

SEMESTER 7_4th YEAR ModIA

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

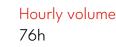
Practical info





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

