2018-00299 - Internship in Continuous Blackbox Optimization

Contract type: Internship agreement
Level of qualifications required: Bachelor's degree or equivalent
Fonction: Internship Research

About Inria
Inria, the French National Institute for computer science and applied mathematics, promotes “scientific excellence for technology transfer and society”. Graduates from the world's top universities, Inria's 2,700 employees rise to the challenges of digital sciences. With its open, agile model, Inria is able to explore original approaches with its partners in industry and academia and provide an efficient response to the multidisciplinary and application challenges of the digital transformation. Inria is the source of many innovations that add value and create jobs.

About the research centre or Inria department
Located at the heart of the main national research and higher education cluster, member of the Université Paris Saclay, a major actor in the French Investments for the Future Programme (Idex, LabEx, IRT, EquipeX) and partner of the main establishments present on the plateau, the centre is particularly active in three major areas: data and knowledge; safety, security and reliability; modelling, simulation and optimisation (with priority given to energy).

The 450 researchers and engineers from Inria and its partners who work in the research centre's 31 teams, the 100 research support staff members, the high-level equipment at their disposal (image walls, high-performance computing clusters, sensor networks), and the privileged relationships with prestigious industrial partners, all make Inria Saclay Île-de-France a key research centre in the local landscape and one that is oriented towards Europe and the world.

Context
As a first step, the student makes herself familiar with the algorithm of [1] as well as with the COCO platform ([2]). Re-implementing the algorithm from [1] in python is then the main step. So far, a Scilab version is available for internal use and can be used as a reference implementation. Since the Scilab code has never been made available to the public, providing the code in python will be a very helpful contribution to the scientific community. Benchmarking the implemented algorithm on the constrained test suite of the COCO platform and interpreting the results from COCO will be the last planned step.

If time allows, the student can furthermore assist in the understanding of the test functions from the existing constrained COCO test suite, for example by numerically analyzing (and visualizing) the proportion of search space volume (close to the optimum or not) that is feasible (in other words the percentage of points that are fulfilling all constraint functions).

Assignment
Assignments:
Under the guidance of the supervisors Anne Auger, Dimo Brockhoff, and Nikolaus Hansen, the recruited person will pursue a research internship around the topic of constrained blackbox optimization. This includes surveying the literature, implementing and improving optimization algorithms and the assistance in the development of a new constrained benchmarking suite for the open source Comparing Continuous Optimizers platform (COCO).

For a better knowledge of the proposed research subject:
More details about the project can be found in the project description here: http://randopt.gforge.inria.fr/thesisprojects/doku.php?id=constrainedopt.

Collaboration:
No concrete collaboration outside the Randopt team is foreseen, but the international COCO development team will be happy to interact with the person recruited.

Responsibilities:
The person recruited is responsible for her own research on adaptive stochastic search algorithms for constrained blackbox optimization and for the implementation of the optimization algorithm by Collange et al.

Steering/Management:

General Information
- Theme/Domain: Optimization, machine learning and statistical methods
- Statistics (Big data) (BAP E)
- Town/city: PALAISEAU
- Inria Center: CRI Saclay - Île-de-France
- Starting date: 3/1/18
- Duration of contract: 5 months
- Deadline to apply: 2/28/18

Contacts
- Inria Team: RANDOPT
- Recruiter: Brockhoff Dimo / dimo.brockhoff@inria.fr

The keys to success
- be motivated and interested in optimization in general
- be fluent in English
- have good knowledge in the python programming language

Conditions for application

Defence Security:
This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST). Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

Recruitment Policy:
As part of its diversity policy, all Inria positions are accessible to people with disabilities.

Warning: you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.
The person recruited will not be in charge of any steering/management.

**Main activities**

Main activities:
- research and development in the context of constrained optimization, benchmarking and the COCO platform
- understand the rationale behind the COCO platform and its algorithm data sets
- re-implement the optimization algorithm by Collange et al. in python, based on the implementation in Scilab
- benchmark the new implementation with the COCO platform and interpret the results
- potentially, investigate numerically the proportion of feasible solutions in the COCO test functions for constrained optimization

Additional activities:
- actively take part in the research environment of the Randopt team (group meetings, etc.)
- actively take part in the development of the open source COCO platform

**Skills**

Technical skills and level required: understanding of the basics of constrained optimization and the benchmarking of them

Languages: python and English

Relational skills: a healthy combination of team player and independent worker

Other valued appreciated: basic Scilab/Matlab knowledge

**Benefits package**

- Subsidised catering service
- Partially-reimbursed public transport
- Social security
- Paid leave
- Flexible working hours
- Sports facilities