

Sparkle Algorithm Portfolio report

Generated by *Sparkle* (version: 0.9.3.2)

June 24, 2025

1 Introduction

Sparkle [2] is a multi-agent problem-solving platform based on Programming by Optimisation (PbO) [1], and would provide a number of effective algorithm optimisation techniques (such as automated algorithm configuration, portfolio-based algorithm selection, etc.) to accelerate the existing solvers.

2 Selection: RandomForestClassifier on PTN

In this scenario, a RandomForestClassifier (MultiClassClassifier) was trained on the performance and feature data using ASF-lib. The following solvers were run with a cutoff time of 60.0 seconds:

- **Solvers/CSCCSat** (1 configurations)
- **Solvers/MiniSAT** (1 configurations)
- **Solvers/PbO-CCSAT-Generic** (1 configurations)

The following training instance sets were used:

- **PTN** (12 instances)

The following feature extractors were used with a extractor cutoff time of None seconds:

- **SAT-features-competition2012 revised without SatELite** (54 features)

2.1 Training Results

In this section, the PAR10 results for the portfolio selector on solving the training instance set(s) listed is reported. The PAR10 values for the Virtual Best Solver (VBS), i.e., the perfect portfolio selector is **303.8595**, the actual portfolio selector performance is **303.9804**.

Below, the solvers are ranked based on PAR10 performance:

1. **Solvers/CSCCSat** (Default): 303.9804
2. **Solvers/MiniSAT** (Default): 401.2956
3. **Solvers/PbO-CCSAT-Generic** (Default): 550.6189

Single Best Solver vs Selector

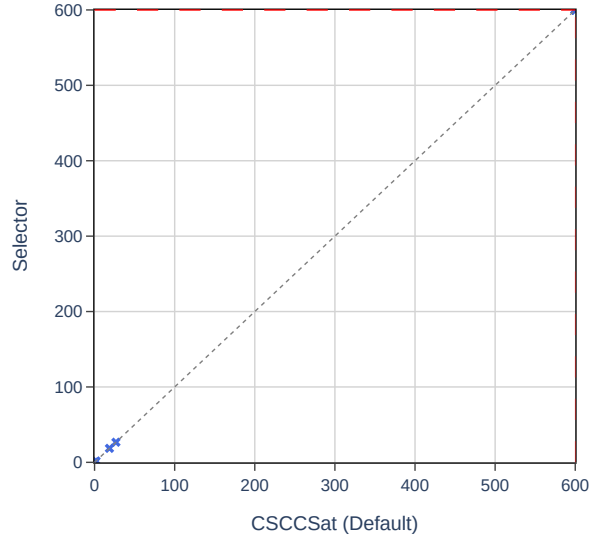


Figure 1: Empirical comparison between the Single Best Solver and the Selector

2.1.1 Marginal Contribution Ranking List

The following list shows the marginal contribution ranking list for the VBS:

1. **Solvers/CSCCSat** (Default): 1.3207 (401.2956)
2. **Solvers/MiniSAT** (Default): 1.0004 (303.9804)
3. **Solvers/PbO-CCSAT-Generic** (Default): 0.0 (303.8595)

The following list shows the marginal contribution ranking list for the actual portfolio selector:

1. **Solvers/CSCCSat** (Default): 1.3201 (401.2956)
2. **Solvers/MiniSAT** (Default): 0.0 (303.9804)
3. **Solvers/PbO-CCSAT-Generic** (Default): 0.0 (303.9804)

2.1.2 Scatter Plot Analysis

Figure 1 shows the empirical comparison between the portfolio selector and the single best solver (SBS). Figure 2 shows the empirical comparison between the actual portfolio selector and the virtual best solver (VBS).

Virtual Best Solver vs Selector

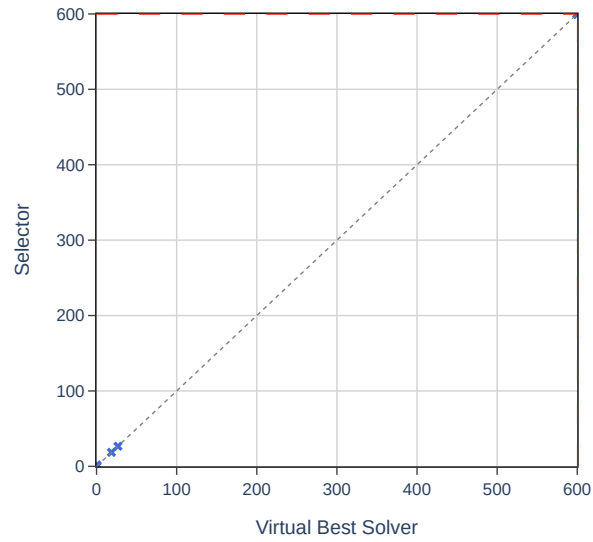


Figure 2: Empirical comparison between the Virtual Best Solver and the Selector

References

- [1] Holger H. Hoos. Programming by Optimization. *Communications of the ACM*, 55(2):70–80, 2012.
- [2] Holger H. Hoos. Sparkle: A pbo-based multi-agent problem-solving platform. Technical report, Department of Computer Science, University of British Columbia, 2015.