2018-01119 - Sound event detection and classification in real environments

Renewable contract : Oui
Level of qualifications required: Graduate degree or equivalent
Fonction : Internship Research

Context
This internship supervised by Romain Serizel and Emmanuel Vincent fits within the scope of the ANR project "LEAUID" involving the Multispeech team at Inria/Loria, the machine learning team at Université de Rouen Normandie, and Natamot. After the end of the internship, there will be opportunities for the successful applicant to pursue a PhD funded by ANR on a closely related topic in collaboration with Université de Rouen Normandie.

Assignment
We are constantly surrounded by a complex audio stream carrying information about our environment. Hearing is a privileged way to detect and identify events that may require quick action (ambulance siren, baby cries...). Indeed, audition offers several advantages compared to vision: it allows for omnidirectional detection, up to a few tens of meters and independently of the lighting conditions. For these reasons, automatic audio analysis has become increasingly popular over the past five years [1, 2].

One of the main degradation encountered when moving from lab conditions to the real world is due to the fact that audio scenes are not composed of isolated audio events but of multiple events occurring simultaneously. Detecting individual events occurring in such a mixture can get challenging. This problem has concentrated some effort in the past few years, based on compositional models [3], temporal context [4], multilabel classification [5], or source separation [6]. However, the relatively low performance of the current systems in real-world conditions remains an obstacle to the exploitation of automatic event detection and classification in mainstream applications.

The goal of this Master internship is to adapt an existing automatic sound event detection and classification system based on deep learning developed at Inria [7] in order to improve its robustness to the variabilities and degradations induced by real conditions.

Main activities
A first research axis consists in simulating degradations in order to increase the variability and the amount of training data. We recently proposed an algorithm to automatically optimize this process that could be applied to sound event detection and classification [8]. A second research axis is to explore the application of source separation methods [9] to segregate sound events prior to classification.

Skills
2nd year Master student in computer science, machine learning, or audio signal processing
Experience with programming in Python
Experience with PyTorch is a plus

Benefits package
- Subsidised catering service
- Partially-reimbursed public transport
- Social security
- Paid leave
- Flexible working hours
- Sports facilities

About Inria
Inria, the French national research institute for the digital sciences, promotes scientific excellence and technology transfer to maximise its impact. It employs 2,400 people. Its 200 agile project teams, generally with academic partners, involve more than 3,000 scientists in meeting the challenges of computer science and mathematics, often at the interface of other disciplines. Inria works with many companies and has assisted in the creation of over 160 startups. It strives to meet the challenges of the digital transformation of science, society and the economy.

Conditions for application
Defence Security :
This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST). Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

Recruitment Policy :
As part of its diversity policy, all Inria positions are accessible to people with disabilities.