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## Master in Photonics – “PHOTONICS BCN” Master ERASMUS+ “EuroPhotonics”

### MASTER THESIS PROPOSAL

Dates: April 2022 - September 2022

**Laboratory:** Semiconductor laser lab, Dynamics Nonlinear Optics and Lasers (DONLL)

**Institution:** Universitat Politècnica de Catalunya

**City, Country:** Terrassa, Barcelona, Spain

**Title of the master thesis:** Machine learning algorithm for the analysis of the intensity pulses emitted by a laser to recover information of a sinusoidal input signal.

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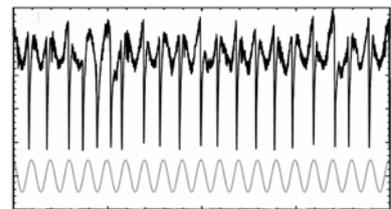
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**Keywords:** semiconductor lasers, model simulations, machine learning

#### **Summary of the subject:**

Thanks to unprecedented advances in photonics, machine learning and signal processing tools, remote optical sensors are nowadays used widely. For example, hospitals and industrial spaces require of ventilation systems whose fans are often found in hard-to-reach places, and are monitored with optical sensors that send alarms when vibrations and/or changes in conditions occur, which may be early indicators of malfunction. Examples include variations in the frequency and/or in the amplitude of a small vibration.

The goal of the TFM is to extract, from the analysis of the pulsing intensity emitted by a laser (black line in the fig.) features that carry information about the period and/or the amplitude of a sinusoidal signal that drives the laser current (gray line, that is the signal that is being monitored by the laser-based sensor).



The student will perform simulations of well-known laser models, and apply feature-extraction and machine learning algorithms to recover, from the simulated sequence of laser pulses, the period or the amplitude of the sinusoidal input signal.

#### **Additional information (if needed):**

\* Required skills: good programming skills and knowledge of machine learning algorithms are mandatory.

\* The TFM requires simulations that can be performed remotely, in a personal computer.