AutoML: Algorithm Selection

Overview and Motivation

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Algorithm Selection

Given a problem, choose the best algorithm to solve it.

[Rice, John R. "The Algorithm Selection Problem." Advances in Computers 15 (1976): 65–118.]

Algorithm Selection

More formally

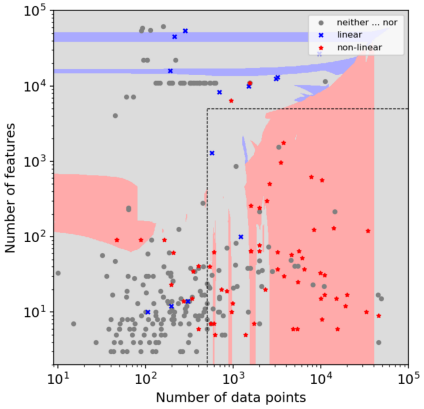
Let

- $p(\mathcal{D})$ be a probability distribution over datasets $\mathcal{D} \in \mathbf{D}$,
- $\mathbf{P}$ a portfolio of algorithms $\mathcal{A} \in \mathbf{P}$, and
- $c : \mathbf{P} \times \mathbf{D} \to \mathbb{R}$ be a cost metric

the *per-instance algorithm selection problem* is to obtain a mapping $s : \mathcal{D} \mapsto \mathcal{A}$ such that

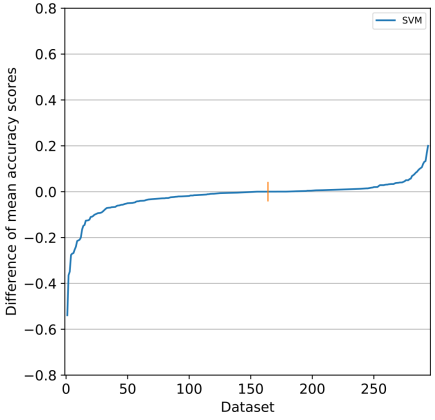
$$\arg\min_{s} \int_{\mathbf{D}} c(s(\mathcal{D}), \mathcal{D}) p(\mathcal{D}) \, \mathrm{d}\mathcal{D}$$

Motivation: Performance Differences I



[Strang, Benjamin, Peter van der Putten, Jan N. van Rijn, and Frank Hutter. "Don't Rule Out Simple Models Prematurely: A Large Scale Benchmark Comparing Linear and Non-Linear Classifiers in OpenML." In Advances in Intelligent Data Analysis XVII, 303–15. Springer 2018.]

Motivation: Performance Differences II



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