



Artificial Intelligence for Improved Container Loading Efficiency (PhD position)

The Combinatorial Optimization group within the Institute of Discrete Mathematics at Graz University of Technology is seeking a PhD student to work on an applied optimization project aiming at efficient solutions for real-world container loading problems as a contribution to a greener future.

Context of position/Advisors

A fully funded PhD position is offered for 3 years. The starting date is September 1, 2024 (slightly later or earlier starting dates are possible upon mutual consent). The annual gross salary is 50103.2 Euro (employment for 40 hours per week, no teaching obligations involved). The position is part of the research project “Artificial Intelligence for Improved Container Loading Efficiency” (AI4CL) which is funded by the Austrian Research Promotion Agency (FFG) within the AI for Green funding call. The project will be carried out in collaboration with the start-up S2data (<https://www.s2-data.at/>) which is offering software-as-a-service solutions for holistic supply chain optimization. The PhD student will be supervised by Eranda Dragoti-Çela and Bettina Klinz on the side of Graz University of Technology and by Stefan Lendl on the side of S2data.

Goals/PhD topic

The goal of the project is to develop new algorithms for container loading problems. The task there is to find an efficient placement of boxes into transport containers such that special loading constraints (e.g., box stacking rules, weight distribution rules, rules about the placement location of dangerous goods) are satisfied. A special focus within this project will be on achieving *more efficient and greener* transports.

From a methodological point of view, the project will involve approaches from different areas of mathematical optimization, computer science and operations research. The developed suite of algorithms will vary strongly in their mathematical foundation. Techniques that we envisage to make use of include mixed-integer programming, column generation, local search algorithms and metaheuristics, tree search based algorithms with neural network state-evaluations and constraint generation approaches. The developed algorithms will be tested and evaluated not only on existing academic benchmark data but also on real industry data.

Requirements

The candidates must have a master degree (or equivalent in mathematics or a related field with a sound mathematical background by October 2024). Due to the applied character of the project some experience in coding and an interest into optimization problems are an absolute requirement. A solid background in optimization, prior experience with C/C++ or Python, knowledge of MIP solvers and familiarity with machine learning are a plus.

Applications

The application should contain

- a cover letter
- a scientific CV
- higher education certificates/diplomas
- the master thesis, or a recent draft of it (if available)
- names and email addresses of at least two references for recommendation letters, including the master thesis supervisor

More documents can be sent if appropriate. There is no need to send recommendation letters at the deadline - we will contact the corresponding letter writers on demand. Please notify them that we might ask for a letter with a relatively short deadline after the application was sent.

Applications (preferably as a single pdf file) should be sent to:

ai4green-applications@math.tugraz.at

The application deadline is **April 15, 2024**. Late applications will be considered until the position is filled.