COURSE DATA

DATA SUBJECT

Code: 44952
Name: Big data in Economics
Cycle: Master's Degree
ECTS Credits: 5
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
2242 - Master's Degree in Economics	Facultat d'Economia	1	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
2242 - Master's Degree in Economics	Materia instrumental	ELECTIVES

COORDINATION

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MONTORO PONS JUAN DE DIOS

SUMMARY

This course introduces the student to the management and understanding of the potential of Big Data information for the analysis of issues of economic interest. The aim is, therefore, to familiarize the student with data sets or combinations of data sets whose size (volume), complexity (variability), and speed of growth (velocity) hinder their capture, management, processing, or analysis using conventional tools. Central to this course is the integration of machine learning techniques, which are essential for analyzing and extracting insights from both structured and unstructured Big Data. This course will demonstrate to students the great possibilities that the use of such data, powered by machine learning, provides for the study of topics in economics.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

To successfully complete this course , it is assumed that the student has a sufficient level of mathematics,

statistics and econometrics.

COMPETENCES / LEARNING OUTCOMES

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Acquire linguistic and technological skills: ability to use English in the scientific field of economics and to use ICT in the field of economic study and research.

Acquire social skills to work in a team: capacity to coordinate activities, ethical and responsible commitment, leadership and mobilisation capacity, all of which are important for economic and team management.

Communicate orally and in writing using an inclusive and egalitarian language.

Desarrollar la capacidad crítica, impulsar la inquietud y el interés investigador en el ámbito de la economía, especializarse en el manejo de material bibliográfico, en la utilización de bases de datos económicas y programas matemáticos y estadísticoeconómetricos, así como aprender a transmitir de forma adecuada los resultados de investigadora a través de artículos científicos y
ponencias en congresos.

Develop time management skills for learning: skills for organisation, planning and decision making in the process of learning advanced economics.

Gain the capacities of abstraction and logical reasoning that are essential for the creation of economic models: ability to express oneself using formal, graphic and symbolic languages, to apply analytical and mathematical methods to economics, and to relate and manipulate concepts according to a purpose.

Know how to manage and process databases using the most appropriate and current techniques and software packages.

Know how to promote, in academic and professional contexts, technological, social or cultural progress in a knowledge-based society that is founded on the respect for: (a) fundamental rights and the principles of equal opportunities for men and women, which involves using an inclusive and egalitarian language that promotes the visibility of women; (b) the principles of equal opportunities and universal accessibility for people with disabilities, and (c) the distinctive values of a culture of peace and democratic values.

Know the databases and bibliography necessary to carry out economic research work.

Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.

Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.

Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.

Students should demonstrate self-directed learning skills for continued academic growth.

Students should possess and understand foundational knowledge that enables original thinking and research in the field.

Use the knowledge gained to identify career prospects and sources of employment, and acquire the personal skills that facilitate professional insertion and development. To that end, students should know and know how to use job search techniques and tools and consider entrepreneurship as a professional alternative.

DESCRIPTION OF CONTENTS

1. Introduction to statistical (machine) learning

1. A brief tour of the world of machine (statistical) learning.
2. Supervised, unsupervised and semi-supervised learning. Active learning.
3. Regression and classification.
4. Ensemble methods and model averaging.
5. Reproducible research: Jupyter notebooks and Quarto/Rmarkdown.

2. Supervised learning (i): regression

1. Linear models and regularization: ridge, lasso and elastic net regression.
2. K-nearest neighbors regression.
3. Advanced regression techniques.
4. Model evaluation and selection: cross validation and hyperparameter tuning.

3. Supervised learning (ii): classification

1. Generalized linear models.
2. Decision trees and random forests.
3. Gradient boosting.
4. Neural Networks and Deep Learning.
5. Cross validation and tuning and model selection criteria (ROC-AUC)

4. Additional topics in machine learning

1. Unsupervised learning: mixture models and clustering.
2. Unstructured data.
3. Text as data: natural language processing.
4. Machine learning and causal inference.

5. Applications

1.Applications of big data in several economic fields: labor market, entrepreneurship, economic growth, trade, urban economics, economic policy, energy economics, among others.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	40,00
Classroom practices	10,00
Total hours	**50,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	75,00
Preparation of lessons	0,00
Preparation for assessment activities	0,00
Resolution of case studies	0,00
Total hours	**75,00**

TEACHING METHODOLOGY

The course is structured around theoretical and practical sessions, where theoretical content will be continuously exemplified with practical cases. In the theoretical sessions, the main content of the topics will be presented, introducing relevant concepts and contextualizing them in various fields of data analysis and the economic environment.

In the practical sessions, the instructor will propose real or fictitious situations and practical cases that students must solve by applying specific techniques and using appropriate software programs. Students will engage in oral presentations, debates, and teamwork or individual work, as appropriate. Additionally, projects and situations will be proposed for students to solve.

In the applications part of the course, students will study academic papers using big data techniques and prepare presentations on these papers. This approach will allow students to consolidate their theoretical and practical knowledge, applying it in real and simulated economic contexts.

EVALUATION

The course has two parts: theory (40%) and applications (60%). It is compulsory to obtain at least 4 points (out of 10) in each part to compute the average grade and pass the course.

In both parts there will be continuous assessment activities and a final exam.

REFERENCES

- Efron, B. and Hastie, T. (2016). Computer Age Statistical Inference: Algorithms, Evidence and Data Science. Cambridge University Press. Hastie, T., Tibshinari, R. and Friedman J. (2009). The Elements of Statistical Learning. Data mining, Inference, and Prediction. Springer. James, G., Witten, D., Hastie, T. and Tibshirani, R. (2013). An Introduction to Statistical Learning, with Application in R. Springer.

- Knaflic, C.L. (2015). Storytelling with Data: A data visualization guide for business professionals, Wiley. Wickham, H. y Grolemund, G. (2017). R for Data Science. OReilly Media, Inc. Xie, Y., Allaire, J.J. y Grolemund, G. (2018). R Markdown: The definitive guide, Chapman & Hall/CRC.