



Postdoctoral research fellow position in machine learning for scientific imaging in astrophysics

Keywords: *Machine learning, Inverse problems in imaging, Uncertainty quantification, Bayesian inference*

The role

The fields of machine learning (ML) and artificial intelligence (AI) have seen significant advancements in recent years, including the development of diffusion models in imaging and self-supervised learning techniques. These advancements have demonstrated promising results across various domains, showcasing the potential of ML to help advance scientific research, specifically astrophysical applications. Among these advancements are “foundational models”, which offer a new way to accelerate scientific research by providing pre-trained off-the-shelf models that can be used for a different inverse problems found in diverse scientific applications. Despite their potential, these methods have not been widely applied to quantitative scientific imaging applications. The primary challenges include: a lack of robustness and validation in realistic scenarios; absence of reliable methods for estimating associated uncertainties; and the computational burden posed by high-dimensional problems.

We invite applications for a 2-year postdoctoral research fellow position focused on overcoming these challenges. The successful candidate will work under the supervision of Dr. Tob as I. Liaudat and Dr. J r me Bobin at the IRFU institute of the CEA Paris-Saclay research centre.

At IRFU we are interested in several astrophysical applications, for example, radio interferometric imaging for the Square Kilometre Array (SKA) observatory, fast gravitational wave inference for the Laser Interferometer Space Antenna (LISA), and spectral unmixing for the Advanced Telescope for High-ENergy Astrophysics (Athena), among others.

This position offers a unique opportunity to contribute to cutting-edge research at the intersection of AI, ML, and scientific imaging, with the potential to make significant contributions to the different scientific applications IRFU is involved and to profit from the vast application expertise found at the CEA.

The applicant

The applicant should have a PhD degree in at least one of the following areas: applied mathematics, signal processing, physics, machine learning, or computer science (or a related discipline). The candidate should be comfortable with the Python programming language, and ideally with a deep learning framework (e.g. PyTorch, JAX, TensorFlow). Experience with open-source and collaborative development tools (e.g. GitHub) is desirable. Good communication skills in English, written and oral, are expected. The team is international so speaking French is not a requirement.

Application

Please send an application by email (tobias.liaudat@cea.fr, jerome.bobin@cea.fr), including:

- A CV with a publication list
- A research statement (up to 4 pages)
- Two reference letters sent by the reference persons

Applications will be considered in a rolling basis. The position will be filled as soon as the selected candidate is available. Further information:

- Application deadline: 30th of September, 2024
- Start date: Flexible within 2024, but ideally as soon as possible

Contact

The postdoctoral position will be based in the Data Analysis Group at the IRFU institute from the CEA Paris-Saclay research centre, which is located 20km south of central Paris in the Paris-Saclay cluster. The group is focuses on signal (and image) processing and machine learning applied to astrophysics applications.

- Contacts: Dr. Tobías I. Liaudat (tobias.liaudat@cea.fr), Dr. Jérôme Bobin (jerome.bobin@cea.fr)
- Lab: IRFU institute at the CEA Saclay centre

The offer

The position includes an internationally competitive salary and is fully funded for 2 years. Benefits for this position include retirement, health care, parental leave, vacation and sick days, subsidized meals, discount for public transport, sport and culture.