

Zero-Shot AutoML with Pretrained Models

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(*equal contrib.)

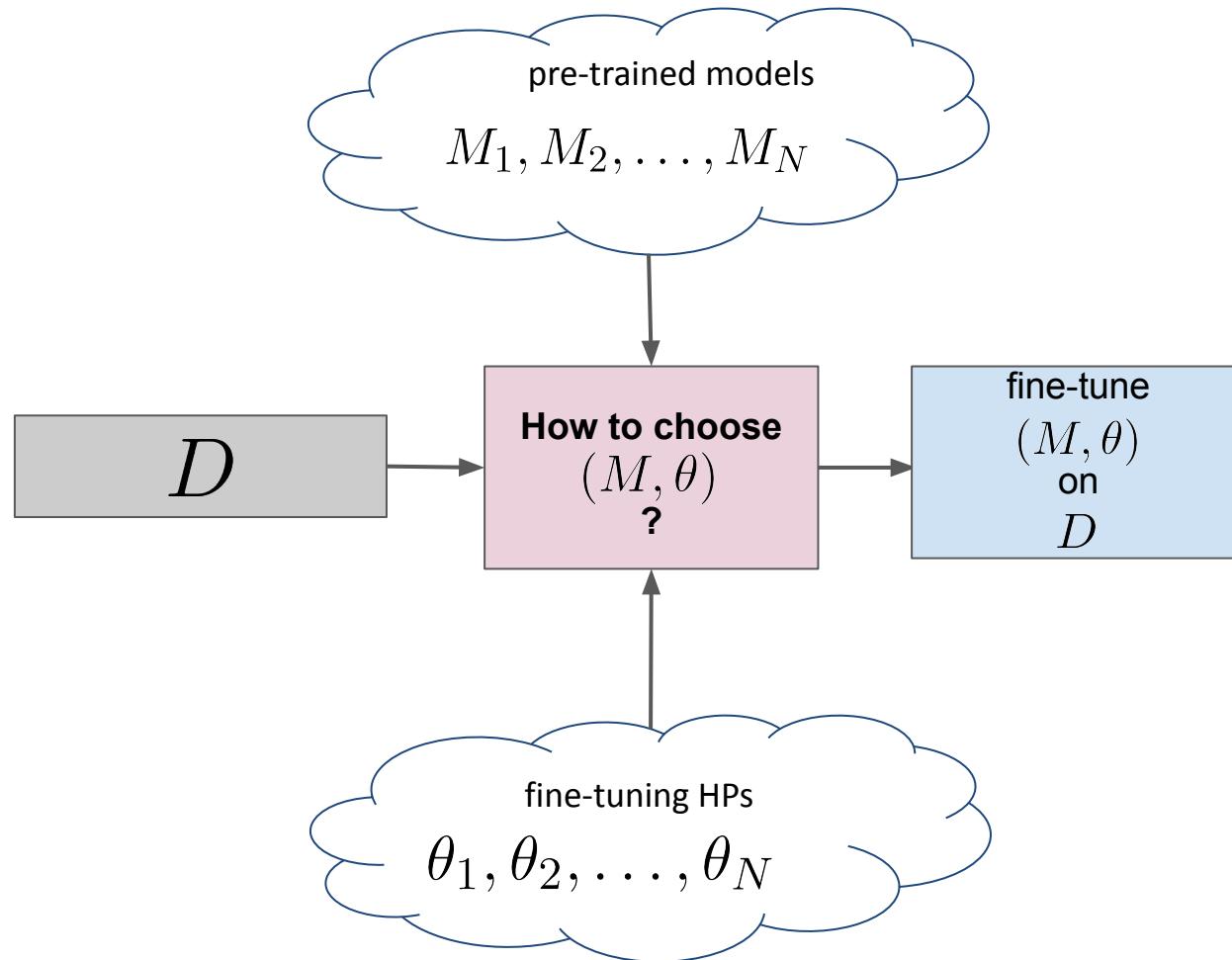
<https://github.com/automl/zero-shot-automl-with-pretrained-models>



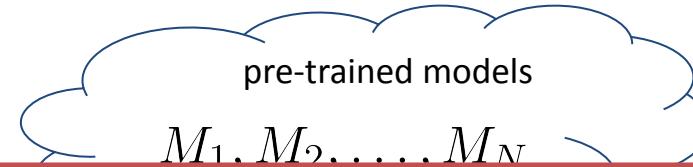
Code



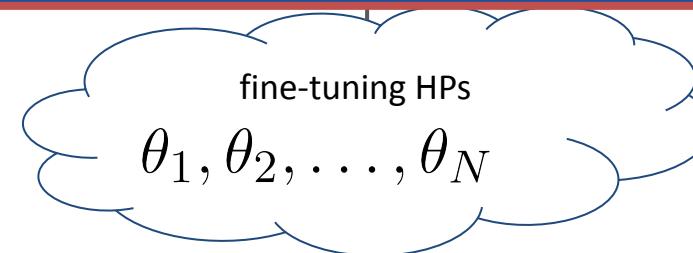
Motivation



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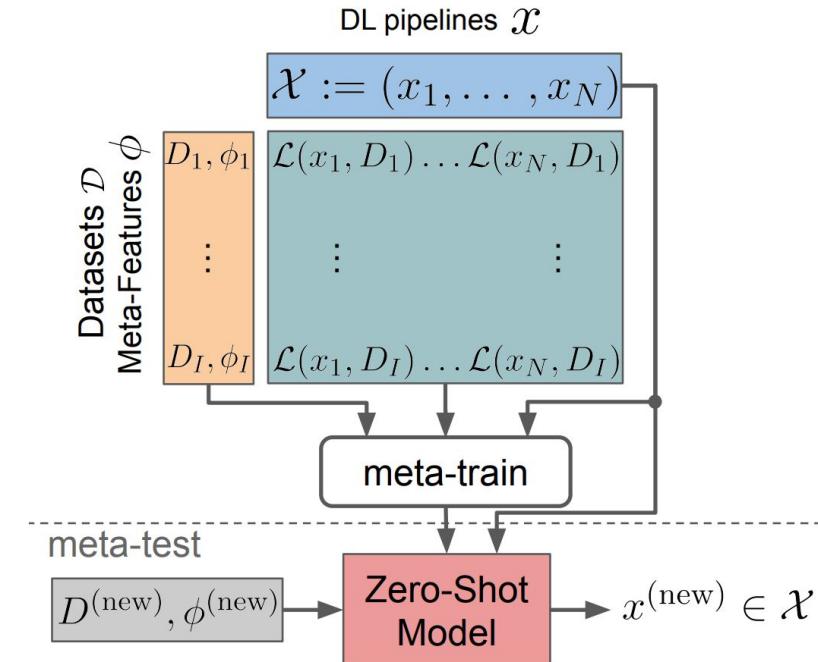


We **extend AutoML** to best make such choices. Our **domain-independent, meta-learning** approach learns a **zero-shot model** that allows to select the **right DL pipeline** **given only trivial meta-features of D**



Approach

- We leverage a **cost matrix** to learn a **joint response surface** conditioned on
 - **meta-features** and
 - **DL pipelines**
- At meta-test time, the **zero-shot model predicts scores of the pipelines trained on unseen datasets**



Approach

- Zero-shot AutoML with Pretrained Models with **Algorithm Selection** (ZAP-AS)
 - learn a **selector** between DL pipelines with AutoFolio
 - yields already **very good performance!**
 - **Drawback:** AS abstracts away our DL pipelines as **uncorrelated**
- Zero-shot AutoML with Pretrained Models with **Hyperparameter Optimization** (ZAP-HPO)
 - interprets the space of **DL pipelines** as **search space for HPO**
 - train an **NN-based selector** with a **pairwise ranking** (of configurations) **objective**

Meta-Dataset

- Meta-Dataset:
 - **set of datasets with meta-features**
 - a set of **DL pipelines**
 - **test costs** for the pipelines on the datasets
- Datasets:
 - **35 core datasets** from TensorFlow Datasets
 - **Diversity**: small, large, colored, b/w, various image resolutions & domains
 - **augmented** each core dataset **15 times**
 - **525 datasets in total**

DL Pipeline Design Space & Optimization

- based on the winning approach of the AutoCV competition
- built a highly parameterized space of DL pipelines around this with **26 hyperparameters**
- **Applied HPO to optimize for the Area under the Learning Curve (ALC) score introduced in the AutoDL challenge**
- **Result:** one optimized DL pipeline per dataset
- To arrive at the described **meta-dataset**, we evaluated each **525 pipelines across all 525 datasets**
→ **Meta-Dataset with 275 625 cost entries**

Results: Own benchmark



Results: AutoDL Benchmark

Solution	Rank (ALC)
DeepWisdom	2.46 ± 0.13
DeepBlueAI	2.76 ± 0.08
PASA NJU	2.62 ± 0.11
ZAP-HPO	2.16 ± 0.15

Thank you!

- Please do check out our paper for more details or stop by our (physical) poster at ICML!