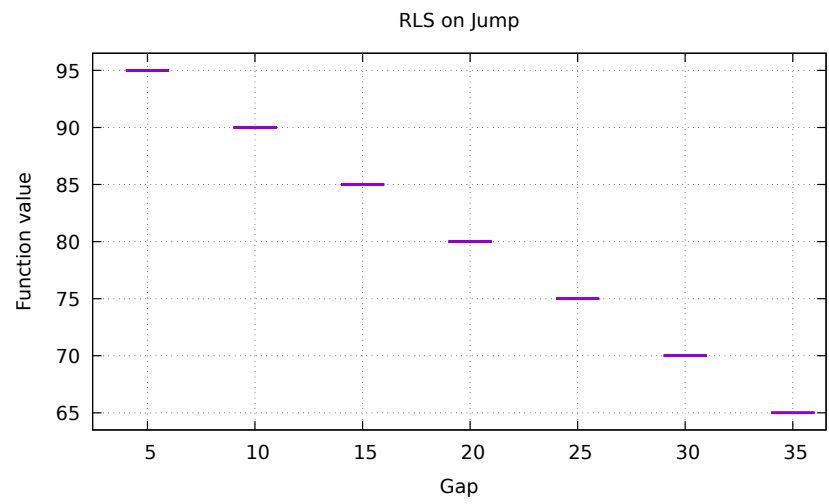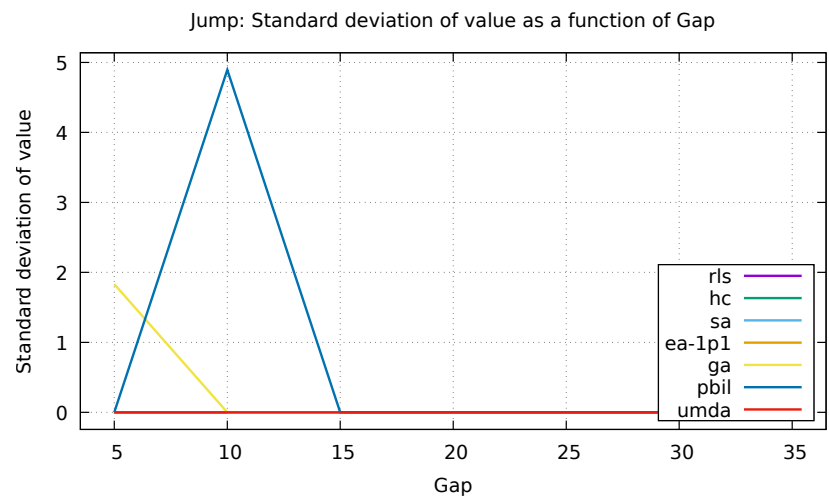# on the performance of search algorithms

May 2, 2020

Abstract

Search algorithms are applied to the functions Four Peaks and Jump. Their performance is studied as a function of the gap, a function parameter which controls the hardness of Four Peaks and Jump.
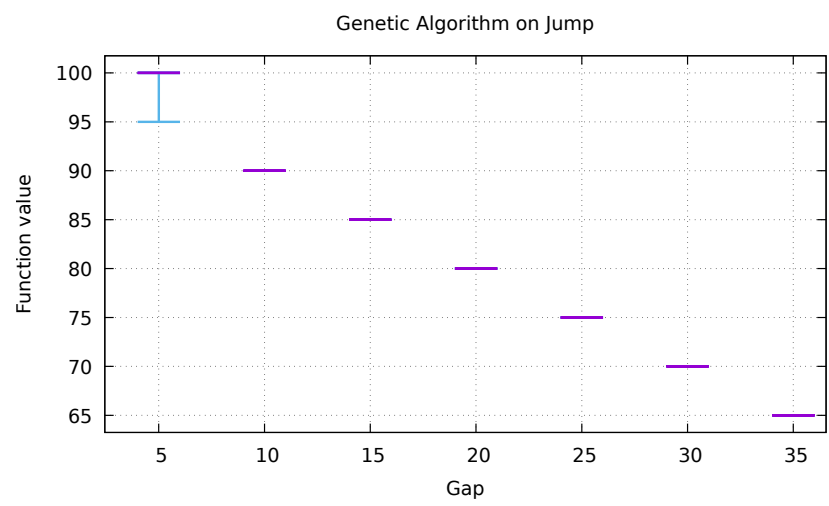
Contents

1 Function Jump

Jump: Standard deviation of value as a function of Gap

RLS on Jump

Hill Climbing on Jump

Simulated Annealing on Jump

(1+1) EA on Jump

Genetic Algorithm on Jump

3

PBIL on Jump

UMDA on Jump

2 Function Four Peaks

Four Peaks: Mean value as a function of Gap

Four Peaks: Standard deviation of value as a function of Gap

RLS on Four Peaks

Hill Climbing on Four Peaks

Simulated Annealing on Four Peaks

(1+1) EA on Four Peaks

Genetic Algorithm on Four Peaks

6
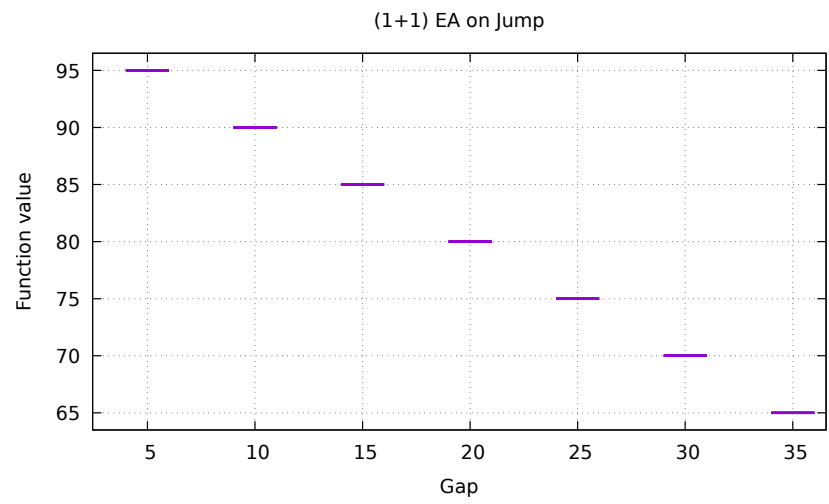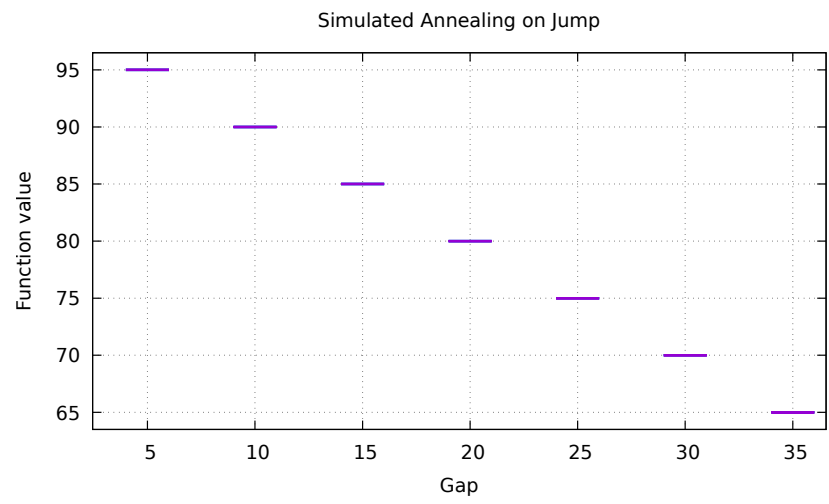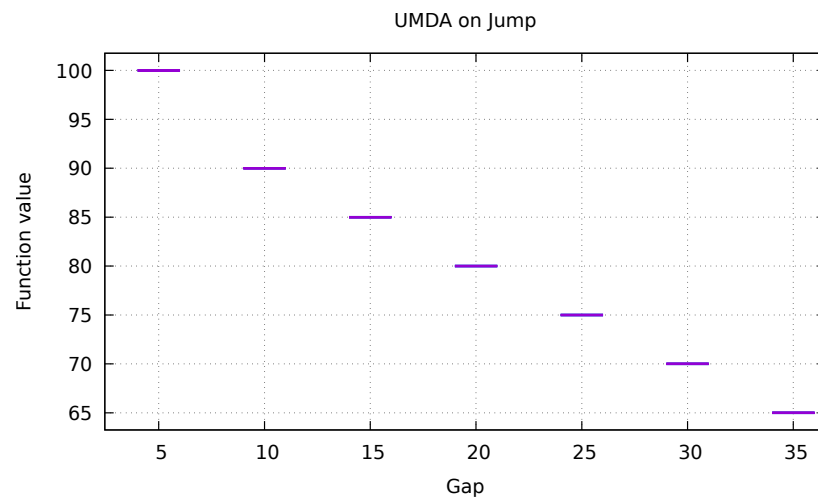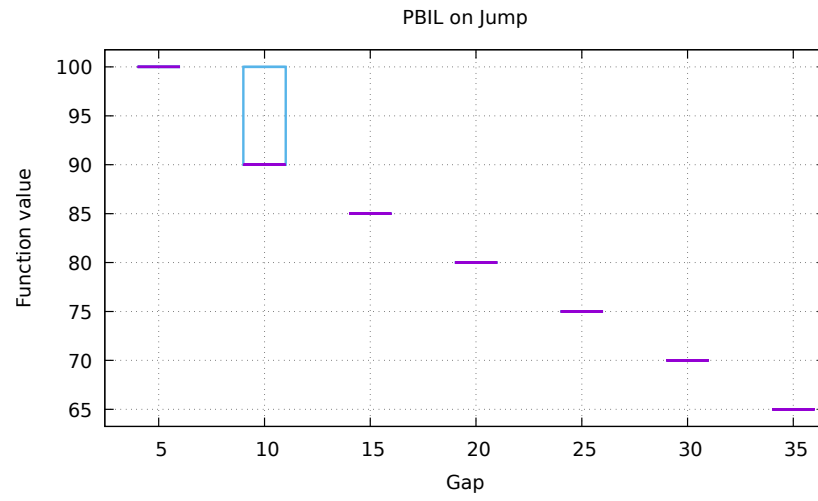
PBIL on Four Peaks

UMDA on Four Peaks
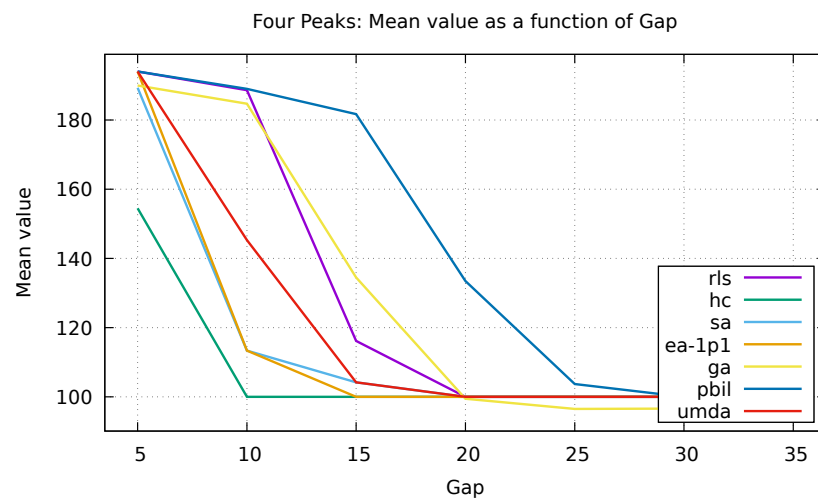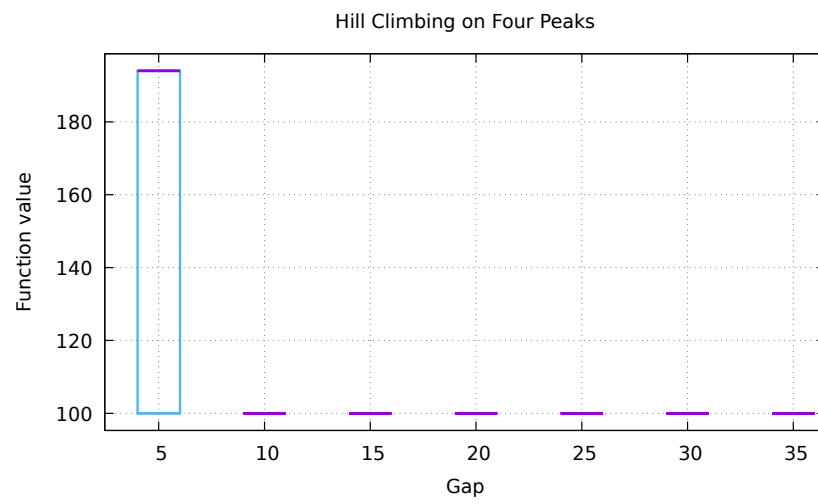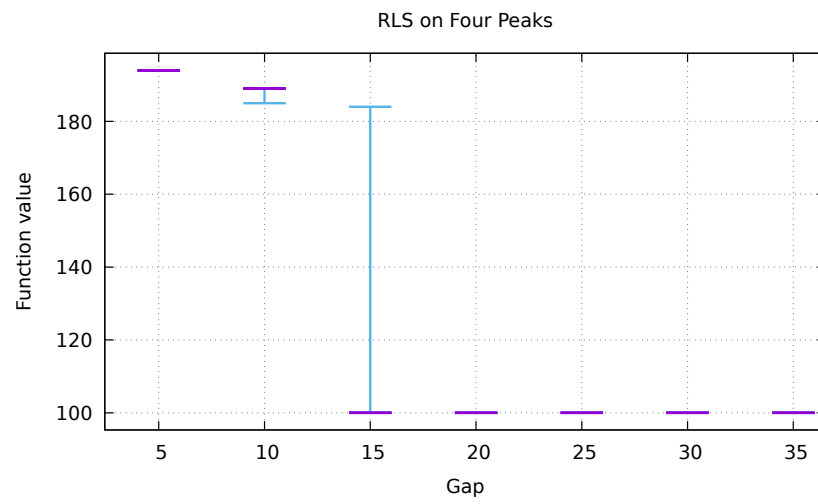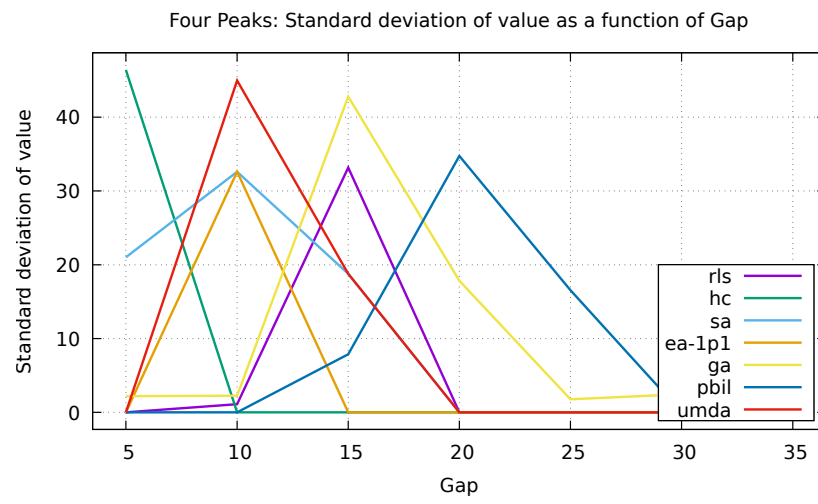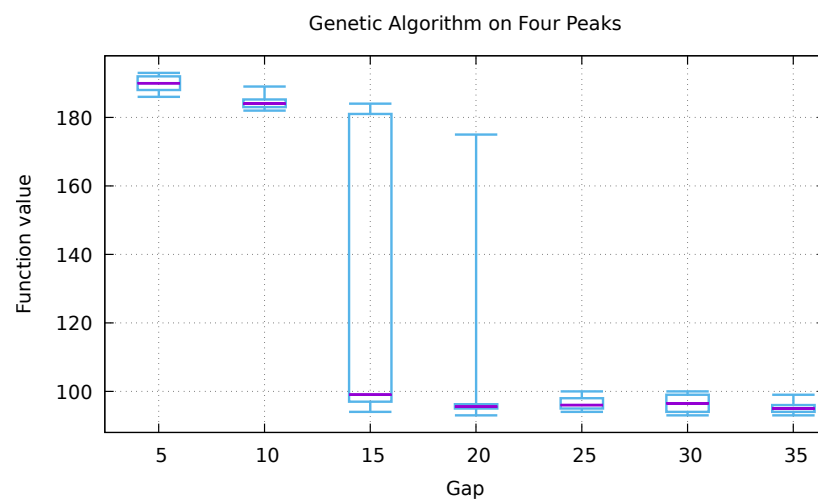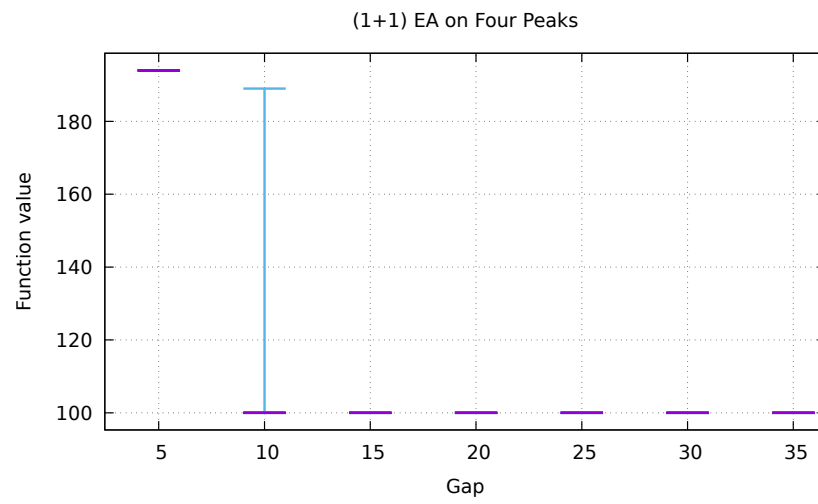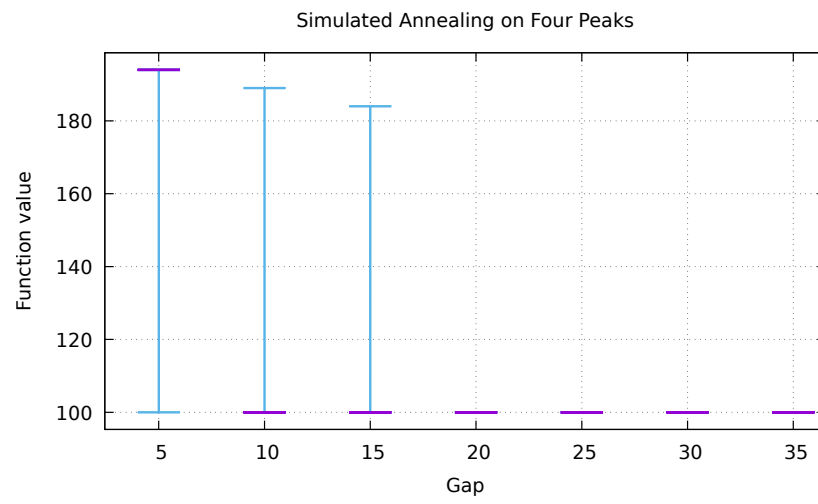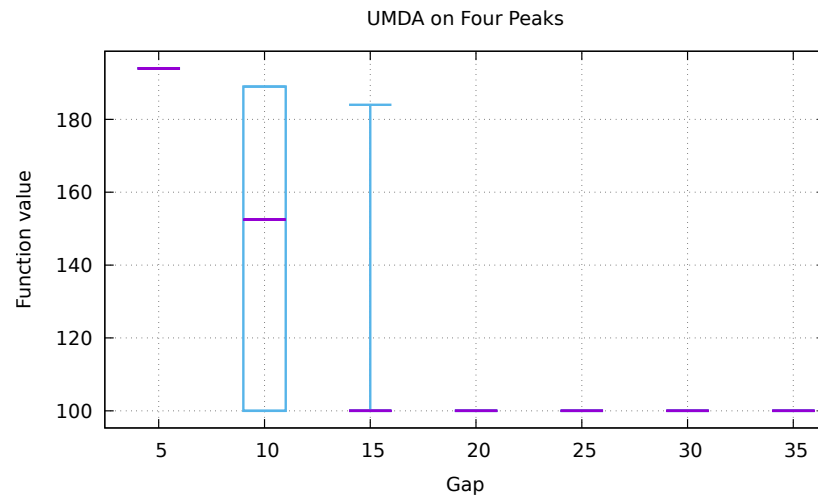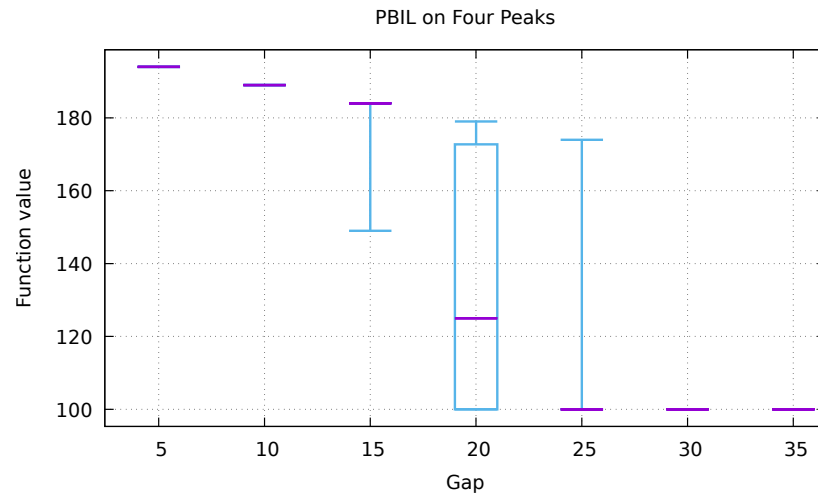
A   Plan

```
{
    "exec": "hnco",
    "opt": "--print-results --map 1 --map-random -s 100",
    "budget": 200000,
    "num_runs": 20,
    "parallel": true,
    "parameter": {
        "id": "fn-threshold",
        "name": "Gap",
        "values": [ 5, 10, 15, 20, 25, 30, 35 ]
    },
    "graphics": {
        "logscale": false,
        "candlesticks": {
            "title": true,
            "boxwidth": "2"
        }
    },
    "functions": [
        {
            "id": "jump",
            "name": "Jump",
            "opt": "-F 30 --stop-on-maximum"
        },
        {
            "id": "four-peaks",
```

```json
            "name": "Four Peaks",
            "opt": "-F 40 --stop-on-maximum"
        }
    ],
    "algorithms": [
        {
            "id": "rls",
            "name": "RLS",
            "opt": "-A 100 --restart"
        },
        {
            "id": "hc",
            "name": "Hill Climbing",
            "opt": "-A 150 --restart"
        },
        {
            "id": "sa",
            "name": "Simulated Annealing",
            "opt": "-A 200 --sa-beta-ratio 1.05 --sa-num-trials 10"
        },
        {
            "id": "ea-1p1",
            "name": "(1+1) EA",
            "opt": "-A 300"
        },
        {
            "id": "ga",
            "name": "Genetic Algorithm",
            "opt": "-A 400 --ea-mu 100"
        },
        {
            "id": "pbil",
            "name": "PBIL",
            "opt": "-A 500 -r 5e-3"
        },
        {
            "id": "umda",
            "name": "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
# 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_probability = 1
# neighborhood = 0
# neighborhood_iterator = 0
# noise_stddev = 1
# num_iterations = 0
# num_threads = 1
# path = function.txt
# pn_mutation_probability = 1
# pn_neighborhood = 0
# pn_radius = 2
# population_size = 10
# pv_log_num_components = 5
# radius = 2
# real_expression = (1-x)^2+100*(y-x^2)^2
# real_lower_bound = -2
# real_num_bits = 8
# real_upper_bound = 2
# 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 = 0.14
# Generated from hnco.json
```