

# Investigation of photonic neuromorphic architectures in a Lithium Niobate on Insulator platform

Ecole Centrale de Lyon



**NICOLAS BAUDIN**  
INTERNSHIPS IN FRANCE INITIATIVE

Name of the hosting institution in France Ecole Centrale de Lyon

Name of the host laboratory / research team Institute of Nanotechnology of Lyon

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Web site <https://inl.cnrs.fr/>

Name of the supervisor Fabio Pavanello

Function Researcher

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## Internship offer

Topic of the internship (title) Investigation of photonic neuromorphic architectures in a Lithium Niobate on Insulator platform

Proposed dates of the internship\* Start: 2020-09-01 End 2021-02-28

\* The supervisors have indicated the dates proposed are flexible and are able to be postponed subject to COVID-19 border closures.

Scientific and academic objectives of the internship (detailed description of the internship content, work expected from the intern and expected outcomes):

The objectives of this internship consist of investigating architectures for neuromorphic computing exploiting photonic platforms such as the Lithium Niobate on Insulator platform developed by the group of Prof. Mitchell at RMIT. In particular, the internship will focus on building compact models of photonic devices that will be afterward used to simulate architectures for neuromorphic computing e.g. reservoir computing architectures. The goal of the architecture-level simulations deals with finding trade-offs in terms of performance such as energy consumption and latency to a given set of tasks and to propose potential improvements at the device level. The intern tasks will consist of;

- i) acquiring expertise in the area of photonic neuromorphic computing, particularly using Lithium Niobate based technology,
  - ii) acquiring expertise with simulation tools,
  - iii) carrying out architecture simulations based on specific optimization criteria,
  - iv) extracting relevant trade-offs for each of the investigated architectures (e.g. latency vs energy consumption vs scalability etc.).
- The expected outcomes from this internship are;

- i) a survey of architectures for neuromorphic computing in Lithium Niobate based technology in terms of performance to specific tasks e.g. header recognition and
- ii) a deeper insight into which physical parameters are most relevant for the considered architectures and how better photonic device properties (e.g. propagation loss) can improve upon the performance.

Name of industrial partner Thales

Role of the industrial partner in the internship project Company will provide directions towards relevant application-driven architectures.

Main contact at the French industrial partner Alfredo DeRossi

Email of contact at French industrial partner alfredo.derossi@thalesgroup.com

Name of the Australian partner institution RMIT

Name of lab/department/team involved in the collaboration at the Australian partner institution Micro Nano Research Facility (MNRF)/Integrated Photonics and Applications Centre (InPAC)

Main contact in the Australian partner institution Arnan Mitchell

Function Professor, Director

Email address arnan.mitchell@rmit.edu.au

Outside of this ongoing collaboration, will applications coming from students of other eligible Australian universities be considered by the hosting institution in France? Yes

## Expected profile of applicant

Level of study Master

Discipline Physical, electrical and/or computer engineering

Required qualities, knowledge and skills We seek a talented student that has a background preferably in photonics and/or computer science. S/he should be familiar with programming languages such as C, python or equivalent and should have a strong passion for multi-disciplinary projects at the frontier of physics and computing.