

HNCO

Influence of a function parameter on the performance of search algorithms

August 7, 2020

Abstract

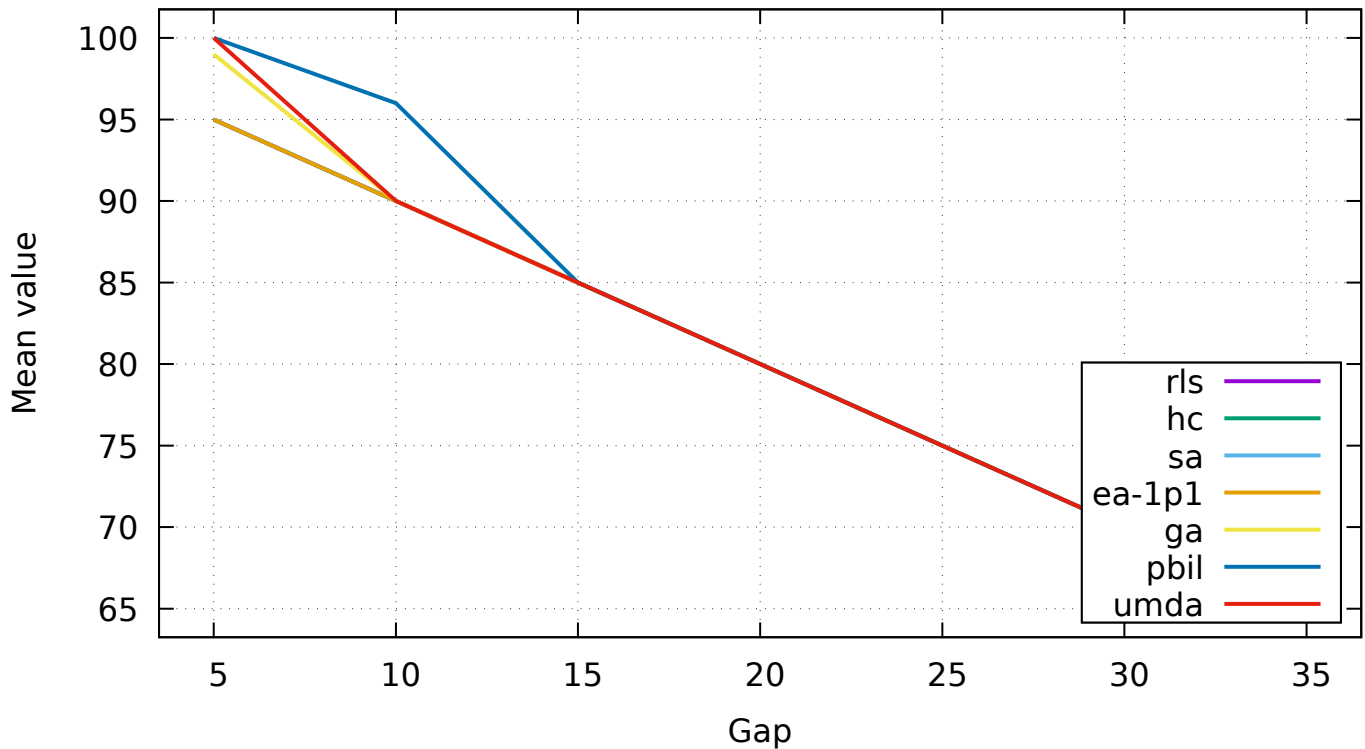
Search algorithms are applied to the functions Four Peaks and Jump. Their performance is studied as a function of the gap, a function parameter which controls the hardness of Four Peaks and Jump.

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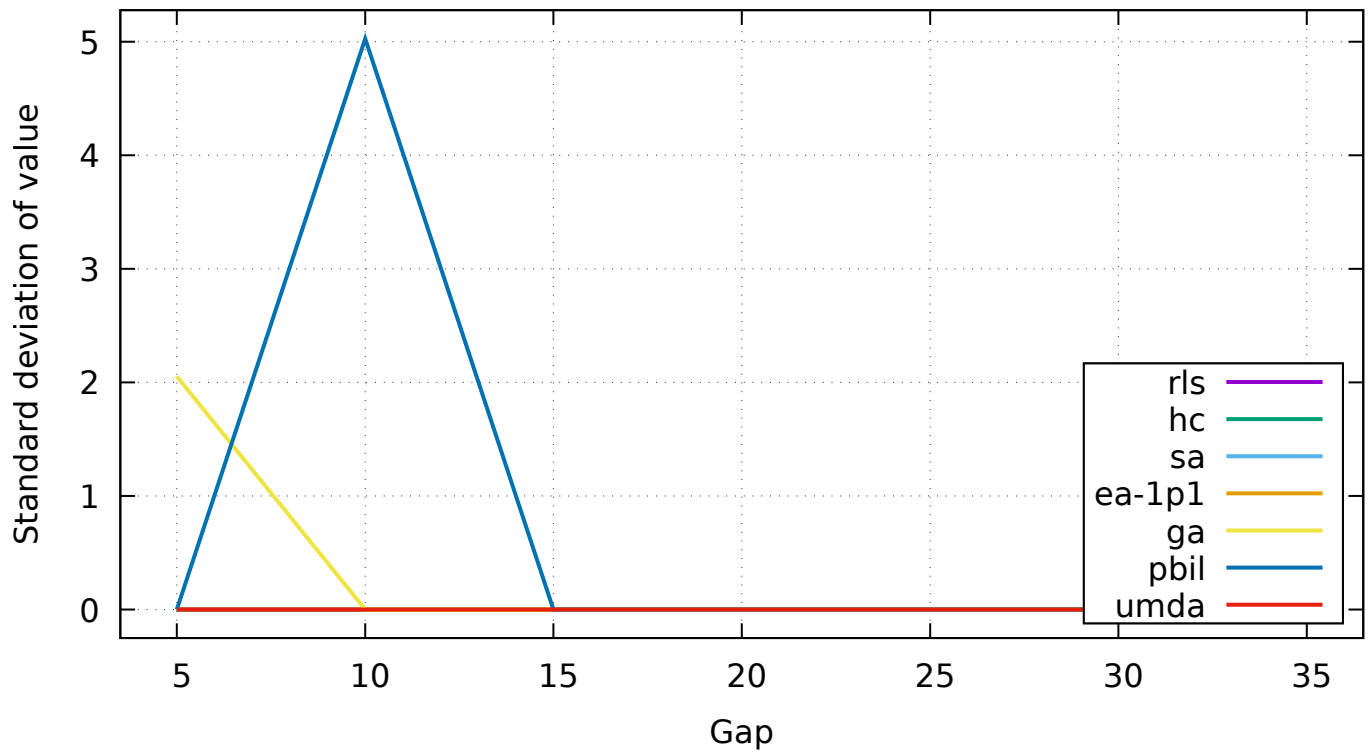
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1 Function Jump

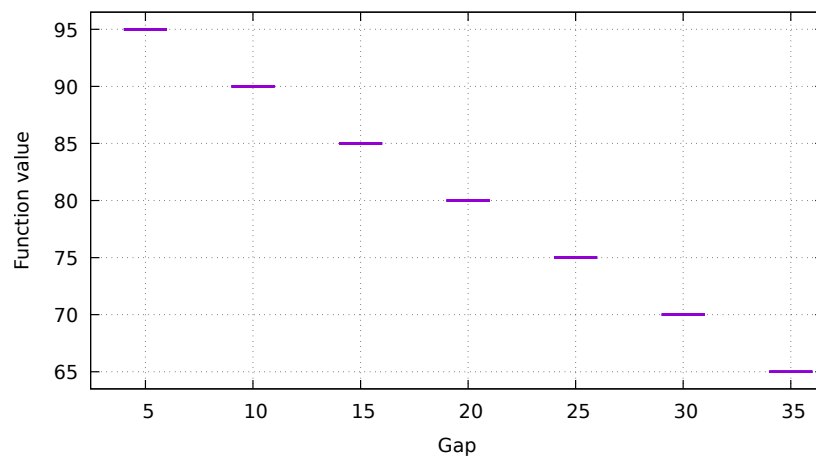
Jump: Mean value as a function of Gap



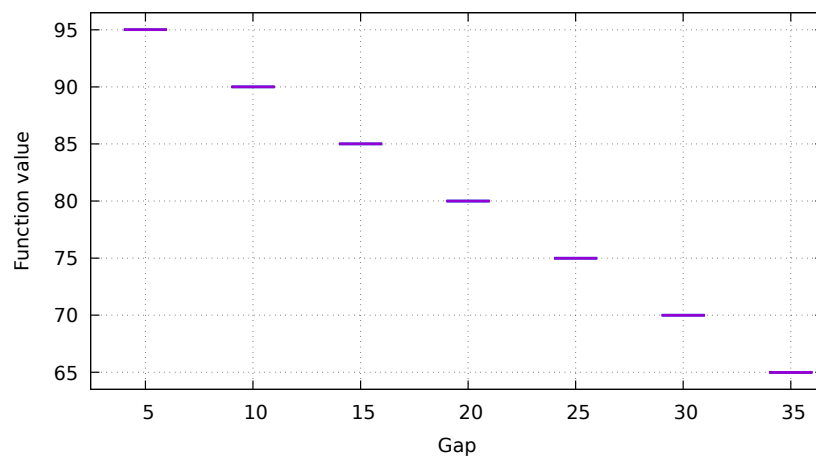
Jump: Standard deviation of value as a function of Gap

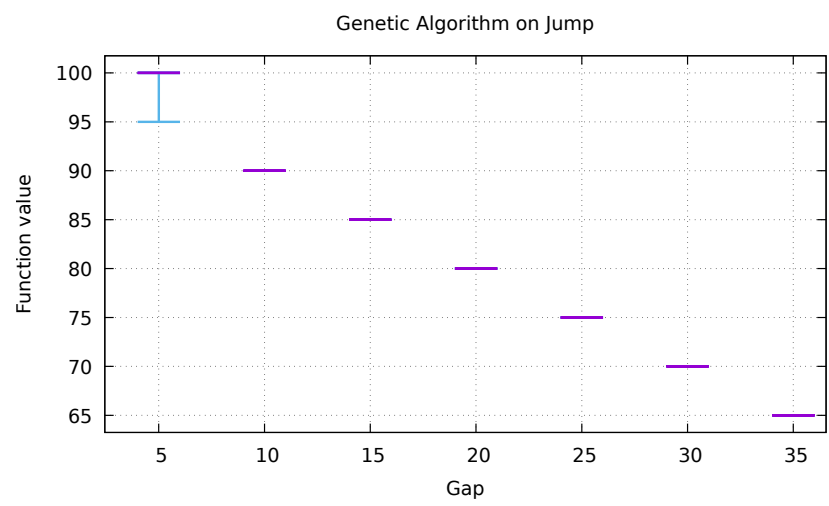
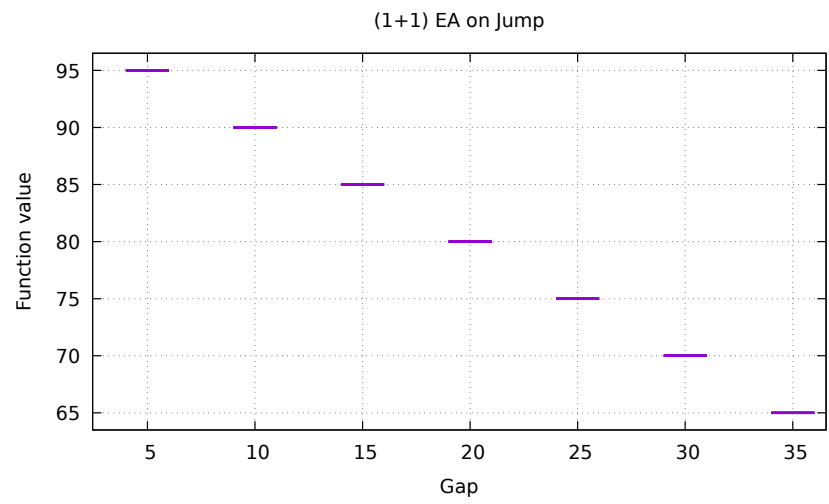
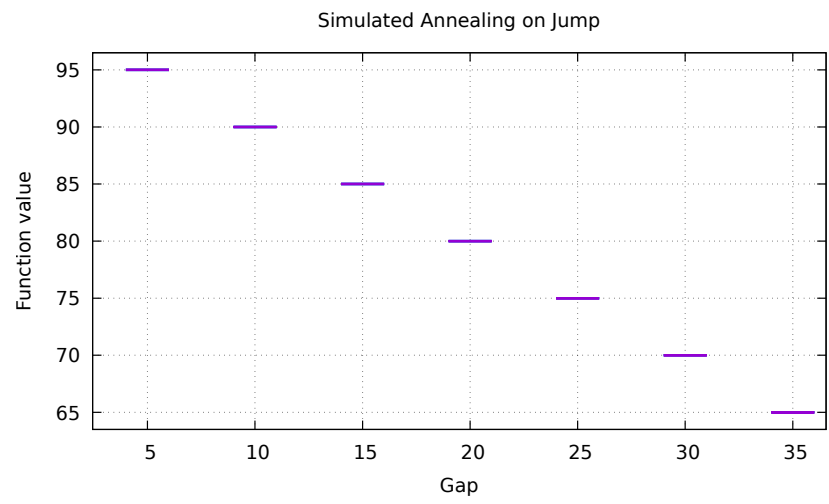


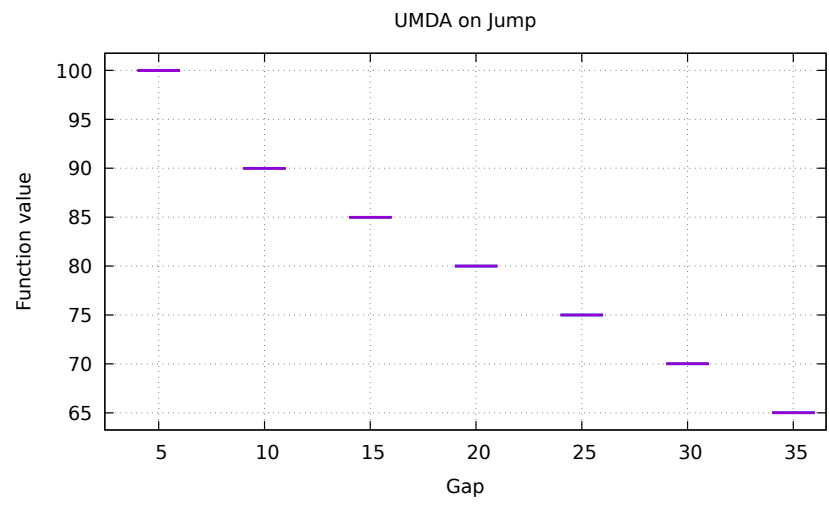
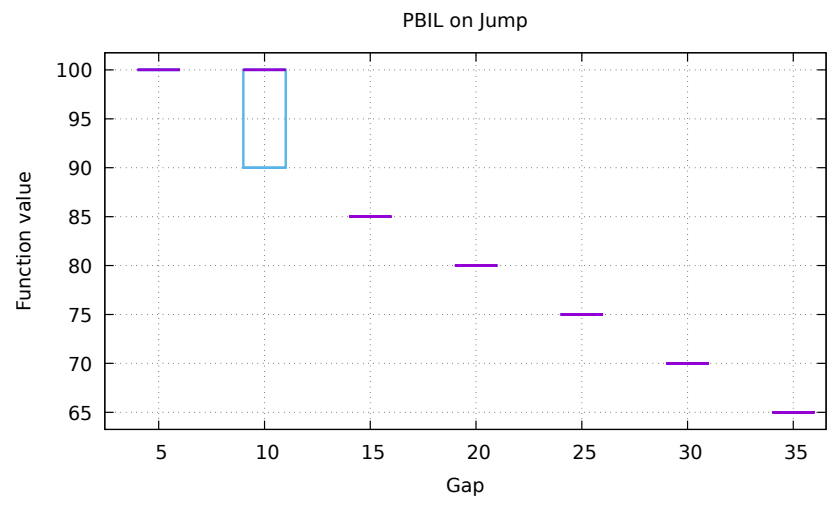
RLS on Jump



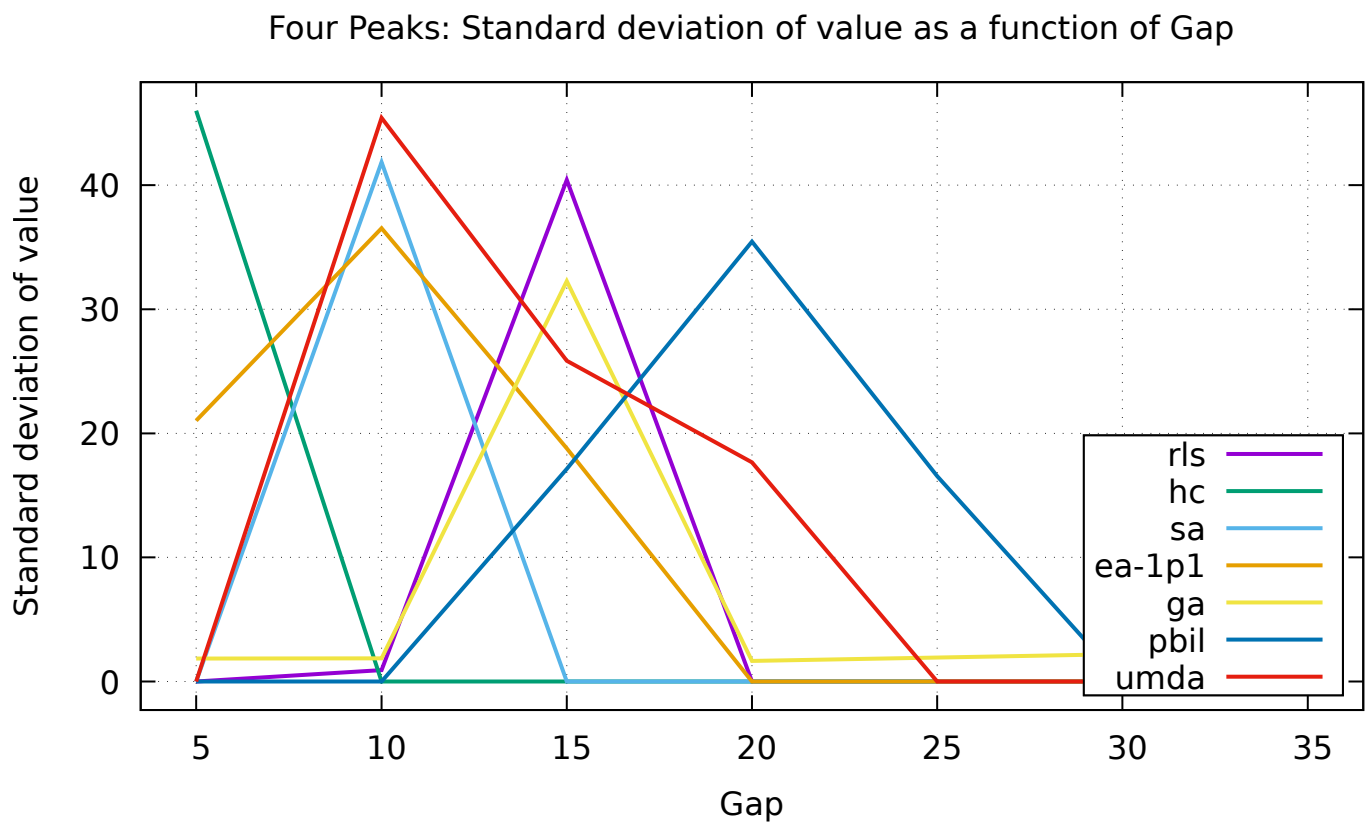
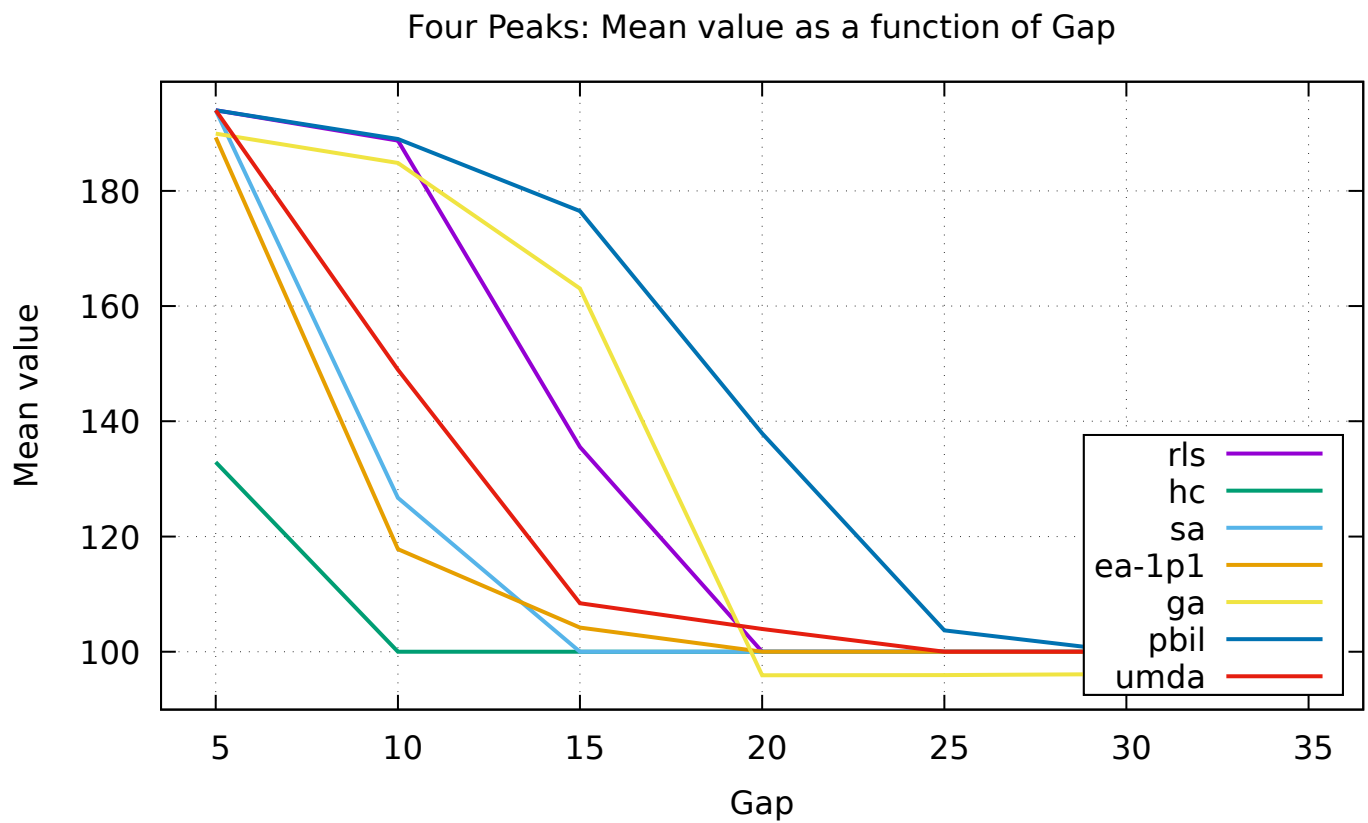
Hill Climbing on Jump

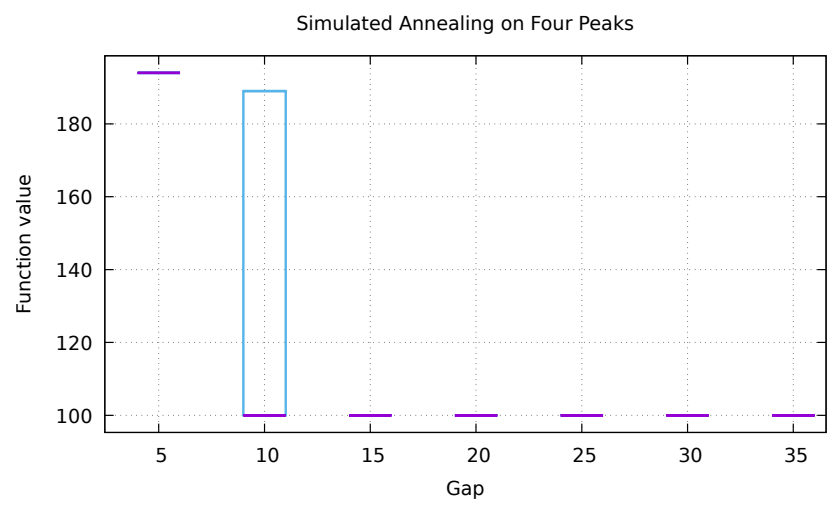
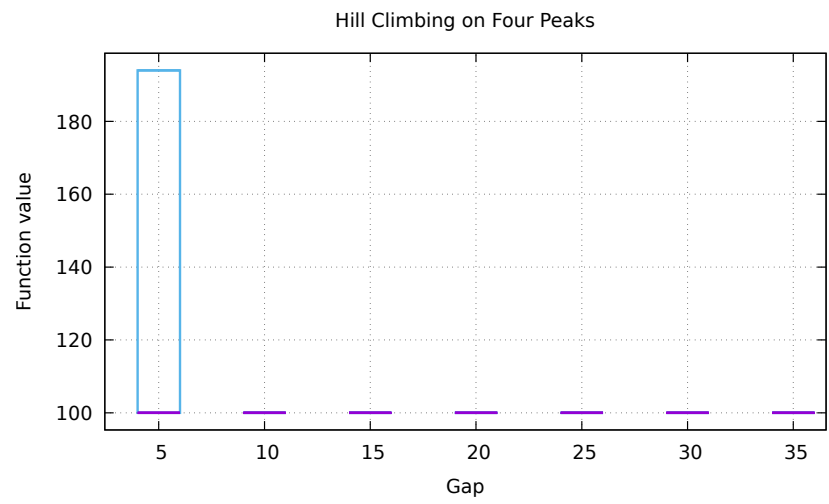
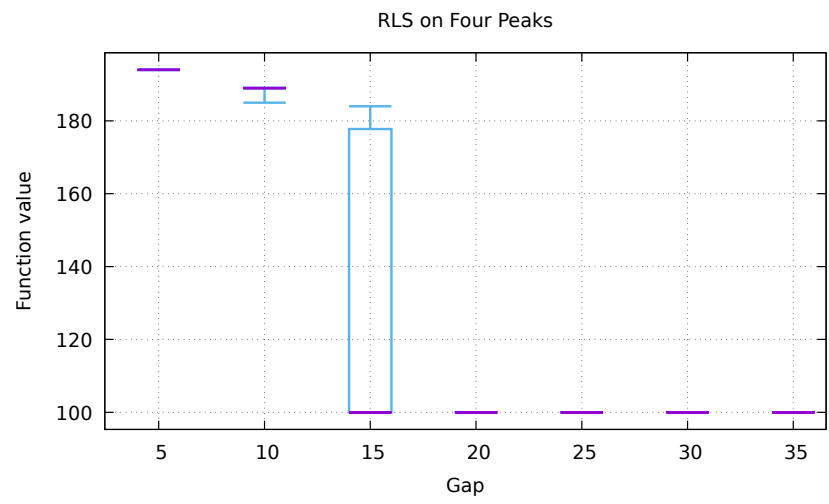


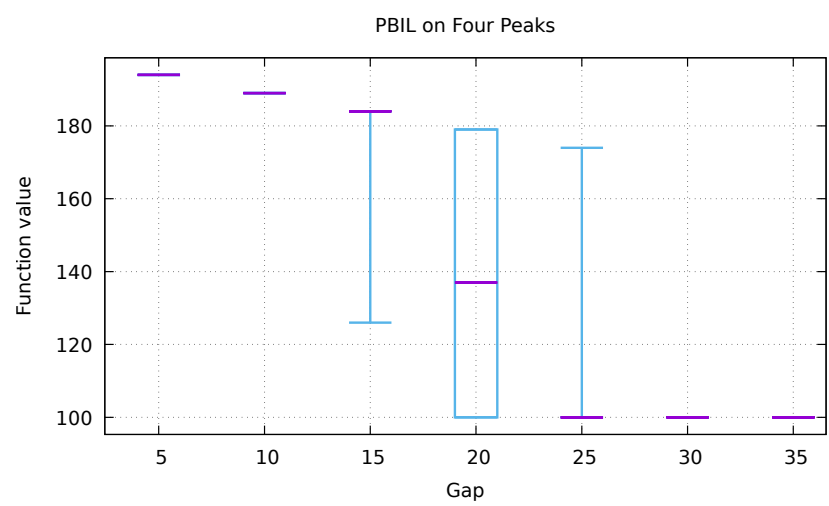
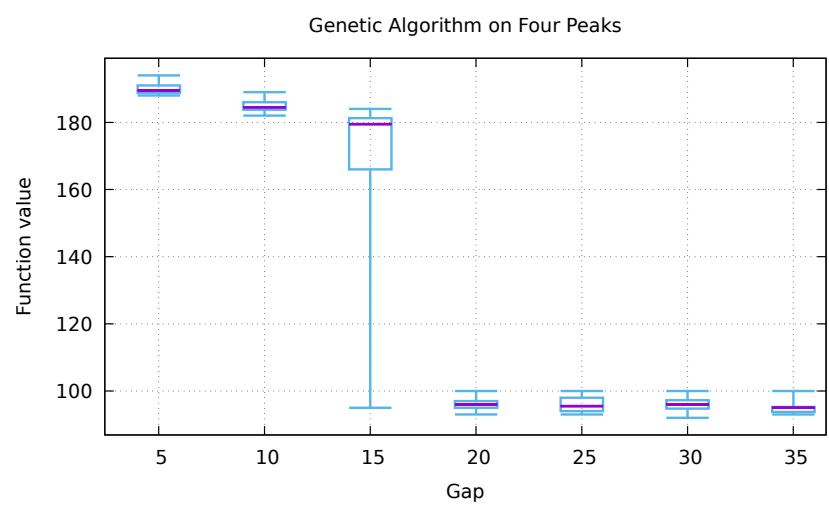
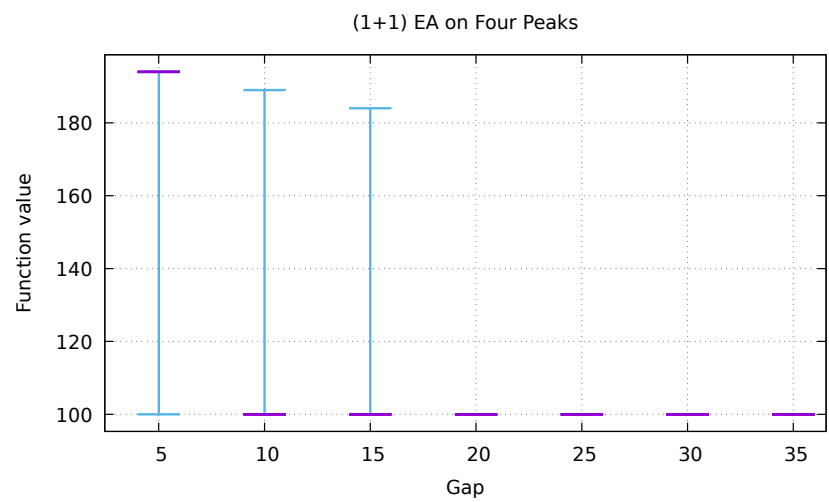


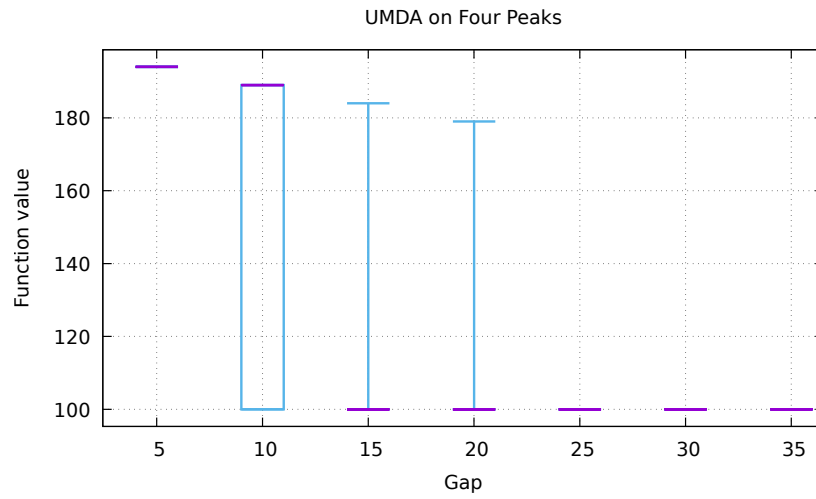


2 Function Four Peaks









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",
      "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 -l 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
# 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
# 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 = 0.15
# Generated from hnco.json
```