

INTERNSHIP OFFER

Learning convexification process

In the most recent years, mathematical optimization and machine learning have been often combined in hybrid methods that combine the advantages of these two complementary disciplines. We follow the line where Machine Learning (ML) is used for speeding-up methods for solving Mathematical Optimization (MO) problems, i.e., ML4MO. Learning has been used for this purpose in several ways, see, for example, [Iommazzo et al., 2020], where ML is used to configure MO solvers, and [Cuesta et al., 2025], where statistical learning is used to find good quality approximations of mixed integer non linear programs.

Missions of the intern:

For this internship, we focus on learning convexification process of non-convex quadratic problems that consists in solving a class of MO problems, namely, Semi-Definite Programming (SDP) problems.

Required profile:

The ideal candidate has a strong background on mathematical optimization, as well as good coding skills (Julia/JuMP/AMPL,python). Knowledge on SDP methods is a plus. A familiarity with standard tools from statistical and machine learning are appreciated. The candidate is expected to have organizational ease, high motivation and autonomy, and willingness to collaborate in the tasks designated by the researchers involved.

To apply:

Please, send the following documents to Amélie Lambert (amelie.lambert@cnam.fr) and Claudia D'Ambrosio (dambrosio@lix.polytechnique.fr):

- CV
- Transcripts
- Motivation letter

Practical information:

Duration: 4/6 months

Starting date: April 2026

Location: CEDRIC (CNAM)

Supervisors: A. Lambert (CNAM) and C. D'Ambrosio (École Polytechnique)

Opportunities to continue with a Ph.D. on the same topic could be discussed with the interested candidates.

References:

- [Cuesta et al., 2025] M. Cuesta, C. D'Ambrosio, M. Durban, V. Guerrero, R.S. Trindade (2025). "On leveraging constrained smooth additive regression models for global optimization", arXiv:2510.14122.
- [Iommazzo et al., 2020] G. Iommazzo, C. D'Ambrosio, A. Frangioni, L. Liberti (2020). "Learning to Configure Mathematical Programming Solvers by Mathematical Programming". In: Kotsireas, I., Pardalos, P. (eds) Learning and Intelligent Optimization. LION 2020. Lecture Notes in Computer Science, vol 12096. Springer, Cham.
- [Billionnet et al 2016] A. Billionnet, S. Elloumi and A. Lambert Exact quadratic convex reformulations of mixed-integer quadratically constrained problems Mathematical Programming. 158 (1), 235-266 (2016)