2023-06788 - Scientific calculus applied to low-rank matrices

Contract type: Internship agreement
Level of qualifications required: Bachelor's degree or equivalent
Function: Internship Engineering

About the research centre or Inria department

The Centre Inria de l'Université de Grenoble groups together almost 600 people in 22 research teams and 7 research support departments.

Staff is present on three campuses in Grenoble, in close collaboration with other research and higher education institutions (Université Grenoble Alpes, CNRS, CEA, INRAE, ...), but also with key economic players in the area.

The Centre Inria de l'Université Grenoble Alpes is active in the fields of high-performance computing, verification and embedded systems, modeling of the environment at multiple levels, and data science and artificial intelligence. The center is a top-level scientific institute with an extensive network of international collaborations in Europe and the rest of the world.

Context

Recently, Inria's Statify research team has developed a scientific library based on the GLLiM (Gaussian Locally-Linear Mapping) method applied to physical model inversion (https://gitlab.inria.fr/kernelo-mistis/kernelo-gllim-is). The approach leverages the covariance matrices associated with the GLLiM model. However, a notable drawback of this approach is the considerable computational time required when dealing with high dimensions. It is worth noting that the covariance matrices of the GLLiM model are low-rank. The idea is to exploit this property to devise more efficient algorithms.

Assignment

The goal of this internship is to investigate the current state of the art in algorithms for low-rank matrix calculations, including inversion, determinant computation, matrix multiplication, and log density estimation. You will conduct comparative analyses of these algorithms, assessing their efficiency, accuracy, and scalability. The goal is to improve the performance of the GLLiM model in two specific domains: space remote sensing in high-dimensional settings, and medical imaging analysis, with a particular emphasis on Functional Magnetic Resonance Imaging (fMRI).

Main activities

Listen, learn, think, act

Skills

- Currently pursuing a M1 or M2 degree in computer science, electrical engineering, robotics, or a related field.
- Good programming skills in C++
- Familiarity with computational statistics
- Solid understanding of mathematics, especially linear algebra and statistics.
- Strong problem-solving skills and the ability to work both independently and in a collaborative team environment.

Benefits package

- 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) + possibility of exceptional leave (sick children, moving home, etc.)
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage (under conditions)

Remuneration

Gratification = 4,05€ gross / hour

General Information

- Town/city: Montbonnot
- Inria Center: Centre Inria de l’Université Grenoble Alpes
- Starting date: 2024-01-01
- Duration of contract: 6 months
- Deadline to apply: 2023-11-30

Contacts

- Inria Team: SED-RAL (DGD-I)
- Recruiter: Borkowski Stanislaw / stan.borkowski@inria.fr

About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

The keys to success

How to apply:

Please send your application including

- Mandatory: Complete CV
- Mandatory: Letter of motivation (at most one page)
- Mandatory: Degrees and lists of grades (translated to English or French)
- Recommended: Name and e-mail address of at most two references

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.

Instruction to apply
Applications must be submitted online via the Inria website. Processing of applications submitted via other channels is not guaranteed.

**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). Authorization 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.