





Prof. R. Wattenhofer

## Evaluating Positional Encodings for Graph Transformers

Graph Transformers are a recent development in graph learning that provides state-of-theart performance on many tasks. Whereas transformers on natural language operate on sequences, graph transformers have to extract information from more general graph topologies. The usual positional sequence encodings used in LLMs are, therefore, not sufficient and need to be extended. Several positional and structural encodings have been proposed, for example based on shortest path or random walk distances between nodes.

In this project, we want to investigate the effectiveness of different encodings on a wide variety of tasks to provide a comprehensive overview of their empirical performance, which is currently missing but hugely important. We can naturally develop and try new encodings, which is encouraged. For a master's thesis, we will extend the project and look into graph tokenization, requiring new encodings and more thorough theoretical investigations. To get started with graph transformers and the latest state-of-the-art model, you should have a look at these papers:

- GraphGPS
- GRIT: We will probably build on top of this!

**Requirements:** Ability to work independently and determined to obtain results, creative thinking, knowledge of Machine Learning and Python. Ideally has worked with graph learning frameworks such as pyG before.

## Contact

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