Sparkle: Towards Automated Algorithm Configuration for Everyone

Koen van der Blom\textsuperscript{1}, Chuan Luo\textsuperscript{2}, Holger H. Hoos\textsuperscript{1,3}  

\textsuperscript{1}Leiden University  
\textsuperscript{2}Microsoft Research Asia  
\textsuperscript{3}University of British Columbia  

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Sparkle

- Make meta-algorithmics more accessible
- Selection
- Configuration
- Best practices
Algorithmic problem solving

- Problem, e.g. SAT

- Is my solver the best?
  - Or, for which instances is it?
Algorithm selection

1. Training instances
2. Feature extractor
3. Instance
4. Selector
5. Solver
6. Result
Algorithm selection

- Surely, it can be simpler?

- But where do the solver and selector come from?
Sparkle is not (entirely) magical

- Someone has to set it up
  - Simple commands!
  - `add_solver`
  - `add_feature_extractor`
  - ...

- Who?
  - Solver developers
  - Competition organisers
  - Scientists
  - Or anyone
Report

• Instance set

• Selector, e.g. AutoFolio [Lindauer et al 2015]

• Settings, e.g. cut-off time

• Solvers, and their contributions

• Ingredients to write a paper!
Cooperative competition

• Traditional competitions
  • Measure overall performance
  • Winner takes it all

• Marginal contribution [Xu et al 2012]
  • Measure contribution
  • Shared credit
  • How valuable is this solver to the selector
Successful applications

- Sparkle SAT Challenge [Luo, Hoos 2018]
- Sparkle Planning Challenge [Luo, Vallati, Hoos 2019]

<table>
<thead>
<tr>
<th>Solver</th>
<th>New rank</th>
<th>Standalone rank</th>
<th>(relative) marginal contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROBE</td>
<td>1</td>
<td>4</td>
<td>34.77%</td>
</tr>
<tr>
<td>dual-bfws</td>
<td>2</td>
<td>1</td>
<td>23.25%</td>
</tr>
<tr>
<td>PASAR</td>
<td>3</td>
<td>6</td>
<td>22.13%</td>
</tr>
</tbody>
</table>

Table from [Luo, Vallati, Hoos 2019]
Sparkle planning challenge
Algorithm configuration

- What are the best settings for my solver?
Algorithm configuration

Parameter space

Scenario

Configurator

Parameter settings

Training instances

Solver
Algorithm configuration

- Surely, it can be simpler…?

- Okay, but someone needs to set it up
Configuration in Sparkle

• Setup with simple commands
  • compute_features
  • configure_solver

• Fair comparison between solvers

• Credit: Sparkle reports which tools were used
What is next?

• Can we simplify things further?

• Can we ‘learn’ the parameter space?
  • Generate based on a few examples?

• Best practices, pitfalls [Eggensperger et al 2019]
Take home

• Algorithm configuration should be easily accessible to everyone

• Low barrier to applying best practices and avoiding pitfalls

• Credit where credit is due
  • Solvers
  • Configurators
  • Selectors

k.van.der.blom@liacs.leidenuniv.nl