

1. BASIC INFORMATION

Course	DATA VISUALIZATION
Degree program	DEGREE IN DATA SCIENCE
School	SCHOOL OF SCIENCES, ENGINEERING AND DESIGN
Year	3º
ECTS	6 ETCS
Credit type	MANDATORY
Language(s)	ENGLISH
Delivery mode	IN PERSON
Semester	6
Academic Year	2023-2024
Coordinating professor	HÉCTOR ESPINÓS MORATÓ
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2. PRESENTATION

The increasing access we have to information is the force that has driven the development of Machine Learning and Artificial Intelligence, but all the data in the world is useless if it cannot be understood, which is why data visualization is of vital importance in the field of Data Science, since it will allow us to obtain information more effectively. So if a picture is worth a thousand words, a data visualization is worth at least a million.

Data visualization is a general term that describes any effort to help people understand the importance of data by placing it in a visual context. Patterns, trends, and correlations that can sometimes go unnoticed in data can be more easily exposed and recognized with data visualization libraries.

The current data visualization tools go beyond the graphs and squares that we were used to making in Excel spreadsheets, now the data is displayed in a more sophisticated way as infographics, geographic maps, heat maps, among others. Images may include interactive capabilities, allowing users to manipulate them and drill down into the information displayed there. These same data visualization tools have been very important in democratizing data analysis.

Data visualization is a way of displaying complex data in a way that is graphical and easy to understand. This can be especially useful when one is trying to explore data and become familiar with it. Plots and charts can be very effective in conveying a clear description of data, especially when disseminating results to an audience or sharing data with other data scientists.

Additionally, they can be invaluable when it comes to backing up any recommendations you make to client managers or other decision-makers in your field.

3. COMPETENCIES AND LEARNING OUTCOMES

Specific competencies

- CE10. Ability to apply Big Data methodologies, architectures, and techniques for effective data management.
- CE11. Ability to apply computational learning techniques to design and implement applications and systems that use them, including those dedicated to the automatic extraction of information and knowledge from large volumes of data.
- CE12. Ability to describe systems interoperability techniques and data integration and aggregation.
- CE13. Ability to design efficient interfaces in the context of Big Data that guarantee accessibility and usability, using graphic and analytical representation techniques.

Core competencies

- CB1: That the students have demonstrated that they possess and understand knowledge in an area of study that starts from the base of general secondary education, and is usually at a level that, although it is supported by advanced textbooks, also includes some aspects that involve insights from the cutting edge of your field of study.
- CB2: That students know how to apply their knowledge to their work or vocation in a professional way and have the skills that are usually demonstrated through the development and defence of arguments and problem solving within their area of study.
- CB3: That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include reflection on relevant issues of a social, scientific or ethical nature.

Cross-curricular competencies

- CT3 - Teamwork: Ability to actively integrate and collaborate with other people, areas and/or organizations to achieve common goals.
- CT5 - Problem analysis and resolution: Being able to critically evaluate information, break down complex situations into their constituent parts, recognize patterns, and consider other alternatives, approaches, and perspectives to find optimal solutions and efficient negotiations.
- CT8. Entrepreneurial spirit: Ability to assume and carry out activities that generate new opportunities, anticipate problems, or imply improvements.

Learning outcomes

- LO1. Use the methodologies, architectures and techniques for the storage and management of large volume databases to solve practical cases.
- LO2. Interpret and apply models and standards in the field of large volume data systems to practical cases.
- LO3. Describe machine learning techniques, select the most appropriate and design a solution to a given problem that uses them.
- LO4. Collect information to analyse trends in the field of Big Data connecting them with real cases and discuss their evolution and future applications.
- LO5. Design, develop and evaluate graphical interfaces for data visualization using specific languages and environments. Propose alternative solutions and decide the most appropriate, prioritizing usability and user experience.
- LO6. Implement computer applications that make use of large-volume databases, including the application of machine learning techniques to obtain models, their visualization, and their interpretation...

Learning outcomes	Competencies
LO1	C10, C11, C13.
LO2	CT5, CB3
LO3	C12
LO4	C10, C11, C12, C13, CT3
LO5	CT3, CB1, CB2, CB3.
LO6	C13

4. CONTENTS

1. Fundamentals of visualization.
2. Usability and cognition
3. XML CSS.
4. Hadoop. R. Simulation techniques and tools.
5. Geolocation systems.
6. Tools for generating scorecards and business decision support systems.
7. User experience in mobile and web environments.

5. TEACHING-LEARNING METHODOLOGIES

Cooperative learning: students learn to collaborate with other people (colleagues and teachers) to solve in a creative, inclusive, and constructive way the questions and problems identified from the cases raised, using the knowledge and material resources available.

Problem-based learning: Problems will be raised with the objective that students solve them working as a team or individually.

Master Class: presentations made by the teacher with the necessary technological tools for the maximum understanding of the concepts taught.

Directed academic activities: more autonomous, individual and group work, with search for information, written synthesis and debates and public defence of works.

6. LEARNING ACTIVITIES

Below, the types of training activities that will be carried out and the student's dedication in hours to each of them are identified:

IN-PERSON MODALITY

Learning activity	Number of hours
Master classes	20 h
Problem solving / case study	12 h
Seminars, debates, dialogues	12 h
Laboratory practices	40 h
Apprenticeship contract	2 h
Autonomous work	68 h
Personal tutorials	6 h
TOTAL	150h

7. ASSESSMENT

The assessment systems are listed below, as well as their weight on the total grade of the subject:

Assessment	Weight
Face-to-face to assess theoretical/practical content objectives (objective multiple-choice test, written presentations, oral presentations, case studies /problem solving, debates, simulation tests)	60%
Non-contact tests to evaluate theoretical/practical content objectives (case study/problem solving)	25%
Tests to assess attitudes (attitudinal assessment)	10%
Self-assessment and co-assessment tests (learning contract, learning objectives)	5%

In the Virtual Campus, when you access the subject, you will be able to consult in detail the evaluation activities that you must carry out, as well as the delivery dates and the evaluation procedures for each one of them.

7.1. First exam period

To pass the course in ordinary call you must obtain a grade greater than or equal to 5.0 out of 10.0 in the final grade (weighted average) of the course.

In any case, it will be necessary for you to obtain a grade greater than or equal to 5.0 in the final test, so that it can be averaged with the rest of the activities.

7.2. Second exam period

To pass the course in extraordinary call you must obtain a grade greater than or equal to 5.0 out of 10.0 in the final grade (weighted average) of the course.

In any case, it will be necessary for you to obtain a grade greater than or equal to 5.0 in the final test, so that it can be averaged with the rest of the activities.

The activities not passed in ordinary call must be delivered, after having received the corrections corresponding to them by the teacher, or those that were not delivered.

8. SCHEDULE

This section indicates the schedule with delivery dates of evaluable activities of the subject:

Evaluable activities	Deadline
First evaluable activity: HTML, CSS, JS	Week 8
Second evaluable activity: Dataviz /UX	Week 11
Third evaluable activity: Interaction	Week 15

This schedule may be modified for logistical reasons of the activities. Any modification will be notified to the student in a timely manner. In this case, this schedule will be repeated in the different weeks in the second semester.

9. BIBLIOGRAPHY

- Data visualization a successful design process; a structured design approach to equip you with the knowledge of how to successfully accomplish any data visualization challenge efficiently and effectively. Andy Kirk. (2012). Birmingham, UK : Packt Pub
- Data visualization: a guide to visual storytelling for libraries. Lauren Magnuson. (2016). Rowman & Littlefield.
- Data visualization: a practical introduction. Kieran Healy. (2019). Princeton University Press.
- Data visualization for dummies. Mico Yuk and Stephanie Diamond. (2014). John Wiley & Sons Incorporation.
- Hands-on data visualization with bokeh: interactive web plotting for python using bokeh. Kevin Jolly. (2018). Pack Pub.
- Python data visualization cookbook. Igor Milovanović. (2013). Pack Pub.

10. UNIT FOR ATTENTION TO DIVERSITY (UAD)

Students with specific educational support needs:

Curricular adaptations or adjustments for students with specific educational support needs, to guarantee equal opportunities, will be ruled by the Unit for Attention to Diversity (UAD).

The issuance of a report on curricular adaptations/adjustments by UAD Unit will be an essential requirement, so students with specific educational support needs should contact: unidad.diversidad@universidadeuropea.es at the beginning of each semester.

11. SATISFACTION SURVEYS

Your opinion matters!

Universidad Europea encourages you to participate in satisfaction surveys to detect strong points and areas for improvement regarding the teaching staff, the qualification and the teaching-learning process. The surveys will be available in the survey area of your virtual campus or through your email. Your assessment is necessary to improve the quality of the degree.

Thank you very much for your participation.