Internship project

Title

Minimizing the smoothed gap to solve saddle point problems

Possibility to continue as a PhD candidate

YES (Funding to be confirmed)

Description of the internship

Supervision

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Location and dates of the internship

Address: Télécom Paris, 19 Place Marguerite Perey, 91120 Palaiseau

Date of the beginning of the internship: spring 2025

Team: Signal Statistique et Apprentissage, Laboratory: LTCI

Keywords

convex analysis, primal-dual optimization algorithms, proximal gradient descent

Detailed subject

The self-centered smoothed gap is a new measure of optimality [1] which helps detect early epsilon-solutions of convex contrained optimization problems. Indeed, its value is 0 if and only if we are evaluating it at (x,y), x being an optimal solution and y being a Lagrange multiplier.

This goal of this internship project is to design a new optimization algorithm whose basic idea is to minimize the smoothed gap. Indeed, since the smoothed gap is the sum of a simple non-smooth function and a differentiable function, one can apply to it proximal-gradient type algorithms to find a minimizer.

There are two main challenges to solve:

1. The smoothed gap is not a convex function. Yet, we conjecture that every stationary point is a global minimizer. This needs to be proved.

2. The smoothed gap is defined using a smoothness parameter. The behaviour of the algorithm with respect to this parameter should be studied in order to obtain an efficient method.

[1] Walwil, I., & Fercoq, O. (2024). The Smoothed Duality Gap as a Stopping Criterion. arXiv preprint arXiv:2403.12579.

Candidate profile

- Student enrolled in a master 2 program in AI, Data Science or optimization
- Programming skills in Python
- Very good command of English or French

Application

To send on the advisors

- Curriculum Vitae

- Personalized motivation letter that explains interest of the candidate in the subject (can be directly in the body of the email)

- Grade reports for recent years

Incomplete applications will not be considered.

About the chair AI4I

The Chair AI4I (Artificial Intelligence For Industry) is an initiative that brings together four (academic and industrial) partners: Télécom Paris, Airbus, Idemia and Renault group. Its goal is to drive research behind AI technologies that are mastered and serve human needs. Alongside three industrial leaders, about 25 academic researchers with a wide range of expertise involving theoretical and algorithmic aspects, and a taste for industrial applications are taking part to this project. More information at https://ai4i.telecom-paris.fr/

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