



## Data Analysis

**Course level:** Master (M1)    **Track(s):** CPS2, MLDM

**ECTS Credits:** 6 (CPS2)/ 6 (MLDM)



**Course instructors:** Fabrice Muhlenbach, Marc Sebban (UJM)

**Education period (Dates):** 1<sup>st</sup> semester    **Language of instruction:** English

**Expected prior-knowledge:** basic mathematics and statistics

**Aim and learning outcomes:** This course gives the necessary mathematical background to perform data analysis using statistics, linear algebra and convex optimization. Practical sessions make use of the R-free software environment for statistical computing and graphics.

**Keywords:** probability, statistics, linear algebra, optimization, linear regression, PCA.

### Syllabus:

- Basics in probabilities (chance experiments, random variables, moments, law of large number, ...)
- Statistics (discrete and continuous distributions, estimates, Maximum Likelihood Estimation,...)
- Basics in linear algebra and in convex optimization.
- Linear Regression (closed-form solution, batch and stochastic gradient descent)
- Principal Component Analysis
- Clustering

**Organisation and timetable:** Lectures (25h), tutorials (10h) and lab sessions (15h).

**Form(s) of Assessment:** written exam (2h, coefficient 2), practical work/project (coefficient 1)

### Literature and study materials:

Reference books:

- Pattern Recognition, S theodoridis, K. Koutroumbas, 4th edition
- Introduction to Statistics and Data Analysis, R. Peck, C. Olsen, J. Devore, Brooks/Cole, 4th edition, 2010.

### Additional information/Contacts:

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