Explainable Planner Selection

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Workshop on Explainable AI Planning

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Motivation
Motivation
Motivation
SymBA*
Motivation

SymBA*

Complementary1
Motivation

SymBA*

Complementary

Symple-1
Motivation

SymBA*

Complementary1

Sympyle-1

...
Motivation

SymBA*

Complementary1

Symplyle-1
Given:

\[ P = \{ \text{SymBA}^*, \text{Complementary1}, \text{Symple-1}, \ldots \} \]
\[ T = 1800\text{s} \]

Portfolio Selector:

\[ f : \text{Tasks} \rightarrow P \]
Delfi (Katz et al., 2018)

Images from the Noun Project: RomStu (file), Agni (network), Alfa Design (image), Samuel Dion-Girardeau (brain)
Delfi (Katz et al., 2018)

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- Problem Description Graph (Pochter, Zohar, and Rosenschein, 2011)
- Abstract Structure Graph (Sievers et al., 2019)

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128x128 pixels

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- Convolutional Neural Network (CNN)

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Contributions

- Explainable techniques and understandable features
- identify important features
- investigate which planners are selected
Machine Learning Techniques

**Linear Regression**

\[ X \cdot \text{weights} = 0 \]

**Multi-Layer Perceptron**

**Decision Tree**

Q1

Yes \rightarrow Q2

No \rightarrow \ldots

Q2

Yes \rightarrow \ldots

No \rightarrow \ldots
# Training

- data set of Ferber et al. (2019)
  - tasks, runtimes
- extract features
- train **one** model per planner
- labels: time, logtime, coverage
- 10 repetitions

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Features

Feature augmentations: normalize
### Performance

<table>
<thead>
<tr>
<th></th>
<th>Linear Regression</th>
<th>MLP</th>
<th>RF</th>
</tr>
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<tr>
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<tr>
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<td>logtime</td>
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<tr>
<td>time</td>
<td>86.5</td>
<td>86.5</td>
<td>86.5</td>
</tr>
</tbody>
</table>
Feature Importance

- requires negative preconditions
- max parameters per predicate
- mean negations per effect
- mean predicates per effect
- requires conditional effects
- requires equality
- max predicates per effect
- #types
- min predicates per effect
Planner Choices

- Delfi
- MLP
- LR
- RF
Single Decision Tree

#atoms / #objects $\leq 6.9$

- true
  - #atoms $\leq 266.5$
    - true: SymBA*
    - false: h2+DKS+iPDB

- false
  - median #objects per type $\leq 22.5$
    - true: SymBA*
    - false: h2+OSS+LM-cut
Explainable planner selection ...

- is possible
- let’s us identify important features
- learns the right planner for a domain
- can be as simple as a single decision tree

