Karlsruhe Institute of Technology

Data Science in Mechanical Engineering

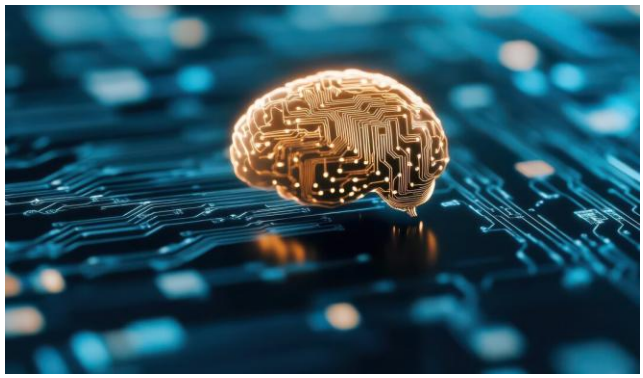
LLM-enabled Automated Heuristic Design

HIWI Job Offer

Heuristics drive real-world systems in production and logistics—but designing them manually is time-consuming and costly. In this student position, you will apply Large Language Models (LLMs) to automatically generate and improve heuristics for complex optimization problems. You will gain hands-on experience at the intersection of generative AI and operations research.

Research Area and Background

Heuristics are widely used in production and logistics to solve complex combinatorial optimization problems. Recent advances in Large Language Models (LLMs) enable automated heuristic design by generating and evolving solution strategies in an evolutionary loop. In this project, we go beyond single-problem settings and study coupled optimization problems, where multiple interdependent subproblems must be solved jointly for high overall performance. You will work on developing LLM-driven methods that coordinate and evolve heuristics across these interacting components, tackling challenging real-world optimization scenarios.



Your Task and Research Challenges

- Support the development (Python) of LLM-based methods for automated heuristic design in combinatorial optimization
- Implement and extend evolutionary frameworks for generating and refining heuristics
- Conduct experiments, evaluate performance, and analyze results on benchmark
- Document findings and contribute to research reports or publications

What we offer

- Hands-on experience with cutting-edge research at the intersection of Large Language Models and optimization
- Flexible working hours compatible with your studies
- Possibility to contribute to publications and build a strong profile for future academic or industry careers
- Close collaboration with researchers and guidance on scientific work

Do you want to work on cutting edge LLM research?

Type: Student assistent job offer 8 h/week

Date: As soon as possible

Supervisors: M.Sc. Thomas Bömer

Contact: thomas.boemer@kit.edu

We look forward to receive your application (inc. current grade transcript)!