

Master thesis in Deep Learning and Transformers

The bioinformatics and machine learning research group (<https://bit.cs.tum.de/>) at TUM Campus Straubing for Biotechnology and Sustainability is looking for a motivated candidate for a master's thesis with the topic

“Deep Learning for Job Shop Scheduling”.

Combinatorial Optimization plays a critical role in many real-world applications in fields as diverse as logistics, manufacturing, genomics, and synthetic biology. The NP-hard nature of these problems and their complex variations make them exceptionally difficult to solve. Traditional methods typically rely on exact algorithms and heuristics based on decades of research. However, they struggle with scalability and adaptability to other problems. To overcome these limitations, the success of deep learning has led to the emergence of the field of **Neural Combinatorial Optimization (NCO)**, which departs from traditional methods to leverage the generalization capabilities of neural networks. Here, neural networks are trained to generate near-optimal solutions by learning from data without manually crafting algorithmic rules.

Job Shop Scheduling is one such complex problem that is receiving much attention from the NCO community. It stems from manufacturing and involves scheduling a set of jobs on a set of machines so that the time required to complete all jobs is minimized.

We are looking for a master's thesis that summarizes the current state-of-the-art in Job Shop Scheduling, and implements ideas based on recent methods that were developed within our research group and published in leading machine learning venues (<https://openreview.net/forum?id=agT8ojoH0X>, <https://arxiv.org/abs/2407.17206>). **Being able to base your thesis on our existing methods guarantees a stable foundation of your thesis, quick start and thorough guidance!**

During your thesis, you will learn to understand Transformers in detail – the main building block of modern language models!

Your tasks:

- Literature research on recent advances in NCO.
- Extend existing neural network architectures for Deep Learning based Job Shop Scheduling.
- Perform ablation studies to better understand the relative importance of neural network design choices.

Your skills:

- You are close to finishing your master's degree, preferably in computer science, mathematics, data science or a related field.
- Very good mathematical and machine learning background.
- Very good programming knowledge and skills in Python.
- Ability to work and learn new topics autonomously.
- Proactive, goal-oriented, and communicative way of working
- Good language competence in English, written as well as spoken

Please send your application including a current transcript of records, to:

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