The sound platforms of the Metz campus (holophony room and anechoic room) are used for the practical aspects of this course.

This course has many areas of application: in-depth analyzes of time series; sound analysis for recognition and coding; phonetic coders for telephony; tools for the arts.

Quarter number
SG6

Prerequisites (in terms of CS courses)
Signal processing (1CC400).
Statistics and machine learning (1CC5000)
Programming experience (1CC1000)

Syllabus

- 1. Non-parametric spectral analysis methods (mainly based on the Fourier transform)
    - 1.1. Further information on these methods, already known
    - 1.2. Review of their limits
    - 1.3. Statistical means used to make the most of these methods
- 2. Parametric spectral analysis methods
    a. 2.1. Introduction to some of them
    b. 2.2. Contributions, compared to non-parametric methods
    c. 2.3. Cost of parametric methods
- 3. The sounds
    - 3.1. Models of perception (ear) and production (voice, mainly)
    - 3.2. Sound localization
    - 3.3. Virtualization of sound sources (holophony)

Class components (lecture, labs, etc.)

18h Lecture

9h Tutorials. (3 hours for each part of the lecture; sequencing Lecture/Tutorials: 6h L; 3h T; 6h L; 3h T; 6h L; 3h T)

8h Labs. A single topic.

Grading

Continuous monitoring (50%, 2/3 MCT at the beginning of the tutorials; individual score) and oral presentation at the very end of the labs (50%). Labs : grading by pair; differentiated in the event of an anomaly in a pair.

Course support, bibliography
Slides.

Resources

- Teacher : Stéphane Rossignol
- Room size for tutorials : 34
- Max room size for labs : 34
- Software : Matlab (34 licences)/Octave (Python)
- Rooms for labs : rooms on Metz campus

Learning outcomes covered on the course

- Design a complete signal processing chain.
- Compare the performances of the various tools at our disposal for the analysis of complicated time series, in order to choose the one which will be best suited for this or that signal to be analyzed.
- Program in an interpreted computer language (matlab/octave/python/...).
- Mastering the basic and advanced principles of analog signal processing and digital signal processing.
- Mastering the basic principles of sound perception (cognitive perception).

Description of the skills acquired at the end of the course

- C1 : Analyze, design, and build complex systems with scientific, technological, human, and economic components
- C2 : Develop in-depth skills in an engineering field and a family of professions
- C6 : Be operational, responsible, and innovative in the digital world