Replacing the Ex-Def Baseline in AutoML by Naive AutoML

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The Ex-Def Baseline

- Is just to cross-validate all learners and pick the best one (no pre-processors considered).
- Proposed (and used only) in the 2013 Auto-WEKA paper.
- Claimed to be outperformed but in fact (much) stronger than one would expect.
- We extend this baseline by also including pre-processors, meta (ensembles) learners, and some random parameter tuning.

Naivity Assumption

Formulation

Let $\phi(D, c_1 \circ .. \circ c_{k+1})$ be the prediction performance of the pipeline consisting of transformers $c_1, .., c_k$ and estimator c_{k+1} on dataset D. *Naive* assumption:

$$c_i^* \in \arg\min_{c_i} \phi(D, c_1 \circ .. \circ c_{k+1})$$

is *invariant* to the choices of $c_1, ..c_{i-1}, c_{i+1}, .., c_{k+1}$.
If we consider the search space an urn and denote as Y the event to observe an optimal pipeline in the urn, then

$$P(Y \mid c_1, .., c_{k+1}) \propto P(c_1, .., c_{k+1} \mid Y)P(Y)$$
$$= P(c_i \mid Y) \prod_{j=1, j\neq i}^{k+1} P(c_j \mid Y)P(Y)$$

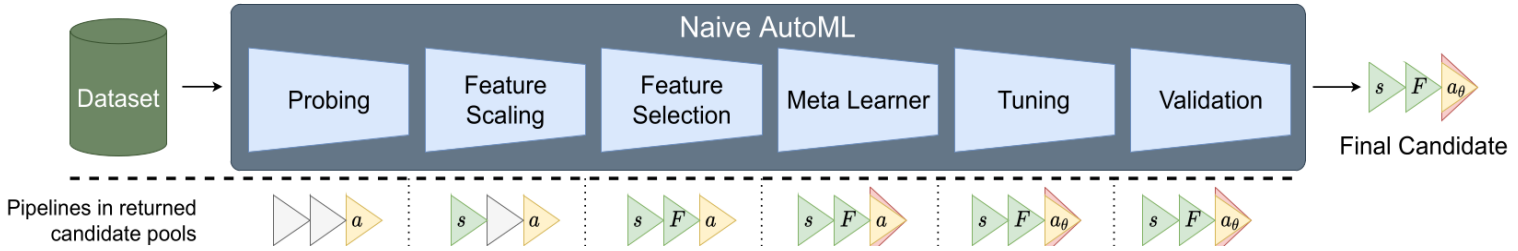
Implication

The naivity assumption allows to optimize all parts in isolation.
Or at least to have only a lose coupling.

Naive AutoML

Idea

Optimize different aspects of the ML pipeline in sequentially *isolated stages*.



Results (ranks after 1h runtime, summarizing 67 datasets from AutoML Benchmark)