Fully funded PhD Position in Security and Privacy of Neuromorphic Computing Systems

In the context of the Chair "Luxant-ANVI: Neuromorphic Architectures for Video-protection", we are looking for a highly motivated candidate for a three-year PhD position interested in the investigation of the security and privacy of neuromorphic architectures, especially in the context of computer vision, human action recognition and video-surveillance.

The research will be conducted within a collaborative, international and highly stimulating environment. The working place will mainly be the IRCICA (https://ircica.univ-lille.fr/) within the CRIStAL lab (https://www.cristal.univ-lille.fr/) of the University of Lille, the IEMN-CNRS Lab at the Polytechnic University Hauts-de-France (https://www.uphf.fr/DOAE/) in Valenciennes, France and Luxant Innovation (https://www.luxantgroup.com/pole-innovation/).

Abstract

Nowadays, human behavior recognition is done with convolutional neural networks. Spiking neural networks (SNNs) on the other hand have very desirable properties for such a task: they respect privacy because they only detect movement, the are highly resistant to difficult lightning conditions and are very power efficient, enabling their use in embedded systems. This PhD thesis will study the suitability of supervised SNNs to the video-protection use case, and will investigate their resistance to adversarial attacks. Indeed, recent works have shown that SNNs could be more resistant to such attacks than CNNs and we will analyze their robustness with different learning schemes, settings, and parameters.

[1] Rida El-Allami, Alberto Marchisio, Muhammad Shafique, Ihsen Alouani, "Securing Deep Spiking Neural Networks against Adversarial Attacks through Inherent Structural Parameters", accepted in Design Automation and Test Conference, DATE 2021. https://arxiv.org/pdf/2012.05321.pdf

[2] S. Sharmin, N. Rathi, P. Panda, and K. Roy, "Inherent adversarial robustness of deep spiking neural networks: Effects of discrete input encoding and non-linear activations," ArXiv, vol. abs/2003.10399, 2020.

Expected Qualifications

- Masters or equivalent in Computer Science, Statistics, or Applied Mathematics with preferably background in machine learning, deep learning computer vision and neuromorphic architectures.
- Motivation and enthusiasm for high standard research in bio-inspired intelligent systems.
- Ability to work in a highly collaborative and interdisciplinary environment
- Fluency in English, both written and spoken

Contacts:
Pierre BOULET, CRIStAL, IRCICA, Villeneuve d'Ascq
Ihsen ALOUANI, IEMN, UPHF, Valenciennes
Chekib GHARBI, Luxant Innovation, Villeneuve d'Ascq

Job Application

The position is expected to start in September/October 2021. For application, please send the following information in a single PDF file to Prs Pierre Boulet (Pierre.Boulet@univ-lille.fr) and Ihsen Alouani (Ihsen.alouani@uphf.fr) and to Mr Chekib Gharbi (chekib.gharbi@luxantinnovation.com) with subject [PhD_Luxant-ANVI]:

- A cover letter.
- A curriculum vitae, including a list of publications, if any.
- The contact information of two references.

The candidate will be funded for 3 years; he/she is expected to defend his/her thesis and graduate by the end of the contract. The monthly gross salary is around 2000€, including benefits (health insurance, retirement fund, and paid vacations).

About Luxant-ANVI Chair

The general objective of the Chair is to make a scientific and technological progress in the mastery of emerging information processing architectures such as neuromorphic architectures as an embedded artificial intelligence technique. The use-case studies will come from video protection in the context of retail and transportation domains.

About IRCICA, University of Lille

The position is located in Lille, France. With over 110 000 students, the metropolitan area of Lille is one France's top education student cities. The European Doctoral College Lille Nord-Pas de Calais is headquartered in Lille Metropole and includes 3,000 PhD Doctorate students supported by university research laboratories. Lille has a convenient location in the European high-speed rail network. It lies on the Eurostar line to London (1:20 hour journey). The French TGV network also puts it only 1 hour from Paris, 35 min from Brussels, and a short trips to other major centres in France such as Paris, Marseille and Lyon.

IRCICA, Research Institute on software and hardware devices for information and Advanced communication, is a Service and Research unit (USR-3380) associating the CNRS and the University of Lille. Based on a hotel for projects structure IRCICA develops since 10 years a multidisciplinary research to imagine and create responsible technologies for information and communication.

About IEMN-Polytechnic University Hauts-de-France in Valenciennes

Polytechnic University Hauts-de-France (UPHF) in Valenciennes, and more specifically the IEMN Lab (Institut d'Electronique, Micro-electronique et Nanotechnologie, https://www.iemn.fr/), are located in Campus Mont-Houy Valenciennes in an international and friendly environnent (https://www.youtube.com/watch?v=kVG_AcGBxvk&ab_channel=UPHFOfficiel).

Polytechnic University Hauts-de-France (UPHF) provides an excellent research environment with recognized teams in different areas of Intelligent Systems.

Contacts:
Pierre BOULET, CRIStAL, IRCICA, Villeneuve d'Ascq
Ihsen ALOUANI, IEMN, UPHF, Valenciennes
Chekib GHARBI, Luxant Innovation, Villeneuve d'Ascq