

## SEMESTER 8\_4th YEAR ModIA

### Practical info

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#### Location(s)

 Toulouse

# Signal Processing/ Hilbert spaces and Wavelets



ECTS  
3 crédits



Hourly volume  
69h

## Introducing

### Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

- Hilbert Spaces: definition, Hilbertian basis, projection on a convex set, Fourier analysis
- Wavelets: Haar wavelets, connection coefficients/regularity
- Approximation of functions in Hilbert Spaces

At the end of this module, the student should be able to:

- Provide examples of Hilbert spaces
- Give examples of Hilbertian basis
- Fourier analysis of a 1d and 2d signal
- Use and analyze the results of Fast Fourier Transform
- Use and analyse the results of Wavelet transform
- Understand the decomposition of a function in a basis of wavelets.

## Practical info

### Location(s)

 Toulouse

### Necessary prerequisites

Python: numpy, scipy, matplotlib

Fourier Analysis: Fourier Series, Fourier Transform,  $L^2$  space.

## Infrastructure for cloud and big data



ECTS  
3 crédits



Hourly volume  
38h

### Introducing

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#### Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

- General concepts of cloud and big data computing infrastructures
- Principles of virtualized infrastructures
- Cloud services
- Tools associated with cloud infrastructures
- Principles of big data computing platforms (map-reduce, stream processing)
- Big data treatment environments (Hadoop, Spark, Storm)

At the end of this module, the student should be able to:

- Use virtualization platforms
- Use cloud platforms
- Program big data applications
- Execute big data applications in a computing infrastructure

### Practical info

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#### Location(s)

 Toulouse

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### Necessary prerequisites

Algorithmic, Java programming, Linux environment handling (shell commands)

# Functional Programming and Graph Theory



ECTS  
4 crédits



Hourly volume  
81h

## Introducing

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## Location(s)

 Toulouse

## Objectives

This unit builds on two courses related to the development of complex software:

-Functional programming : Data collecting and network computing applications cannot be programmed efficiently with the common shared memory paradigm (centralized state that can be accessed by all components from the application). Functional programming relies on the stateless paradigm derived from the notion of mathematical functions to avoid bottlenecks.

-Graph theory : Graphs are mathematical objects that are used to model many problems relying on complex data. Many dedicated data structures and algorithms have been designed to represent and use them efficiently.

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## Necessary prerequisites

Computer system use  
Imperative Programming

## Practical info

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# Machine learning



ECTS

4 crédits



Hourly volume

82h

## Introducing

### Objectives

At the end of this module, the student will have understood and be able to explain (main concepts):

- Main concepts and risks of machine learning.
- Advanced methods of machine learning on vector data, requiring tuning effort and/or expert knowledge.
- Ethics of artificial intelligence.

At the end of this module, the student should be able to:

- Solve simple exercises about the underlying mathematical theory.
- Put in action the data science methodology on case studies with R and Python.
- Explain to non-experts the tuning choices in the algorithms.
- Criticize the assumptions and results, summarize the main conclusions.
- Detect legal defects (bias, discrimination) in the algorithms.

## Practical info

### Location(s)

 Toulouse

## Necessary prerequisites

Course « Data science »

Course « Generalized linear model »

## [FRANCAIS] Développer ses compétences managériales



ECTS  
4 crédits



Hourly volume  
43h

### Practical info

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#### Location(s)

 Toulouse

## [FRANCAIS] Formation en entreprise 2



ECTS  
12 crédits



Hourly volume  
12h

### Practical info

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#### Location(s)

 Toulouse

## [FRANCAIS] FLE Semestre 8



ECTS



Hourly volume  
12h

## Practical info

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### Location(s)



Toulouse