

Offer of a doctoral thesis

Ph.D. in machine learning algorithms for column generation

Problem

The use of machine learning techniques to improve the performance of algorithms and heuristics for combinatorial optimisation is becoming increasingly popular. Among the methods for solving combinatorial problems, algorithms using column generation have proven to be successful on many problems, including vehicle routing problems. Compared to other methods, notably meta-heuristics, there are fewer studies on the improvement of algorithms using column generation through machine learning. However, their iterative nature and reliance on linear programming structures opens up many possibilities. The objective of this thesis is to propose machine learning methods to improve column generation algorithms. The proposed methods will be applied to problems encountered in machine learning and combinatorial optimisation. The use of high performance computing will also be considered to allow the solution of large size problems.

Methodology, tools

- Proposal and implementation of decomposition algorithms of the column generation type for problems related to machine learning
- Use of machine learning methods and high performance computing to boost the proposed decomposition algorithms
- Strong algorithmic and programming skills (especially on efficiency issues of algorithms and programs)
- Proficiency in a programming language (C++, Julia, Python, etc.)

Condition of the thesis

The thesis is part of the ANR project ADHOC (High Performance Decomposition Algorithms for Combinatorial Optimisation and Machine Learning) which brings together the University of Lorraine and the University of Luxembourg. The thesis will take place at the University of Lorraine on the site of Metz.

The salary is about 1750€ net.

Starting date: from September 2023

Documents to be provided

- CV
- Transcripts (M1, M2 if possible)
- Letter(s) of recommendation or contact(s)

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