Ph.D. and PostDoc positions in Optimization at IDSIA, USI-SUPSI, Lugano, Switzerland

The Algorithms and Complexity Group of IDSIA, USI-SUPSI, Lugano (Switzerland), opens

- 2 Ph.D. positions
- 1 PostDoc position up to 4 years.

These positions are supported by the Swiss National Science Foundation project "**Computational methods for integrality gaps analysis**", project n. no n° 200021_212929 / 1.

1. **The Project**

Inspired by recent advances in the hybridization of machine learning methods and heuristic/exact search methods, this project investigates how to challenge current state of the art algorithms for optimization problems such as traveling salesman problem, the tree augmentation problem, etc. The approach is innovative, and it aims to generate hard-to-solve instances. This will help to obtain new and better optimization algorithms.

In addition to optimization algorithms, this project studies how to challenge mathematical programming relaxations which play a central role in solving combinatorial optimization problems and analyzing approximation algorithms. An important concept here is the integrality gap, the maximum ratio between the solution quality of the integer linear program (ILP) and of its linear program (LP) relaxation. For many problems the integrality gap of a natural LP (or SDP) formulation is equal to the approximation ratio of the best algorithm as well as the hardness of approximation ratio and essentially represents the inherent limits of the considered relaxation. To some extent integrality gap instances are the “hard” instances for the class of approaches based on linear programming.

2. **Open Positions**

- The 2 Ph.D. positions are for 2+2 years (4 years is expected), and they are supposed to start in 2023. The gross salary is around 50.000 CHF per year, with low taxes. The position involves a moderate teaching load (as teaching assistant) at USI. There is travel support. Candidates should hold (or be close to obtaining) a master's degree in computer science or related areas. A solid background in Algorithms, artificial intelligence, Mathematical Programming is helpful. A good knowledge of written and spoken English is also required (while knowledge of Italian is not needed).

- 1 Postdoc position up to 4 years. The gross salary is around 80.000 CHF per year, with low taxes. There are no teaching duties and there is travel support. Candidates with strong background in mathematics or theoretical computer science will be considered. Candidates should hold (or be close to obtaining) a Ph.D. in Computer Science or related areas and should have a solid publication record. Background in Algorithms, artificial intelligence, Mathematical Programming would be useful. There is no specific deadline; the position will be filled as soon as an eligible candidate with an appropriate background apply.
3. How to apply

PostDoc applications can be sent at any time during the first 3 years of the project.

Ph.D. applications: applicants should submit the following documents (written in English) to Prof. Luca Gambardella (luca.gambardella@usi.ch) and Prof. Monaldo Mastrolilli (monaldo@idsia.ch).

- Curriculum vitae with publications list (if any) and possibly link to the thesis.
- List of exams and their grades obtained during the Bachelor and the Master of Science.
- List of two/three references (with e-mail addresses).
- Motivation letter, including a brief description of past research experience and future interests (1-2 pages).

PostDoc applications: applicants should submit the following documents (written in English) to Prof. Luca Gambardella (luca.gambardella@usi.ch) and Prof. Monaldo Mastrolilli (monaldo@idsia.ch).

- Curriculum vitae with publications list and possibly link to the thesis.
- List of two/three references (with e-mail addresses).
- Motivation letter, including a brief description of past research experience and future interests (1-2 pages).

Applications that are incomplete, submitted to other addresses, or submitted beyond the deadline, will be not accepted.

IDSIA offers an international working environment. Lugano is a tidy and lively town, with a wonderful view on Ceresio lake and mountains around. Ticino Canton offers many opportunities for hiking, biking, skiing, etc. Local restaurants serve very good food.

4. Contact

For any question, do not hesitate to contact:

Prof. Luca Gambardella
luca.gambardella@usi.ch
https://people.idsia.ch/~luca/

Prof. Monaldo Mastrolilli
monaldo@idsia.ch
http://people.idsia.ch/~monaldo/

Lugano, December 13, 2022