Universidad de Navarra

***Machine learning***

*Guía docente 2026-27*

# PRESENTACIÓN

**Breve descripción**:

- **Degree**: ECOb, ADEb
- **Módulo/Materia**: Módulo 7. Materias Optativas. Materia 7.2; optativas específicas
- **ECTS**: 6
- **Course, semester**: 3º(ECO+DATA), 4º (ECO+IEF), first semester
- **Carachter**: for profiles ECO+Data, ECO+IEF
- **Professor**: Ignacio Rodríguez Carreño, irodriguezc@unav.es
- **Language**: English
- **Classroom, schedule**: Computers Lab in the ground floor (Amigos Building). Tuesdays from 12:00 to 14:00 h. and Wednesdays from 10:00 to 12:00 h. https://mese.webuntis.com/WebUntis/index.do?school=universidad%20de%20navarra#/basic/timetable?selectedTab=3

# RESULTADOS DE APRENDIZAJE (Competencias)

**Competencias optativas de perfil:**

SSOP1. Accessing and managing massive data.

SSOP2. Understanding programming languages potentially used to solve economic and/or business problems.

SSOP4. Identify patterns and trends and gather useful information from massive data in economics and/or business.

SSOP5. Effective communication of results to a professional audience in economics and/or business.

# PROGRAMA

1. Introduction to Machine Learning..
2. Basics of R and Python
3. Dimmensionality Reduction: pca, t-sne
4. Unsupervised Learning: clustering, Kmeans and other algorithms
5. Supervised Learning: knn, Naive Bayes, decision trees, SVM, neural networks, bagging bagging (randomforest) and boosting
6. Association Rules
7. Algorithms for Text analysis.

# ACTIVIDADES FORMATIVAS

**Classes.** There will be theoretical classes showing the concepts and computer practices with the programming language and tools chosen.

**Attendance.** Attendance is compulsory and will have to attend the 80% of the clases to get the **10%** of the final grade.

Universidad de Navarra

**Final project.** The students will have to do a final project by pairs that will be **50%** of the subject. Students will write their own machine learning code. The **50%** of the project will be evaluated from three deliveries concerning reports and a final presentation in class (5%, 40%, 40% and 15% respectively). The presentation in class of the project will last 5 minutes. The resting **10%** of the project will be an autoevaluation, coevaluation and professor evaluation of each student. The different rubrics and date deliveries will be properly informed in ADI.

**Final exam.** The students will have to do a final exam that will be the **40%** of the subject. The students will have to get a 5/10 in order to average with the rest of the assesments.

## EVALUACIÓN

**Ordinary evaluation:**

**SE1. Attendance.** It will have a value of **10%** of the final grade of the ordinary evaluation.

**SE2. Project.** It will consist of carrying out a project of the subject that includes group work that will have three deliveries and a final presentation at the end of the semester (**50%)**

**SE3. Exams.** There will be a final exam that will worth **40%** of the final grade. The exam will consist on questions about the knowledge of the processes, interpretation and decisions of outputs from a certain case of use. **You will have to get a 5 out of 10 in the final exam to average with the project grade.**

**Students with special educational needs must contact the Degree Program Coordinator of the (faculty/school) in advance to obtain the corresponding authorization for any required accommodations (e.g., extended time on exams). This authorization must be submitted by the student to the instructor. It is recommended that this process be completed at the beginning of the semester.*

**Extraordinary evaluation:**

For the extraordinary evaluation, the project will account for the **40%** and the final exam will account for the **60%** of the grade. **You will have to get a 5 out of 10 in the final exam to average with the project grade.**

**Honesty is the best policy:**

We value honesty. Without it, there can be no trust or any meaningful social relations. Therefore, the School expects honesty and fairness from all of its members: professors, non-academic staff, and students.

Dishonest behaviours will be sanctioned in accordance with the University Norms on Student Academic Discipline, and include lying, cheating in exams, and plagiarism in written work. We take such violations seriously. Depending on their gravity, these offences will be dealt with by the Professor in charge of the subject, by the Dean of Students, and in very severe cases, by the Vice President for Student Affairs.

Sanctions include:

- Formal warnings
- Prohibition from entering University premises for a given period
- Loss of admission rights to exams
- Loss of scholarships
- A failing grade for the piece of work or the whole course

## HORARIOS DE ATENCIÓN

**Dr. Ignacio Rodríguez Carreño. (irodriguezc@unav.es)**

- Office 2080 Amigos building. 2nd floor-corridor
- Office Hours: Wednesdays from 15:00 to 18:00 h.

To schedule an appointment for office hours, please send me an email.

## BIBLIOGRAFÍA

- Lantz, Brett: *Machine Learning with R*. Find it in the library.
- *An Introduction to Statistical Learning with Applications in R*, G. James, D. Witten, T. Hastie and R. Tibshirani
- *A Course in Machine Learning*, H. Daumé III
- *Bayesian Reasoning and Machine Learning*, David Barber
- *The Elements of Statistical Learning: Data Mining, Inference, and Prediction*, T. Hastie, R. Tibshirani, J. Friedman
- R for Data Science
- Text mining with R. Os puede interesar si queréis hacer text mining.
- Un tutorial breve de R

A link to find R packages related to Machine Learning. For databases:

- UCI Machine Learning Repository
- Kaggle. You have to register to download databases for free.
- Bases de datos de paquetes de R. There is a description and the database.
- Gigasheet Sample Data: https://www.gigasheet.com/sample-data
- Tableau Public Data: https://www.tableau.com/learn/articles/free-public-data-sets
- Google Datasearch Set: https://datasetsearch.research.google.com/
- FiveThirtyEight: https://data.fivethirtyeight.com/
- Quandl: https://data.nasdaq.com/publishers/QDL
- Standford Large Network Dataset Collection: https://snap.stanford.edu/data/
- Harvard Dataverse: https://dataverse.harvard.edu/
- World Health Organization data: https://www.who.int/data/gho

Some *cheatsheets* for **R**:

- R Base
- Import data
- Data transformation
- *Gráficos con* ggplot

Some cheatsheets for Python:

- Python for begginers
- Pandas- Python