Postdoctoral position in computational imaging and wavefront shaping

Planned starting date: fall 2026

Laboratory: Laboratoire Interdisciplinaire de Physique (LIPhy), Université Grenoble Alpes, France
Principal Investigator: Dr. Dorian Bouchet (dorian.bouchet@univ-grenoble-alpes.fr)
Webpage: https://dbouchet.github.io
Duration: 1-year contract, renewable for 1 additional year (funding: ANR OPTIMAGE)
Salary: €2400–€3400 net/month, depending on prior postdoctoral experience

Goal of the project

How should light be structured to extract the maximum amount of information from scattered light? This postdoctoral project aims to answer this question by developing a new generation of imaging methods combining **wavefront shaping**, **information theory**, and **computational optics**.

Project description

Wavefront shaping has transformed our ability to control light propagation through scattering systems. Using programmable optical devices such as digital micromirror devices (DMDs), it is now possible to engineer optical fields with high speed and focus light behind or inside complex media [1]. Yet a central question remains open: **How should one shape light to make images with optimal precision?**

We propose to answer this question using tools from statistical estimation theory, and in particular the Fisher information, which quantifies the ultimate precision achievable in parameter estimation [2]. Building on previous work demonstrating the existence of structured light fields that maximize the Fisher information [3], the project will extend these concepts from single-parameter estimations to the reconstruction of high-dimensional images involving many unknown degrees of freedom.

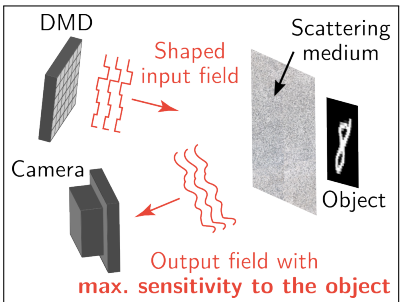

Fig. 1: Representation of the proposed experiment, in which the incident field is optimally shaped to maximize the Fisher information relative to an object.

Specific role

Depending on the candidate's interests and background, the postdoctoral researcher may work on:

- the manipulation of theoretical concepts in wave scattering and information theory;
- the implementation of numerical simulations combining wave physics and deep-learning approaches;
- the development of a proof-of-concept experiment using wavefront-shaping devices.

The balance between theory, numerics, and experiment can be tailored to the candidate profile. The postdoctoral researcher will be encouraged to develop independent ideas and shape the scientific direction of the project.

Candidate profile

The candidate should have a PhD in physics, engineering, or a related field. We welcome candidates with expertise in one or more of the following areas: optics/photonics, wavefront shaping, imaging and inverse problems, information theory, experimental optical instrumentation, and machine learning. Candidates from either experimental or theoretical/computational backgrounds are encouraged to apply.

Research Environment

Grenoble is a dynamic scientific city, with a rich ecosystem including Université Grenoble Alpes, CNRS, CEA, ESRF, and numerous deep-tech initiatives. The city also offers an excellent quality of life with immediate access to the Alps.

The project will be hosted at the Laboratoire Interdisciplinaire de Physique (LIPhy), an interdisciplinary research laboratory with broadly recognized activities in optics, waves, and complex systems. Equipment available for the project include lasers, wavefront shaping devices and imaging systems, as well as computing clusters, a manufacturing workshop, a chemistry room and a clean room. The successful candidate will join an international research group, with many opportunities for collaborations with experimentalists and theorists working on waves in complex systems.

Application procedure

Interested candidates should send an email to Dorian Bouchet (dorian.bouchet@univ-grenoble-alpes.fr) with a CV and a brief description of their research interests and motivations. Applications will be reviewed on a rolling basis starting May 2026 until the position is filled.

References

[1] S. Gigan et al., Roadmap on wavefront shaping and deep imaging in complex media, Journal of Physics: Photonics 4, 042501 (2022).

[2] D. Bouchet, An unbreakable limit, Nature Physics 20, 1518 (2024).

[3] D. Bouchet, S. Rotter, and A. P. Mosk, Maximum information states for coherent scattering measurements, Nature Physics 17, 564 (2021).