PhD Position
IRISA lab, University of Rennes 1 at Lannion, Côtes d'Armor
Expression Team http://www-expression.irisa.fr/

EXPRESSION
Expressiveness in Human Centered Data/Media

Subject: Machine learning models for multimodal detection of anomalous behaviors

Application: URGENT
Please send a CV, application and reference letters, academic results of previous diploma to all the contacts: Arnaud Delhay (arnaud.delhay@irisa.fr), Pierre-François Marteau (pierre-francois.marteau@irisa.fr) and Damien Lolive (damien.lolive@irisa.fr) **BEFORE April 10th 2018**.

This thesis will be co-financed by the DGA (Direction Générale de l'Armement, French ministry of defense). **Only students who are nationals of the European Union or Switzerland and have a master's degree or equivalent, or an engineering degree, who have not started their professional career, are eligible**. No derogation from this rule will be granted.
The candidate is expected to conduct cutting-edge applied research in one or several of the following domains: signal processing, statistical machine learning, speech and gesture recognition. S/he should have excellent computer programming skills (e.g. C/C++, Python/Perl, etc.), and possibly knowledge in machine learning, signal processing or human computer interaction.

Duration: 3 years

Date: October 2018 – September 2021

This PhD, proposed by the EXPRESSION team at IRISA, is focused on the general framework of "anomaly" detection in multicanal sequences. An "anomaly" is charaterized by the existence of foreign elements to a normal situation in a precise context. These sequences can concern both temporally and spatially changing data: for instance, vocal and video recordings, but also system call sequences on a host machine of a network. The goal is to generate models of abnormal behaviors through machine learning methods.

This study can occur naturally in the particular context of the detection of an abnormal behavior of a human being from the facial movements and the vocal signal. We think of extreme stress situations for airplane pilots or machine operators, for example. One can also think of the detection of hostile behaviors by observing a vocal statement and a neutral face in a situation where the speech should be relaxed and expressive. This study could also interest applications in the medical field, as for example, the detection of abnormal behaviors due to psychic handicaps such as autism. Finally, the evaluation of the falsification of a detection system is possible.

We aimed at developing a system capable of detecting abnormal behaviors by the analysis of records of concrete situations. The thesis will then explore several issues as collect, segment and annotate multimodal data; Identification of descriptors enabling the description of abnormality; Development of dedicated machine learning approaches for abnormality detection; Development of a decision system.

Keywords: Speech, facial expressivity, gesture analysis, heterogeneous information, machine learning, classification

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