

MGT-302

**Data driven business analytics**

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Cursus	Sem.	Type
Humanities and Social Sciences	BA6	Obl.

Contact language	English
Credits	2
Session	Summer
Semester	Spring
Exam	During the semester
Workload	60h
Weeks	14
<b>Hours</b>	<b>2 weekly</b>
Lecture	2 weekly
<b>Number of positions</b>	<b>80</b>

**Remark**

Une seule inscription à un cours SHS+MGT autorisée. En cas d'inscriptions multiples elles seront toutes supprimées sans notification

**Summary**

This course focuses on on methods and algorithms needed to apply machine learning with an emphasis on applications in business analytics.

**Content**

The following topics will be covered in the course:

**1. Supervised learning**

- Linear Regression
- Gradient Descent and Stochastic Gradient Descent
- Multiclass Classification
- K-NN
- Support Vector Machines
- Decision Tree and Random Forest

**2. Unsupervised learning**

- Regularization and Model Selection
- Cross Validation
- PCA

**3. Deep Learning**

- Deep Neural Networks
- Back propagation

**4. Graphical models**

- Bayesian networks
- Inference and structure learning

**5. Causal inference in time series**

- Granger causality

- Directed information Graphs

## 6. Quantitative Risk Management

- Risk Measures: Value at Risk and Expected Shortfall
  
- Statistical Estimation and Risk Measurement

## 7. Statistical Learning for Finance

- Shrinkage, Ridge Regression, LASSO and Dimension Reduction
- Predicting Financial Returns

## Keywords

machine learning, causal inference, time series, quantitative risk management

## Learning Prerequisites

### Required courses

A course in basic probability theory  
A course in basic linear algebra  
Calculus  
Familiarity with Python or Matlab

### Important concepts to start the course

Students should be familiar with basic concepts of probability theory, calculus, linear algebra, and programming.

## Learning Outcomes

By the end of the course, the student must be able to:

- Formulate supervised and unsupervised learning problems and apply it to data

## Transversal skills

- Assess one's own level of skill acquisition, and plan their on-going learning goals.

## Teaching methods

Formal teaching interlaced with practical exercises.

## Expected student activities

Attending lectures and working on homework and projects.

## Assessment methods

Three homeworks (33.33333333% each)

## Supervision

Office hours	Yes
Assistants	Yes
Forum	No

## Resources

**Moodle Link**

- <https://go.epfl.ch/MGT-302>