



Algorithmic Reasoning with Graph Neural Networks

Neural Algorithmic Reasoning (NAR) tries to bridge the gap between classical algorithms and modern learning networks. The goal is to combine the advantages of algorithmic reasoning, which can generalize to arbitrary instances and gives provable guarantees with the learning power and general applicability of neural networks. A promising approach to study NAR is with using Graph Neural Networks (GNNs) due to their ability to handle instances of different sizes and easily argue about relationships between items. The [CLRS](#) benchmark, a vast collection of common algorithms covering graph algorithms, sorting, strings or DP, has recently gained lots of traction in evaluating neural reasoning capabilities.



We have developed a new extension called [SALSA-CLRS](#), which focuses specifically on scalability and sparseness. The goal of this thesis would be to further investigate how neural algorithmic reasoning could be approached: either by coming up with new ideas or further developing the SALSA benchmark by extending the list of tasks or coming up with novel scalable graph architectures.

what to do what to try

Requirements: Strong motivation, knowledge in deep learning, or a solid background in graph theory, machine learning, Python and PyTorch. We will have weekly meetings to discuss open questions and determine the next steps.

Interested? Please contact us for more details!

Contact

In a few short sentences, please tell us why you are interested in the project and about your coding and machine learning background (i.e., your own projects or courses).

- Joël Mathys: jmathys@ethz.ch, ETZ G63
- Florian Grötschla : fgroetschla@ethz.ch, ETZ G63