



Within an ERC CoG project, CEA-Grenoble/IRIG is seeking to recruit a:

## Post-Doctoral Fellow (f/m): Nano-imaging with deep neural networks

### The Subject

The postdoctoral research project is part of a five-year ERC-funded project called CARINE (*Coherent diffraction foR a Look Inside NanostructurEs towards atomic resolution: catalysis and interfaces* – <https://carine-erc.eu>) to develop and apply new coherent diffraction imaging (CDI) capabilities. We want to develop and apply machine learning and, more generally, data science approaches for imaging and characterisation of nanoscale systems. Coherent x-ray diffraction imaging is a strong new tool to probe the structure of nanomaterials in a non-destructive way with a spatial resolution of 10 nm. The reconstruction problem, known as “phase retrieval”, is typically solved by iterative algorithms that do not always converge. Machine learning will be applied to different tasks like e.g. phase retrieval, super-resolution, phase unwrapping, etc, to unambiguously reverse the diffraction patterns and image the structure of 3D object with nm-resolution.

### The Function

The work will be performed in close collaboration with the ID01 beamline of The European Synchrotron (ESRF), a world-leading x-ray facility located at Grenoble (France). The applicant will apply machine learning:

- to the different tasks of the phase retrieval process, like e.g. phase retrieval, super-resolution, denoising, phase unwrapping,
- to identify characteristics features in diffraction patterns, like crystallographic defects [1]
- to directly recover the missing phase and/or the reconstructed complex-valued object from the measured intensity,
- to evaluate the algorithm with real datasets collected at ESRF and provide analysis on performance improvements.

### Profile Of The Applicant

The applicant should hold a PhD in physics, material science, computer science or closely related science. We expect the candidate to have broad interests in computer science and machine learning as well as a good background in physics and mathematics (linear algebra, numeric methods, statistics). The applicant should have very good skills in programming (Python). He/she should have good interpersonal, communication, organisational and presentational skills. The working language is English.

### Contract Characteristics

This is an **18-month** contract located at Grenoble, ESRF, with the possibility of a 18-month extension. Interested applicants should submit:

- (1) 1 page cover letter stating the motivation, research experience and goals, and anticipated available date;
- (2) curriculum vitae, and
- (3) contact information for 3 references (reference letters are not required at this time) to Marie-Ingrid Richard ([mrichard@esrf.fr](mailto:mrichard@esrf.fr)).

[1] B. Lim, E. Bellec, M. Dupraz, *et al.*, *A Convolutional Neural Network for Defect Classification in Bragg Coherent X-Ray Diffraction*, *Npj Comput. Mater.* **7**, 1 (2021).