2021-04188 - Research engineer in geometric data processing for the Geomstats open source library

Type de contrat : CDD
Contrat renouvelable : Oui
Niveau de diplôme exigé : Bac + 5 ou équivalent
Fonction : Ingénieur scientifique contractuel
Niveau d'expérience souhaité : Jeune diplômé

A propos du centre ou de la direction fonctionnelle

The Inria Sophia Antipolis - Méditerranée center counts 34 research teams as well as 8 support departments. The center's staff (about 500 people including 320 Inria employees) is made up of scientists of different nationalities (250 foreigners of 50 nationalities), engineers, technicians and administrative staff. 1/3 of the staff are civil servants, the others are contractual agents. The majority of the center's research teams are located in Sophia Antipolis and Nice in the Alpes-Maritimes. Four teams are based in Montpellier and two teams are hosted in Bologna in Italy and Athens. The Center is a founding member of Université Côte d'Azur and partner of the I-SITE MUSE supported by the University of Montpellier.

Contexte et atouts du poste

In the context of the ERC Advanced grant G-Statistics, a research engineer position (18 months) is offered to contribute to the development and maintenance of the geomstats Python package.

There is an increasing interest in leveraging differential geometry in the machine learning community. Indeed, in many applications the data or the model parameters belong to a manifold, i.e. a space that is defined by a set of constraints or invariance properties, and that only locally resembles the usual Euclidean space. It is now common to account for this geometric structure and to define an adequate Riemannian metric to measure distances on the manifold. Statistics and machine learning methods thus need to be generalized to manifold-valued data, both for mathematical coherence and statistical consistency, but also with the aim to encode prior knowledge into geometric constraints and consequently improve learning. This research field, termed Geometric Statistics, has been prolific in the past decades, with applications to many fields, such as directional statistics, medical imaging, computer vision, robotics, and others.

The ERC G-Statistics aims at grounding the mathematical foundations of geometric statistics and demonstrating their impact on selected applications. A strong attention is given to the implementation of novel generic algorithms. In particular, we are actively involved in the development of Geomstats, an open-source Python package that provides tools to perform statistics and machine learning on Riemannian manifolds. The package is designed both for mathematicians and for applied scientists for whom most of the mathematical difficulties are hidden under high-level functions, while providing the suitable material to learn Riemannian geometry. With this tool, we ambition to democratize the use of geometric statistics in data science.

Links : https://github.com/geomstats/geomstats
https://geomstats.github.io/
https://gstats.inria.fr/

The successful candidate will be part of both the G-Stats group and the Epione team at Inria, the French national research institute for digital science and technology that conducts world-class research. She/he will find an exciting working environment in Sophia-Antipolis on the French Riviera, with the ability to collaborate daily with international researchers on technical implementations and practical applications. Through our international collaborations, she/he will have the opportunity to travel, e.g. to our collaborators' labs in the Silicon Valley.

Mission confiée

The successful candidate will work closely with the researchers of the team and our collaborators in the USA, to pursue the development of the package. She/he will be expected to contribute directly to the codebase by refactoring the sampling and visualization modules to make them work with more geometries, implementing new statistical learning algorithms and implementing new geometries.

Research scientists of the G-Statistics team will bring the mathematical expertise needed for the new geometries and algorithms while the successful candidate will support their personal projects, with the goal to identify what can be generic and help bringing the code to a level that can be included in geomstats. Every code contribution will come with the corresponding documentation and unit-tests and will be reviewed by peers on Github.

She/he will also oversee the deployment of unit-tests to ensure the compatibility of geomstats on GPUs. Furthermore, the successful candidate will be expected to interact with the international community of geomstats contributors and users via Github, by performing code reviews, responding to issues, and addressing bug reports. Finally, a few hackathons may be organized to gather the contributors around a coding challenge.

Principales activités

- Contribute to the development of geomstats
- Support the developments of the G-Statistics team members
- Test the library on GPUs
- Respond to issues and address bug reports
- Organize hackathons

Compétences

Educational level is expected to be at the Master / Engineering degree. Applicants should have a strong background in mathematics and experience in scientific programming with Python. Knowledge
of the standard numerical libraries (NumPy, SciPy, Matplotlib, Scikit-learn) is required. Experience with GPUs and the related libraries (PyTorch, TensorFlow, Jax) is a plus. Applicants should also have good communication skills to interact with the researchers of the team (fluent English speaking and writing is required), be willing to learn some mathematics and be eager to solve complex numerical problems.

**Avantages**

- 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.)
- Possibility of teleworking (after 6 months of employment) and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

**Rémunération**

From 2632 euros gross monthly (according to degree and experience)