PhD POSITION AVAILABLE
Département Optique Institut FEMTO-ST, Université Bourgogne Franche-Comté
Ecole Doctorale SPIM Spécialité : Optics & Photonics
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Smart Light: Machine Learning control of lasers and applications in nonlinear optics

Machine learning is a field of artificial intelligence that applies advanced techniques from statistics and numerical analysis to carry out tasks without explicit programmed instructions. Recent years have seen dramatic impact of machine learning in society, with commonplace applications in health-care, autonomous vehicles, and language processing. The impact of machine learning on basic research has been just as significant, and the use of advanced algorithmic tools in data analysis has resulted in new insights into many areas of science.

The objective of this thesis is to apply techniques of machine learning to understand and exploit nonlinear propagation in optical systems to develop customized and programmable light sources. In particular, the aim will be to focus on ultrafast laser sources producing picosecond and femtosecond pulses, and to develop deep learning (neural network) approaches to both aid in the overall design of the laser sources themselves, as well as to optimize the generation and propagation of these pulses in nonlinear optical fibre. A parallel numerical and theoretical objective is to use deep learning techniques to determine underlying propagation equation models from analysis only of experimental data.

Profile of the Candidate

Applicants should have a strong background in physics, electrical engineering, or engineering science, with previous training in optoelectronics, optics and laser physics an advantage. Previous experimental experience in nonlinear fibre optics is desirable, and applicants must have excellent computer skills and ideally experience in Python and GPU Programming. Candidates with excellent skills in MATLAB will also be very welcome to apply but it would be expected that algorithmic tool development will require conversion to Python. Experience with interfacing to laboratory equipment will also be an asset, but the main requirement is a passion and desire to learn advanced techniques at the state of the art of artificial intelligence applied to one of the most exciting fields of research in optics.

Contract Details

36 months starting from October 2020. Salary at the level fixed by thesis funding from the French Ministry of Higher Education and Research and Innovation. Approximately 1900 €/month before tax.

Work Environment

FEMTO-ST is one of France's leading research centers in engineering science and photonics, and combines permanent staff from the CNRS and Université Bourgogne Franche-Comté in an exciting multidisciplinary environment. Besançon is a picturesque town dating back to Roman times containing a UNESCO World Heritage Site, many cultural attractions, and easy access to outdoor pursuits.

Contact Information

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