# SHAKE THE FUTURE.





## 2<sup>ND</sup> AND 3<sup>RD</sup> YEAR SPECIALISATION

# DATA ANALYSIS AND APPLICATIONS IN SIGNAL AND IMAGE PROCESSING

The objective of this specialisation is to train multidisciplinary engineers to design and implement methodological and algorithmic solutions to data processing problems in various industrial application fields.

The courses are based on the theory and the practice of methods from computational statistics, applied mathematics, signal and image processing, as well as applied computer science and scientific computing. These courses also offer application-oriented content from healthcare, research and development, imaging science, information and communication technology.

This specialisation confers Centrale engineers the skills needed for a professional orientation to research and innovation in industrial and academic fields related to data sciences, audio engineering, industrial imaging, decision support and biomedical engineering









# **COURSE CONTENT**

#### **AUTUMN SEMESTER**

- Scientific computing and numerical optimization
- > Signal representation and analysis
- > Image processing and analysis
- > Statistical data modelling and analysis
- > Machine learning theory and practice
- > Systems identification and signal filtering
- Imaging and inverse methods
- > Biomedical signal analysis

> Project in signal and image processing

### SPRING SEMESTER

- Biomedical imaging
- > Audio content analysis and Information Retrieval
- > Multimodal data analysis
- > R&D applications
- Project in signal and image processing







## **INDUSTRY SECTORS**

- > Data sciences
- > Biomedical engineering
- > Digital, sound and multimedia
- > Industrial R&D (troubleshooting, decision support)
- > ICT

## **CAREER PROSPECTS**

- > R&D engineer
- > Data scientist
- > Digital applications design
- > Data acquisition and processing project manager

## **TEACHING STAFF**

#### **HEAD OF SPECIALISATION:**

Saïd Moussaoui

#### **CENTRALE NANTES LECTURERS:**

Sébastien Bourguignon Eric Le Carpentier Jean-François Petiot

#### CNRS NANTES:

Jérôme Idier Mathieu Lagrange

#### **EXTERNAL SPEAKERS:**

Ewen Carcreff (DB SAS, Nantes) Thomas Carlier (CHU Nantes) Alexandre Dufour (Institut Pasteur, Paris) Cédric Fevotte (CNRS, Toulouse) Grégoire Pau (CHU, Rennes) Vincent Roualdes (CHU Nantes)

## **EXAMPLES OF PREVIOUS PROJECTS**

- > Real-time processing of audio signals
- > Optimization algorithms for ultrasonic waves
- > Hyperspectral image analysis of the coastline to identify plant species
- Brain-computer interfaces using Emotiv electroencephalographic headsets
- > Study on the perception of environmental sound scenes
- > Handling of a system for recording electromyographic signals

## **EXAMPLES OF PREVIOUS INTERNSHIPS**

- Voice and gesture control for sound design tools, Genesis, Aix-en-Provence
- > Optimization and online checking of fuel mixtures, Total, Lyon
- > Fast algorithms for structured illumination microscopy, Institute of Photonic Technology, Jena, Germany
- > Characterization of sports movements from accelerometric signals, Parrot
- Decomposition and classification of electromyographic signals, University Hospital Göttingen, Germany
- Processing of electroencephalographic signals for brain-machine interfaces, CHU Nantes

contact: said.moussaoui@ec-nantes.fr

Centrale Nantes is a French engineering school and member of the Ecoles **Centrale Group**. Its graduate, master and PhD programmes are based on the latest scientific and technological developments and the best management practices. Founded in 1919, Centrale Nantes' 40-acre campus welcomes 2320 students, including 1550 graduate students, 150 Executive Education and degree apprenticeship students, 240 PhD students and 380 Master and Advanced Master students.