ST7 – 79 – DIGITAL TECHNOLOGY AT THE SERVICE OF THE HUMAN FACTOR

Dominante : Info&Num (Computer Science & Digital), MDS (Mathematics, Data Sciences), VSE (Living-Health, Environment)
Langue d'enseignement : English
Campus où le cours est proposé : Rennes

Engineering problem

The massive recourse to computer automation of numerous processes, to AI-type decision-making agents, and to the analysis of ever larger data sets, question the relationship between humans and information technologies.

In fact, the current speed of development of these technologies, and the wealth of tools that are emerging, allow us to get even closer to the human being. Analysis of expressions and emotions by extraction of multi-sensor data (webcam, kinect, micro, EEG, sweating), modeling of human behavior in critical contexts (crisis, health problems, depression) and advanced analysis of interactions between different agents, are all possibilities offered by digital tools.

For research in the humanities and medicine, these new methods represent an opportunity to refine our understanding of subjects, patients and their relationship to the world or to others (autistic behavior, collaborative contexts).

The CentraleSupélec engineer will be able to understand how to put digital technology at the service of the human factor, what its possibilities and limits are, and which technologies are appropriate for building the computer science of tomorrow.

Advised prerequisites

Courses in Algorithms and Complexity, Statistics and Learning, Signal Processing

Context and issue modules: These modules include an introductory lecture on the theme, presentations on the technological and scientific challenges, and a presentation of the associated projects. The whole will allow to highlight a common problem (the analysis of non-verbal behavior) with very

varied application fields, and will give an introduction to social psychology, on the aspects of verbal and non-verbal language.

Specific course (60 HEE) : *2D-3D Image and Sound Analysis*

Brief description: the course will cover three important parts necessary for project completion:

Image analysis: Filtering, segmentation, feature detection Sound analysis : time-frequency representation, speech modeling, spatial audio

Project: *What you say without meaning to: deciphering and automatic analysis of non-verbal behavior*

- Associated partner :

- Location: Rennes

- Brief description: Every year, the audio, video and machine learning communities gather around international research challenges on the automatic analysis of human behaviors: emotions, depression, mood, motion detection, etc. (e.g. http://sspnet.eu/avec2017/). The project consists in the participation to one of these challenges. It is about, from a large corpus of data representing subjects in action, to automatically determine information about their behavior and emotions.

Each project team will focus on a particular study (e.g. voice, face, etc.), knowing that all the teams will participate in the same international challenge.

It will therefore be necessary to choose and apply certain methods seen in the course of image and 3D sound analysis. The classification and regression tools will lead to the implementation of optimization algorithms (neural network regression, fuzzy logic, SVM,...).