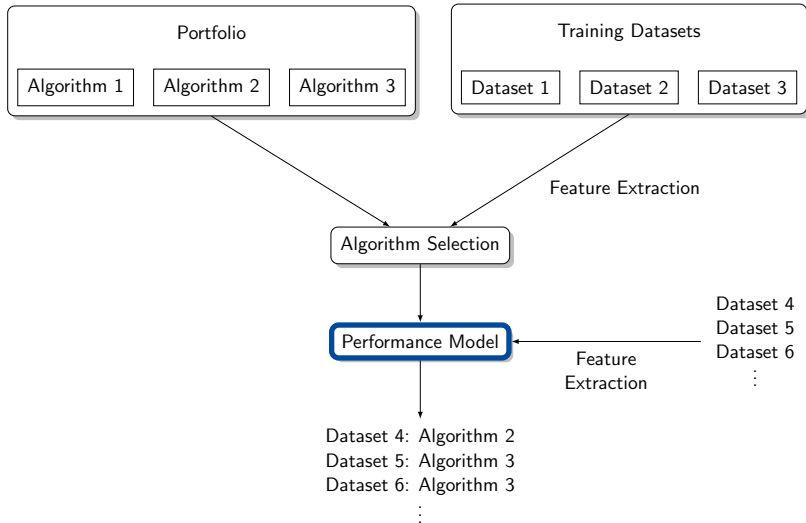


# AutoML: Algorithm Selection

## Performance Models

Bernd Bischl   Frank Hutter   Lars Kotthoff  
Marius Lindauer   Joaquin Vanschoren

# Algorithm Selection



# Types of Performance Models

- models for entire portfolios
- models for individual algorithms
- models that are somewhere in between (e.g. pairs of algorithms)

→ for each of these, many different machine learning approaches are suitable

# Models for Entire Portfolios

- predict the best algorithm in the portfolio (e.g. classifier to use)
- alternatively: cluster in meta-feature space and assign best algorithm to each cluster

optional (but important):

- attach a “weight” during learning (e.g. the difference between best and worst algorithm) to bias model towards the “important” datasets
- special loss metric

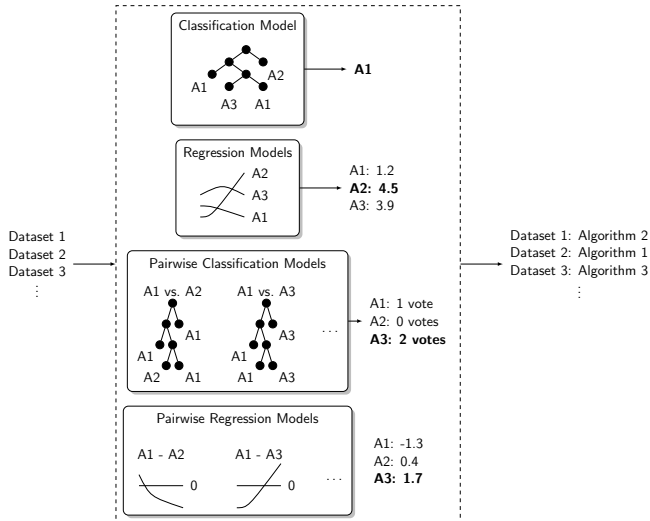
# Models for Individual Algorithms

- predict the performance for each algorithm separately
- combine the predictions to choose the best one
- for example: predict accuracy, choose algorithm with highest predicted accuracy

# Hybrid Models

- for example: consider pairs of algorithms to take relations between them into account
- for each pair of algorithms, learn model that predicts which one has better performance, or predicts performance difference
- ... or collaborative filtering approaches

# Types of Performance Models



# Types of Predictions/Algorithm Selectors

- best algorithm (and its performance)
- $n$  best algorithms ranked
- ensemble of  $n$  best algorithms



# Time/Frequency of Prediction

- one-shot
  - ▶ select algorithm(s) once
  - ▶ want to process single dataset and choose the best approach
- multi-shot
  - ▶ continuously monitor dataset(s) features and/or performance
  - ▶ for example on data streams or to process sets of datasets