Centre de Nanosciences et de Nanotechnologies

Soutenance de thèse

Lundi 20 septembre
10h00
Centre de Nanosciences et de Nanotechnologies
10 boulevard Thomas Gobert
91120 Palaiseau
Amphithéâtre

Anirudh PAMMI

“Photonic Computing with Coupled Spiking Micropillars & Extreme Event Prediction in Microcavity Lasers”

Lien public : https://us02web.zoom.us/j/86277738532

Jury members :

Daniel Brunner, Femto-ST CNRS, Reviewer
Marc Sciamanna, Centrale Supelec Metz, Reviewer
Peter Bienstman, Ghent University, Examiner
Massimo Giudici, Université de Nice Sophia Antipolis, Examiner
Alice Mizrahi, UMR CNRS/Thales, Examiner
Sylvain Barbay, CNRS-C2N Palauseau, Thesis advisor

Abstract :

The work presented in this thesis can be divided into two parts: photonic neuromorphic computing and machine learning applied to photonics. In the first part of the thesis, we present results on excitable micropillar lasers. Excitable lasers exhibit several similarities to biological neurons but operate at much faster timescales. We present experimental and numerical results on independent and coupled micropillar lasers. Depending on the coupling mechanism, the micropillars display a variety of dynamical properties that can be used for neuromorphic computing. In the second part of the thesis, we present numerical results on predicting of occurrence of extreme events by using experimentally recorded data from a quasi 1-D semiconductor laser displaying spatio-temporal chaos. Our prediction is based on partial information of the spatio-temporal field in the system and on the identification of precursors. We analyzed the performance of a variety of machine learning techniques such as Logistic Regression, k-Nearest Neighbours, Reservoir Computing, and Recurrent Neural Networks on the prediction task.