AutoML: Neural Architecture Search (NAS)

NASLib: A Modular and Extensible NAS Library

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Marius Lindauer   Joaquin Vanschoren

Motivation for NASLib [Zela et al. 2020]

NASLib is a framework for easily implementing different NAS methods, aiming to:

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  - Different search and evaluation pipelines
  - Different hyperparameter settings
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- Modularize different components of NAS optimizers to allow combining them
- Offer researchers a convenient way of prototyping new NAS methods
- Offer users reliable implementations of NAS methods
  - Facilitate the use of NAS for new search spaces
  - Develop a robust true AutoML framework

NASLib building blocks: Search Spaces, Optimizers, Evaluators

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- NASLib's main building block is the graph object represented as a NetworkX [1] graph
  - Easily manipulate the graph by adding/removing nodes/edges
  - Hide complexity of dealing with the PyTorch computational graph
  - Easy high-level way of creating complex structures, e.g., hierarchical search spaces

[1] https://networkx.github.io/

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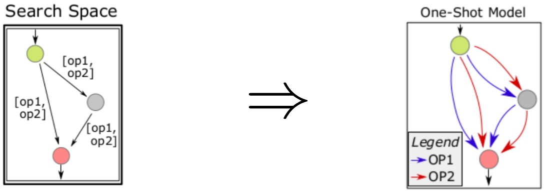

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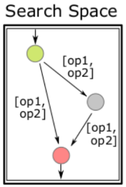

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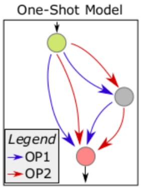
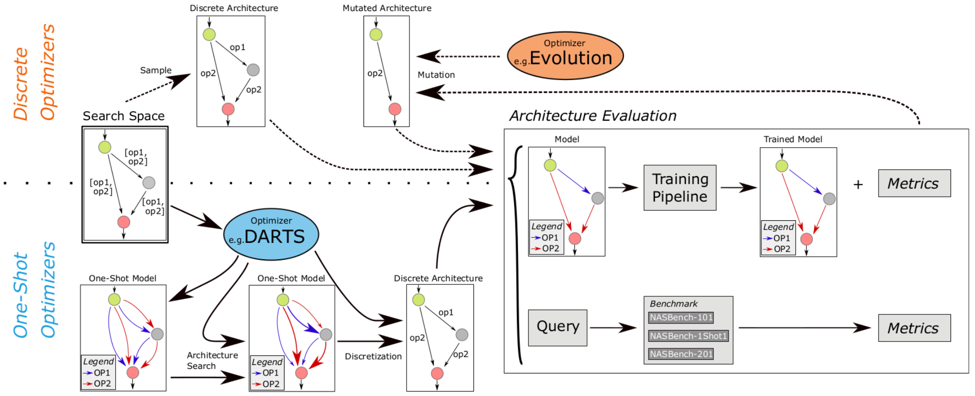


- Depending on the optimizer, each operation choice in the NetworkX object becomes:
  - a `MixedOp` – for one-shot NAS optimizers, e.g. DARTS
  - a `CategoricalOp` – for black-box optimizers, e.g. Regularized Evolution

NASLib: Overview



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- NAS-Bench-201 [Dong and Yang. 2020]
  - Much smaller than NAS-Bench-101 and largest NAS-Bench-1Shot1 subspace
    - 15 625 architectures
  - Every architecture in the search space evaluated on 3 image classification datasets

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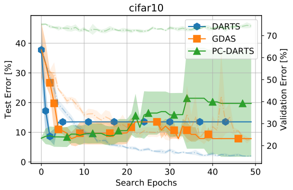

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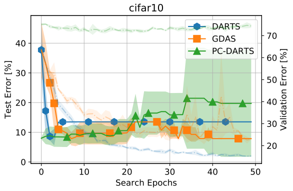

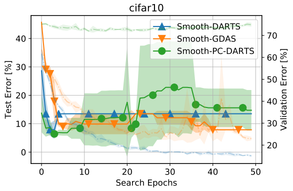

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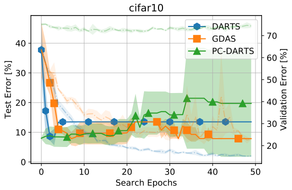
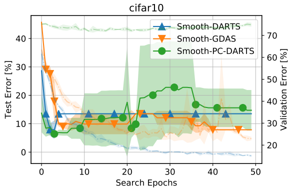
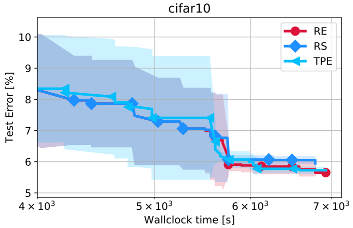
- We can also evaluate black-box optimizers cheaply with a tabular benchmark







Opportunities with NASLib

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- Applications of NAS to your problem of interest, with interesting search spaces
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Room for interesting Hiwi projects

- Not everything is perfect yet, we can use lots of support by great programmers

Questions to Answer for Yourself / Discuss with Friends

- Repetition:
  What would one have to do in order to apply the methods in NASLib to a new search space?
- Discussion:
  Is there a problem of your interest that you would you like to apply the methods in NASLib to?
- Discussion:
  Given that NASLib's modular design allows mixing and matching components of one-shot NAS methods, which of the methods we discussed might make sense to combine?

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