UAB
Universitat Autònoma de Barcelona

Machine Learning 2

2026/2027

Code: 104871
Credits: 6

Degree programme	Type	Course
Applied Statistics	OB	3

Contact lecturer

Name : Víctor Navas Portella

Email : victor.navas@uab.cat

Teaching staff

Laura Rodriguez Cima

Roger Borras Amoraga

Group languages

You can consult this information at the end of the document.

Prerequisites

s, in addition to Numerical Methods and Optimization and Machine Learning 1.

- The first year subjects
- Numerical Methods and Optimisation
- Statistical Inference 2
- Unsupervised Learning
- Machine Learning 1

Objectives

To learn at theoretical and practical levels the potential of deep learning for structured and also unstructured data.

Learning outcomes

- CM11 (Create new machine learning models, running experiments to demonstrate their feasibility and improved performance compared to the state of the art.) Create new machine learning models, running experiments to demonstrate their feasibility and improved performance compared to the state of the art.
- CM12 (Assess the existence of inequalities on the grounds of gender in databases, to avoid bias in automatic (algorithmic) decision-making.) Assess the existence of inequalities on the grounds of gender in databases, to avoid bias in automatic (algorithmic) decision-making.
- KM16 (Recognise supervised and unsupervised, profound and generic machine learning models,

fostering innovation in the field of statistics.) Recognise supervised and unsupervised, profound and generic machine learning models, fostering innovation in the field of statistics.

Contents

Block 0: A Brief History of Artificial Intelligence (AI)

Block 1: Introduction and Foundations of Deep Learning

- Contextualization of Deep Learning
- The artificial neuron
- Shallow networks
- Universal approximation theorem
- Deep networks

Block 2: Neural Network-Based Learning

- Learning algorithms
- Backpropagation algorithm
- Parameter initialization
- Performance evaluation
- Regularization techniques

Block 3: Learning Solutions

- Unstructured data and embeddings
- Advanced architectures

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Theory sessions	50	2	CM12, KM16
Personal study of the subject	46	1.84	
Lab sessions	30	1.2	CM11, CM12

Teaching will combine classroom lessons by teachers and practical work for students with a computer.

In all aspects of teaching/learning activities, the best efforts will be made by teachers and students to avoid language and situations that can be interpreted as sexist.

To achieve continuous improvement in this subject, everyone should collaborate in highlighting them.

Annotation: within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Exam	50%	4	0.16	CM11, CM12, KM16
Practical Part	50%	20	0.8	CM11, CM12, KM16

Continuous grading

The grading for the course will be done in two parts: the theory part, NT, and the practice part, NP. The final grade for the course will be N = 0.5*NT + 0.5*NP.

- The grading for the theory part will be based in two exams: a partial exam, NEP, and a final exam, NEF. The final grade for the theory part will be NT = max(NEF, 0.4*NEP + 0.6*NEF), as long as NEF is higher than 3,5, otherwise NT = NEF.
- The evaluation of the practical part will consist of three items: classroom activities (AA), a practical project (PEP) and a practical exam (PE). The grade for the practical part will be PG = 0.1 AA + 0.4 PEP + 0.5 PE.

On the day of the second-chance exam only the grade for the theory part will be updated. If a student goes to the second-chance exam then the theory grade, NT, will be the grade for the second-chance exam.

In order for an activity to be taken into account in the final grade, the activity grade has to be a minimum of 3,5. If NT or NP are below 3,5, then the final grade for the course will be N = min(NT, NP).

The student who has submitted works for at least 50% of the subject will be considered evaluable. Otherwise, it will appear in the record as non-evaluable.

Single grading

The grading for a student who chooses to be evaluated with the single grading modality will be based on the final examn grade (50%) and the grade for the practical assignement and the practical exam (50%).

Use of Artificial Intelligence (AI)

For this course, the use of AI technologies is permitted exclusively for support tasks, such as:

- Literature search.
- Code debugging, text proofreading, and translations

Students must:

- Clearly identify which parts have been generated with the assistance of this technology.
- Specify the tools used.
- Include a critical reflection on how these tools have influenced both the process and the final outcome of the activity.

A lack of transparency in the use of AI in gradable activities will be considered a breach of academic honesty.

The teaching staff reserves the right to call any student for a validation interview regarding the content and development process of any course activity.

The inappropriate or fraudulent use of AI may result in a partial or total penalty on the activity's grade, or more severe sanctions in more serious cases.

Bibliography

- Prince, S. (2023) Understanding Deep Learning
- Geron, A. (2019) Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow (O'Reilly)
- Goodfellow, I. et al (2016) Deep Learning (MIT Press)
- Chollet, F. (2017) Deep Learning with Python (Manning)

Software

Python

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this link. To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	1	Catalan	second semester	afternoon
(PLAB) Practical laboratories	1	Catalan	second semester	afternoon