**A propos du centre ou de la direction fonctionnelle**

The Inria Lille – Nord Europe Research Centre was founded in 2008 and employs a staff of 360, including 300 scientists working in sixteen research teams. Recognised for its outstanding contribution to the socio-economic development of the Nord – Pas-de-Calais Region, the Inria Lille – Nord Europe Research Centre undertakes research in the field of computer science in collaboration with a range of academic, institutional and industrial partners.

The strategy of the Centre is to develop an internationally renowned centre of excellence with a significant impact on the City of Lille and its surrounding area. It works to achieve this by pursuing a range of ambitious research projects in such fields of computer science as the intelligence of data and adaptive software systems. Building on the synergies between research and industry, Inria is a major contributor to skills and technology transfer in the field of computer science.

**Contexte et atouts du poste**

Bilevel programs allow the modeling of situations in which a decision-maker, hereafter the leader, optimizes his/her objective by taking explicitly into account the response of another decision maker or a set of decision makers (the follower) to his/her decisions. Bilevel programs are closely related to Stackelberg (leader-follower) games as well as to the principal-agent paradigm in economics. In other words, bilevel programs can be considered as demand-offer equilibrium models where the demand is the result of another mathematical problem. The structure of bilevel programs allows the modeling of a large number of real-life problems involving two decision makers interacting sequentially hierarchically (2) and (3).

Bilevel programming problems, being generically difficult due to their non-convexity and non-differentiability, it is not surprising that most research to date has focused on the simplest cases of bilevel programs, that is problems having nice properties such as linear, quadratic or convex objective and/or constraint functions.

When the second level problem is NP-hard, the single-level reformulation of the bilevel program based on the KKT conditions cannot be applied because no complete linear description of the convex envelope of the solution set is available. Up to now most of the research devoted to integer bilevel programs has been devoted to the case where the objective functions of both levels are linear (4) and (5).

**Mission confiée**

**Research environment**

The INOCS team aims to develop new models, algorithmic techniques and implementations for optimization problems with complex structure (CS). More precisely, we consider that an optimization problem presents a CS when for example it involves some hierarchical leader-follower structure (bilevel optimisation). Luce Brotcorne is specialist in bilevel optimization with a particular expertise to solve Stackelberg games, while Bernard Fortz has also a strong experience in decomposition methods that will be at the core of algorithms developed in the project.

**References**


**Principalas activités**

The goal of the post-doc is to study the properties of mixed integer bilevel bilinear programs on two levels and develop efficient solution methods. This field of research is very innovative and promising because of many problems of everyday life fall within this framework (e.g. pricing problems) (1). The particular cases of energy pricing problems or joint pricing and location problems could be considered.

**Compétences**

Knowledge of French is not required, but good communication skills and a solid knowledge of English are essential.

**Avantages**

Knowledge of French is not required, but good communication skills and a solid knowledge of English are essential.
- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours)
- Access to vocational training
- Social security coverage

Rémunération
Net monthly salary (after taxes): 2132.97€