

### **Postdoctoral Fellowship**

Funded by Google Grant Program on Mathematical Optimization and Combinatorial Optimization

LIPN (Laboratoire d'Informatique de Paris Nord), UMR CNRS 7030, Université Paris 13

**Context** Re-optimization consists in looking for a new solution by taking into account the original solution and changing in the system. This situation can happen in several fields like, for example, train timetabling or deployment and re-deployment of emergency vehicles. Papers on column generation approach have increased exponentially over the last ten years. This approach is ever more commonly used to solve medium/large scale instances of complex problems to optimality. This study aims at developing different methods (both heuristic and exact) for solving re-optimization problems by means of a column generation approach. The proposed approaches will be tested on several benchmark instances. The instances are derived from different real-life problems such as for example the last three subjects of the ROADEF Challenge. The core of this PostDoc is to investigate the following questions. Given a problem instance with an optimal (or heuristic) solution, and a variation of the problem instance that we obtain through small, local modifications, what can we learn about the new solution? Does the old solution help at all? Under what circumstances does it help? How much does it help? How much does it help for the runtime, how much for the quality of the output?

**Mission** The PostDoc shall contribute to the project by doing the following tasks : To analyse the definition of the re-optimization problem : we would like to study in particular the impact of continuity constraints and penalty function ; to study how to solve the new column generation problem derived from the re-optimization problem to optimality ; and to develop a heuristic approach when the exact algorithms fail since they use too much computational time or the number of useful columns is too large and it is not possible to generate all of them.

**Skills and profile** A strong background in mathematical programming and specially in column generation is required, completed by algorithmic and C/C++ implementation skills.

### **Practical informations**

Location : LIPN (Laboratoire d'Informatique de Paris Nord), UMR CNRS 7030, Université Paris 13. The PostDoc will integrate the AOC team.

Duration : 12 monhs.

Salary : about 2500 Euros / month

Applications should be sent by email to wolfler@lipn.fr and letocart@lipn.fr (including a letter of motivation, a curriculum vitae, a summary of previous research projects and collaborations, a list of publications, names of persons from whom references may be requested).