

## Machine Learning (F000942)

Due to Covid 19, the education and assessment methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

**Course size** *(nominal values; actual values may depend on programme)*

**Credits 6.0**                      **Study time 180 h**                      **Contact hrs**                      45.0h

**Course offerings and teaching methods in academic year 2021-2022**

A (semester 1)	English	Gent	seminar: practical PC room	15.0h
			classes	
			lecture	7.5h

**Lecturers in academic year 2021-2022**

Benoit, Dries	EB23	lecturer-in-charge
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**Offered in the following programmes in 2021-2022**

	<b>crdts</b>	<b>offering</b>
<a href="#">Master of Science in Business Engineering(main subject Data Analytics)</a>	6	A
<a href="#">Master of Science in Business Engineering(main subject Operations Management)</a>	6	A
<a href="#">Exchange programme in Economics and Business Administration</a>	6	A

**Teaching languages**

English

**Keywords**

non-linear regression techniques, tree-based methods, Support Vector Machines, bagging and boosting, Bayesian methods, neural networks, R

**Position of the course**

This course introduces the most important models and algorithms in the field of Machine Learning. The focus is on applications that are relevant for business and management. The starting point of the course is basic extensions of the linear model and continues with computer intensive methods and state-of-the-art models.

Students will learn how to apply a broad set of methods in a correct way to solve real-life business problems. They will also learn the skills of how to interpret the results from such analyses in a meaningful way. All exercises will be solved using the statistical programming language R.

This course builds on the concepts introduced in the course "Data Mining".

**Contents**

- \* Non-linear regression methods
  - Polynomial regression
  - Regression splines
  - Smoothing splines
  - Generalized Additive Models
- \* Tree-based methods
  - decision trees
  - bagging and boosting
  - random forests
- \* Support vector machines
  - kernels
  - Multi-class SVM
- \* Bayesian methods
  - Naive Bayes
  - Hidden Markov Models
  - Gaussian processes
- \* Neural networks

- representation
- parameter estimation with stochastic gradient descent
- Keras en Tensorflow libraries
- Deep Learning for text: recurrentneural networks

### **Initial competences**

Students need to have a thorough understanding of the basic statistical principles and concepts as treated in the course "Data Mining" and experience with the programming language R.

### **Final competences**

- 1 Understand the most important methods and models in the field of Machine Learning
- 2 Apply these in a correct way, using the programming language R
- 3 Interpret and report the results of the analyses in a meaningful way
- 4 Choose the most relevant and appropriate methodology for a specific business problem, while being aware of the advantages and disadvantages of the chosen approach.

### **Conditions for credit contract**

Access to this course unit via a credit contract is determined after successful competences assessment

### **Conditions for exam contract**

This course unit cannot be taken via an exam contract

### **Teaching methods**

Online lecture, Online seminar: practical pc room classes, Guided self-study, Lecture, Project, Seminar: practical pc room classes

### **Extra information on the teaching methods**

The learning management system Ufora will be used to guarantee a swift organisation of the course. We will make use of flipped classroom and exercises are made on the Dodona platform.

### **Learning materials and price**

All learning materials will be made available on Ufora.

### **References**

- James, G., Witten, D., Hastie, T. & Tibshirani, R. (2015) An Introduction to Statistical Learning with Applications in R, Springer.
- Hastie, T., Tibshirani, R. & Freedman, J. (2008) The elements of Statistical Learning, Springer.
- Chollet, F. & Allaire J. (2018) Deep Learning with R, Manning Publications.

### **Course content-related study coaching**

Students can rely on the teaching assistants and teacher of the course. Communications and interaction through the Ufora and Dodona platforms.

### **Assessment moments**

end-of-term and continuous assessment

### **Examination methods in case of periodic assessment during the first examination period**

Written examination

### **Examination methods in case of periodic assessment during the second examination period**

Written examination

### **Examination methods in case of permanent assessment**

Peer assessment, Assignment

### **Possibilities of retake in case of permanent assessment**

examination during the second examination period is not possible

### **Extra information on the examination methods**

Periodic evaluation: Theory and exercises: written exam (closed book)  
Non-periodic evaluation: Project work in groups with oral defense and peer-evaluation

### **Calculation of the examination mark**

Periodic: 50%  
Non-periodic: 50%