HNCO
Empirical cumulative distribution functions of the runtime of various black box optimization algorithms

November 22, 2020

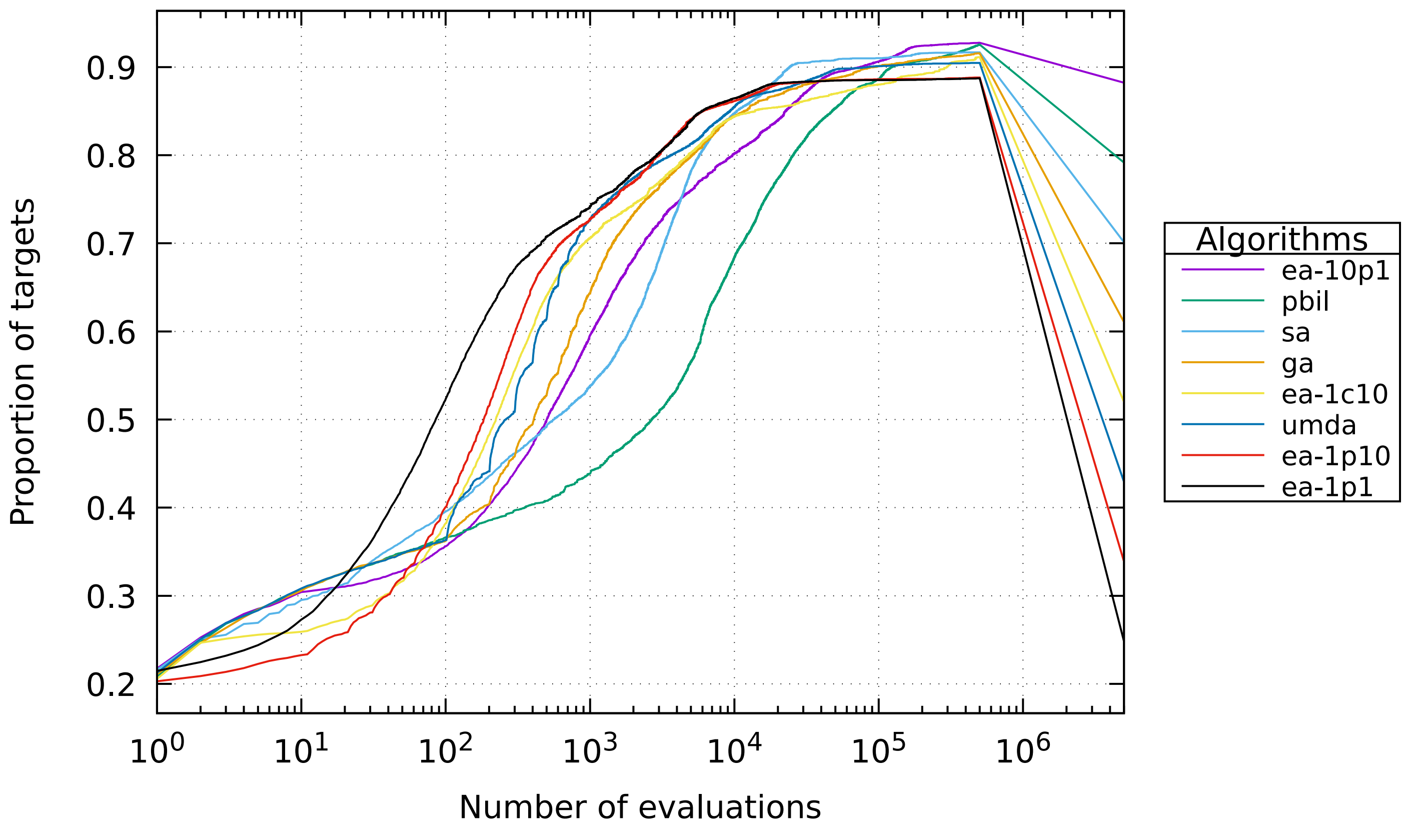
Abstract

We partly follow the experimental procedure of the COCO framework for the performance assessment of black box optimization algorithms Hansen et al. [2016]. Each algorithm is run independently 20 times on each objective (or fitness) function. The dimension is fixed at $n = 100$. Then 50 equally spaced targets are computed for each objective function. For each algorithm and each function we compute the empirical cumulative distribution function (ECDF) of the runtime, that is the proportion of targets reached as a function of the number of evaluations over all 20 runs. We also compute the global ECDF which takes into account the targets of all functions. The results are listed by function. For clarity reasons only 8 algorithms (hence 8 colors) are included in the study. It should be noted that the linear scale of targets does not fit the function EqualProducts.

Contents

1 Global results

1.1 All algorithms



1.2 Groups

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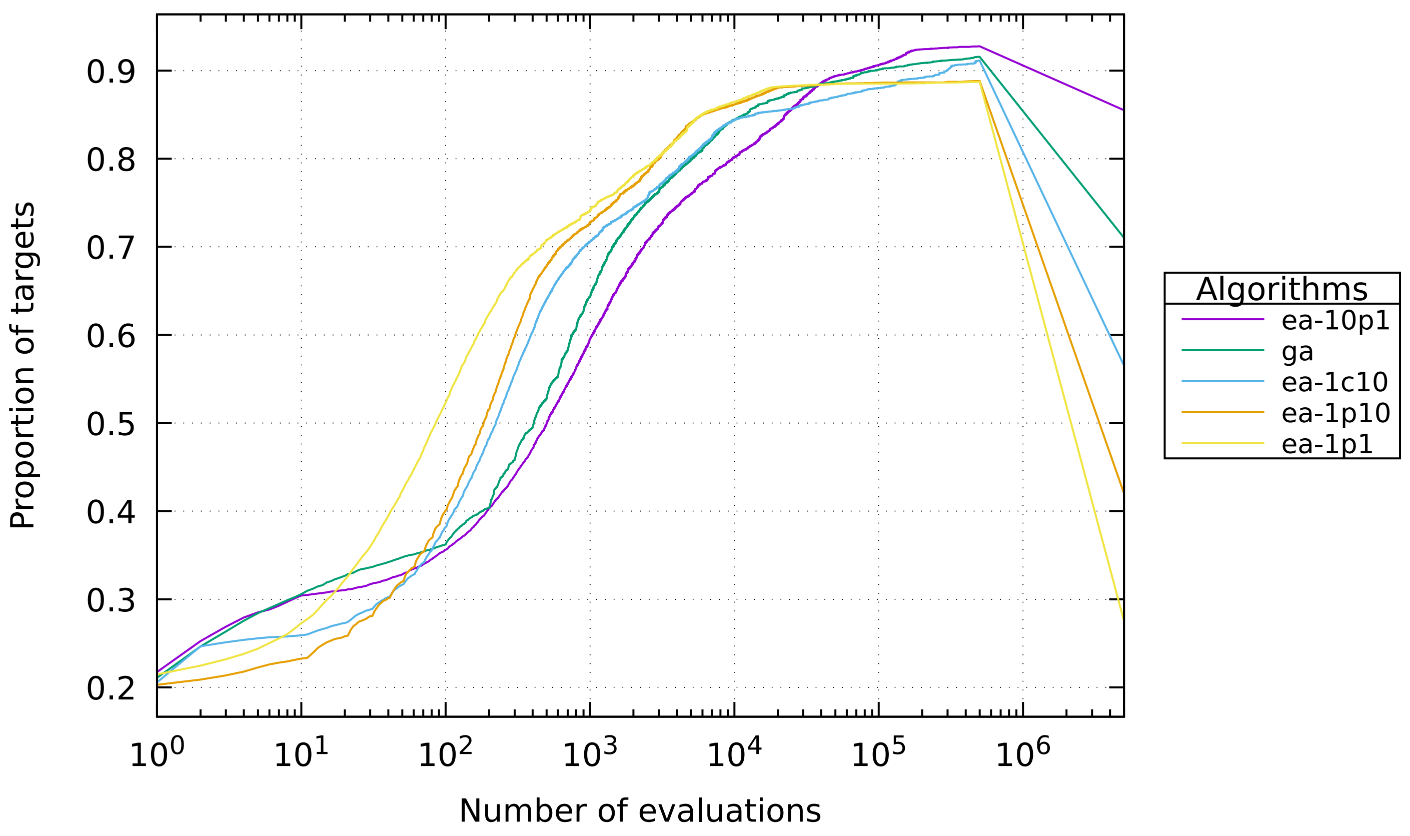

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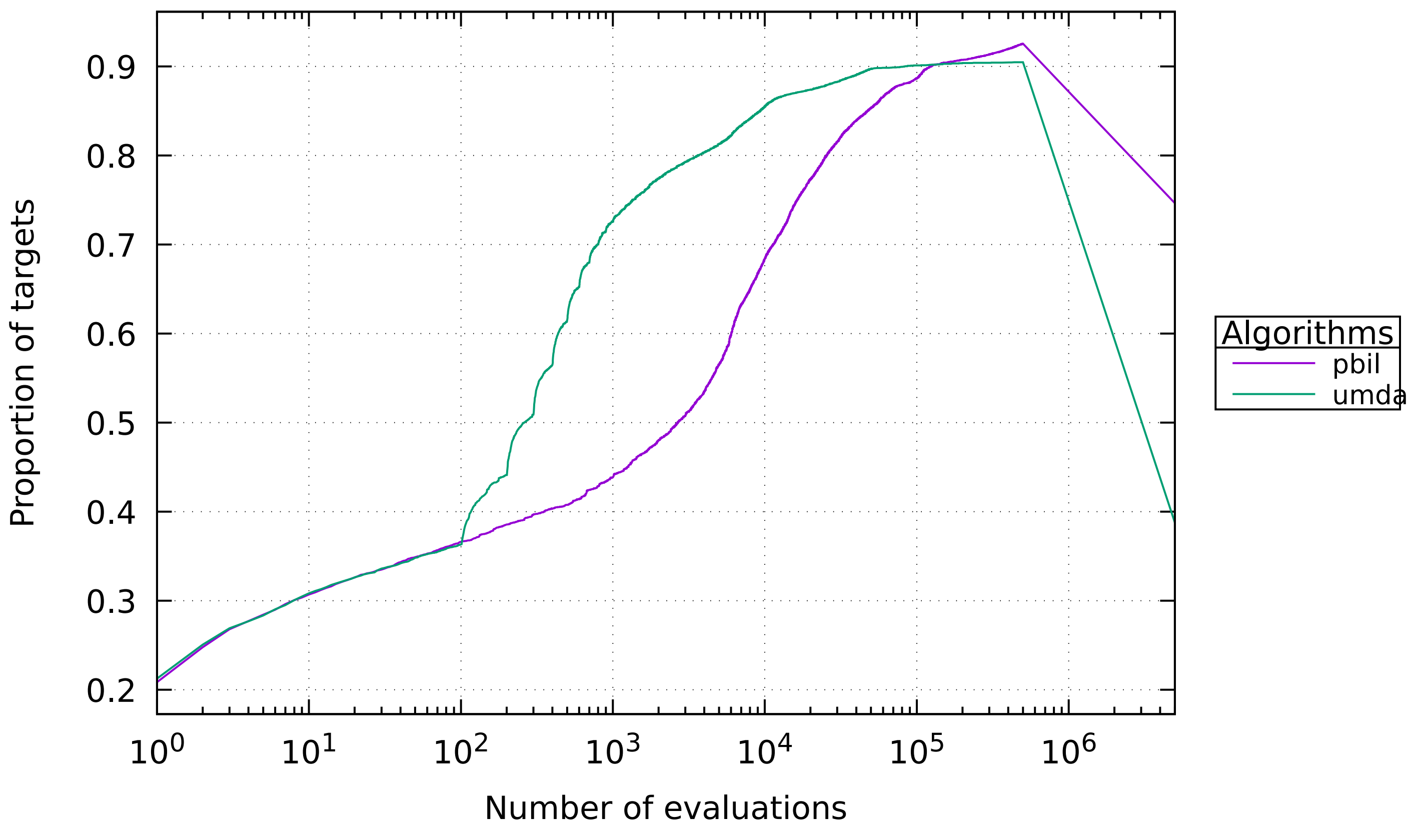
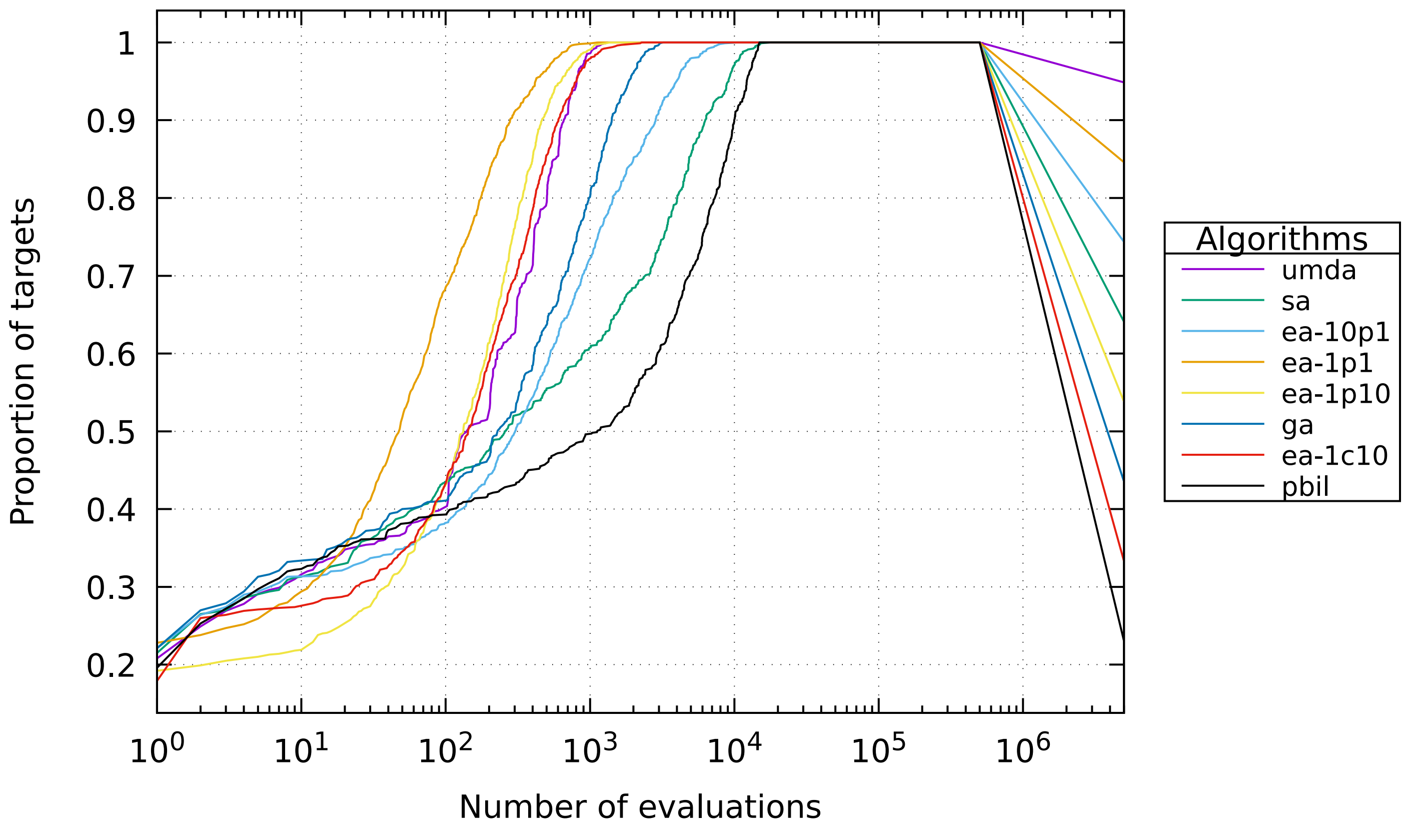


2 Results for one-max

2.1 All algorithms



2.2 Groups

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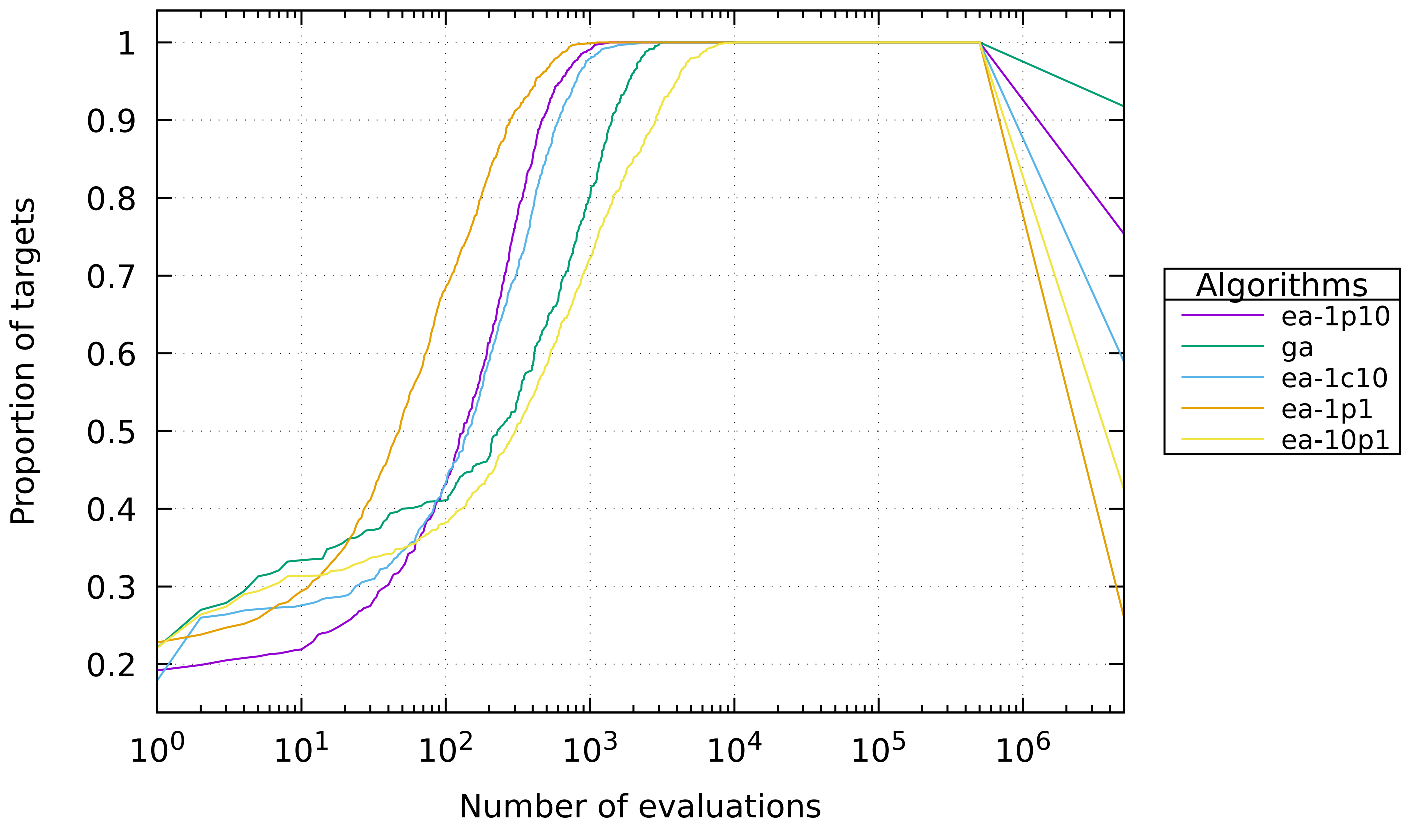

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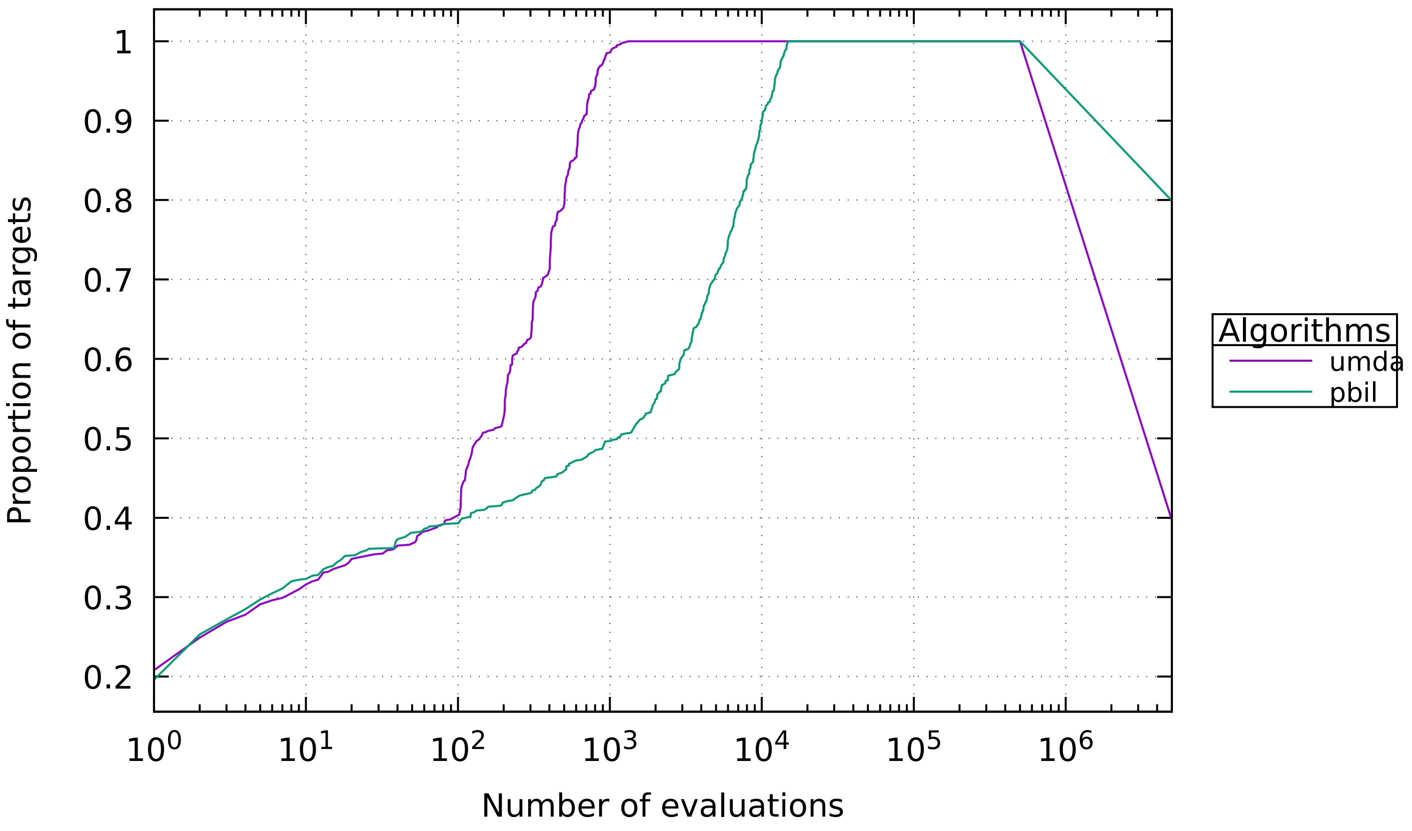
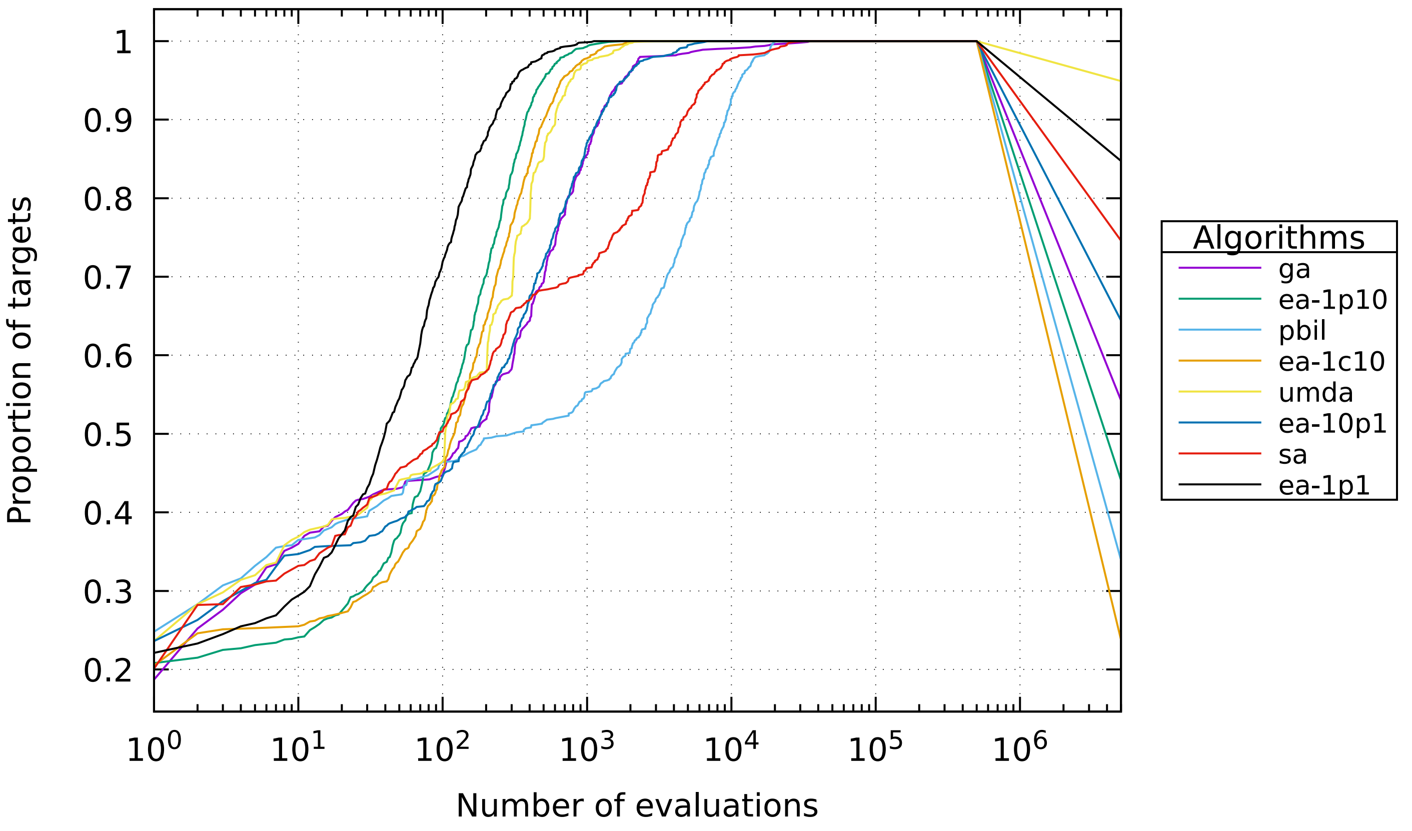


3 Results for lin

3.1 All algorithms



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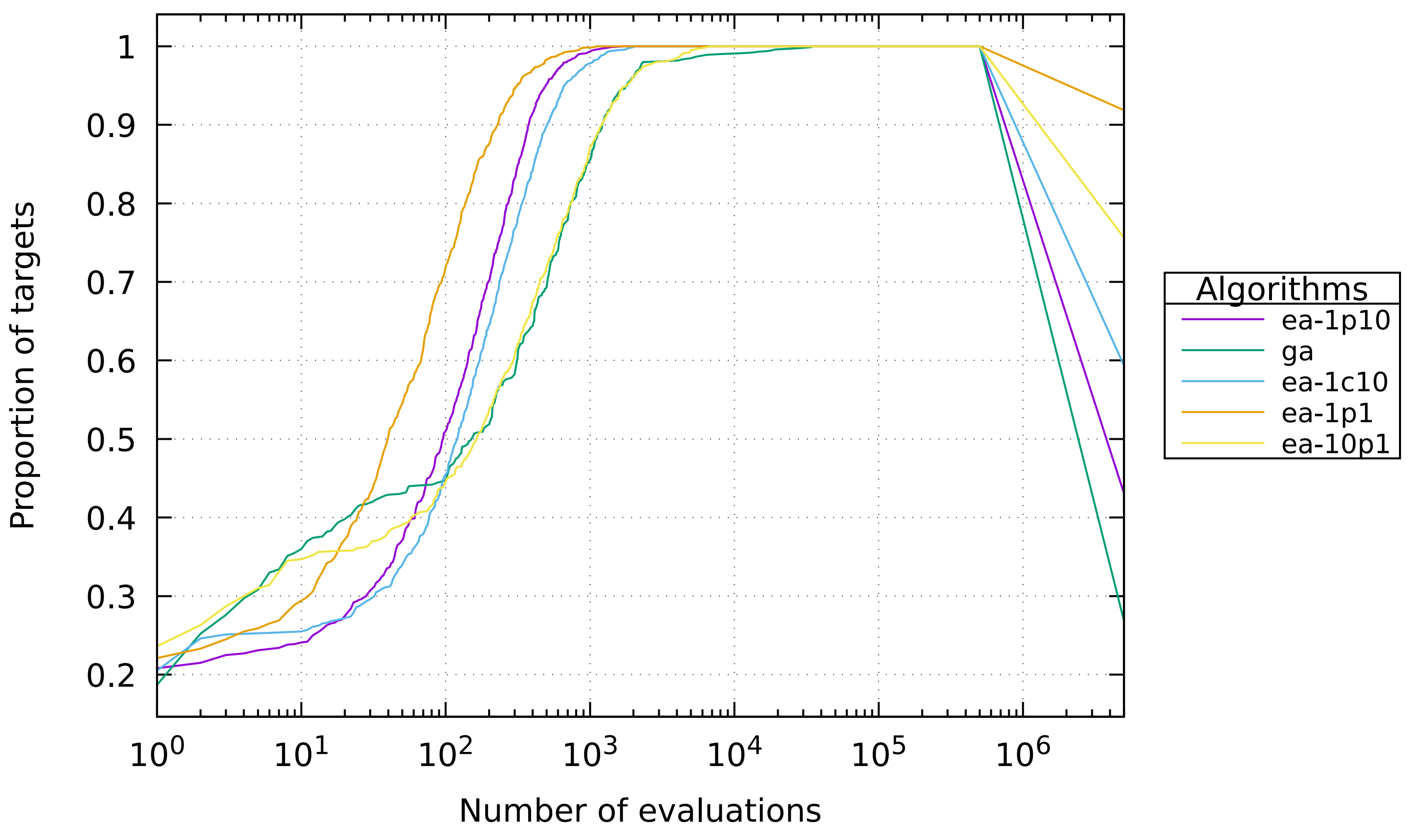

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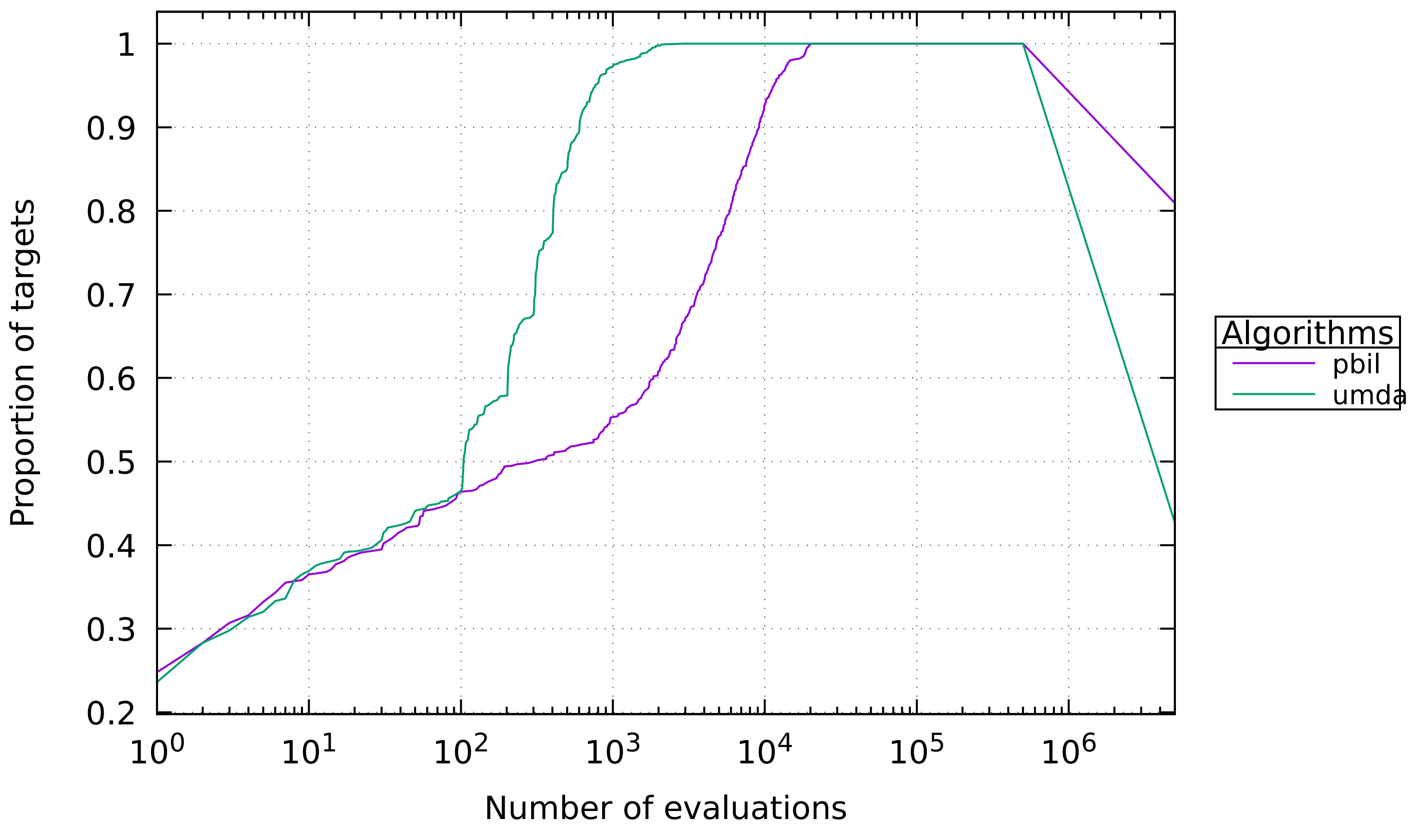
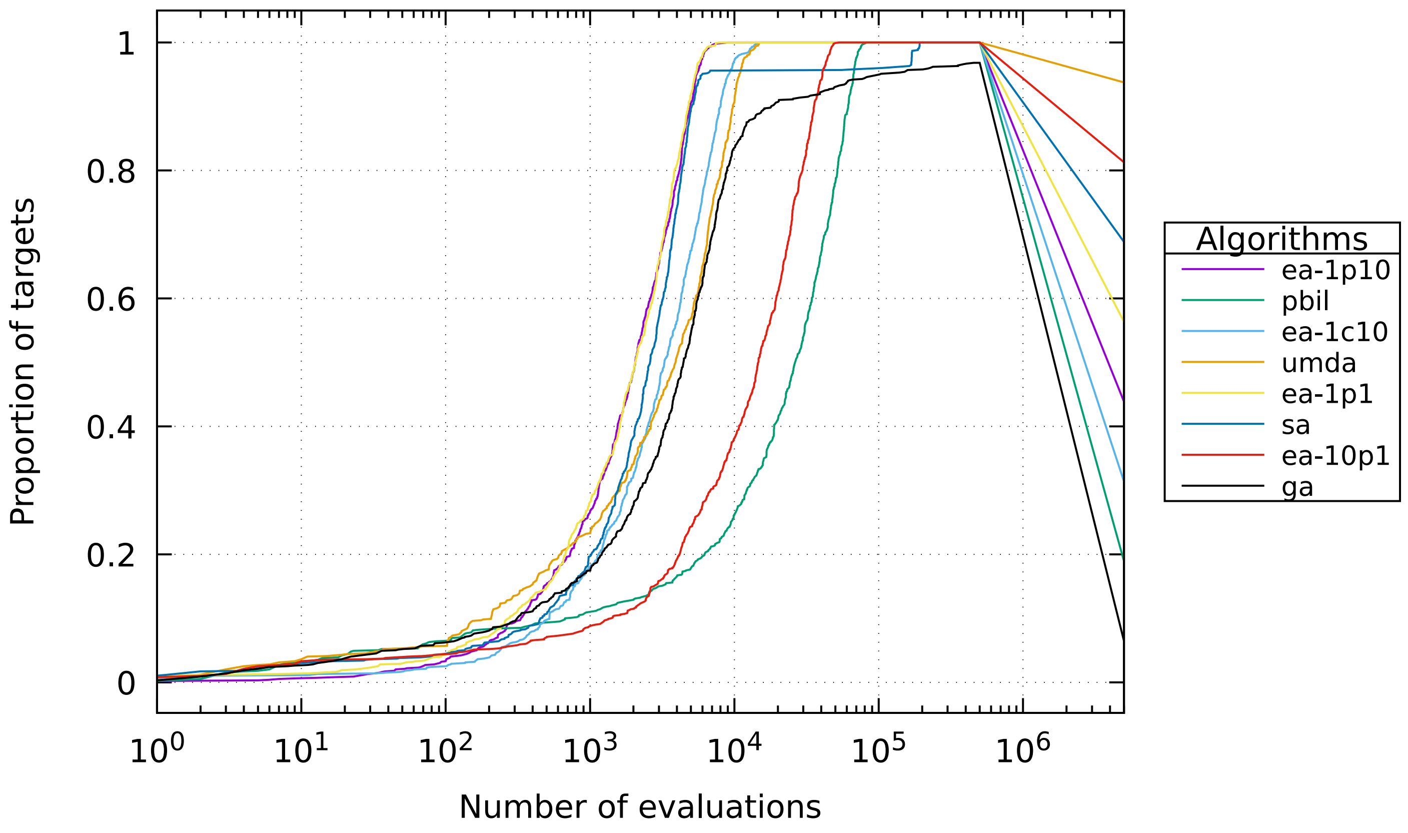


4 Results for leading-ones

4.1 All algorithms



4.2 Groups

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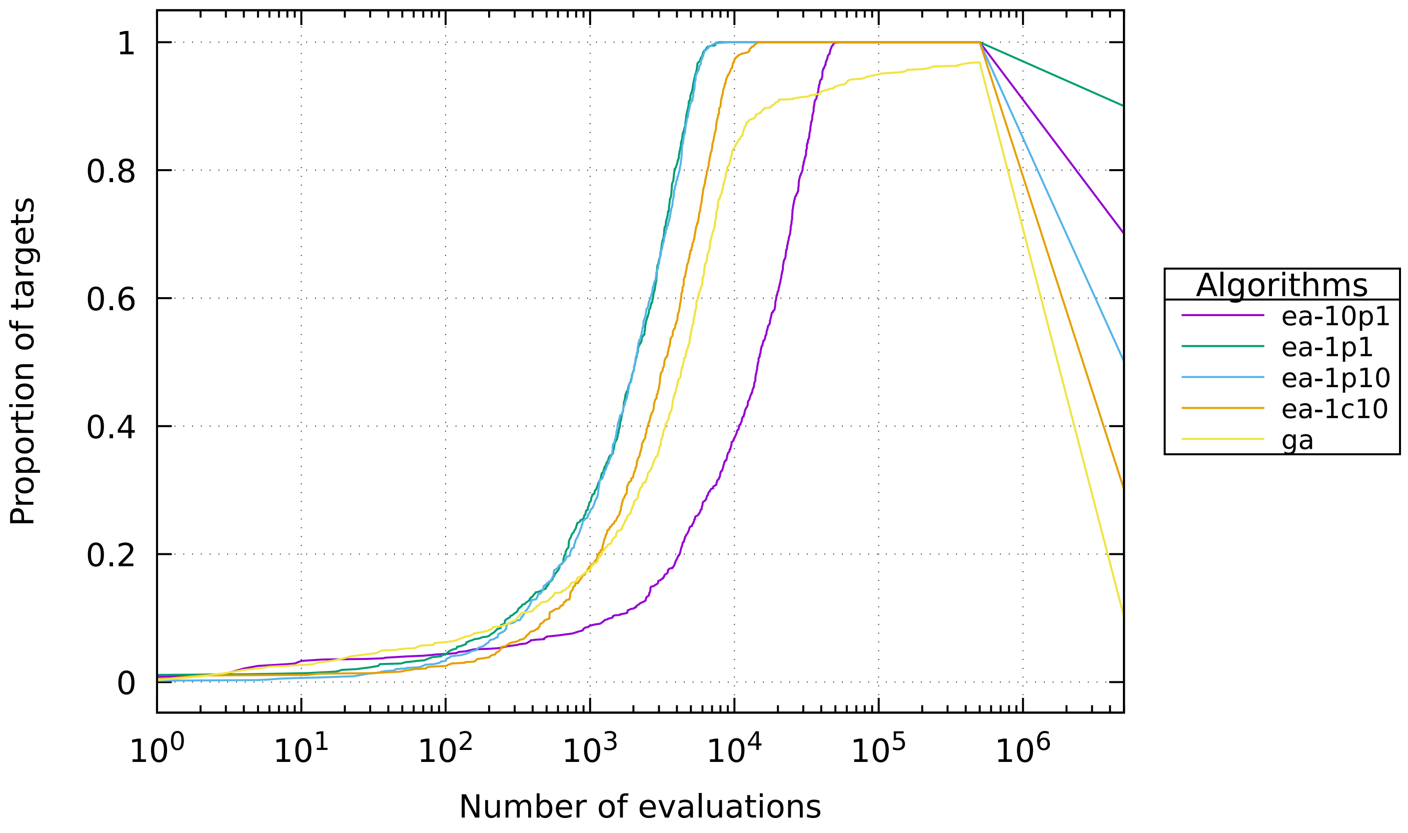

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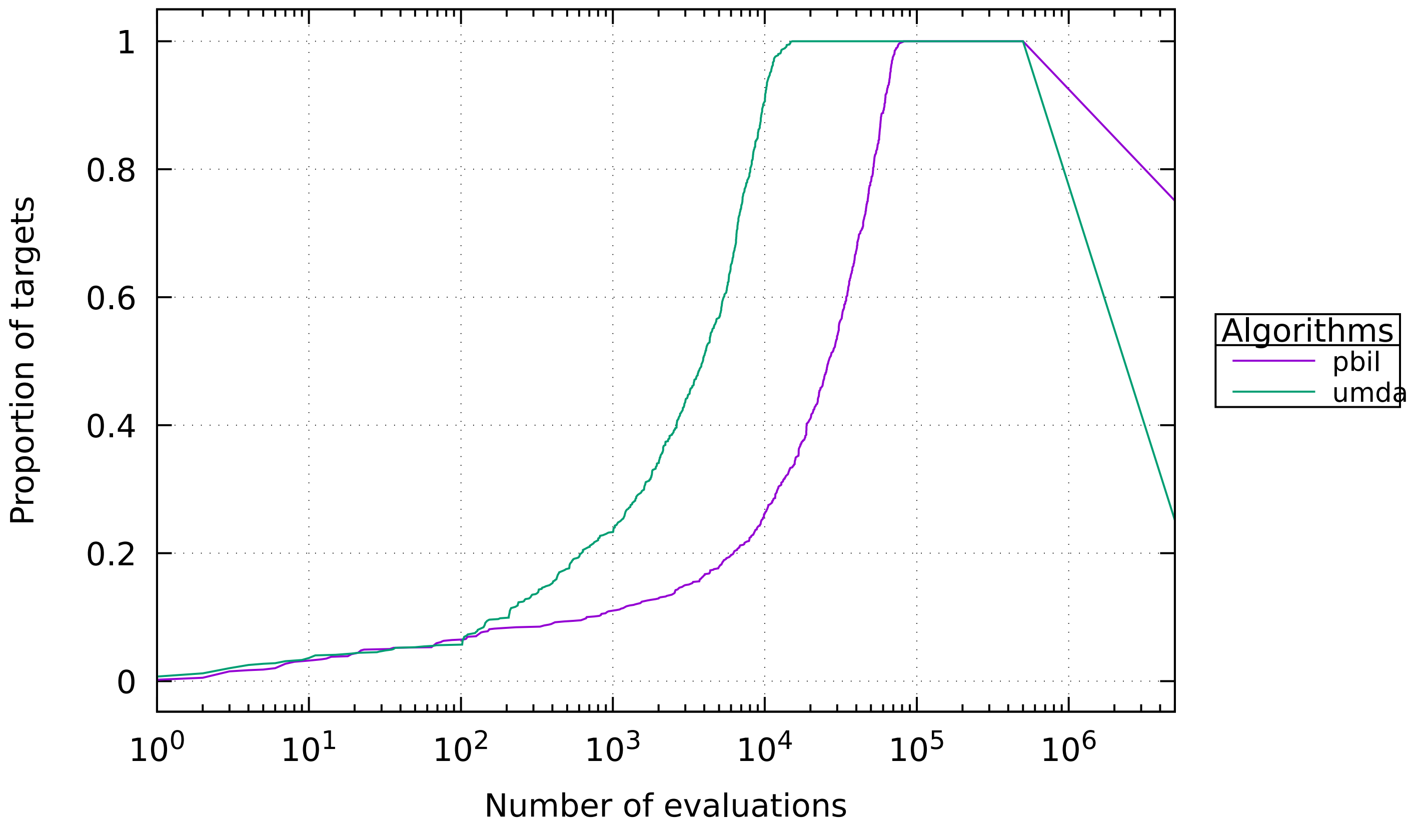
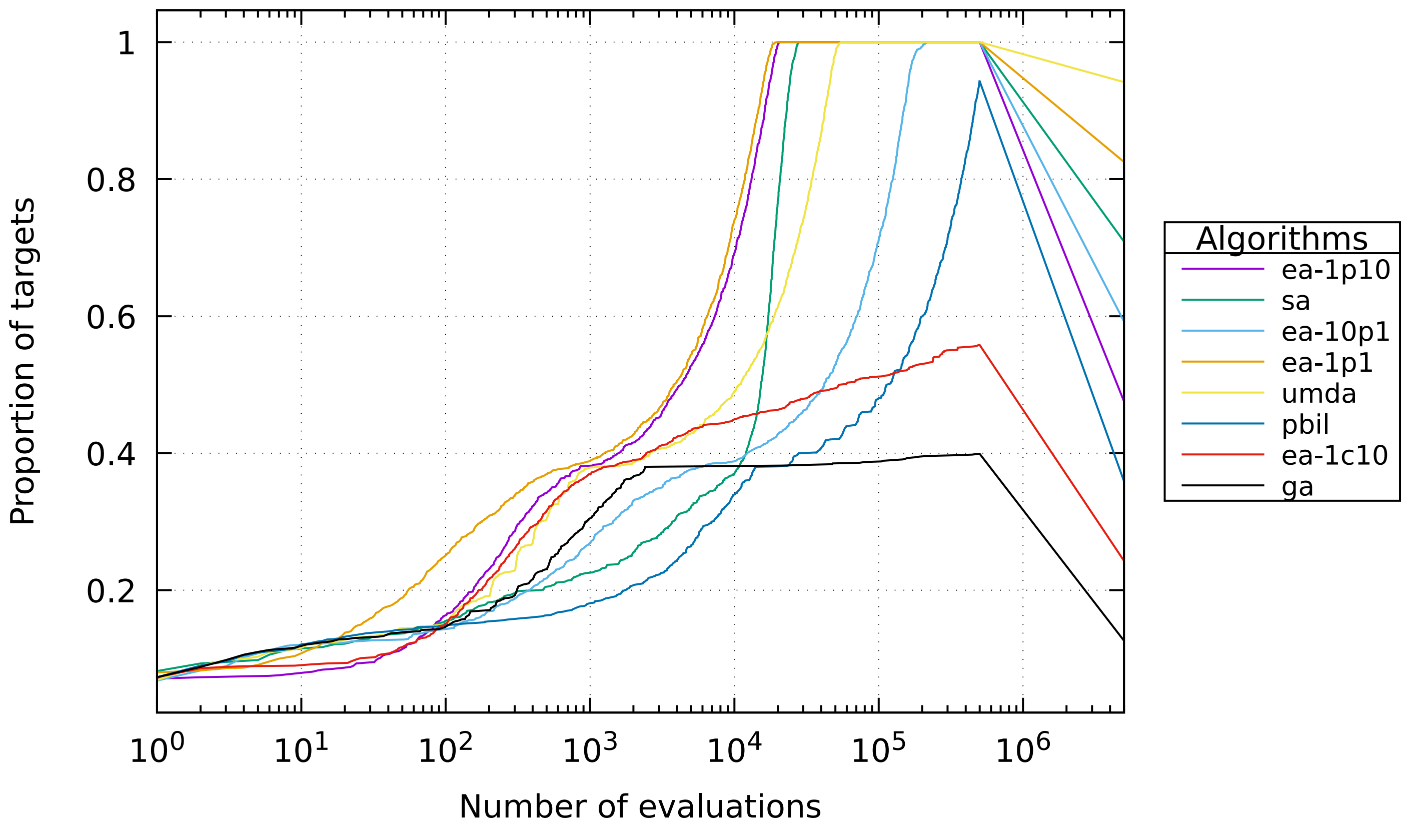


5 Results for ridge

5.1 All algorithms



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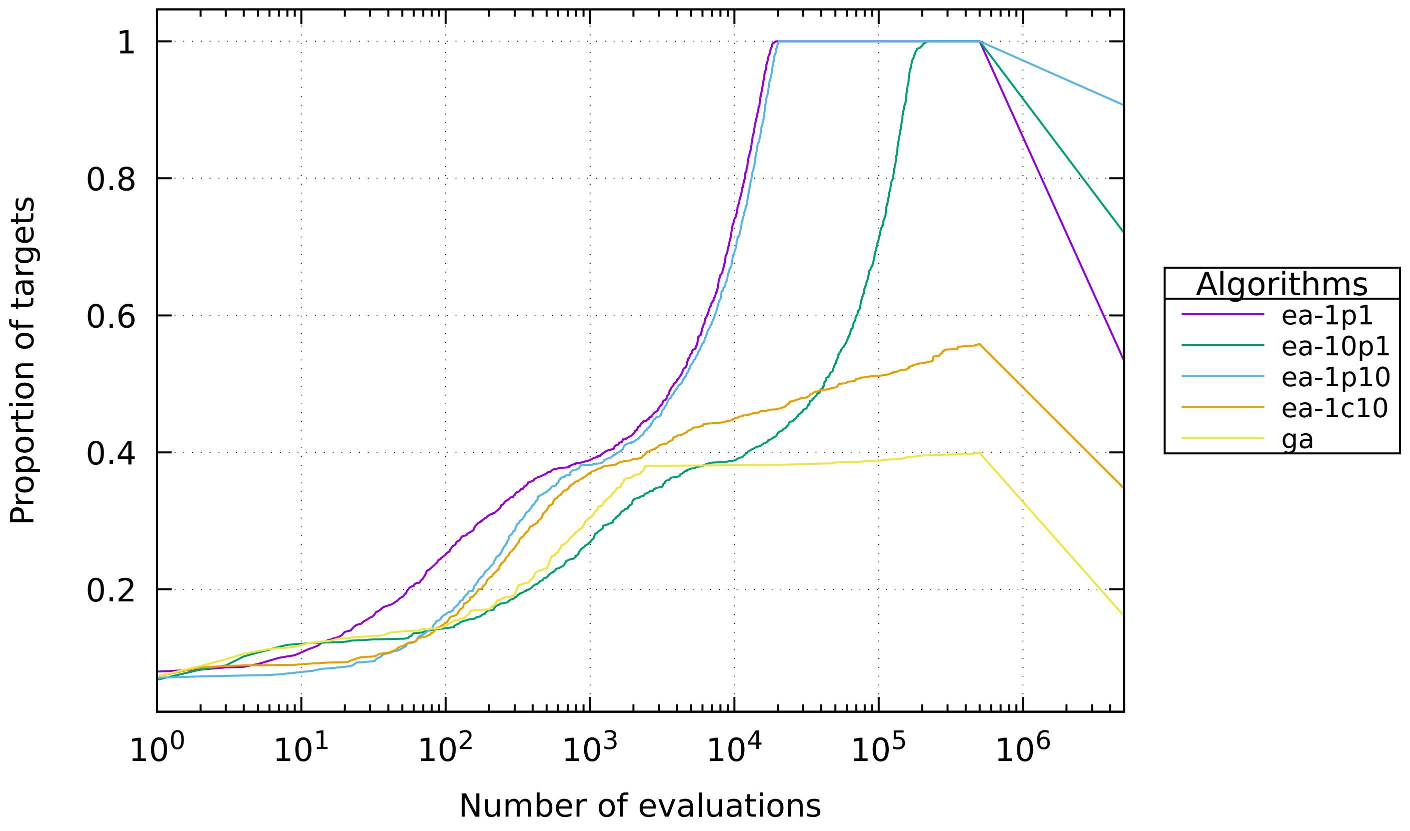

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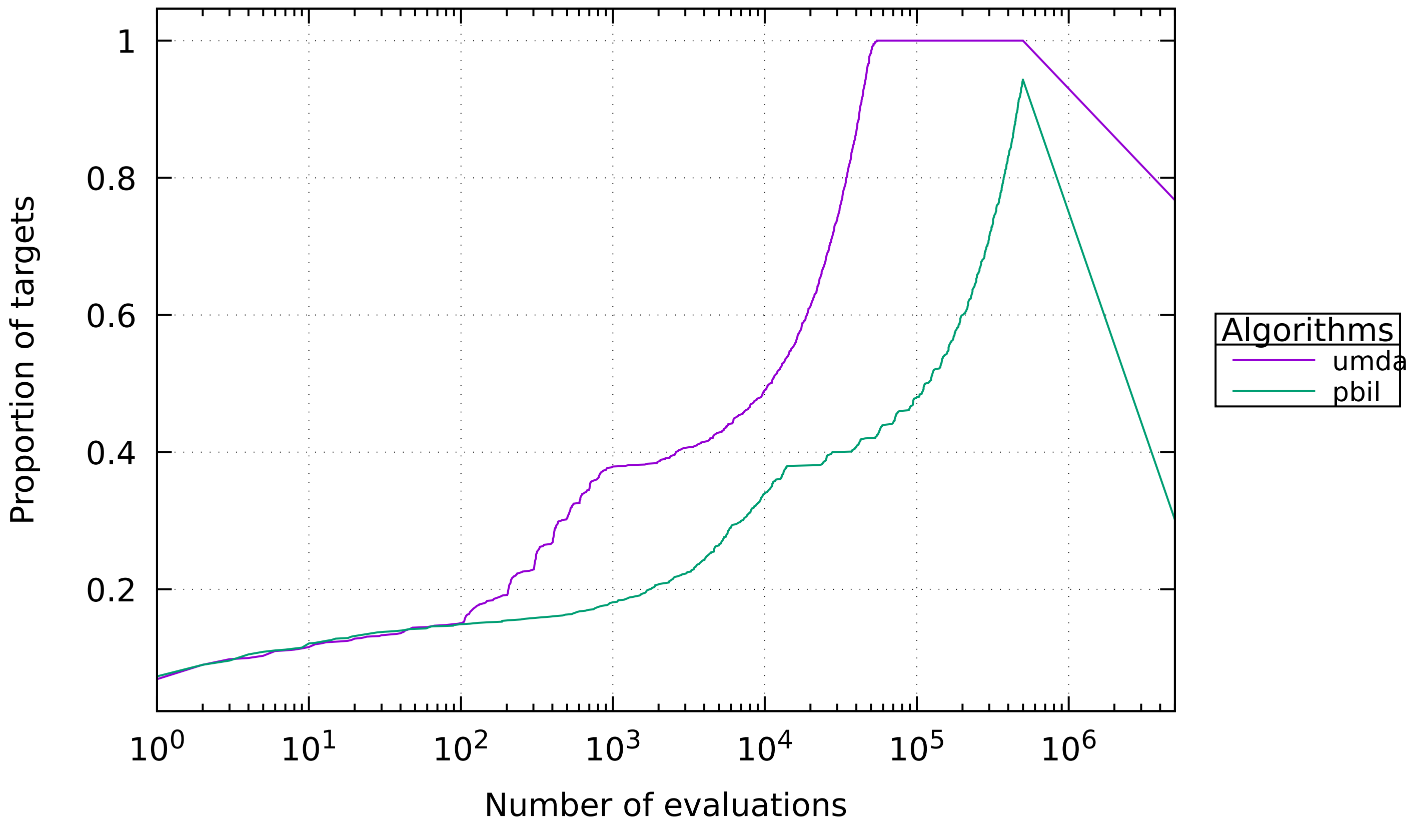

6 Results for jmp-5

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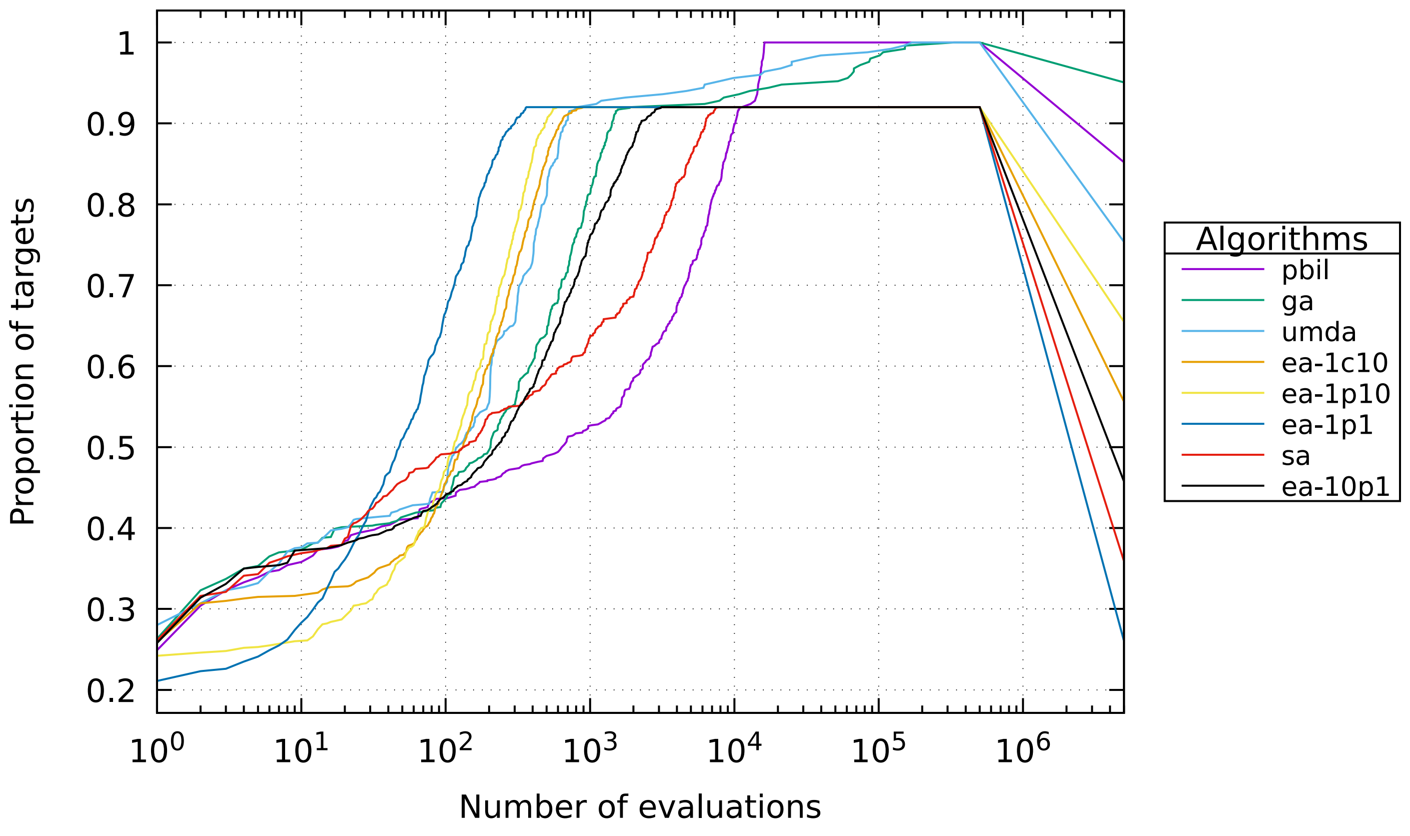

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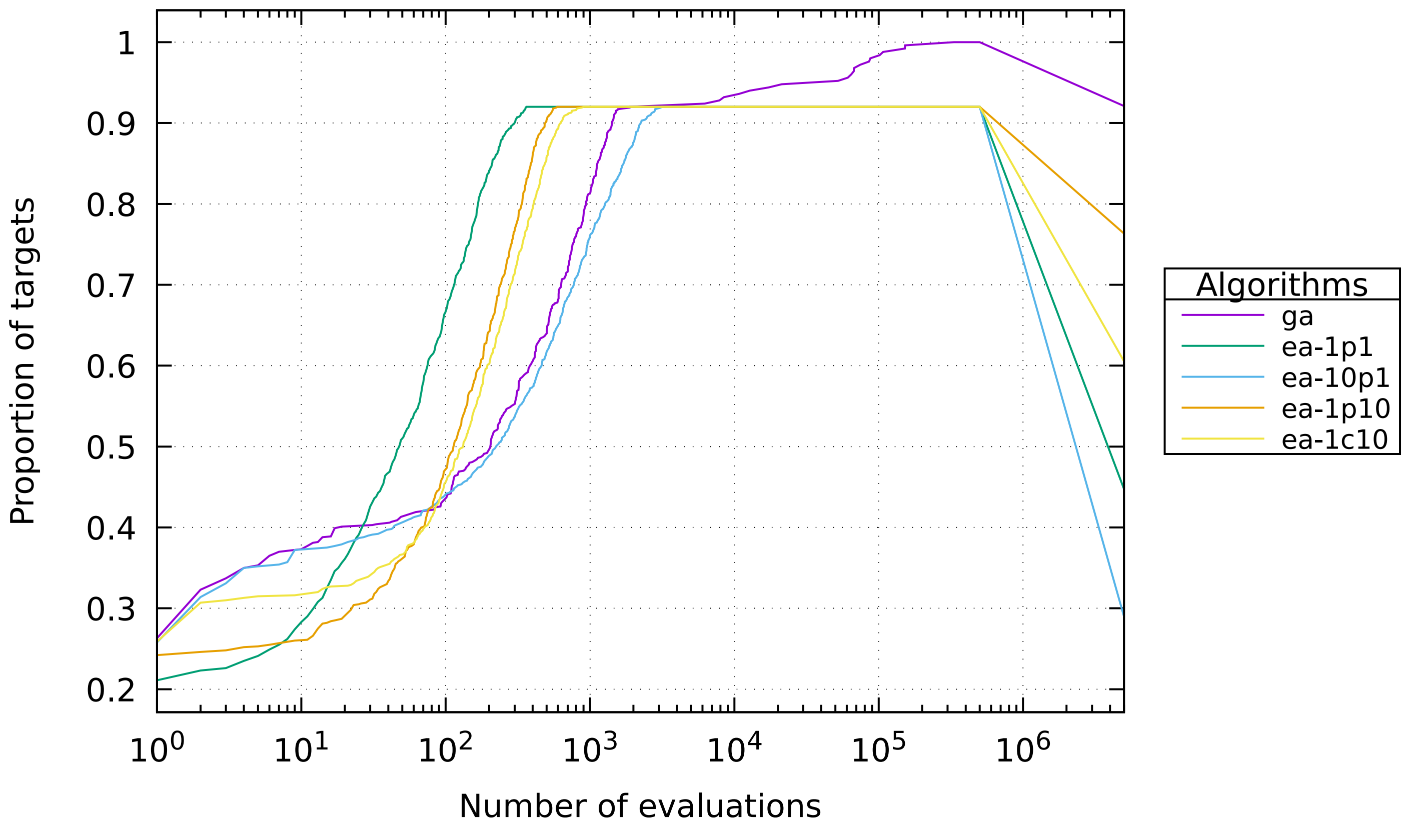

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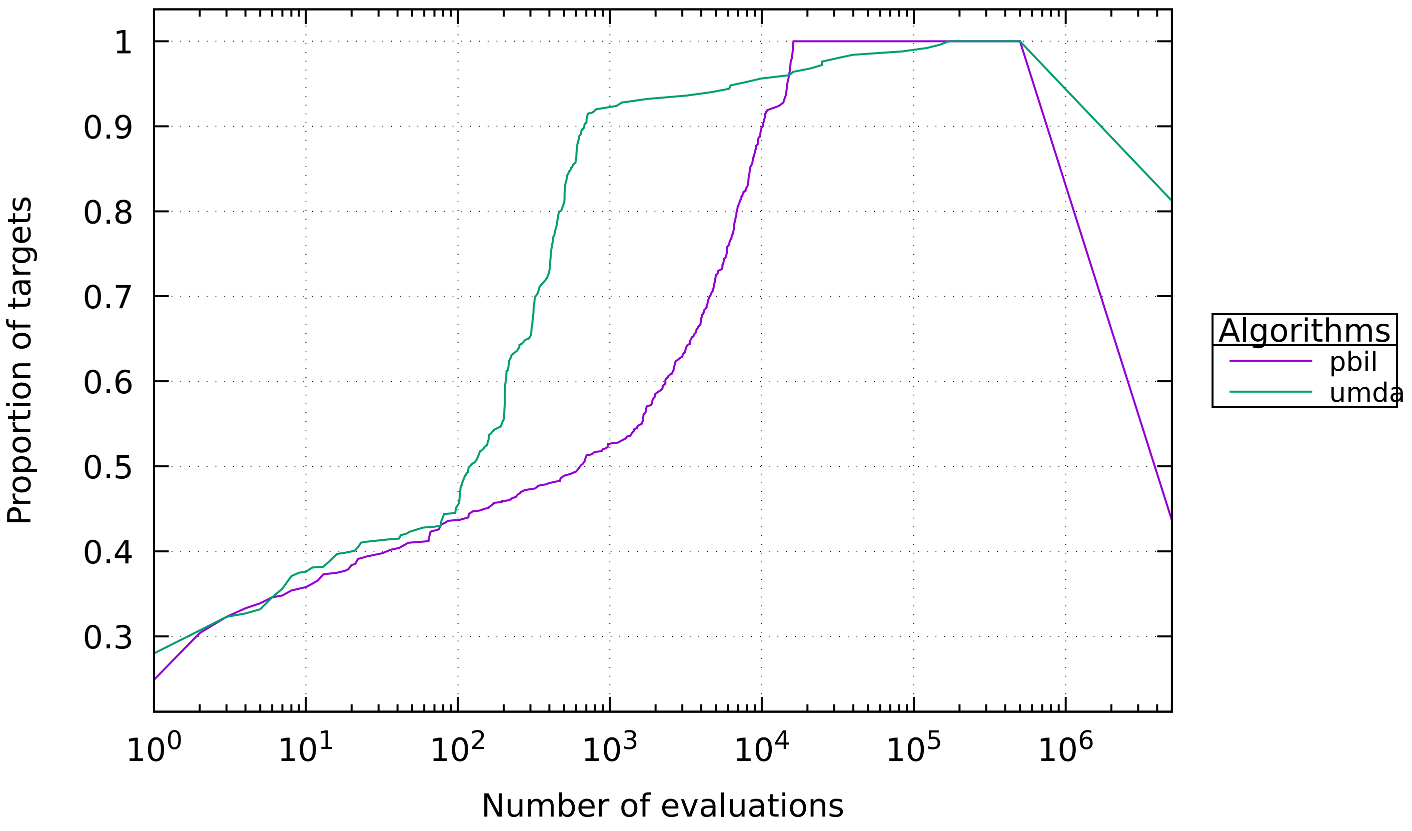

7 Results for jmp-10

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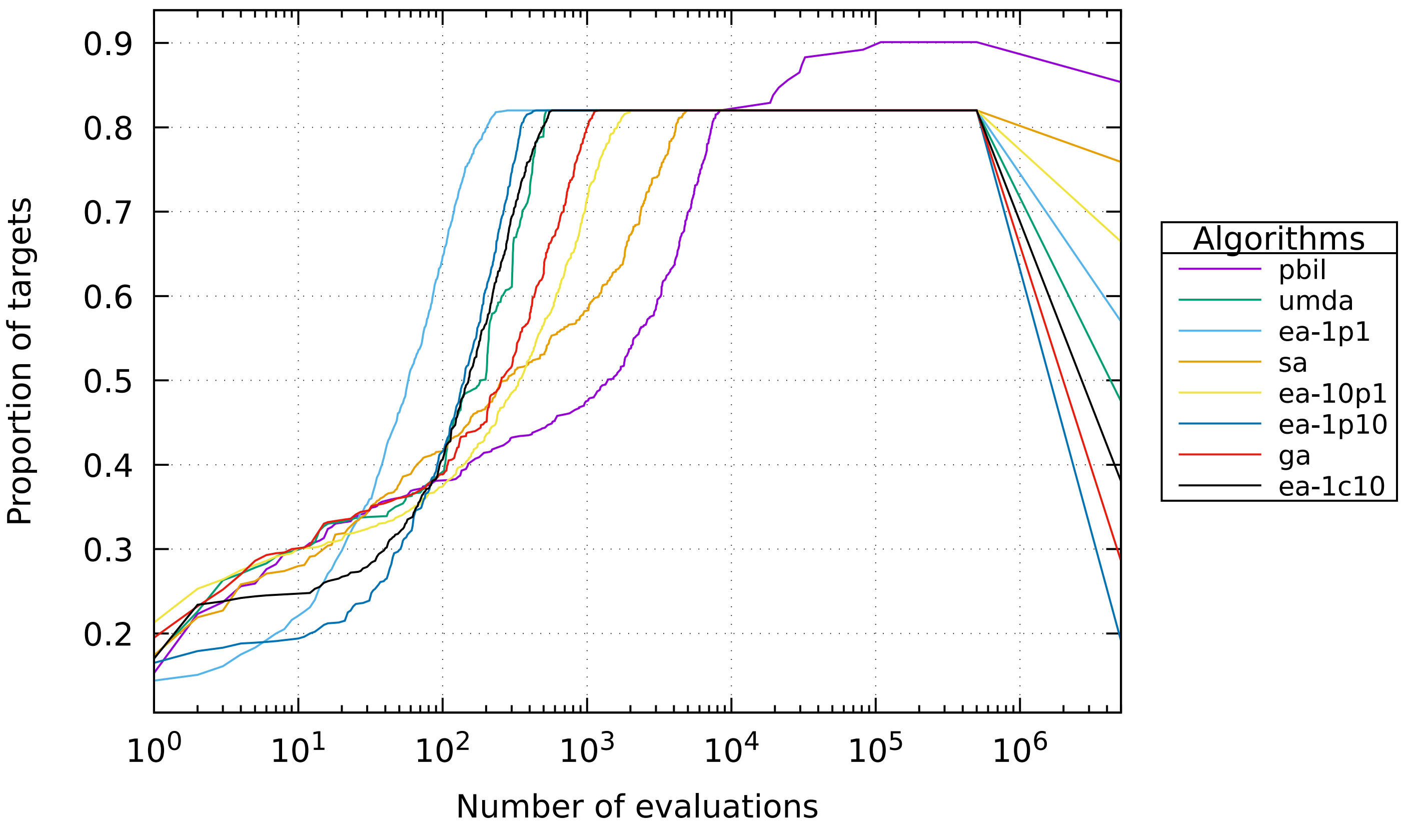

7.2 Groups

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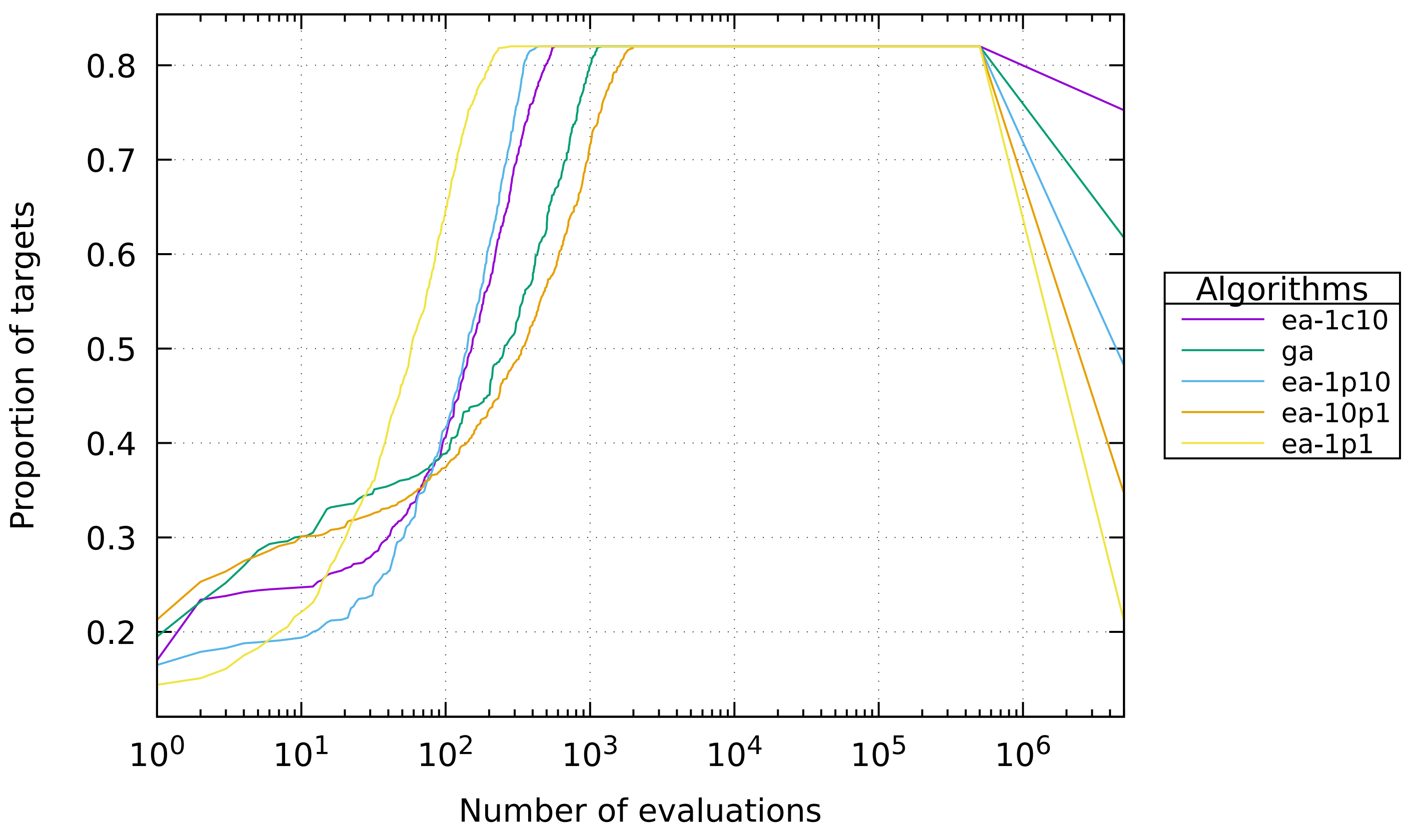

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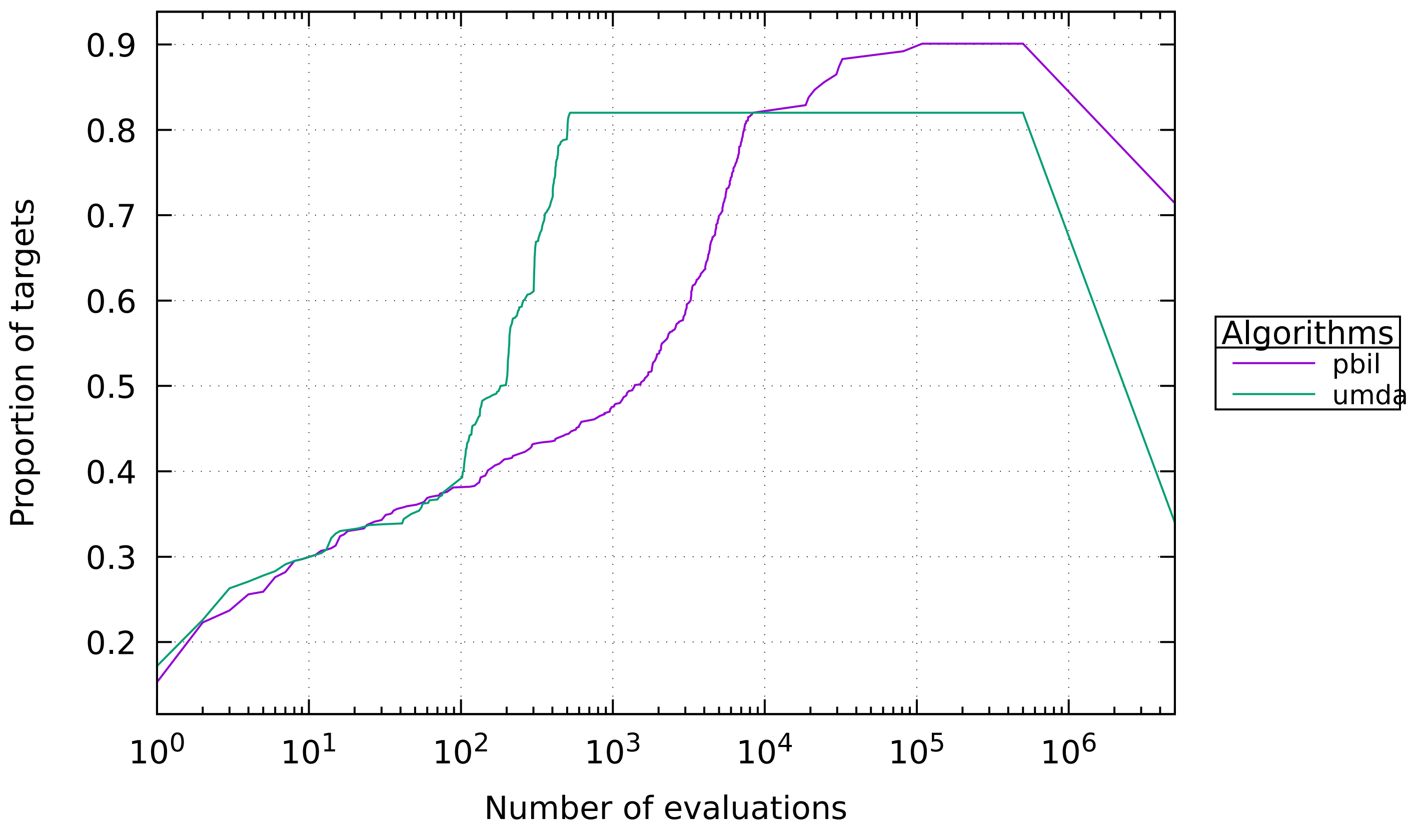

8 Results for djmp-5

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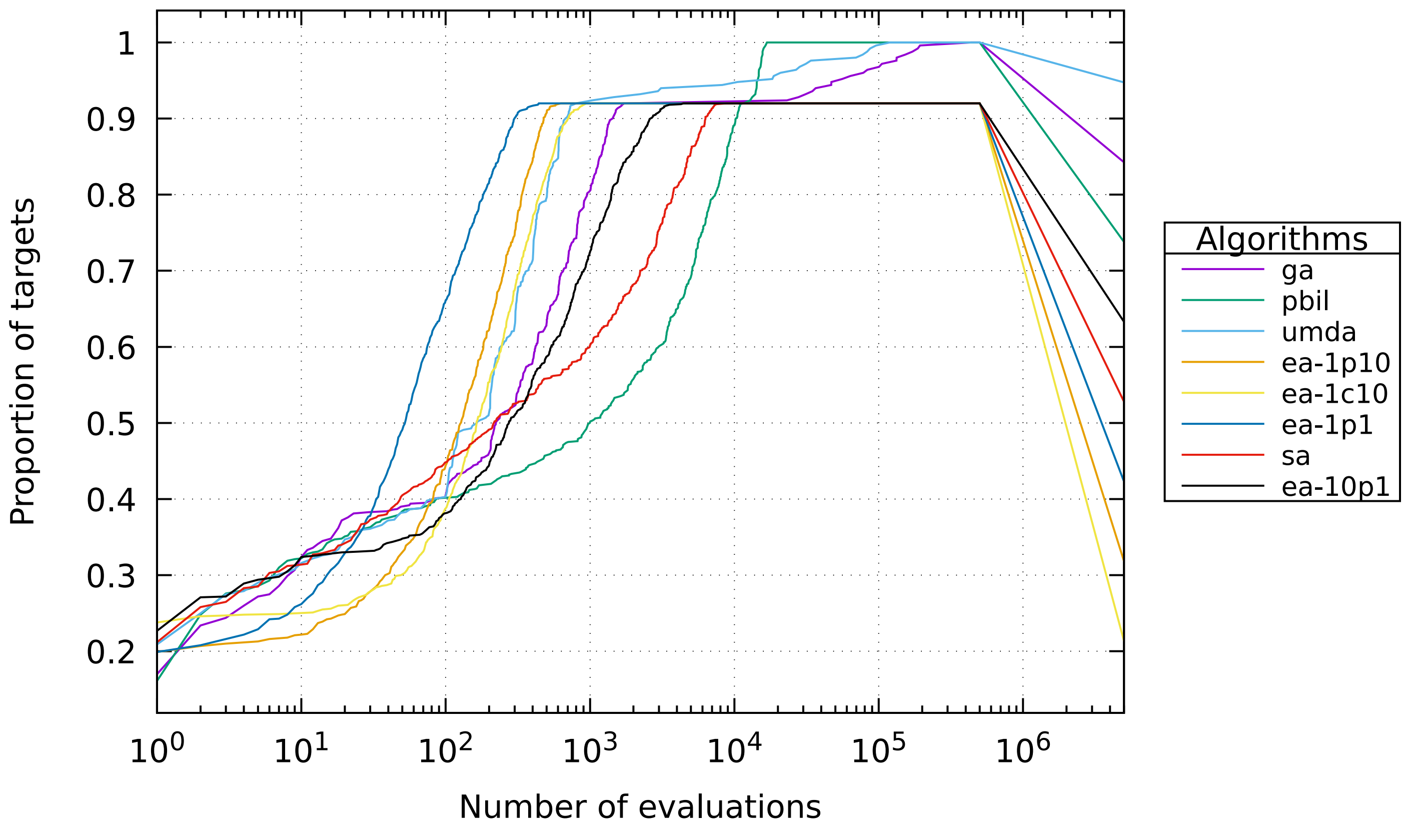

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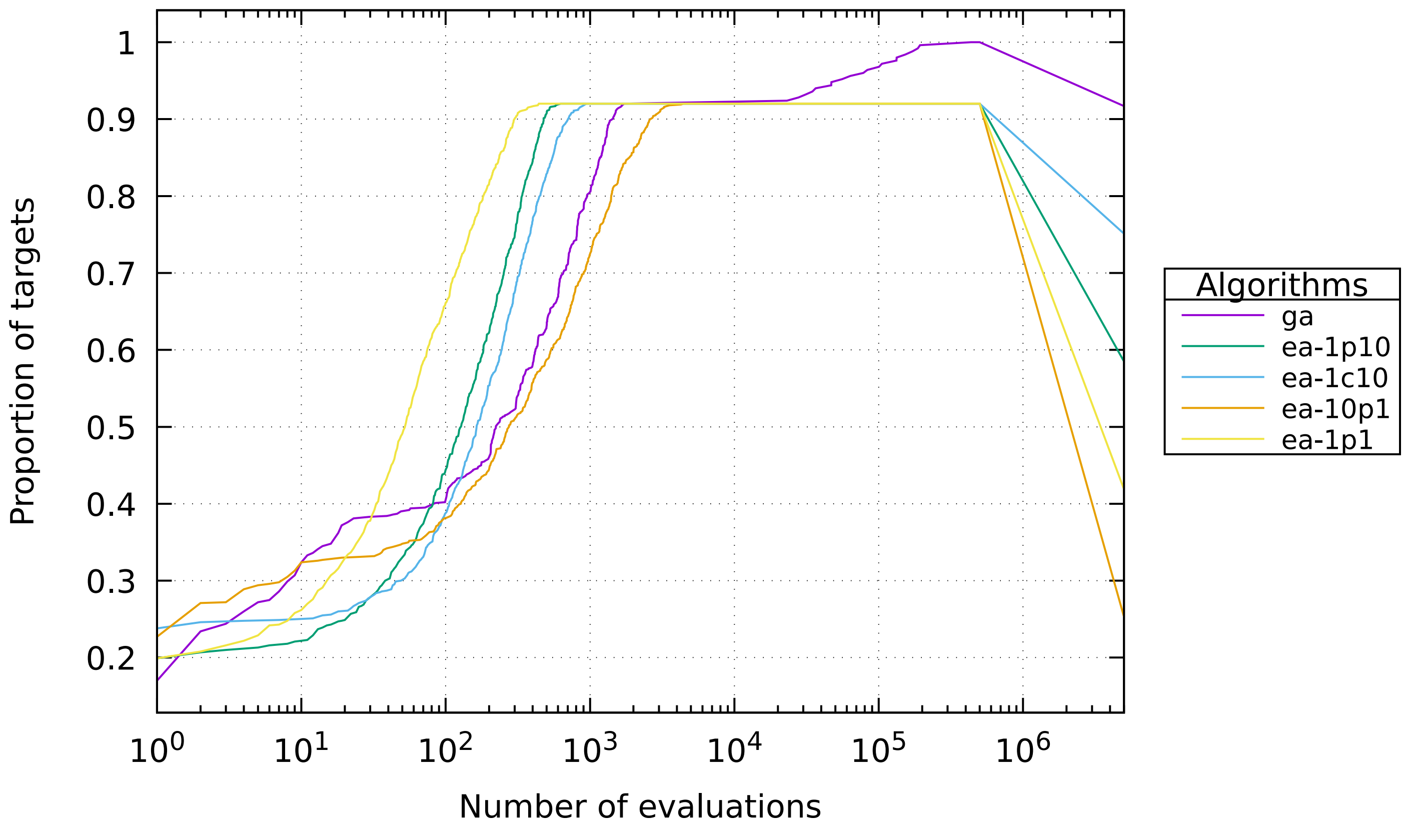

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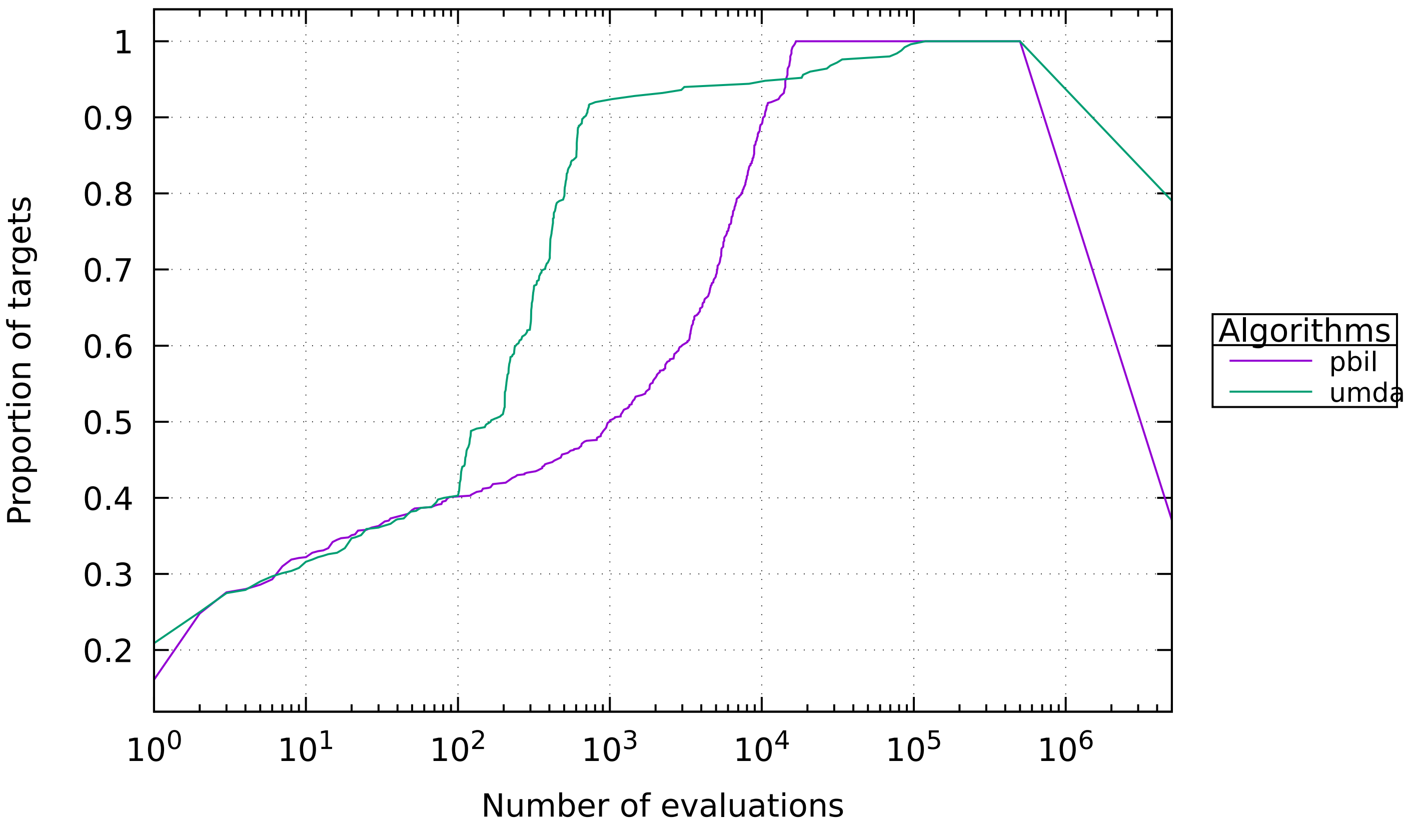

9 Results for djmp-10

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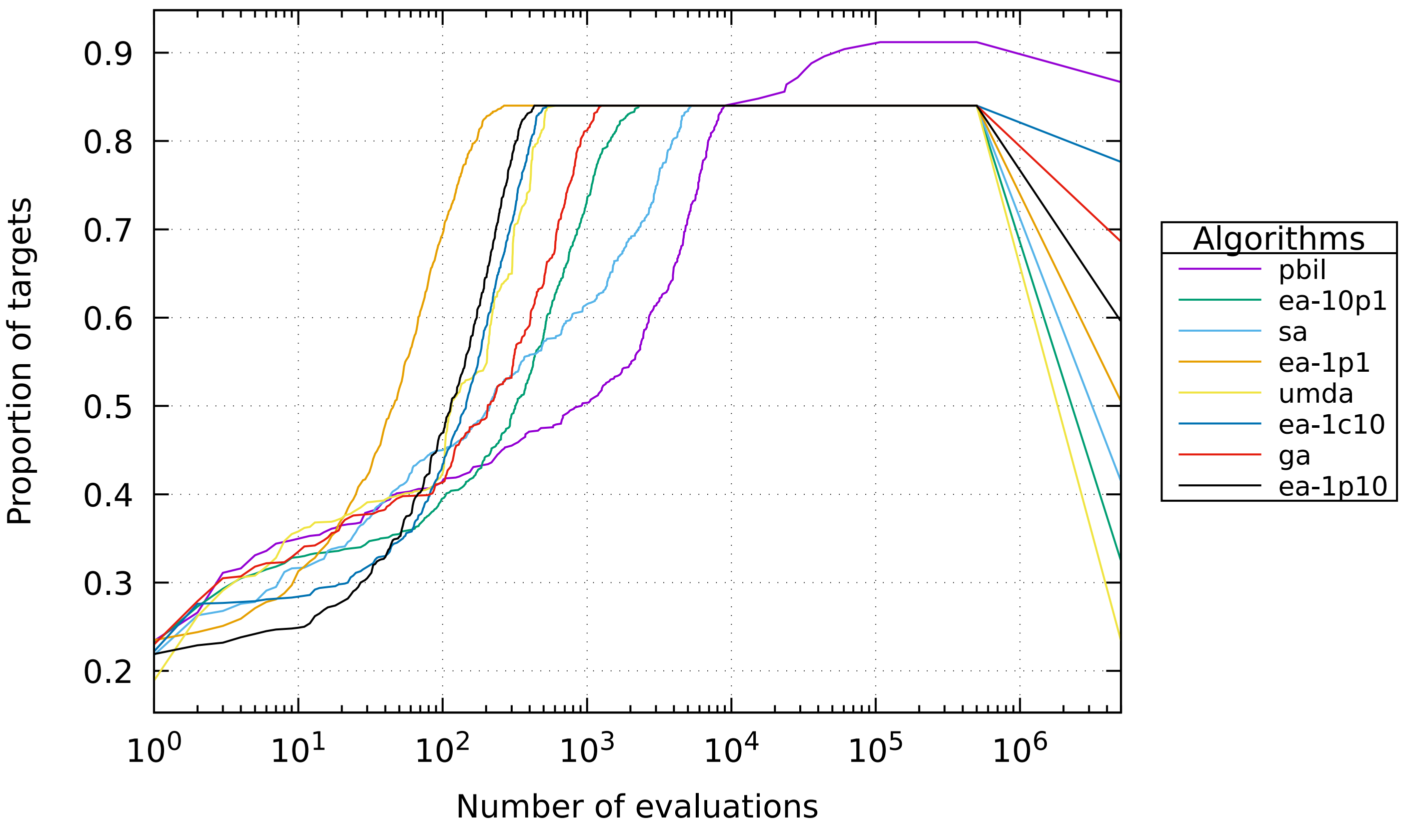

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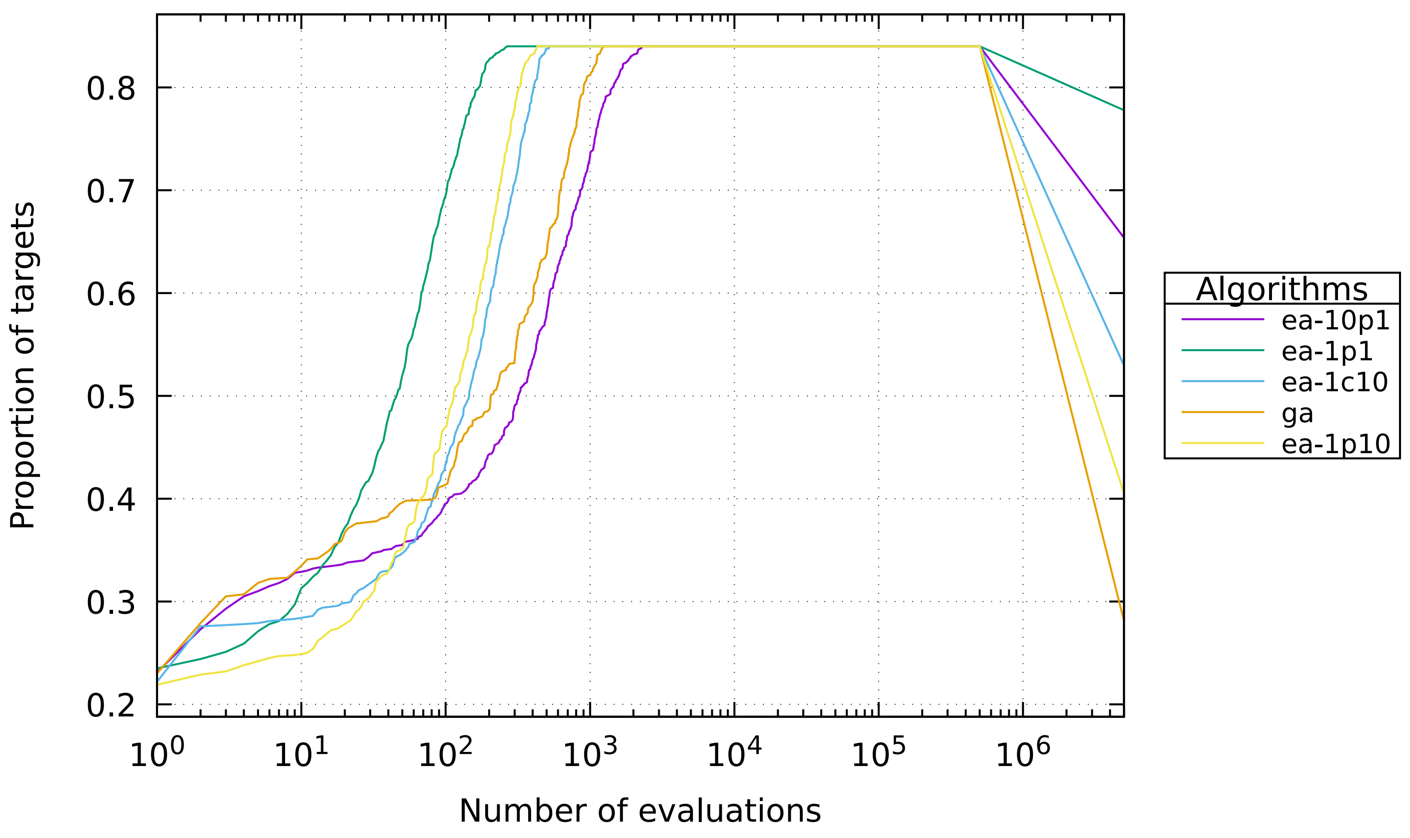

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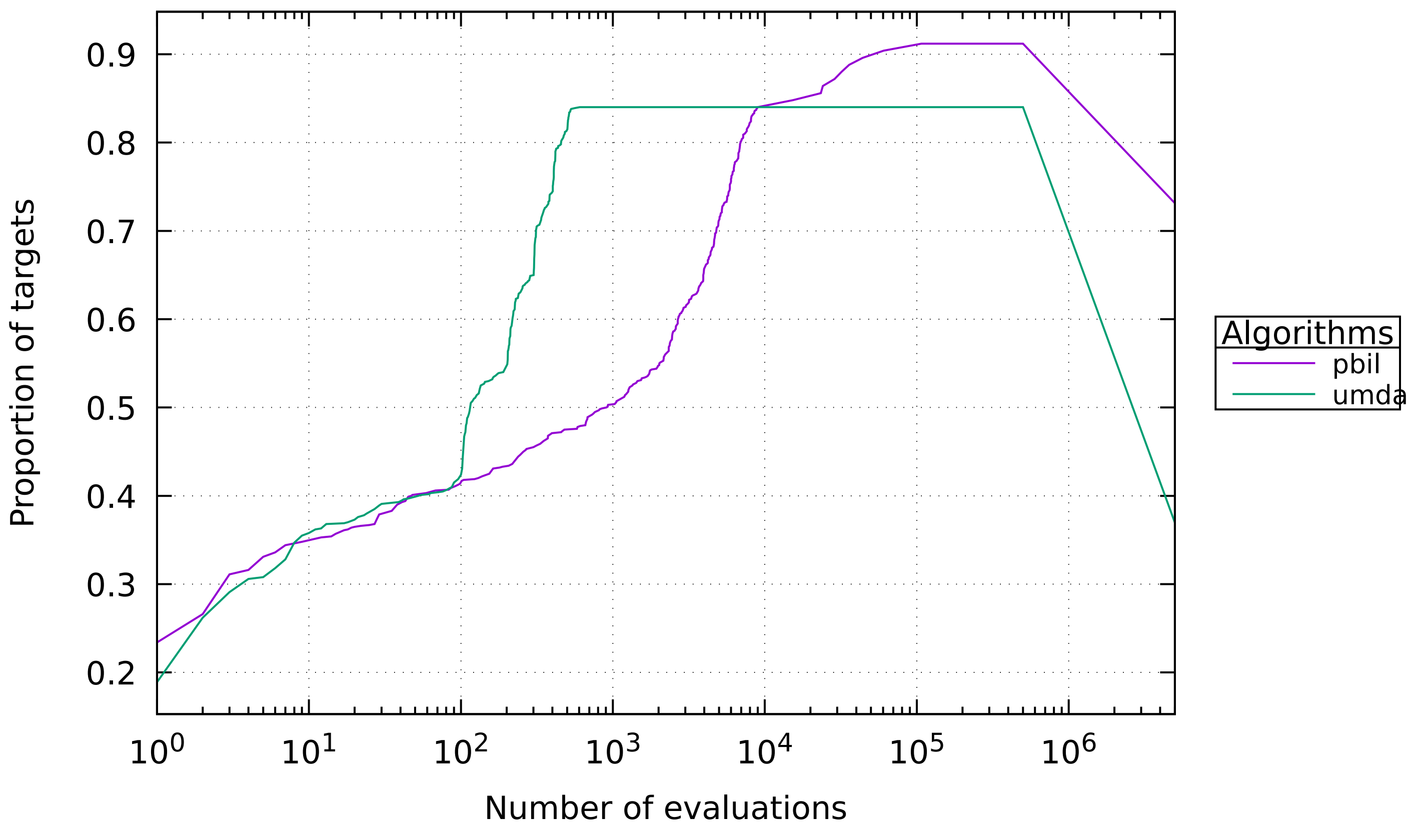

10 Results for fp-5

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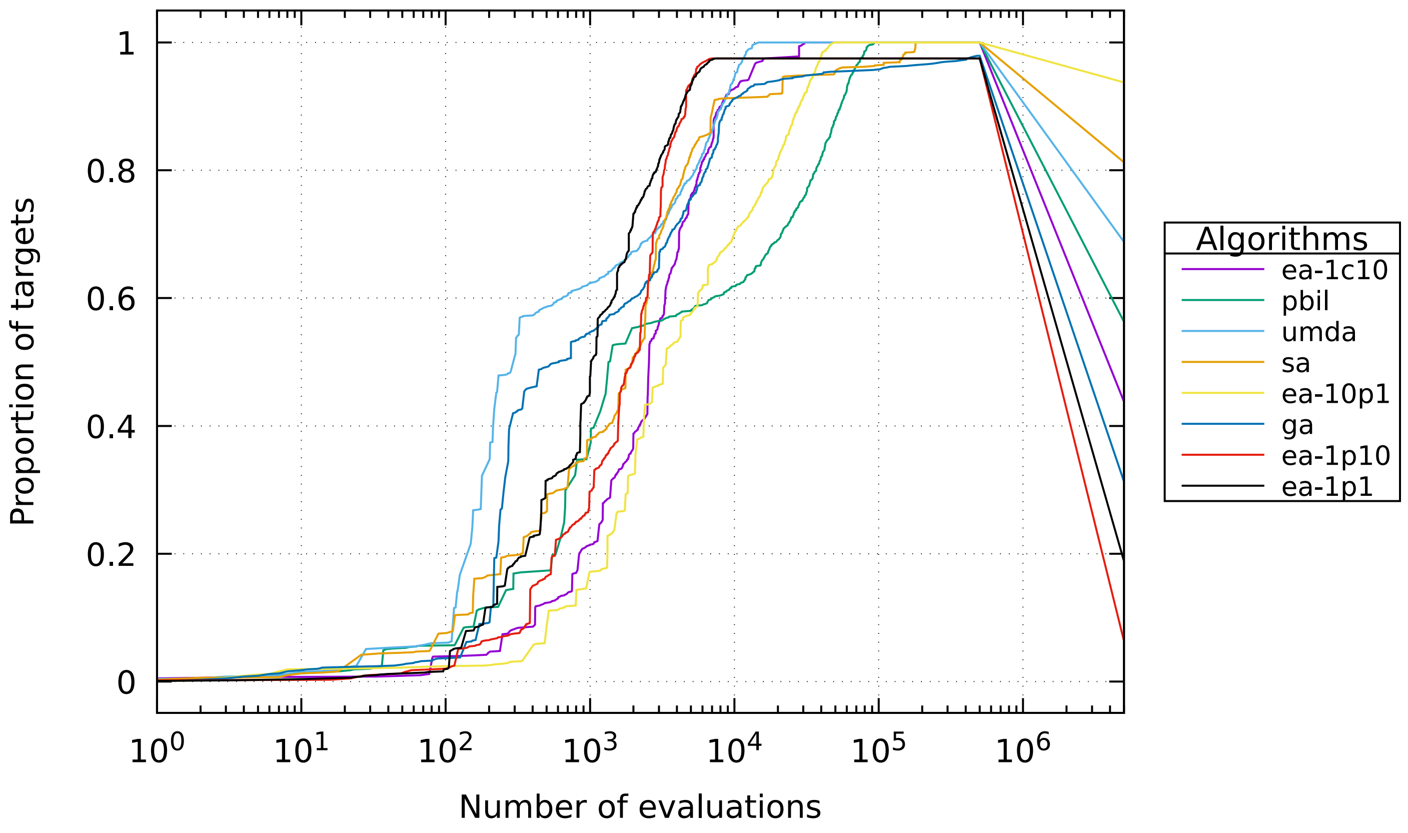

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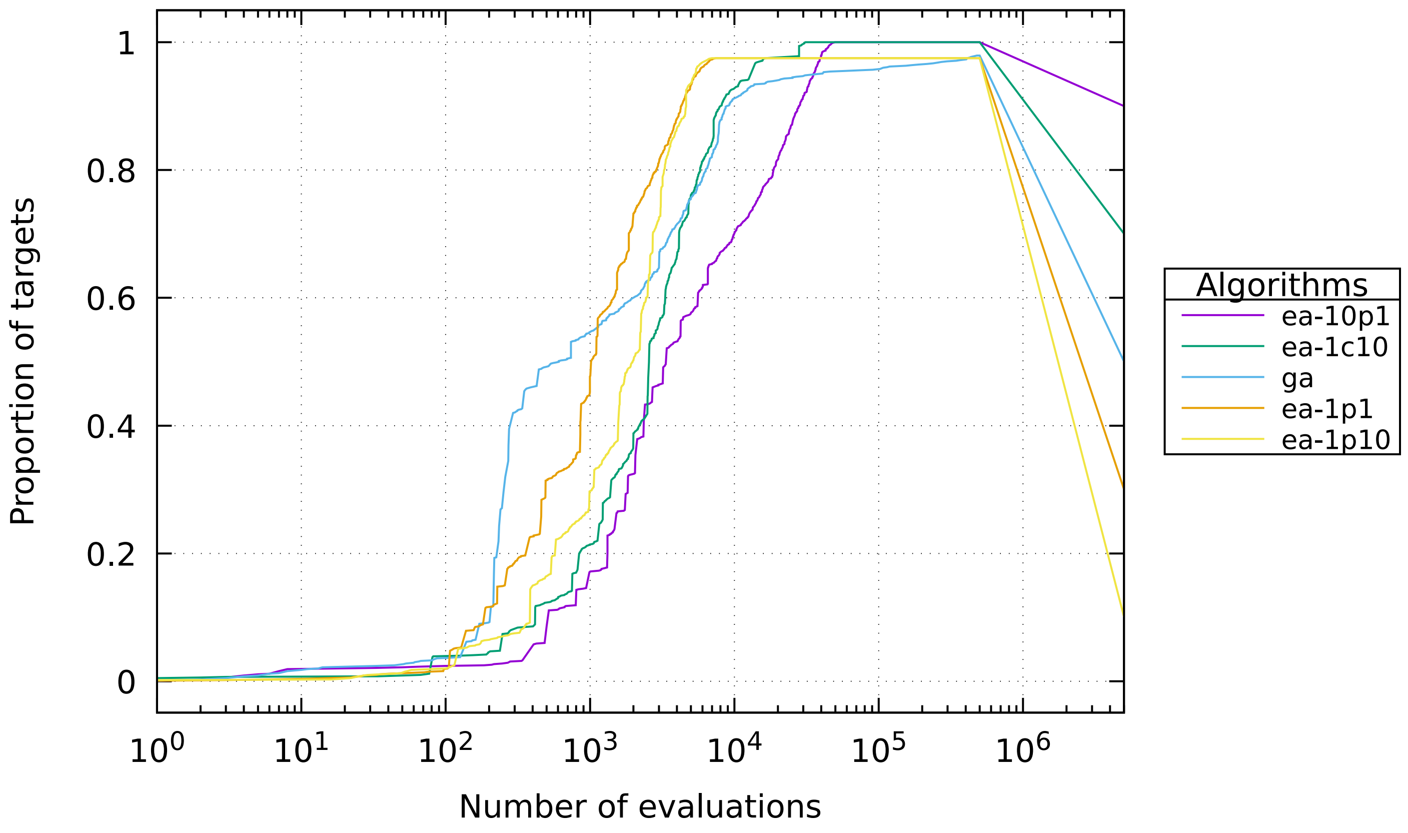

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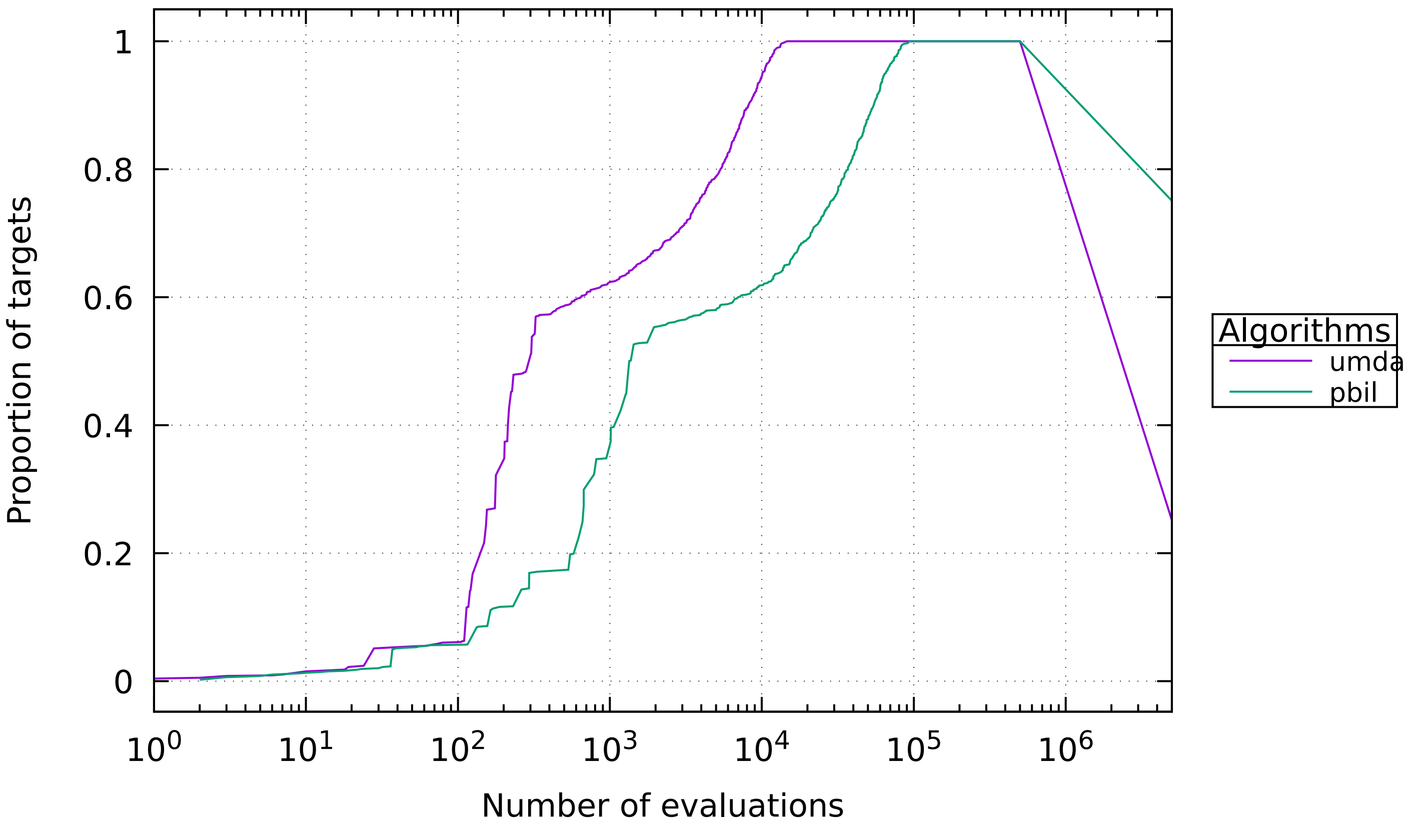

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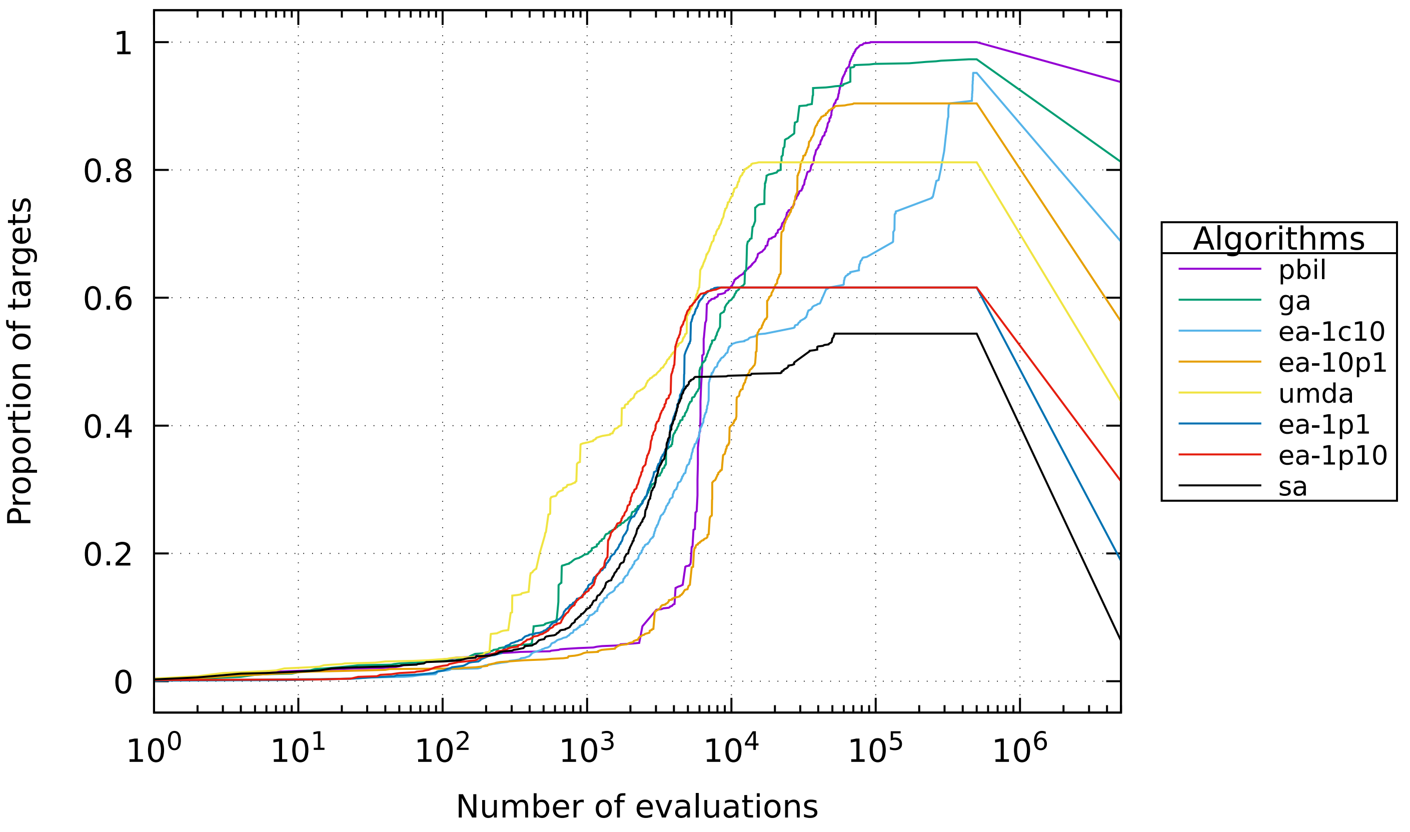
11.1 All algorithms



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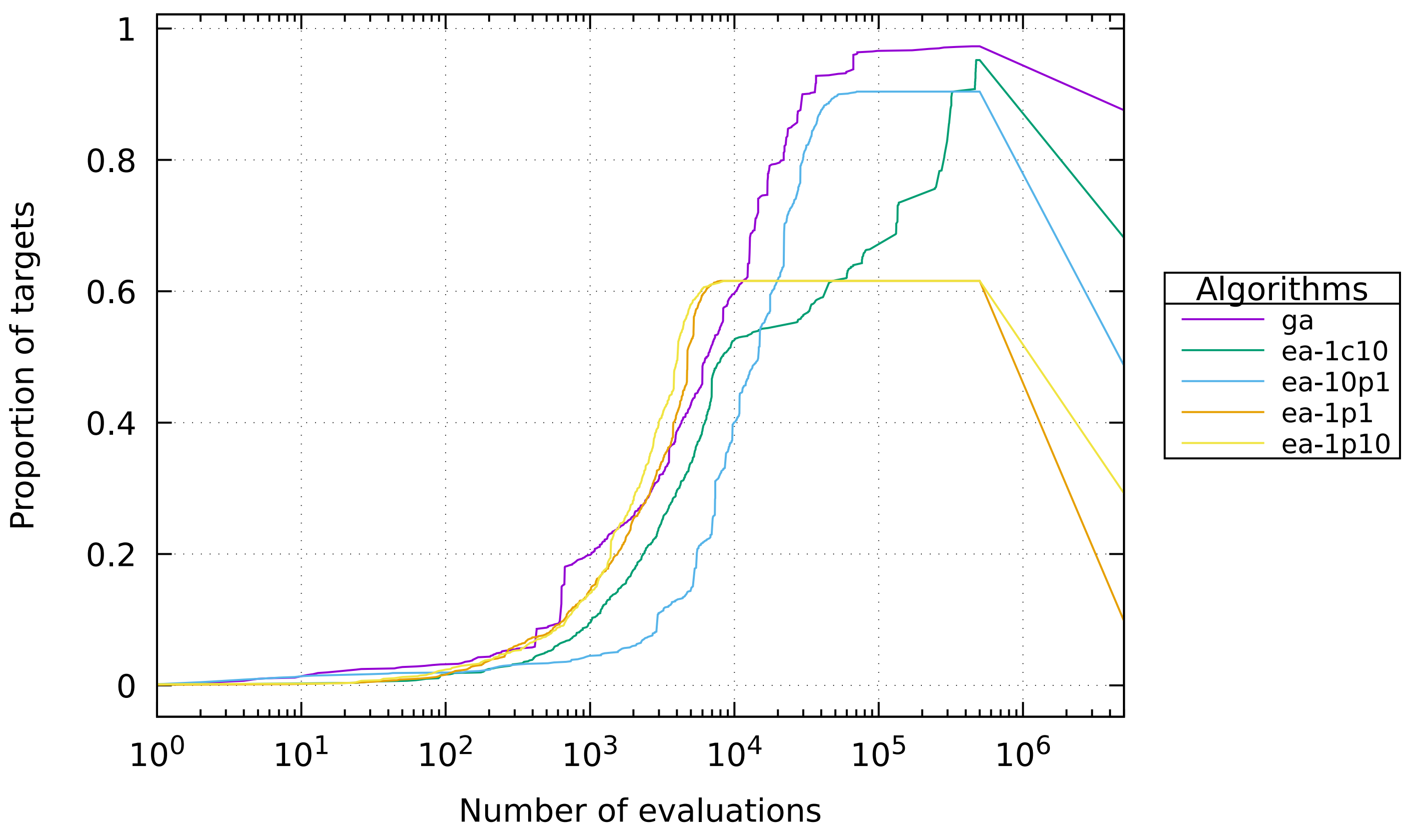

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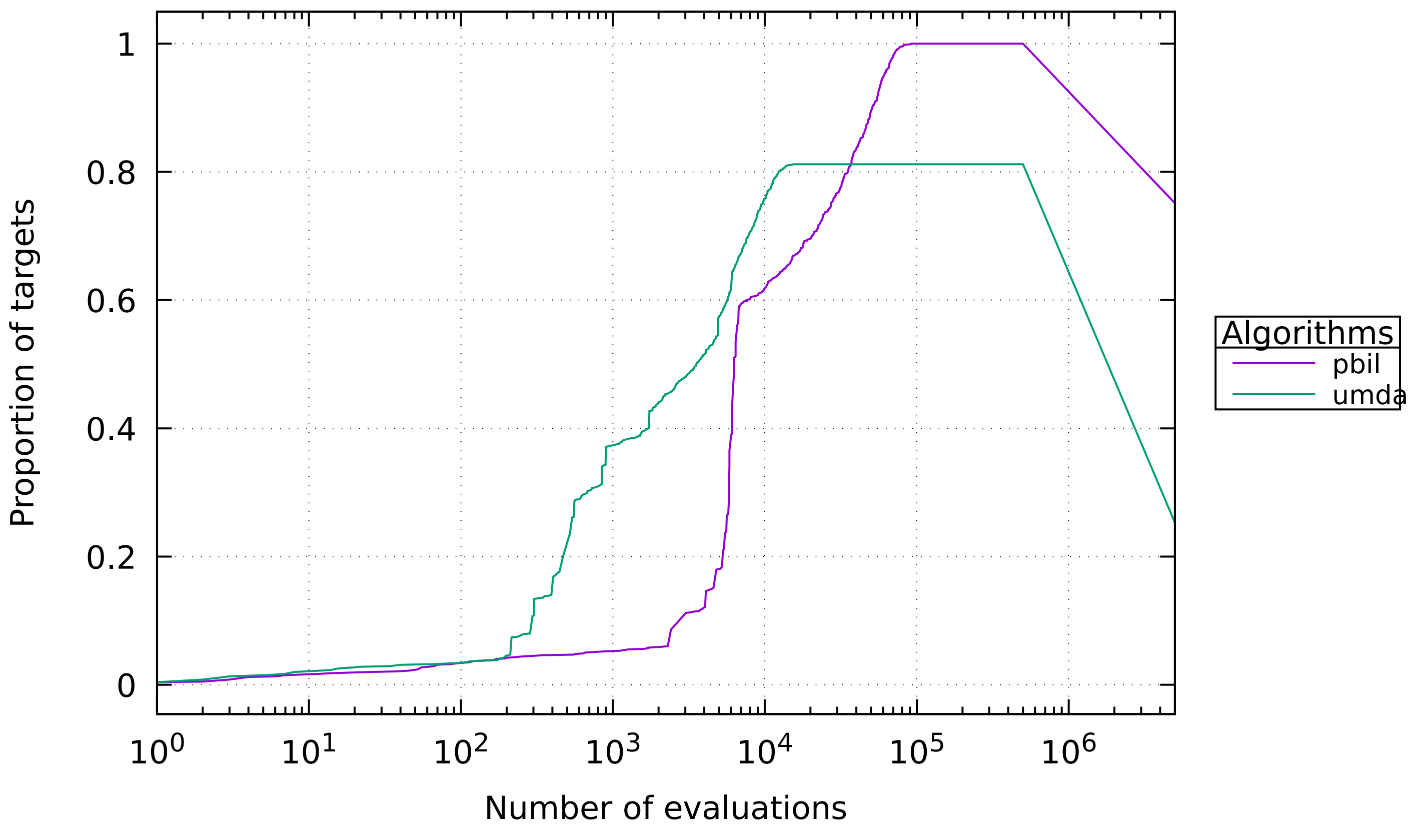

12 Results for nk

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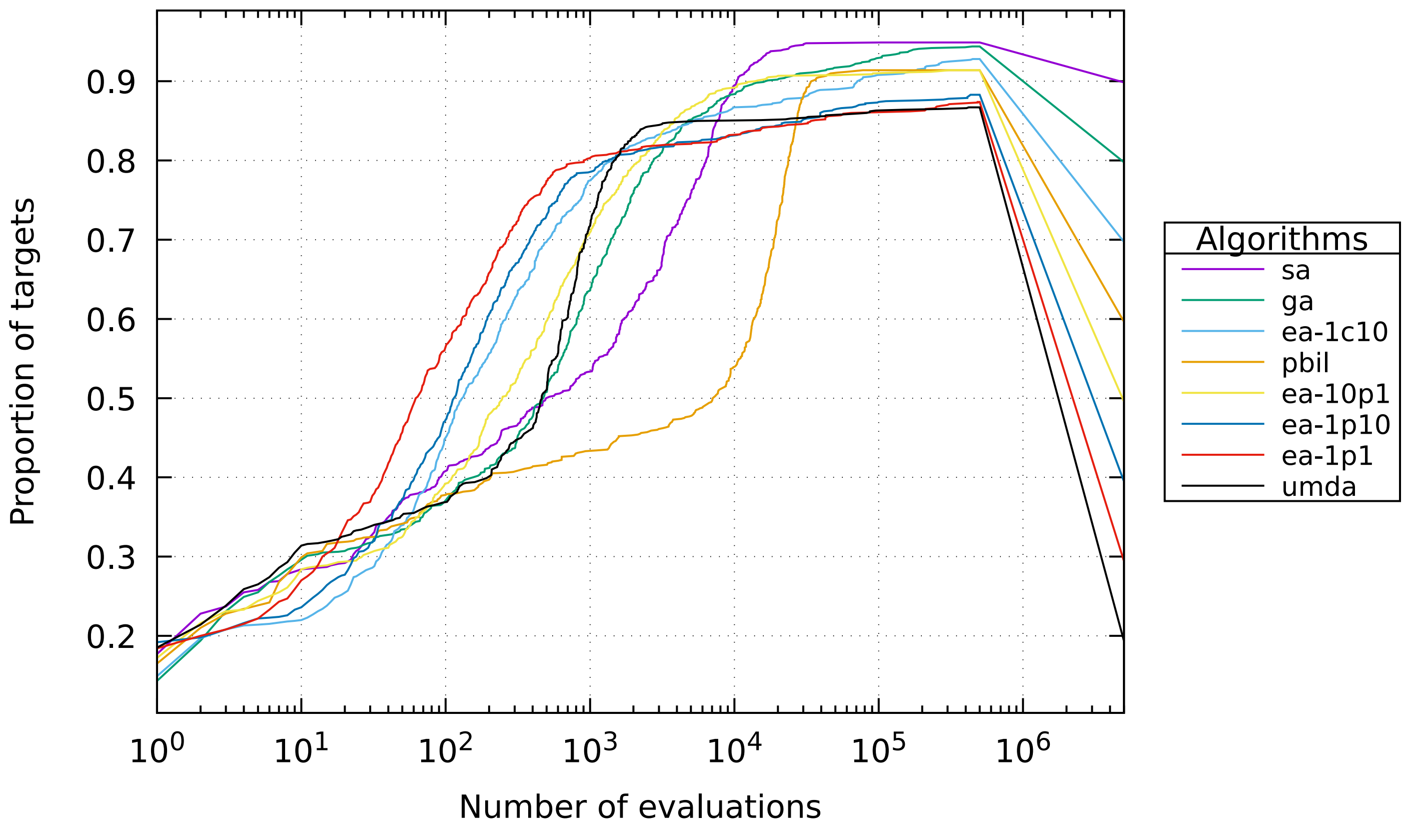
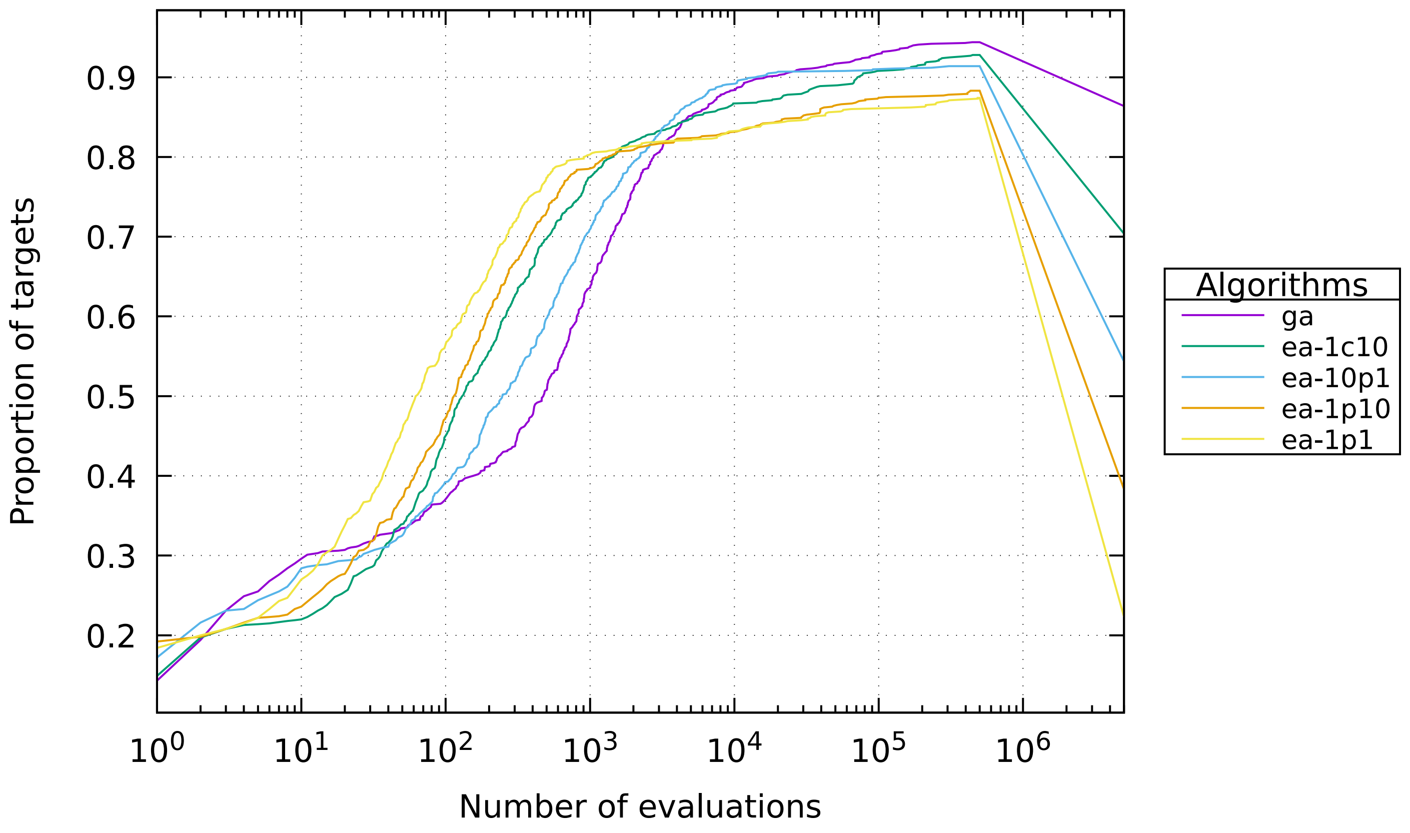


12.2 Groups

12.2.1 ec



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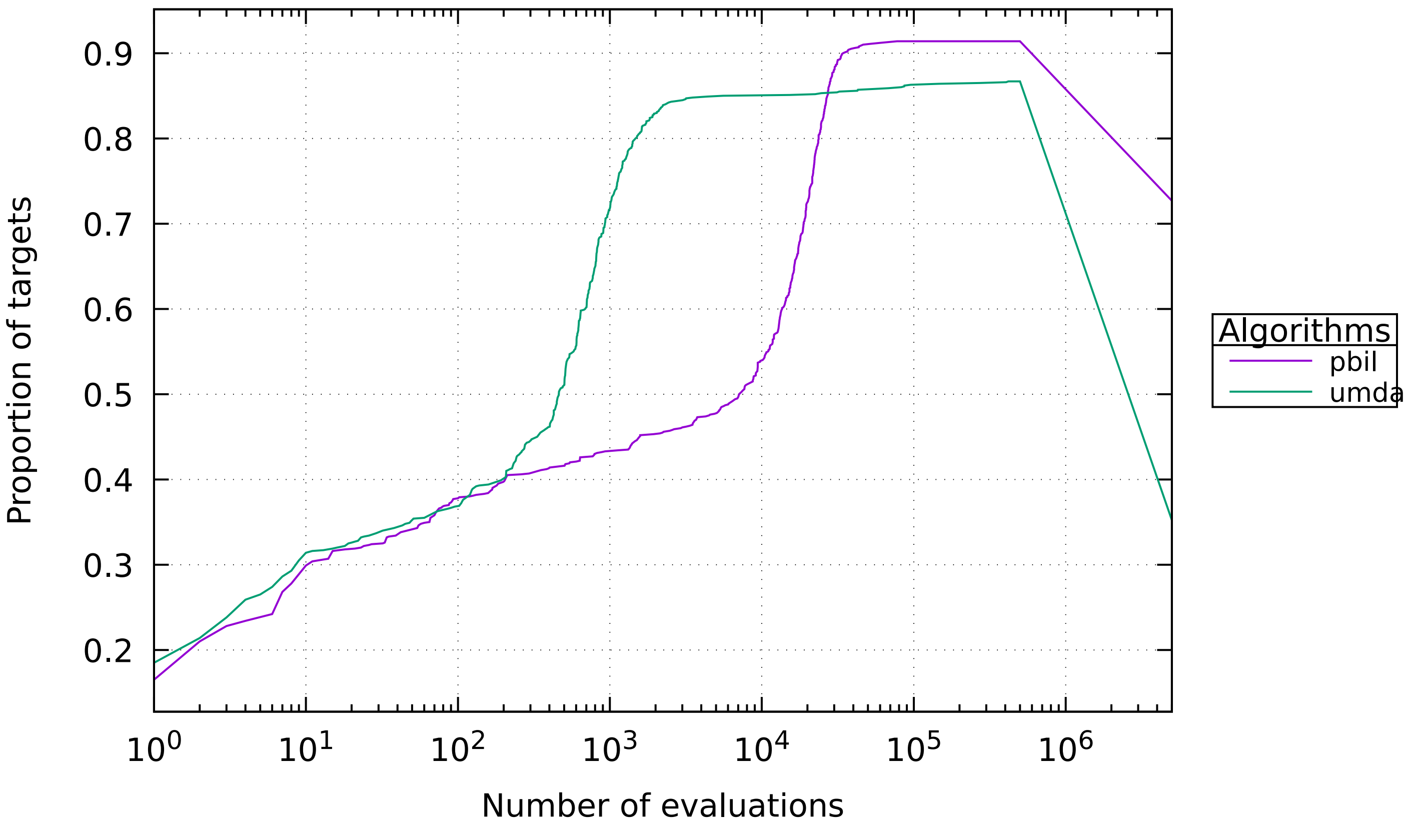
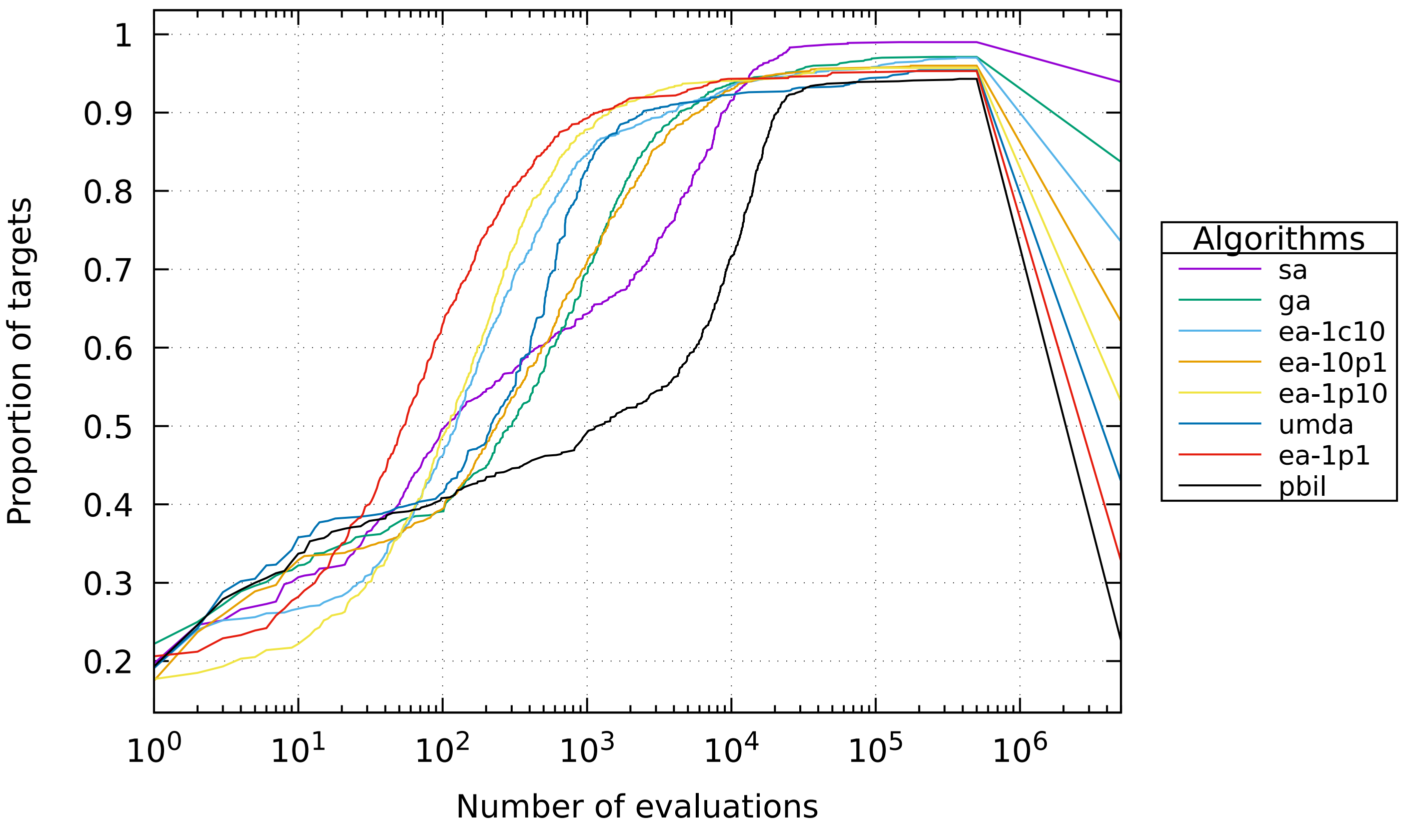


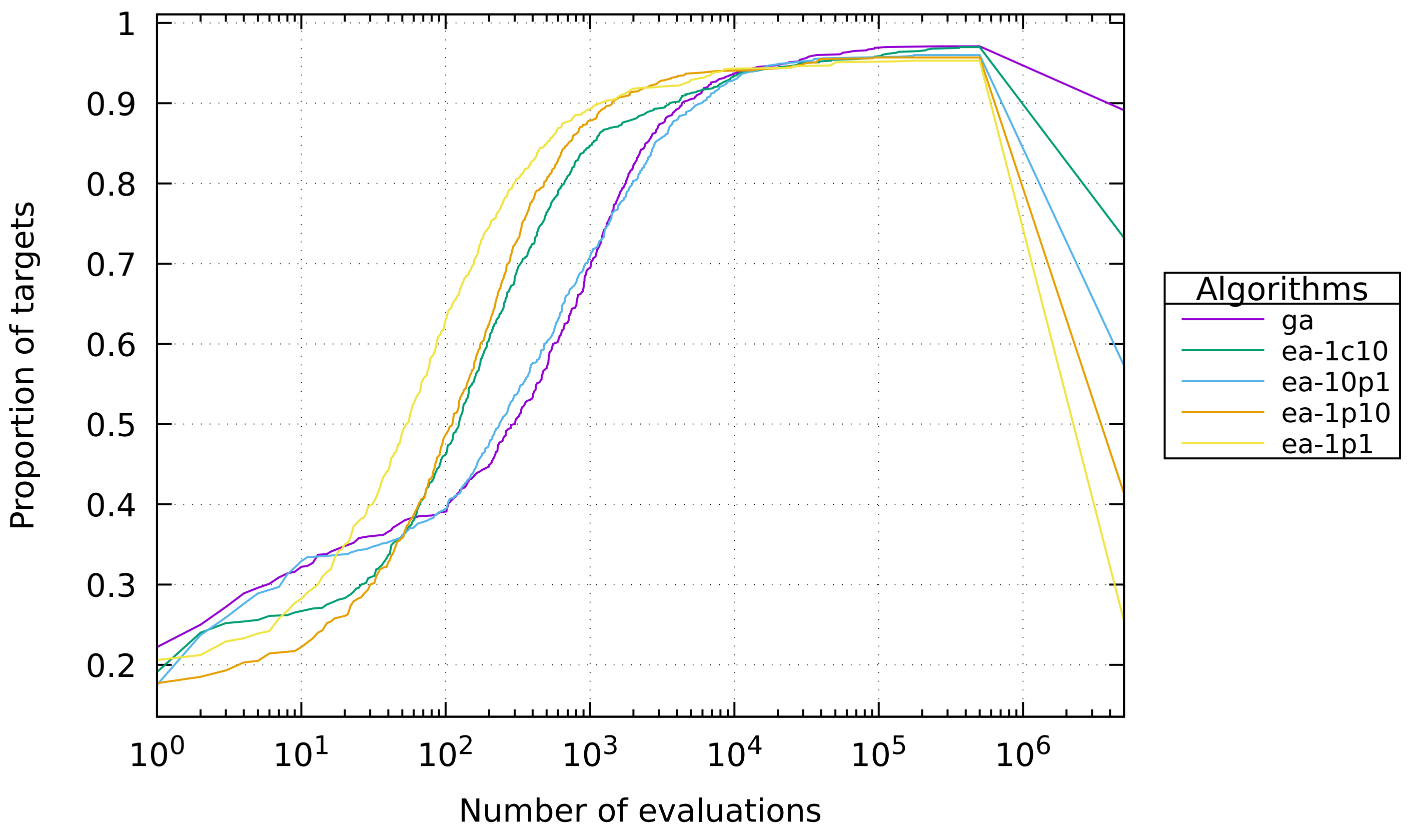
13 Results for max-sat

13.1 All algorithms



13.2 Groups

13.2.1 ec



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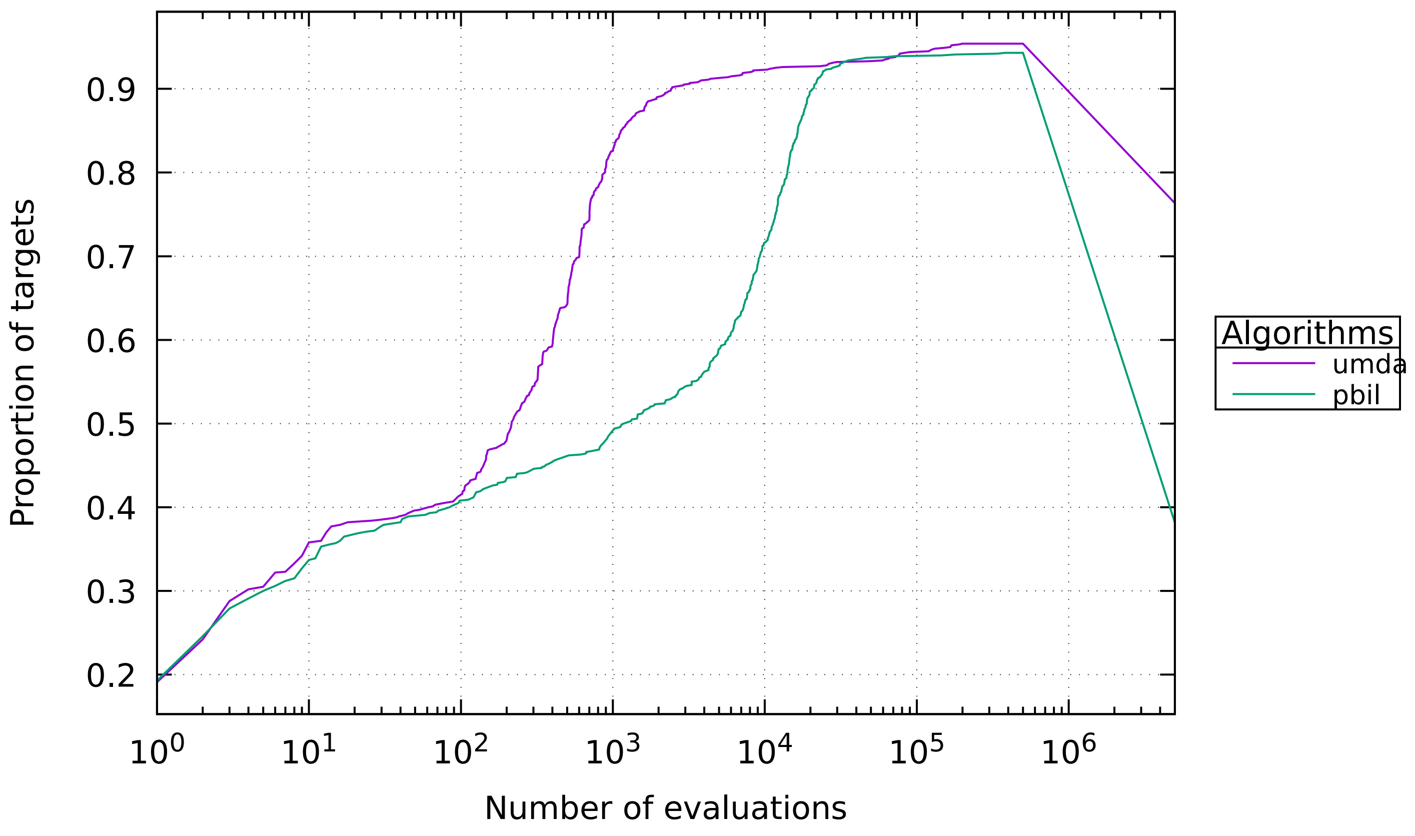
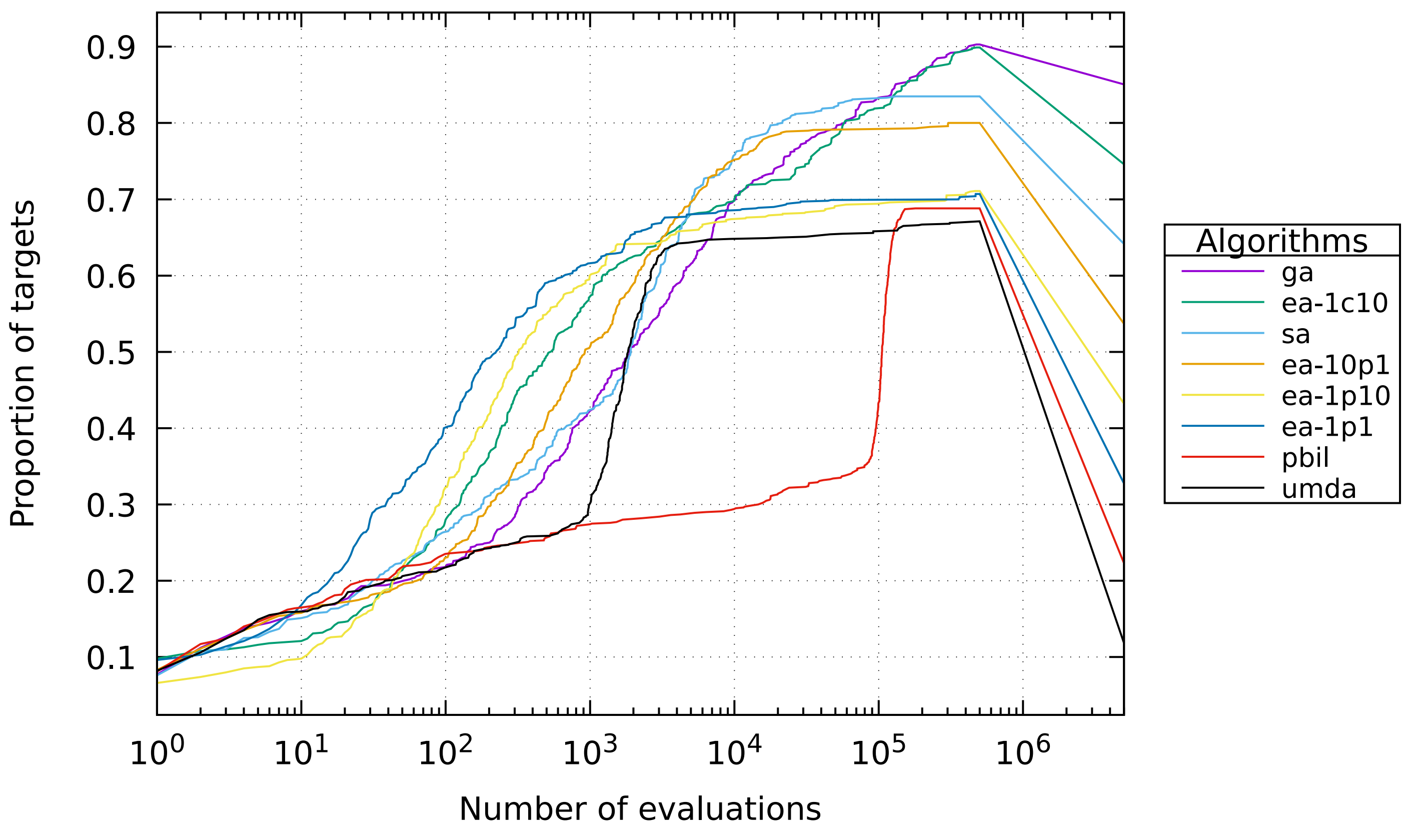


14 Results for labs

14.1 All algorithms



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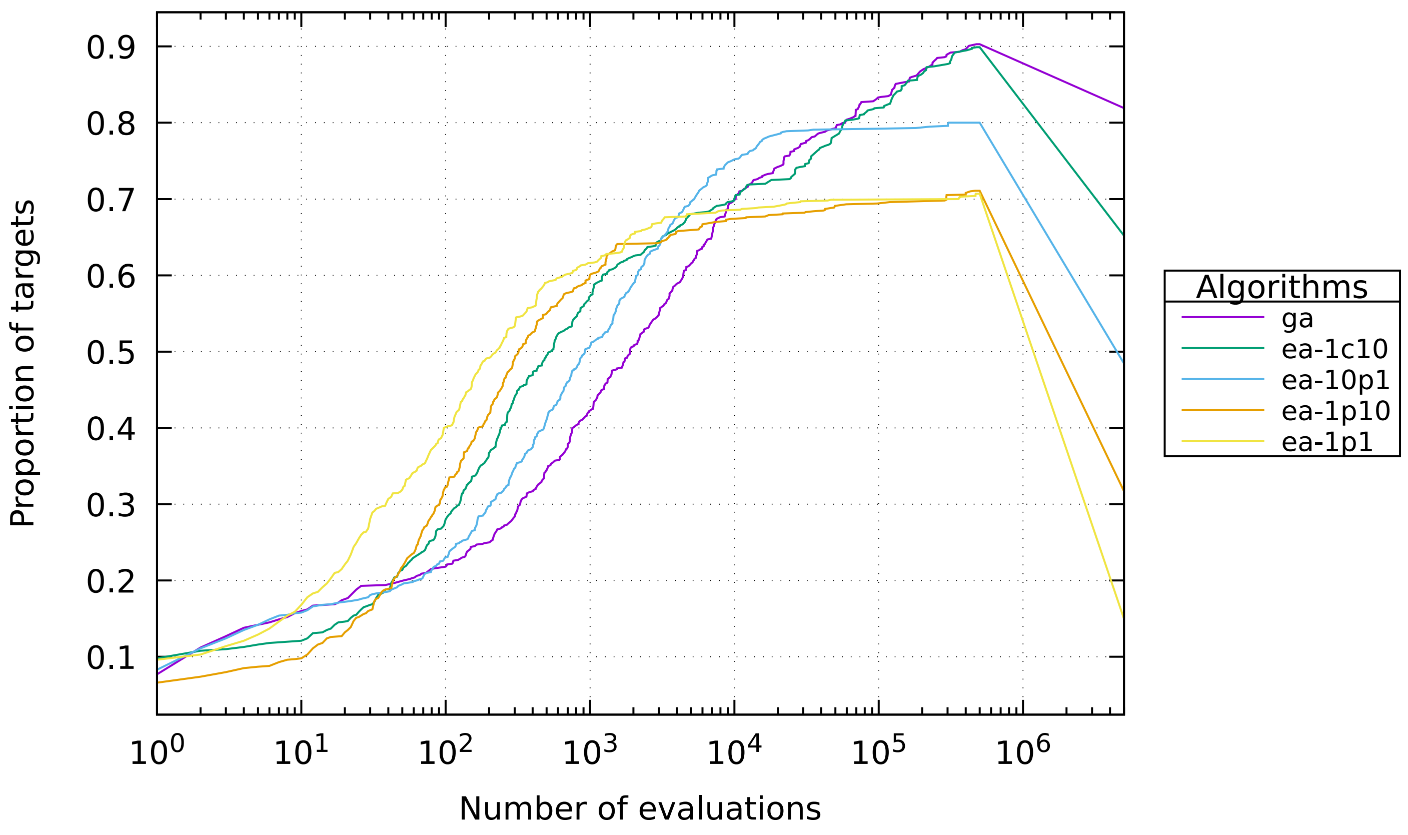

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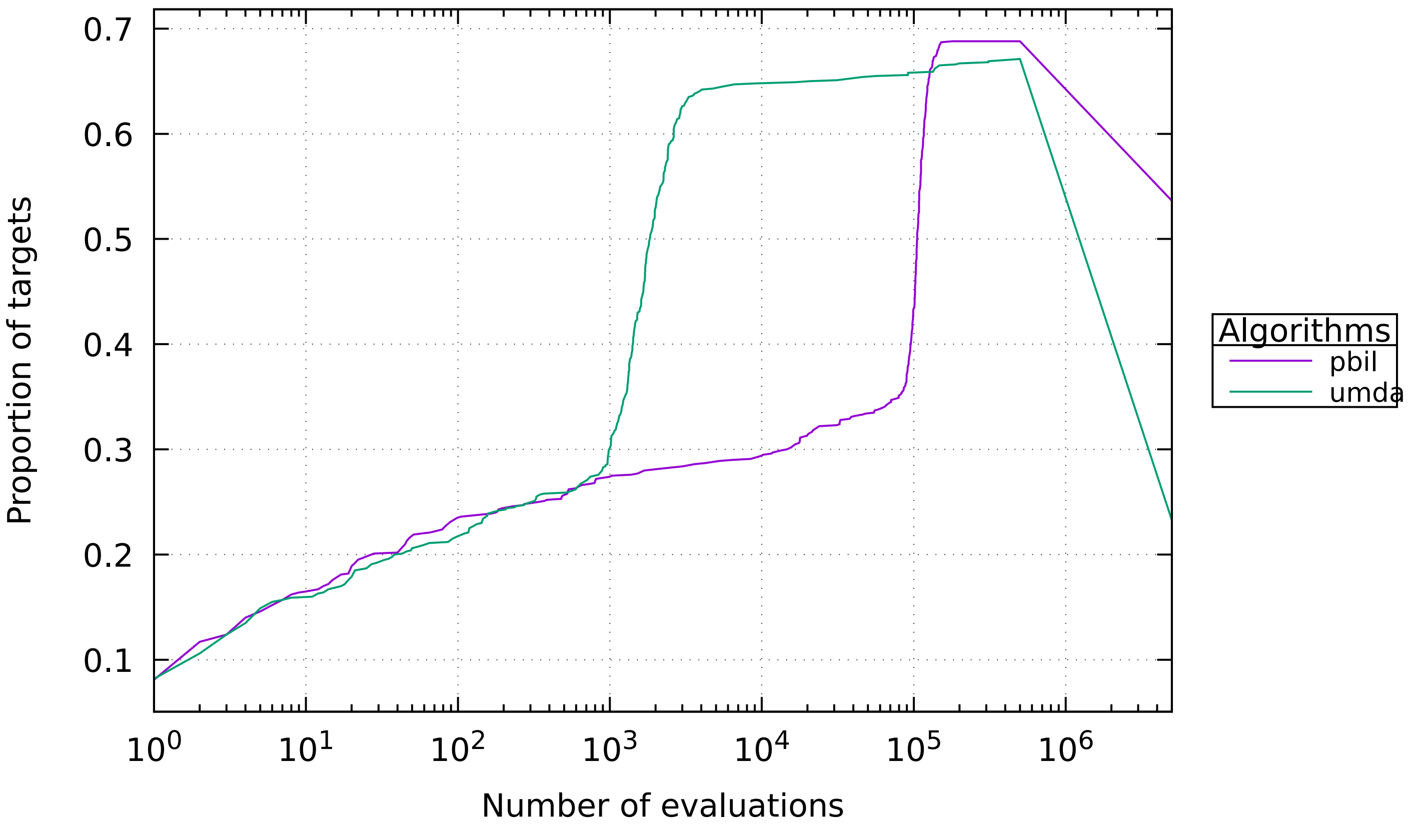

15 Results for ep

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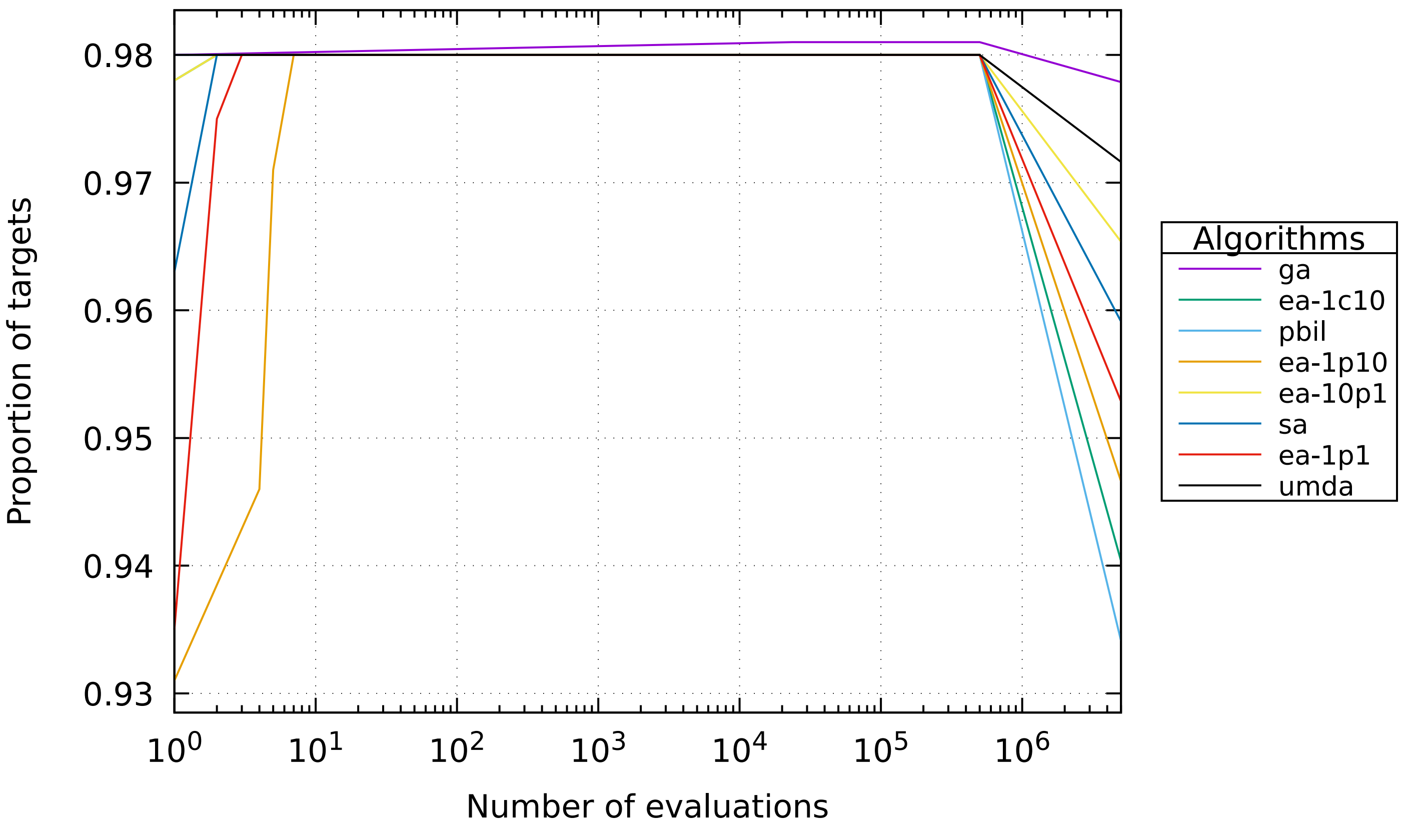
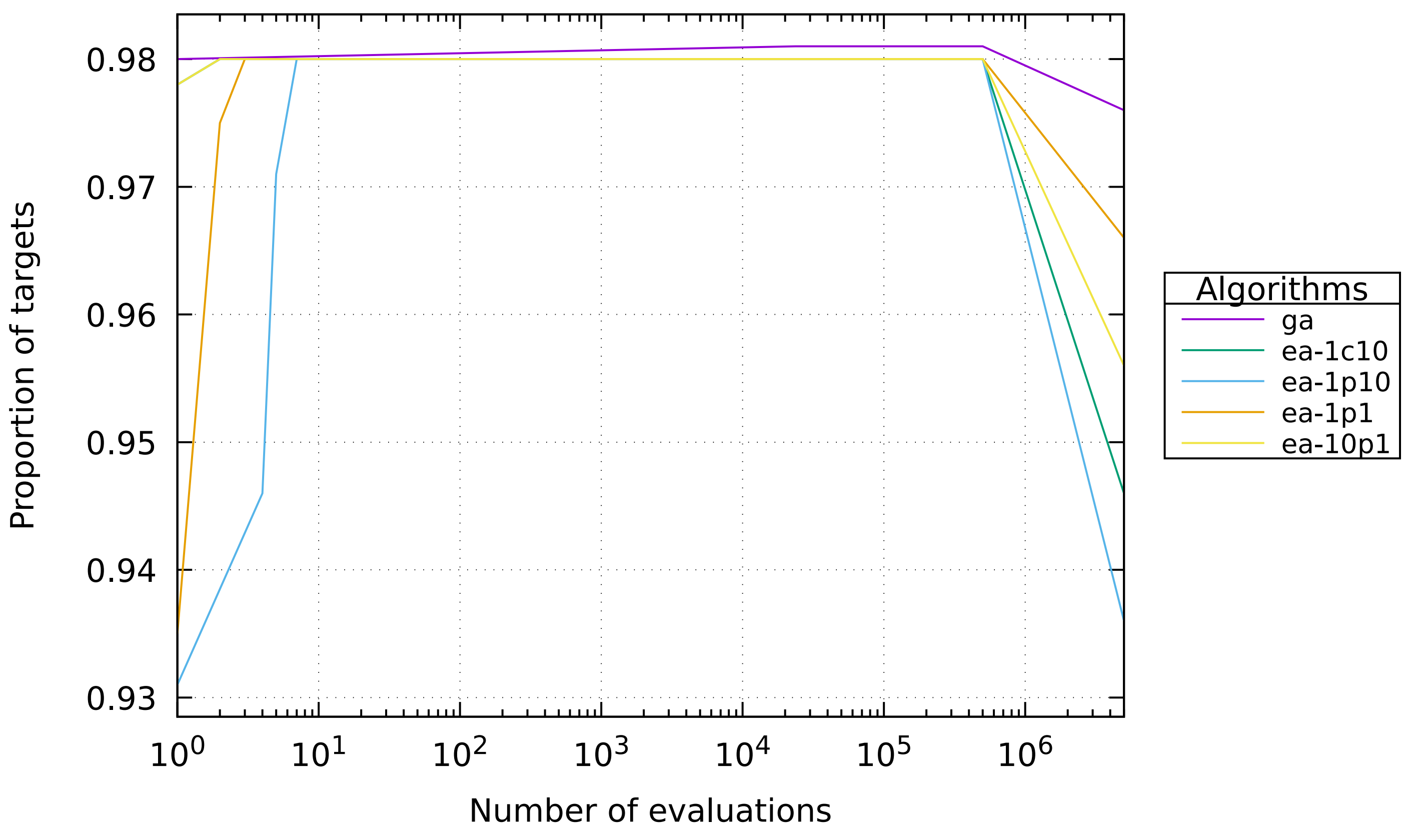


15.2 Groups

15.2.1 ec



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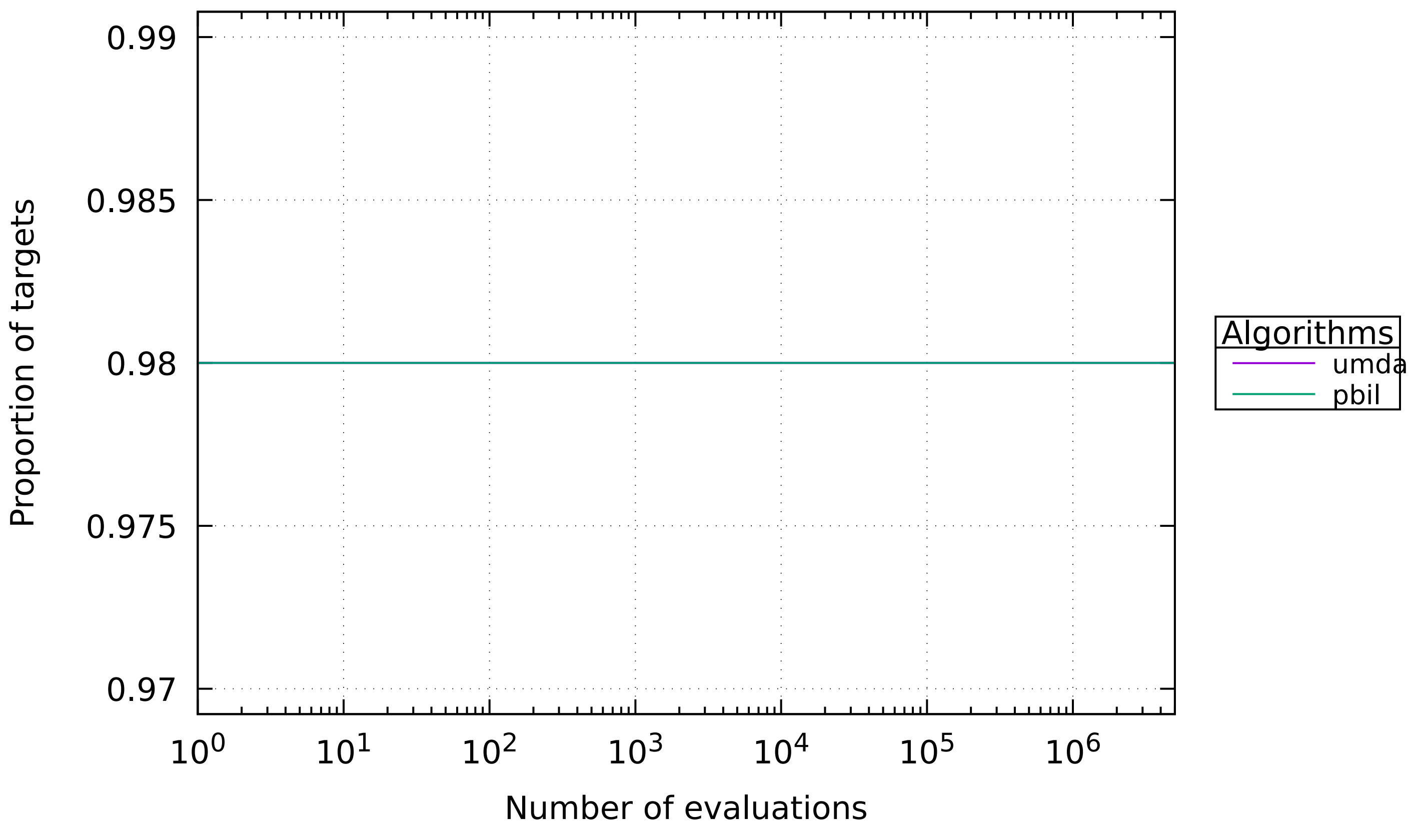
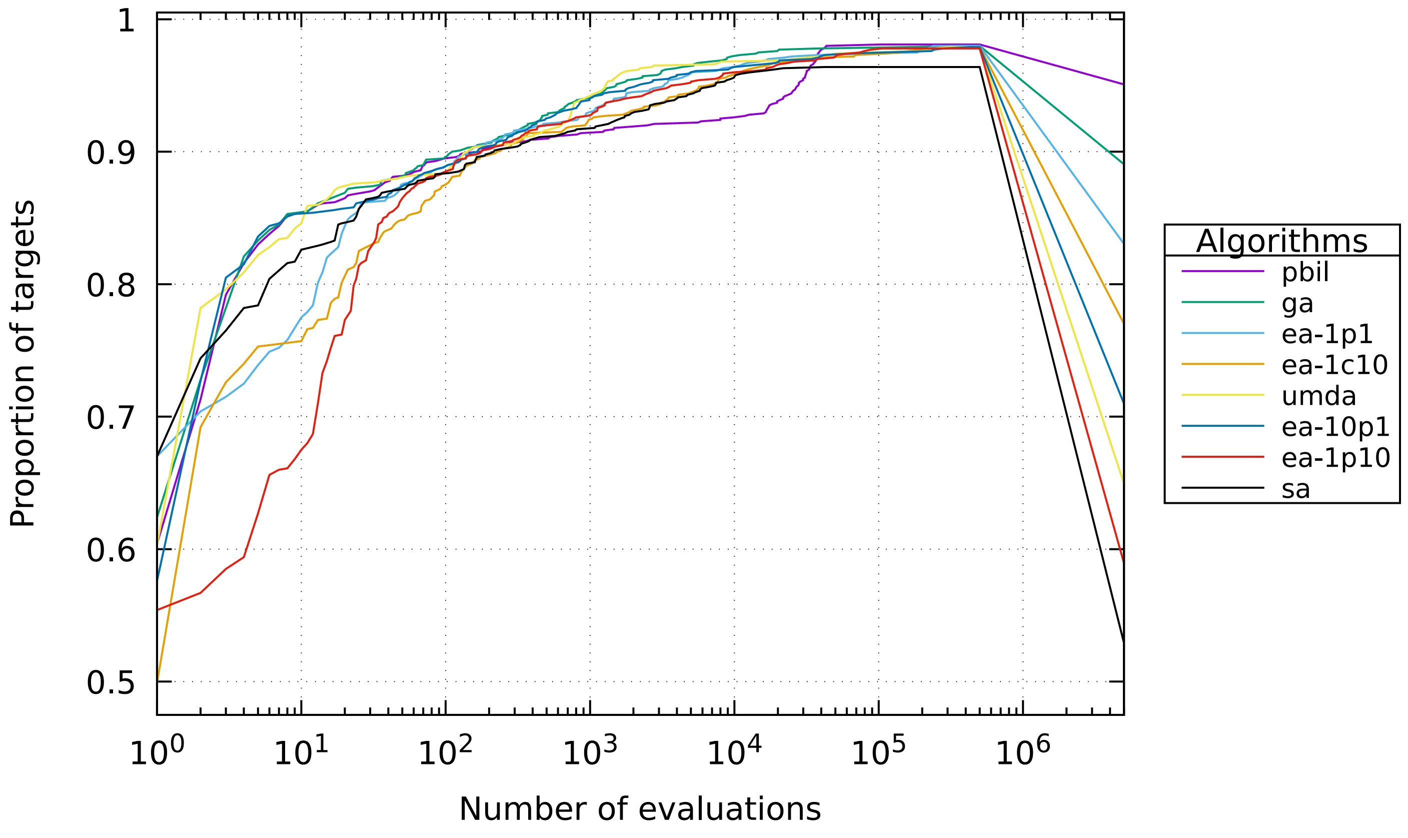


16 Results for cancel

16.1 All algorithms



16.2 Groups

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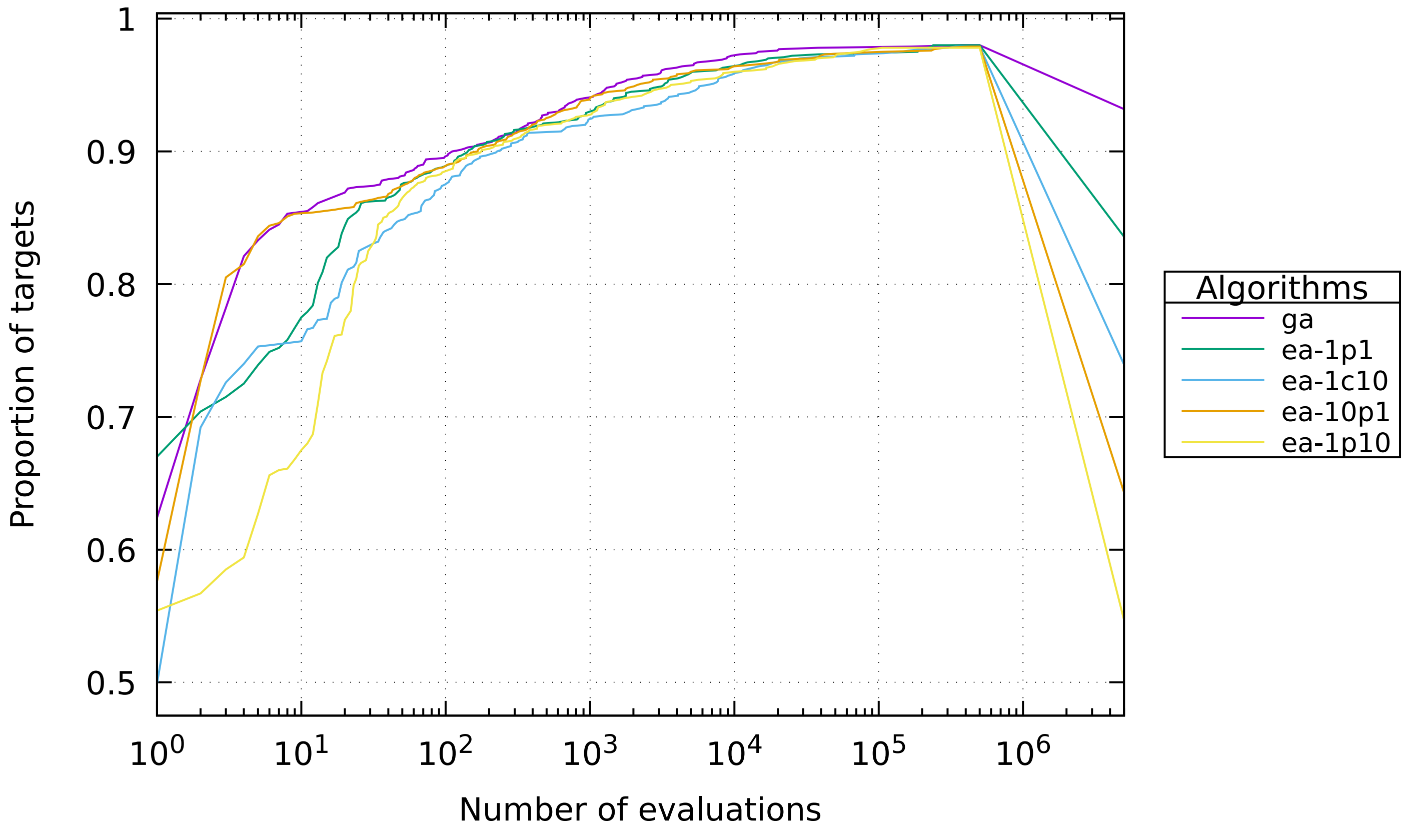

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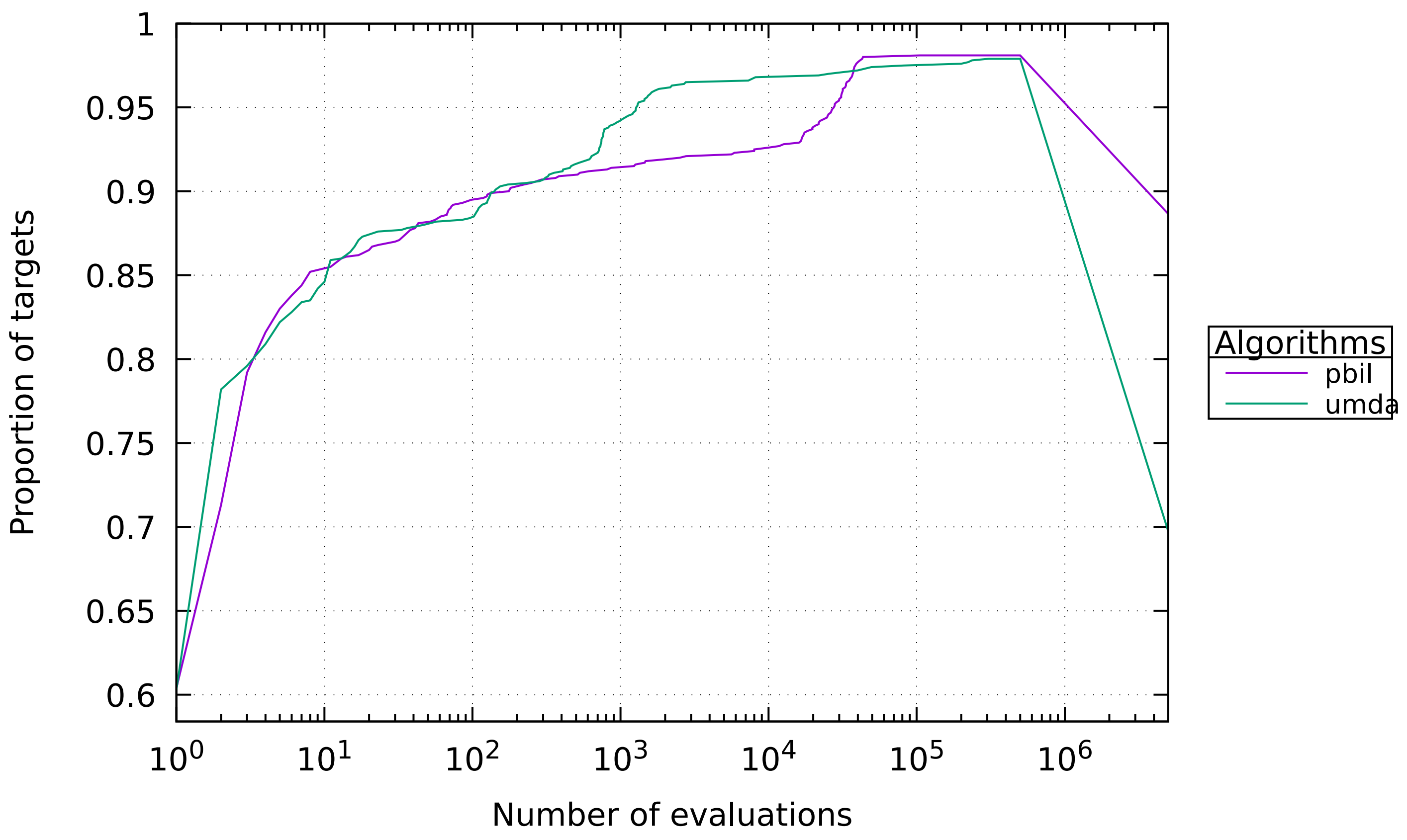
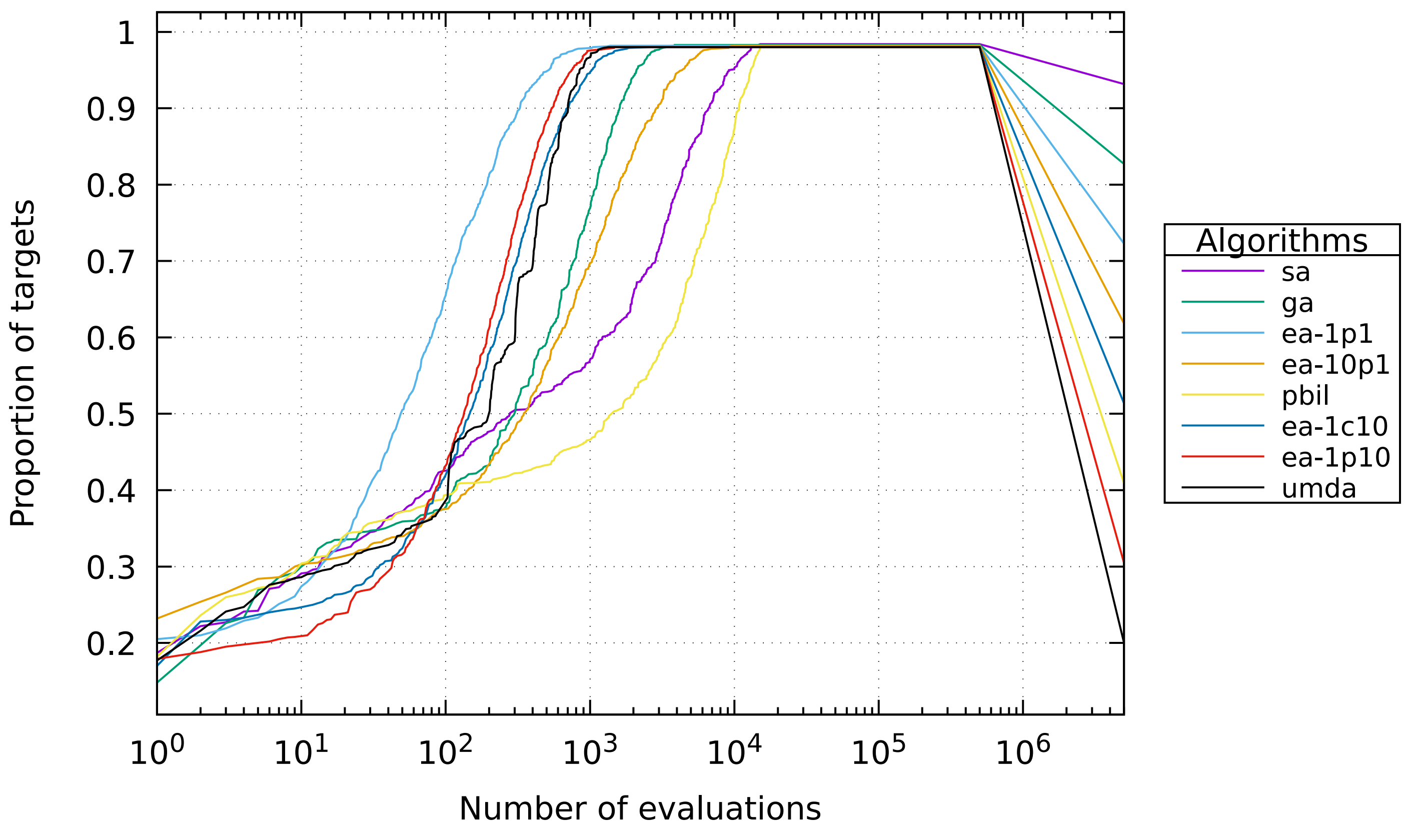


17 Results for trap

17.1 All algorithms



17.2 Groups

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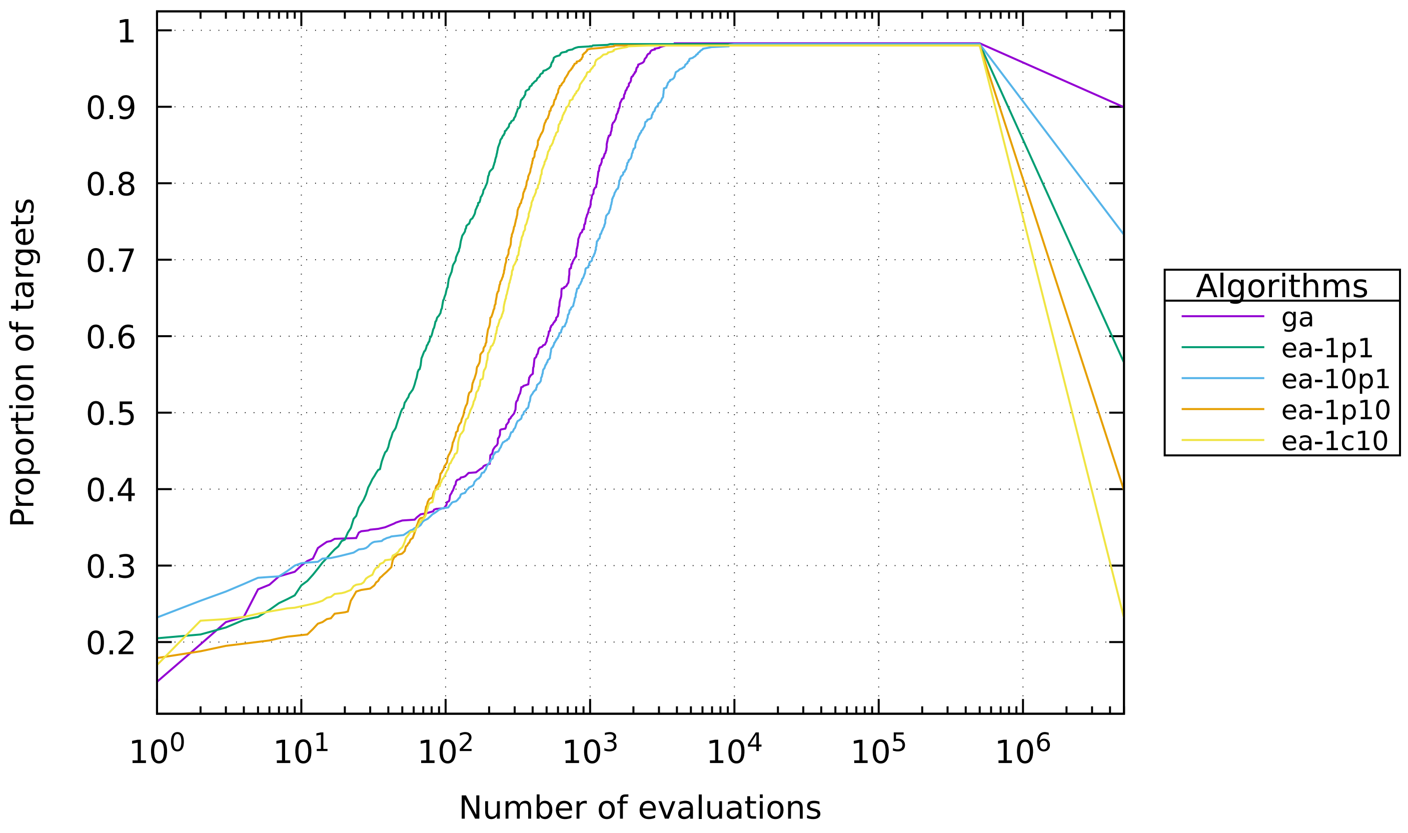

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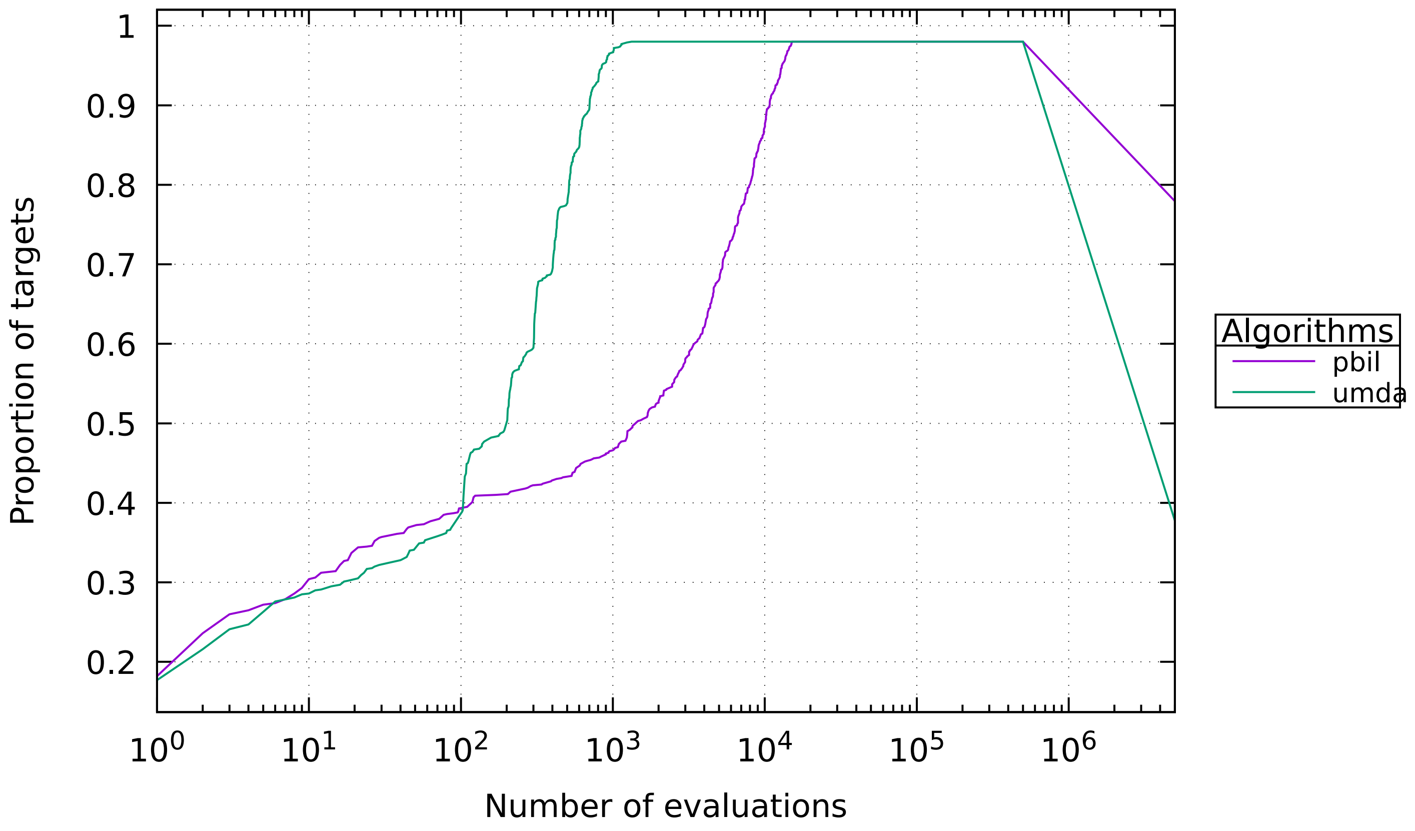
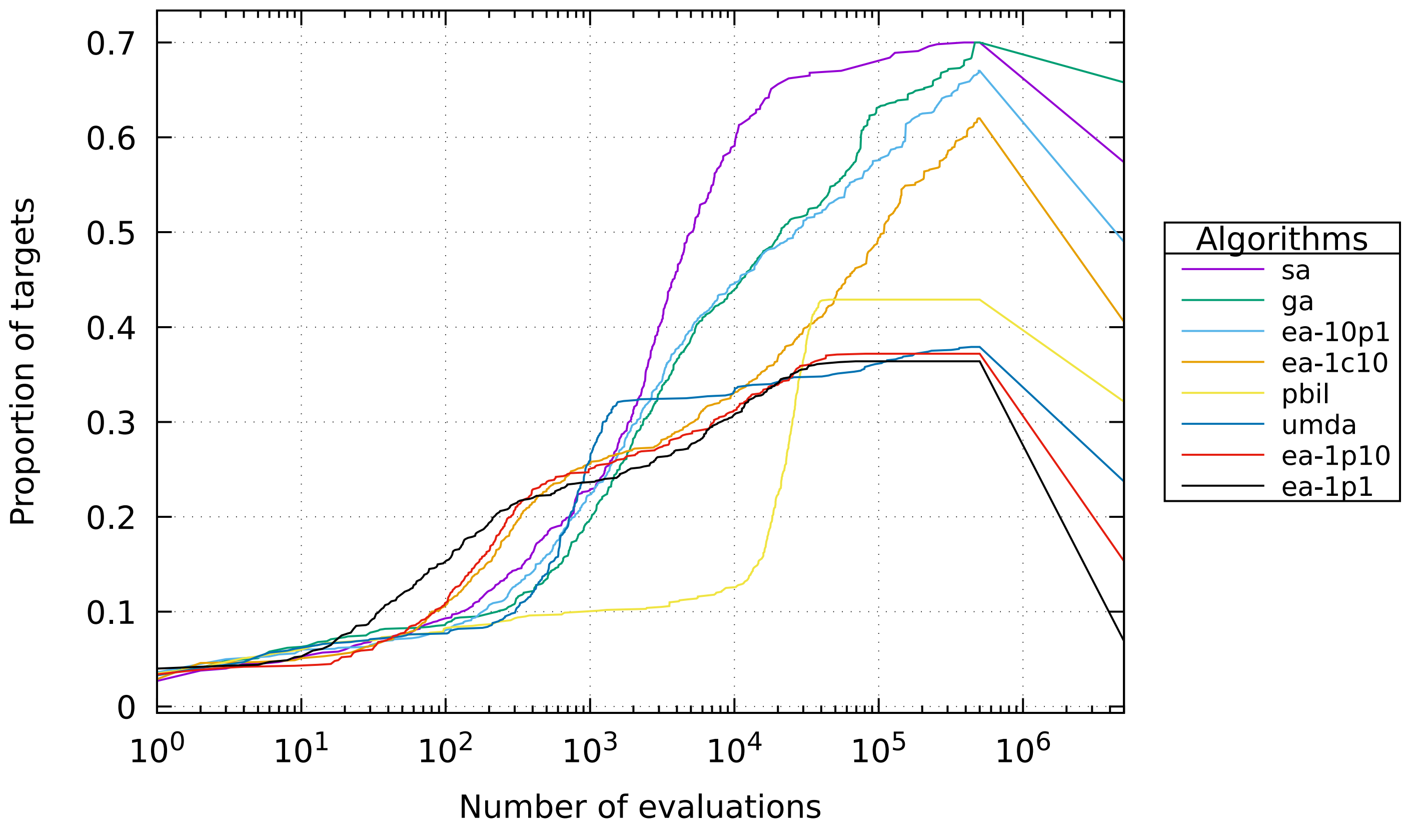


18 Results for hiff

18.1 All algorithms



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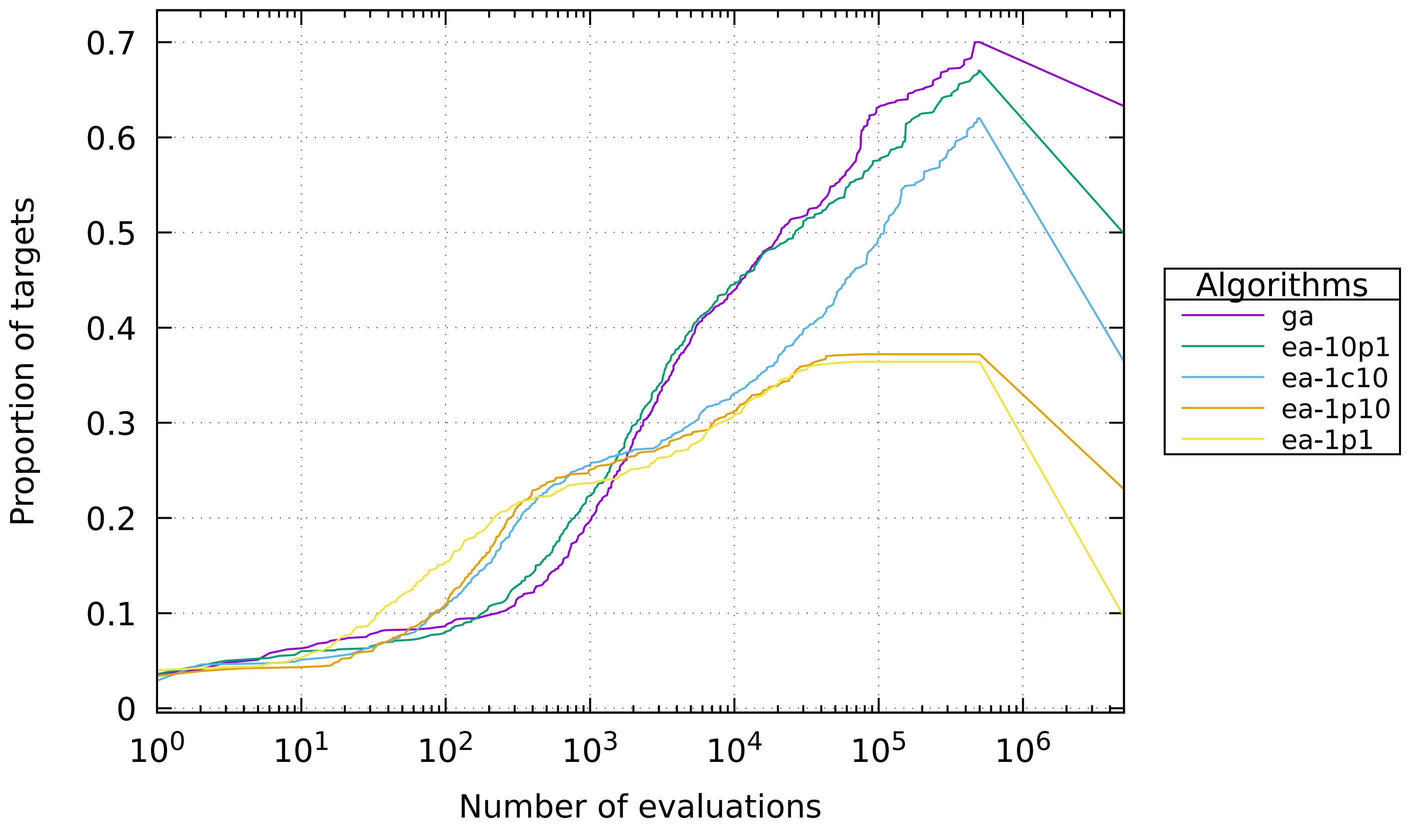

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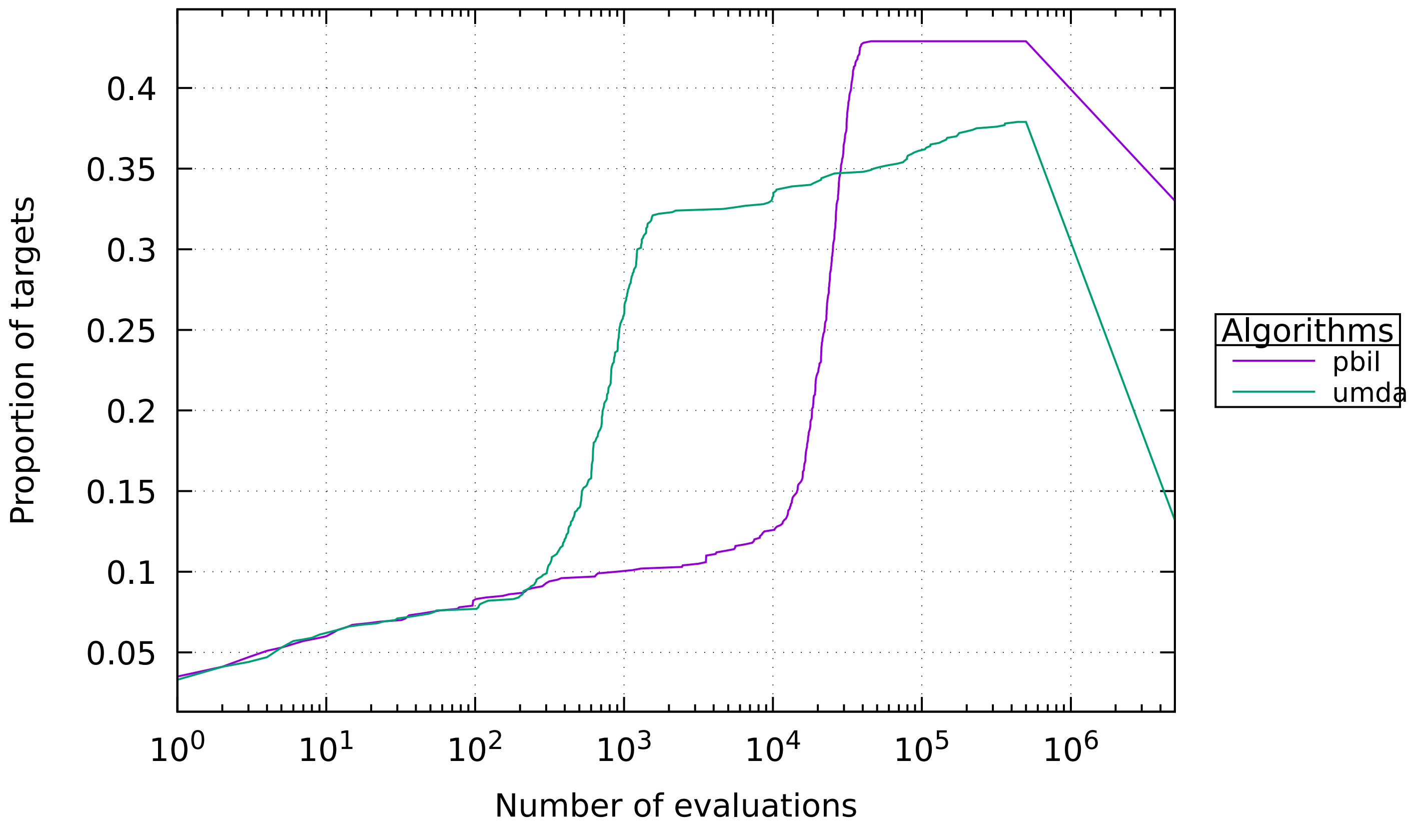
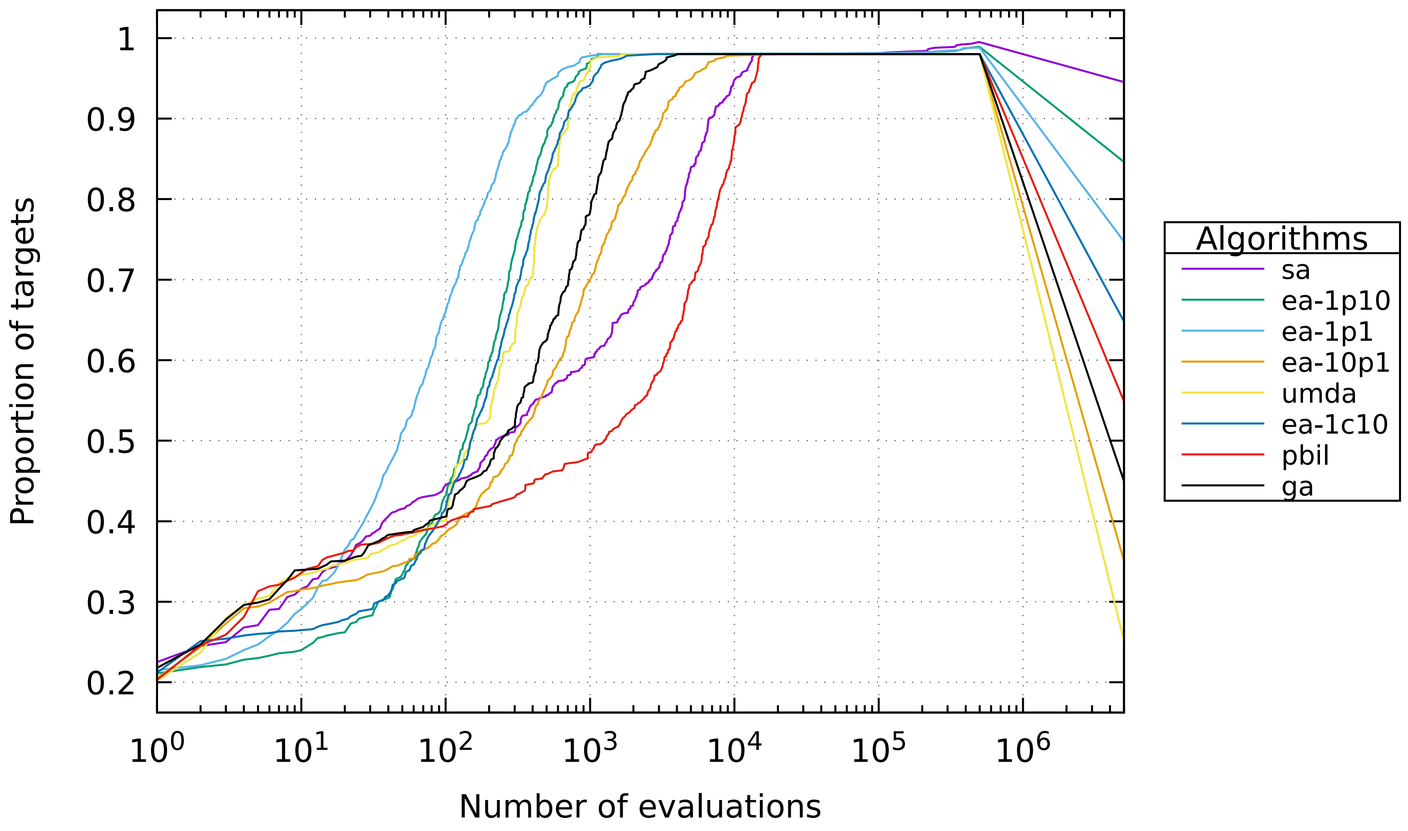


19 Results for plateau

19.1 All algorithms



19.2 Groups

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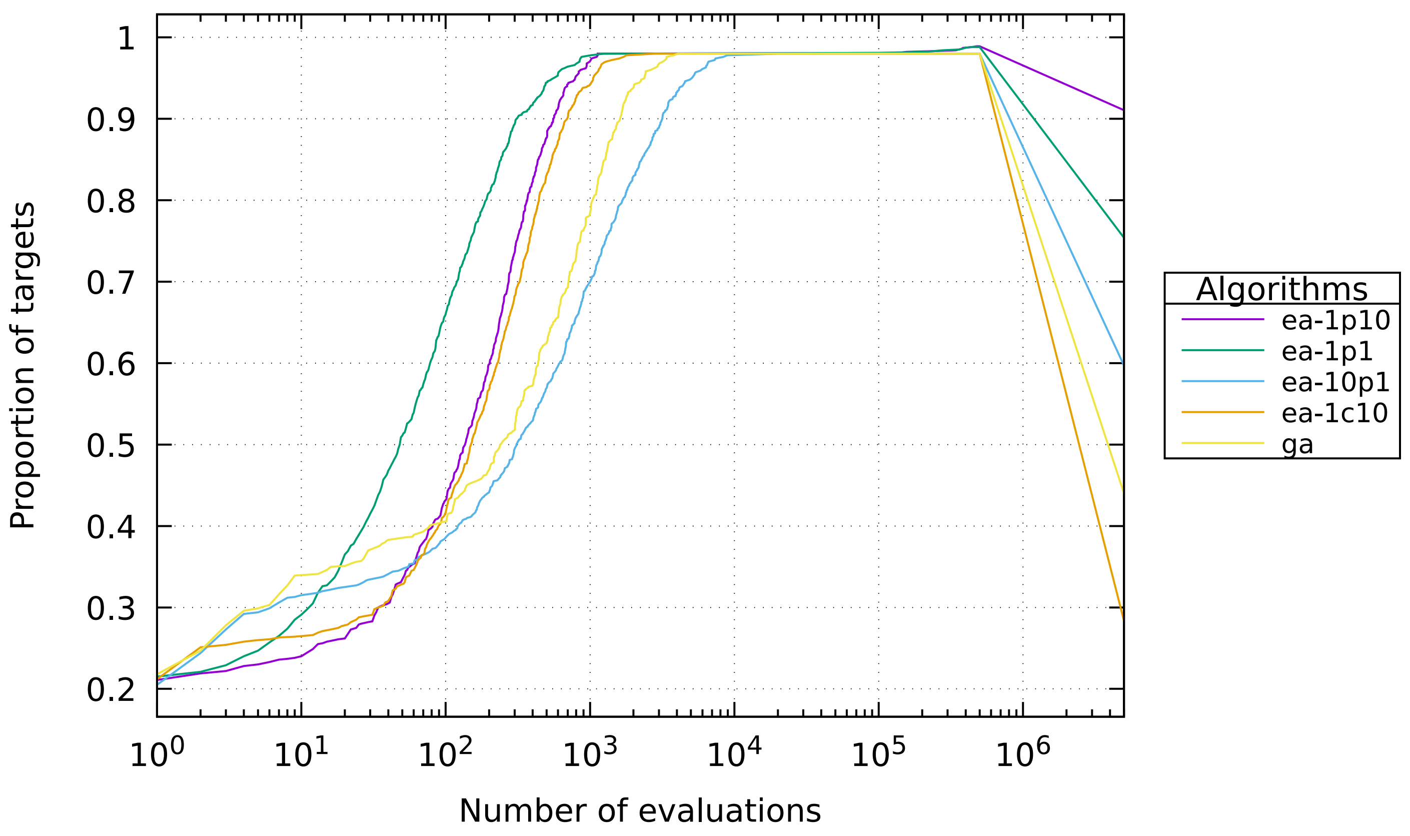

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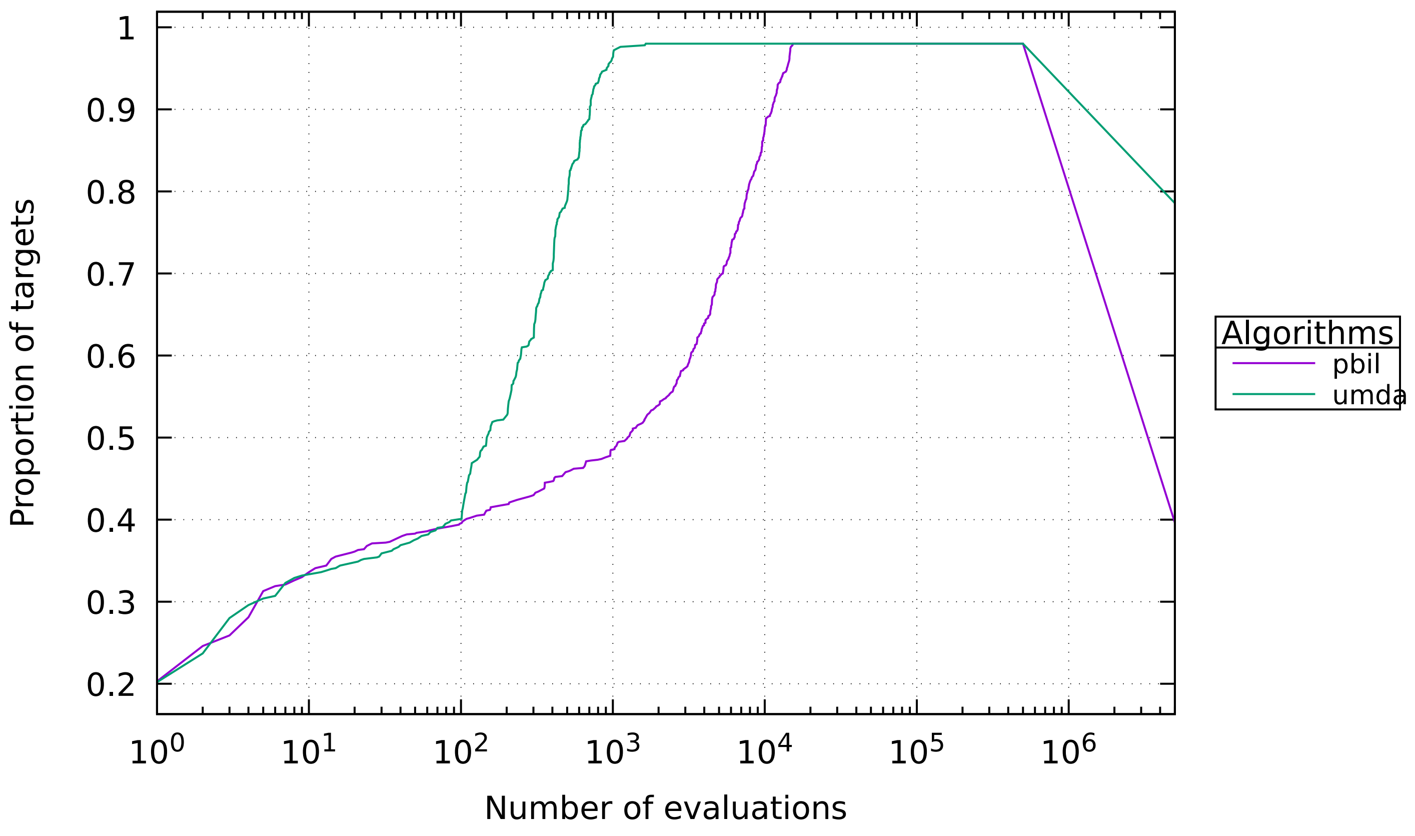
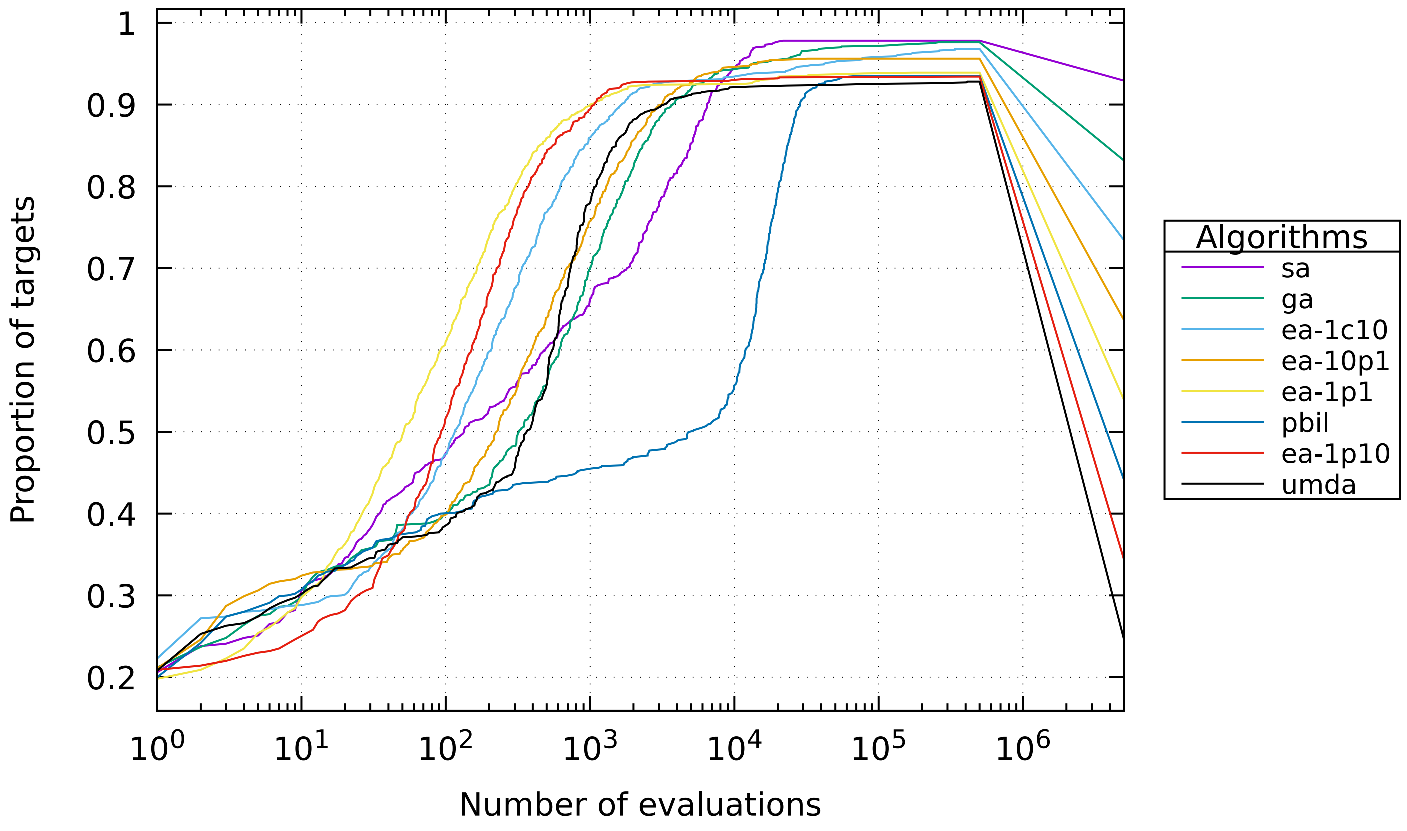


20 Results for walsh2

20.1 All algorithms



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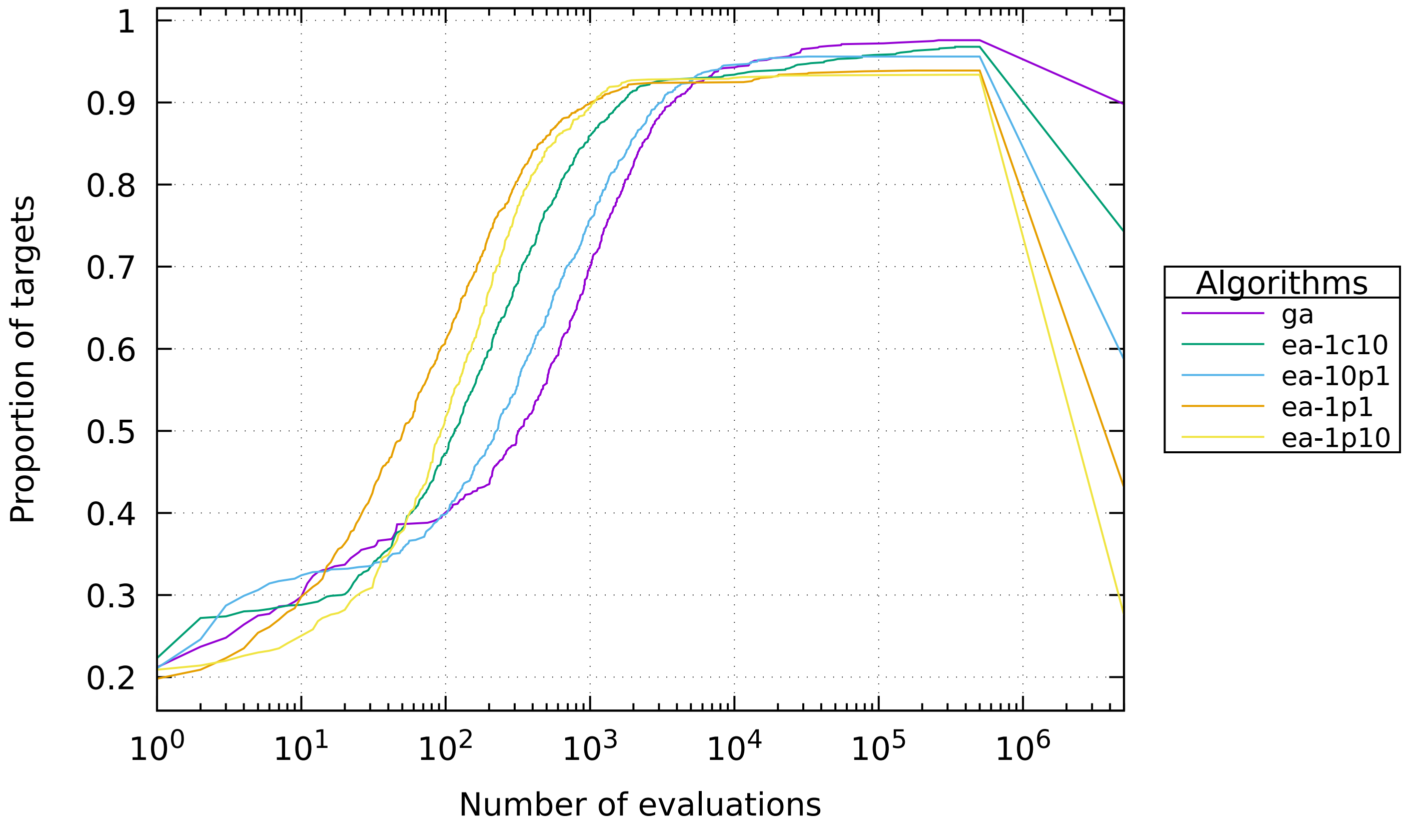

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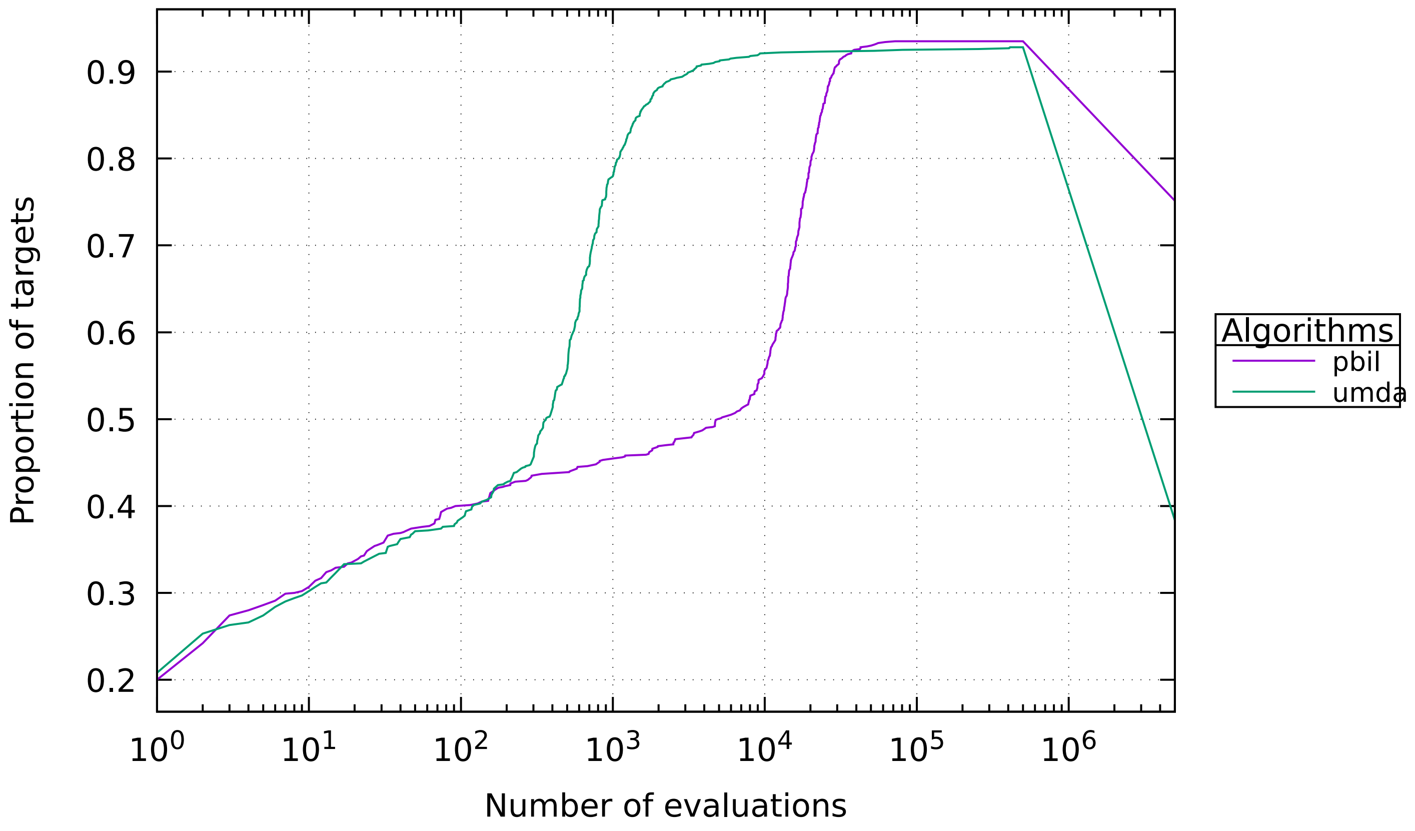

References

Nikolaus Hansen, Anne Auger, Dimo Brockhoff, Dejan Tusar, and Tea Tusar. COCO: performance assessment. *CoRR*, abs/1605.03560, 2016. URL `http://arxiv.org/abs/1605.03560`.

A Plan

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        },
        {
            "id": "plateau",
            "opt": "-F 130 --stop-on-maximum"
        },
        {
            "id": "walsh2",
            "opt": "-F 162 -p instances/walsh2.100"
        }
    ],
    "algorithms": [
        {
            "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
# 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
```