# (MScA – PhD) Design and implementation of spiking neural networks for signal enhancement

Record number : OPR-570

## Overview

**RESEARCH DIRECTION**

Éric Plourde, Professeur - Department of Electrical and Computer Engineering

**INFORMATION**

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**ADMINISTRATIVE UNIT(S)**

Faculté de génie
Département de génie électrique et de génie informatique

**LEVEL(S)**

2e cycle
3e cycle

**LOCATION(S)**

Campus de Sherbrooke

## Project Description

Mobile or wearable multimedia devices such as tablets, smartphones, smartwatches or smart glasses are used daily by billions of people worldwide. All of these devices include different speech processing modules such as speech coders or automatic speech recognition systems, e.g. Apple's Siri or Amazon's Alexa. Due to the increasing mobility of multimedia devices, these modules are more than ever subjected to diverse noisy environments, however, their performance is seriously affected by the presence of noise. In order to limit the decrease in performance of these modules in the presence of noise, speech enhancement (SE) algorithms are used to reduce the noise without affecting the speech quality. Despite decades of research, the performance of these SE algorithms are largely sub-optimal. In fact, even with the most efficient machine learning approaches, the performance in low signal-to-noise ratio and non-stationary noises, particularly never seen before noises, have yet to give satisfying results. In sharp contrast, the auditory system deals very well with noise. In fact, it is somewhat easy for humans to follow a conversation in a noisy environment. Spiking neural networks (SNN) mimic biological neurons more closely than classic machine learning approaches. Moreover, SNN have been found to be more computationally efficient than these approaches.

Objective:
The objective of the project is to design and implement different SNN algorithms for speech enhancement.

Requirements:
• Excellent academic record.
• Degree in computer engineering, electrical engineering, computer science, computational neuroscience or other relevant field with a strong background in mathematics.
• Sufficient knowledge in French to pursue a graduate class with a proven test result from one of the following tests if no prior studies were performed in French (TFI (>605), TCF (>B2), DELF (>B2) or DALF (>C2).
• Excellent ability to write and speak in English.

The Université de Sherbrooke is a French-speaking institution located in the province of Quebec, Canada, and the heart of an international research pole. It is host to more than 30 000 students from over 80 different countries worldwide. (Source: UdeS)

Interested candidates should send their CV, academic transcripts, an example of a written technical document (e.g. master's thesis, journal/conference paper) as well as the names of 2 references to Prof. Eric Plourde.  Only successful applicants will be contacted.

Contact: Eric Plourde, Eng., Ph.D., Université de Sherbrooke  (eric.plourde@usherbrooke.ca)

# Funding offered

To be discussed

The last update was on 12 March 2024. The University reserves the right to modify its projects without notice.