VNIVERSITAT DE VALÈNCIA

Course Guide
44952 Big data in Economics

COURSE DATA

Data Subject	
Code	44952
Name	Big data in Economics
Cycle	Master's degree
ECTS Credits	5.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
2242 - M.D. in Economics	Faculty of Economics	1	First term

Subject-matter

Degree	Subject-matter	Character
2242 - M.D. in Economics	10 - Materia instrumental	Optional

Coordination

Name	Department
PAVIA MIRALLES, JOSE MANUEL	110 - Applied Economics
PEIRO PALOMINO, JESUS	132 - Economic Structure

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 (speed) hinder their capture, management, processing or analysis using conventional tools. This course will show to students the great possibilities that the use of this type of data 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.

OUTCOMES

2242 - M.D. in Economics

- 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.
- Develop time management skills for learning: skills for organisation, planning and decision making in the process of learning advanced economics.
- Develop a critical capacity, show a research concern and interest in the field of economy, specialise in the use of bibliographical materials, in the use of economic databases and econometric, mathematical and statistical software. Also, learn to adequately disseminate research findings through scientific articles and presentations in congresses.
- 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.
- 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.
- 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.

- Communicate orally and in writing using an inclusive and egalitarian language.
- Know the databases and bibliography necessary to carry out economic research work.
- 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.
- Know how to manage and process databases using the most appropriate and current techniques and software packages.

LEARNING OUTCOMES

The expected results of learning this subject are as follows:

• Understand the potential of Big Data information for the analysis of issues of economic interest.

• Know the main methods of extraction and treatment of Big-data.

• Communication: summary of results through visualization, stories and interpretable summaries.

• Knowledge of basic statistical or machine learning techniques.

• Application of statistical or automatic learning to economic problems.

• Interpret both databases and economic models. Be familiar with microeconomic techniques in applied economics.

• Use the R statistical package to solve practical cases that use the different algorithms explained in the theoretical part of the program.

DESCRIPTION OF CONTENTS

1. 1

1. THEORY UNIT 1: INTRODUCTION TO STATISTICAL (MACHINE) LEARNING
1. A brief tour for the machine (statistical) learning world.
2. Supervised, unsupervised and semi-supervised learning. Active learning.
3. Regression and classification.
4. Bootstrap.
5. RMarkdown.

2. 2

2. THEORY UNIT 2: LINEAR MODELS FOR REGRESSION. REGULARIZATION
1. Linear models and regularization.
2. Ridge, lasso and net elastic regression.
3. Nearest neighbours.
4. Model assessment and selection.
5. High dimensional problems, p >>N.

3. 3

3. THEORIY UNIT 3: CLASSIFICATION
1. Regression models for classification.
2. Decision trees. Bagging and Random Forest.
3. (Gradient) Boosting.
4. Support Vector Machines.
5. Neural Networks and Deep Learning.

4. 4

4. THEORY UNIT 4: BIG DATA SOURCES
1. How big is big?
2. Open data.
3. Goggle trends.
4. Administrative data.
5. Real time data.

5. 5

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

ACTIVITY	Hours	% To be attended
Theory classes	40,00	100
Classroom practices	10,00	100
Study and independent work	75,00	0
TOTAL	**125,00**	

TEACHING METHODOLOGY

The development of the subject is structured fundamentally around the sessions where the theoretical contents will be continuously exemplified with practical case studies and practical sessions where the student will practice and test the case studies of the classes with examples. Depending on the type of session (theoretical or practical), one didactic method or another will be chosen.

In the theoretical aspects of the sessions, the main contents of the topics that make up the subject will be exposed, introducing the pertinent elements and concepts and contextualizing them to the different fields of application of data analysis, the economic environment and its application to the business world.

In the sessions, applications will discuss published papers and articles that will analyze the problem treated, the set of data used and the analysis techniques used. In the practical sessions the teacher will propose to the students situations (real or fictitious) or case studies that they must solve with the application of techniques and the use of appropriate computer programs, making oral presentations or debates, if appropriate, individually and / or team up. In the practical classes, projects and situations will be proposed that the students must solve, delivering, in a timely manner, the outputs that are determined.

In the applications part of the course, the students will study academic papers using big data techniques. The students will prepare presentations of these papers.

EVALUATION

The subject will be evaluated as follows:

Final exam (50%)

Continuous assessment activities (50%)

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.

REFERENCES

Basic

- 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.

Additional

- 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.