# Postdoctoral Research Position Offer:
# Apply your experience in machine learning to fusion research!

The *Instituto Superior Técnico, University of Lisbon* and the fusion startup *Proxima Fusion* invite applications for a joint **postdoctoral researcher** position focusing on the application of machine learning and optimization methods to stellarator optimization. This joint program provides the successful candidate with a unique opportunity to contribute to cutting-edge fusion energy research.
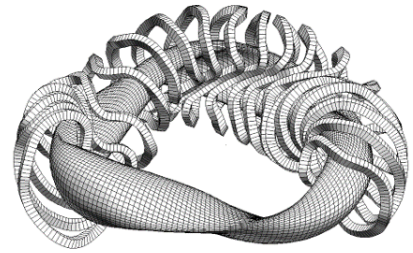
Hosts:

- **The Instituto Superior Técnico (IST) in Lisbon, Portugal**, is a prestigious academic institution with a diverse research portfolio which spans over a wide range of disciplines, including physics, engineering and computational science. The Postdoctoral project will be hosted by the group of Prof. Rogerio Jorge at IST, whose research interests include numerical stellarator optimization, near-axis expansions and plasma turbulence optimization.
- **Proxima Fusion** is a stellarator fusion startup based in Munich, Germany. Proxima Fusion focuses on optimization and design of fusion power plants using stellarator technology.

Topic: Stellarators are attractive candidates for fusion power plants: they operate in steady-state, are not prone to dangerous plasma disruptions and do not have current-driven plasma instabilities. Stellarators however require optimization in a very vast design space, which is to date largely unexplored. In recent years, several breakthroughs in stellarator modeling have been triggered by computational advances [1,2,3]. However, machine learning methods, despite their evident potential, have not been applied widely to the field of stellarator optimization, but fore-front research is already underway within Proxima Fusion and IST.
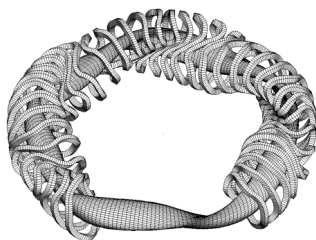
IST and Proxima Fusion offer a postdoctoral fellowship to contribute to find modern optimized stellarator fusion devices using advanced numerical optimization and statistical methods. The position offers a 12-month stay at IST Lisbon, Portugal, followed by a possible 12-month extension at Proxima Fusion's headquarter in Munich, Germany.

Position Overview: We seek a highly motivated individual with a strong background in machine learning and optimization to apply their expertise to the field of stellarator optimization. Expertise in the field of fusion research is optional. A background in physics is desirable. The successful candidate will work closely with a diverse team of researchers from IST Lisbon and Proxima Fusion to develop and implement advanced optimization techniques for the design and operation of stellarator fusion reactors.

Key Points:

- Conduct research on the application of machine learning and optimization methods to stellarator optimization problems;
- Collaborate with researchers at IST Lisbon and Proxima Fusion to develop and implement novel optimization algorithms for stellarator reactors;
- Communicate research findings through the publication of high-quality journal articles and conference presentations;
- Benefit from professional software development within a private industry.

Qualifications:

- A Ph.D. in Machine Learning, Optimization, or a closely related field, either as a central subject of dissertation or as applications in various fields of Physics or Mathematics.
- Demonstrated expertise in computational modeling and optimization techniques;
- Interest in applying machine learning and optimization methods to problems in plasma physics and fusion energy research;
- Excellent communication and interpersonal skills, with the ability to work effectively within interdisciplinary teams.

How to Apply: Interested candidates should submit their application materials, including a cover letter, curriculum vitae, and contact information for two references, to *jlion@proximafusion.com*. Review of applications will begin immediately and continue until the position is filled.

Successful candidates shall embark on a unique two-year joint program at IST Lisbon and Proxima Fusion, applying skills in machine learning and optimization to the challenging and impactful field of stellarator fusion research. The project contributes to the development of clean, sustainable energy solutions for the future, while benefiting from the combined expertise of academic and startup environments. Successful candidates can expect to be provided with attractive employment opportunities in the nascent fusion industry. For more references on the topic, see [1,2,3].
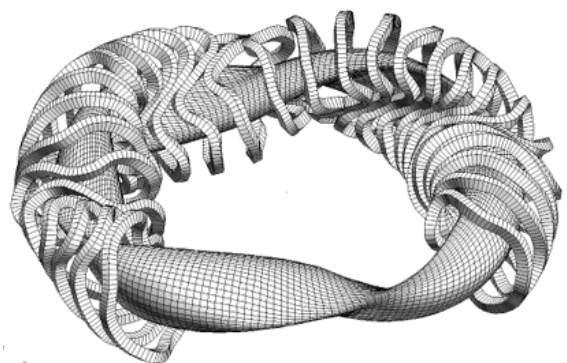
[1] R Jorge, et al. *Single-Stage Stellarator Optimization: Combining Coils with Fixed Boundary Equilibria* arXiv:2302.10622 (2023)

[2] R Jorge, et al. *Direct Microstability Optimization of Stellarator Devices* arXiv:2301.09356 (2023)

[3] D Bindel, et al. *Understanding Trade-offs in Stellarator Design with Multi-objective Optimization* arXiv:2304.08698 (2023)