

# Data science and statistical learning



## In brief

➤ **Course language:** French

## Presentation

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### Prerequisites

Common core course of mathematics and signal processing of the first year of the École Centrale Méditerranée.

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### Learning objectives

Acquire the essential knowledge and know-how on data processing and learning methods for engineering sciences (applied physics, quality, consulting, risk management, complex systems engineering, logistics, etc.). A wide range of methods is presented with particular attention paid to their basis, implementation and limitations. These methods are illustrated by examples from various fields of application.

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### Description of the programme

- Data and uncertainty modeling,
  - Estimation and learning techniques,
  - Decision techniques (probabilistic, Bayesian, artificial neural networks),
  - Correlated models (Markov analysis and techniques),
  - Large deviations and rare events,
  - Unsupervised learning and non-parametric estimation.
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### Generic central skills and knowledge targeted in the discipline

- Know how to define, implement and characterize different data processing systems for many fields of activity,

- Master the fundamentals of data analysis from industrial and physical systems or for project management in the broadest sense,
- Acquire critical expertise on the choice and limitations of data processing and learning methods,
- Understand the essential factors involved in complex systems.

## How knowledge is tested

- Written exam CC1 : 50%
- Reports CC2 : 50%

## Bibliography

- Ph. Réfrégier « Noise theory and application to physics » - Springer 2003.
- G. Saporta « Probabilité Analyse des données et statistique » - Editions Technip 1990.
- P.H. Garthwaite, I.T. Jolliffe and B. Jones « Statistical Inference » - Prentice Hall 1995.
- T.M. Cover and J.A. Thomas « Elements of information theory » - Wiley 2006.
- A. Ruegg « Processus stochastiques - Avec applications aux phénomènes d'attente et de fiabilité » - Presses Polytechniques et universitaires romandes 1989.

## Teaching team

- G. Berardi
- J. Fade
- F. Galland
- Ph. Réfrégier
- Ph. Roudot

## Sustainable Development Goal



Quality education

| Total des heures |                | 100h |
|------------------|----------------|------|
| CM               | Master class   | 48h  |
| TD               | Directed work  | 14h  |
| TP               | Practical work | 18h  |
| PJ               |                | 20h  |

## Useful info

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### Name responsible for EU

#### Lead Instructor

Julien Fade

✉ [julien.fade@centrale-med.fr](mailto:julien.fade@centrale-med.fr)