

Position Description

Group of research topics: Photonic Convolutional Neural Networks (CNNs)

Position is funded by	<ul style="list-style-type: none"> - COFUND, Marie Skłodowska-Curie Actions (MSCA), Horizon 2020, European Union - École Centrale de Lyon (EC Lyon), France - RMIT University (RMIT), Australia
Research Host	École Centrale de Lyon (EC Lyon), France
PhD awarding institution/s:	Dual PhD awarded by EC Lyon and RMIT
Locations	<ul style="list-style-type: none"> - Primary: Lyon, France - Secondary: Melbourne, Australia - Annual workshops in Barcelona, Spain
Contract	Full time, fixed term (36 months)
Gross annual salary	26.340 EUR
Preferred start date	01/01/2023 (tentative)
Deadline for applications	19/09/2022 (Reference: EC Lyon-DC1)

Your choice of research topics (only one of these projects will be funded):

A photonic neural network (PNN) is a physical implementation of an artificial NN with photonic components. With respect to conventional NN implementations, PNNs offer several key benefits, such as orders of magnitude improvements in energy consumption, latency and bandwidth density. However, photonics-based CNNs, widely deployed for e.g., image recognition tasks, have been mostly focused on photonic accelerators due the complex task of implementing non-linear functions in photonics. The group of research topics below aims to explore how Lithium Niobate on Insulator (LNOI) platforms can be leveraged to achieve more complex functionalities missing in standard Silicon-based platforms, thus enabling the realization of the whole CNN, rather than only the acceleration portion for input pre-processing (e.g., kernel multiplication) in challenging energy-efficient edge computing applications, or for environment safety-critical applications.

Project 1: Photonic CNN for large-scale image processing	Project 2: Photonic CNN for low-power edge applications	Project 3: Photonic CNN for safety-critical applications
In this project we will consider implementations of high-speed low-latency photonic convolutional neural networks (CNNs) integrated on-chip based on Lithium Niobate on Insulator (LNOI) platforms. We will analyze required performance of key components which will be developed at RMIT. System-level simulations will be carried out with models built	In this project we will consider implementations of low-power energy-efficient photonic convolutional neural networks (CNNs) integrated on-chip based on Lithium Niobate on Insulator (LNOI) platforms. We will analyze required performance of key components which will be developed at RMIT. System-level simulations will be	In this project we will consider implementations of robust photonic convolutional neural networks (CNNs) integrated on-chip based on Lithium Niobate on Insulator (LNOI) platforms. We will analyze required performance of key components which will be developed at RMIT. System-level simulations will be carried out with models built on the

on the experimental data. Systems will be fabricated at RMIT and demonstrators will be tested at INL/RMIT for large-scale image processing applications.	carried out with models built on the experimental data. Systems will be fabricated at RMIT and demonstrators will be tested at INL/RMIT for edge computing applications.	experimental data. Systems will be fabricated at RMIT and demonstrators will be tested at INL/RMIT for environment-sensitive safety-critical applications.
Supervisors: <u>Prof. Ian O'Connor (EC Lyon), Dr. Fabio Pavanello (EC Lyon) and Professor Arnan Mitchell (RMIT)</u>		
Research Fields: Photonics, Computing, Neural networks, Photonic integrated circuits, Optoelectronics		

For more information on the Projects, contact us: redi.help@rmit.edu.au

Are you REDI? (Expected Profile)

Your background and skills: You are a talented and ambitious researcher with a good knowledge and a solid background in the field of solid-state physics, optics, and semiconductor devices. You should work towards your Masters/honours or Engineering degree in a field apposite to one of these areas. An experience in photonics, clean-room fabrication, programming or optical modelling and characterization will be strongly appreciated.

Your work experience: Professional experience is not required.

Your research experience: You should have a Master in a relevant field: electrical/electronic engineering/physics with a focus on integrated photonics.

For more information about the general conditions of the REDI Program and the Eligibility Criteria, please visit: <https://www.rediprogram.eu/>

Employment Benefits and Conditions

EC Lyon offers a 36-months full-time work contract (extendable up to 48 months in duly justified cases), indicatively starting on 1st January 2023. The position will be based in Ecully (France). International travel is foreseen, including to Australia (up to 12 months) and Spain (one week per year). At EC Lyon, there is a probation period of two (2) months and there are 35 working hours per week.

The remuneration, in line with the European Commission rules for Marie Skłodowska-Curie grant holders, will consist of a gross annual salary of 32.500 EUR gross per year (gross amount before employee's taxes and contributions). Of this amount, the estimated net salary* to be perceived by the Researcher is 1.500 EUR. However, the definite amount to be received by the Researcher is subject to national tax legislation. For more information on the estimated net monthly salary, please use the [net salary calculator](#).

**Net salaries can fluctuate in accordance with an individual's personal circumstances (marital status, age, disability, family and dependents, etc. The above indicative net salaries offer an approximation of what a single person in their early 20s could expect to receive in their bank account after taxes.*

Benefits include:

- Sick leave
- Maternity leave
- Paternity leave
- Family events leave (marriage, death, etc.)



- A family bonus is granted from the birth of the first child.
- A transport bonus is granted if the Doctoral Student has a monthly public transport pass.
- 1,000€ yearly travel allowance to cover flights and accommodation to participate in the annual workshop at RMIT Europe in Barcelona (Spain)
- 10,000€ allowance to cover flights and living expenses for up to 12 months in Australia

For more details, please see: <https://www.ec-lyon.fr/>

Learn more on [RMIT](#) and [EC Lyon](#) on our website:
<http://www.rediprogram.eu/about/#hostinstitutions>

PhD enrolment. Successful candidates for this position will be enrolled by the following two universities:

EC Lyon

Admission

You will be enrolled as Doctoral Student at EC Lyon for the entire duration of the assignment. At admission, you will need to supply:

- Degree certificate and transcript of records of an applicable higher university degree. Official translations in English are required in addition to the documents in the original language.
- Proof of English according to the European Framework of Reference for Languages (CEFR)

More information: <https://www.ec-lyon.fr/en/research/doctorate/admission-enrolment-doctorate>

RMIT

Admission

You will also be enrolled as Doctoral Student at RMIT for the entire duration of the assignment. At admission, you will need to supply:

- CV
- Complete transcripts for all academic qualifications
- Research proposal or statement of interest in an available research project
- Language certificates
- List of referees

More information: <https://www.rmit.edu.au/research/research-degrees/how-to-apply>

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