

#### Liste d'éléments pédagogiques

### Practical info

Location(s)





#### Modelling & Scientific Computing



lits



### Introducing



Toulouse

#### Objectives

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

-How to model a problem in physics, biology, economics, etc. using a system of ode or pde -How to numerically solve such a problem in simple cases

The student should be able to:

-model a problem via ode or pde

-classify problems according to their mathematical structure and choose appropriate numerical methods of solution

-implement (in PYTHON or JULIA) these numerical methods

#### Necessary prerequisites

Undergraduate courses in analysis and linear algebra. Basics of Physics PYTHON language

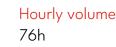
### Practical info





### Statistical modelling





## Introducing

#### Objectives

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

-The principle of nonparametric statistical tests for goodness-of-fit, independence, comparison of two populations

-The characteristics of a linear model and a generalized linear model, and their use for statistical modelling

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

-Choose a test procedure suited to a given problem

-Build nonparametric test procedures to compare two populations

-Build goodness-of-fit tests for a single distribution or a family of distributions

-Choose a linear model or a generalized linear model suited to a given problem

-Estimate the parameters in a linear model and a generalized linear model

-Use statistical tests to validate or invalidate hypotheses on these linear models and generalized linear models.

-Implement a variable selection strategy

-Perform a complete statistical analysis on a real data set using a linear model or a generalized linear model

#### Necessary prerequisites

Probability: random variables, usual probability laws, expectation, variance, cumulative distribution function, limit theorems, Gaussian vectors, ¿

Inference statistics: moment estimators, maximum likelihood estimators, confidence interval for the mean / the variance for a Gaussian / non-Gaussian sample. Basics of R software

### Practical info

#### Location(s)

Toulouse





#### Optimization and Stochastic Optimization

Hourly volume

86h

# Introducing

4 crédits

**ECTS** 

3

# Practical info

#### Objectives

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

-The theory aiming at caracterise local/global minimum of a real function with or without respect to constraints.

-The main first-order methods in optimisation.

-How to find a subdifferential of a convex function, and a subgradient.

-The worst-case complexity of an algorithm.

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

-Model and solve an optimisation problem numerically with/without constraint.

#### Necessary prerequisites

Linear algebra, Calculus, Unconstrained optimisation, Newton and Gauss-Newton algorithms.

#### Location(s)

**O** Toulouse





#### Data analysis





### Introducing

Bayes law, multivariate normal distribution.

Algebra: vector spaces, Euclidean spaces, matrix calculus, eigenvalue decomposition.

Geometry / mecanics: barycenter, inertia, Huygens formula.

#### Objectives

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

-The main steps of a data science analysis: preparation, visualization & exploration, prediction, interpretation.

-The main methods in data exploration.

-The main concepts / dangers of statistical learning.

-The main methods of statistical learning on vector data, requiring little expert knowledge / tuning.

-The functioning of R and Python software for data science.

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.

-Criticize the assumptions and results, summarize the main conclusions.

### Practical info

#### Location(s)

• Toulouse

#### Necessary prerequisites

Statistics: descriptive statistics Probability: random vectors, probability distribution,





#### Human sciences S7





## Introducing

#### Objectives

#### ENGLISH

- Develop awareness of scientific publications and presentations

- Prepare students for technical courses given in English on Artificial Intelligence

- Linguaskill preparation for the weakest students

#### LAW

- Understand the legal structures of companies and how they operate

- Understand the concepts of risk and the resulting responsibilities

### Practical info

#### Location(s)





#### [FRANCAIS] Formation en entreprise 1





Hourly volume

## Practical info

#### Location(s)





### [FRANCAIS] FLE Semestre 7

### **ECTS**

Hourly volume

## Practical info

#### Location(s)





### [FRANCAIS] Accompagnement recherche d'entreprise

#### ECTS 0



Hourly volume 24h

## Practical info

#### Location(s)

**O** Toulouse

