



TECHNICAL SHEET OF THE SUBJECT

Data of the subject	
Subject name	Data Visualization
Subject code	DTC-BA-316
Main program	Bachelor's Degree in Business Analytics
Involved programs	Grado en Análisis de Negocios/Business Analytics y Grado en Relaciones Internacionales [Second year] Grado en Análisis de Negocios/Bachelor in Business Analytics y Grado en Derecho [Second year] Grado en Análisis de Negocios/Business Analytics y Grado en Derecho [Third year] Grado en Administración y Dirección de Empresas y Grado en Análisis de Negocios/Business Analytics [Second year] Grado en Admin. y Dirección de Emp. y Grado en Análisis de Negocios/Bachelor in Business Analytics [Second year] Grado en Ingeniería en Tecnologías de Telecom. y Grado en Análisis de Negocios/Business Analytics [Third year]
Level	Reglada Grado Europeo
Quarter	Semestral
Credits	3,0 ECTS
Type	Obligatoria (Grado)
Department	Department of Telematics and Computer Sciences
Coordinator	Luis Francisco Sánchez Merchante
Office hours	To be arranged with the teacher

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SPECIFIC DATA OF THE SUBJECT

Contextualization of the subject

Contribution to the professional profile of the degree

The recent shift in the business paradigm towards data-centric business models has contributed to the growing importance of different data visualisation techniques. These include not only techniques that support data exploration and data explanation, but particularly those that enable the creation of dashboards. These new dashboards make it possible to replace traditional reports, primarily based on statistics and data tables, with visualisations that can be interpreted much more quickly and that may also be interactive and capable of being updated in real time.

This transformation has been accompanied by the incorporation of artificial intelligence and machine learning techniques into data analysis and visualisation tools. These technologies make it possible to identify patterns, anomalies and complex relationships within data, automate certain analytical tasks, and facilitate the generation of explanations, recommendations and proposals for graphical representations. In addition, natural-language interfaces and generative artificial intelligence are changing the way users interact with data by enabling them to ask questions, generate preliminary visualisations and obtain interpretative summaries in a more accessible manner. Nevertheless, their use requires the development of critical judgement in order to verify the quality of the results, identify potential biases, and ensure that the visualisations produced are rigorous, transparent and appropriate to the context.

The recent growth of data visualisation, data-driven storytelling and artificial intelligence-assisted analytical tools represents a significant improvement in the way results are communicated to decision-makers. These technologies make it possible to present up-to-date, understandable and actionable information, thereby helping organisations make decisions based on a broader body of evidence.



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The aim of the course is to familiarise students with the theory of data visualisation and, more specifically, with the generation of statistical charts that support exploratory data analysis. Many of the techniques and tools covered in the course are widely used in industry as graphical synthesis tools for large datasets.

The course is structured into three sections. In the first section, students will learn how the brain processes different visual stimuli and how this knowledge can be used to improve the effectiveness of a visualisation. In the same section, students will also become familiar with concepts related to the grammar and semantics of visualisation and will examine a wide range of use cases.

In the second section, students will be introduced to the tools currently used in industry, which are mainly divided into applications for dashboard creation and visualisation libraries associated with programming languages. Both dashboard-building frameworks and more programmatic tools are entirely valid mechanisms for the statistical representation of data and the performance of exploratory data analysis.

The final section will present students with a series of practical challenges to be addressed throughout the course. These challenges will culminate in an individual visualisation proposal based on a dataset jointly selected by the lecturer and the student. Students will choose the technological solution that best suits the specific use case from among the various alternatives covered during the course.

By the end of the course, students should be able to distinguish between the different visualisation technologies and exercise appropriate judgement when choosing among them. They should also have acquired the ability to design and develop visualisations that communicate a data-driven story as efficiently as possible.

Prerequisites

Basic knowledge of R and Python

Competencies - Objectives

Competences

THEMATIC BLOCKS AND CONTENTS

Contents - Thematic Blocks

Theme 1: Introduction

- Perception and cognition
- Visualisation or infographics
- Exploration or explanation
- Purposes of visualisation
- Graphic excellence
- Bibliography

Theme 2: Visualisation basics

- Same facts, different stories
- Grammar of graphs
- Graphics semantics



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- Types of graphs
- Enhancing a graph
- Multidimensional visualisations
- Design tools and environments
- Success stories

Theme 3: Programmatic visualisation

Using programming languages such as R, Python,...

- Statistical visualisations
- Construction of dashboards
- Exploratory analysis and visualisation

Theme 4: Commercial visualisation environments

- Building dashboards with multipurpose tools such as Tableau, PowerBI, Qlick,...

Theme 5: Real-time metrics visualisation tools

- Trends in tools for building monitoring dashboards

TEACHING METHODOLOGY

General methodological aspects of the subject

SUMMARY STUDENT WORKING HOURS

CLASSROOM HOURS	
Lecciones de Carácter expositivo	Ejercicios y resolución de casos y de problemas
15.00	17.00
NON-PRESENTIAL HOURS	
Estudios individual y/o en grupo, y lectura organizada	Trabajos monográficos y de investigación, individuales o colectivos
29.00	29.00
ECTS CREDITS: 3,0 (90,00 hours)	

EVALUATION AND CRITERIA

The use of AI to produce full assignments or substantial parts thereof, without proper citation of the source or tool used, or



without explicit permission in the assignment instructions, will be considered plagiarism and therefore subject to the University's General Regulations.

Evaluation activities	Evaluation criteria	Weight
Practical exams at the end of multi-purpose and programmatic tools.	Evaluate graphical excellence and commitment of the requirements	55
Group work	Evaluate compliance with the proposed practice	15
Individual evaluation of theoretical/practical knowledge of each tool	Choosing the correct answer in a quiz	30

Ratings

The final grade for the course in the **ordinary assessment period** will be calculated on the basis of three assessments distributed throughout the course:

Assessment component	First Assessment	Second Assessment	Final Assessment
Group assessment: practical examinations	5%	5%	5%
Individual assessment: practical examinations	15%	15%	25%
Individual assessment: theory	10%	10%	10%

The final grade in the **extraordinary assessment period** will consist of a practical component completed during the examination in a controlled environment and without the use of AI tools, together with a theoretical assessment:

Assessment component	Extraordinary Assessment
Individual assessment: practical examination	70%
Individual assessment: theory	30%

To pass the course, students must obtain an overall grade of at least 5 out of 10, calculated in accordance with the percentages specified in the tables above.

Policy on the Use of Artificial Intelligence Tools in the Course

This course adopts a clear policy regarding the use of artificial intelligence (AI) tools, with the aim of ensuring academic integrity, fostering



the development of students' own competencies, and guaranteeing that the assessed learning outcomes are attributable to the student.

To support the interpretation and implementation of this policy, the **AI Assessment Scale** proposed by Perkins, Furze, Roe & MacVaugh (2024) will be used as a reference framework. This scale defines five levels of AI integration based on the degree of assistance allowed, as illustrated in the following figure:

The AI Assessment Scale

1	NO AI	The assessment is completed entirely without AI assistance in a controlled environment, ensuring that students rely solely on their existing knowledge, understanding, and skills. You must not use AI at any point during the assessment. You must demonstrate your core skills and knowledge.
2	AI PLANNING	AI may be used for pre-task activities such as brainstorming, outlining and initial research. This level focuses on the effective use of AI for planning, synthesis, and ideation, but assessments should emphasise the ability to develop and refine these ideas independently. You may use AI for planning, idea development, and research. Your final submission should show how you have developed and refined these ideas.
3	AI COLLABORATION	AI may be used to help complete the task, including idea generation, drafting, feedback, and refinement. Students should critically evaluate and modify the AI suggested outputs, demonstrating their understanding. You may use AI to assist with specific tasks such as drafting text, refining and evaluating your work. You must critically evaluate and modify any AI-generated content you use.
4	FULL AI	AI may be used to complete any elements of the task, with students directing AI to achieve the assessment goals. Assessments at this level may also require engagement with AI to achieve goals and solve problems. You may use AI extensively throughout your work either as you wish, or as specifically directed in your assessment. Focus on directing AI to achieve your goals while demonstrating your critical thinking.
5	AI EXPLORATION	AI is used creatively to enhance problem-solving, generate novel insights, or develop innovative solutions to solve problems. Students and educators co-design assessments to explore unique AI applications within the field of study. You should use AI creatively to solve the task, potentially co-designing new approaches with your instructor.



Perkins, Furze, Roe & MacVaugh (2024). The AI Assessment Scale

For each type of course activity, the following levels will apply by default:

- **Support in studying course materials, resolving doubts, or clarifying procedures: Level 4 – Full AI.** Students may freely use AI tools to support their understanding, provided that such assistance does not replace their own learning process.
- **Graded quizzes completed during class time: Level 1 – No AI.** These activities must be completed without any technological assistance, relying solely on the student's acquired knowledge.
- **Graded assignments or exercises completed and submitted during class time: Level 1 – No AI.** Similarly, all work must originate directly from the student, without external assistance.
- **Graded assignments or exercises with a multi-day deadline: Level 3 – AI Collaboration.** The use of AI tools is permitted to support specific tasks such as drafting, restructuring, or reviewing. However, students must critically evaluate and modify any AI-generated content they choose to incorporate, taking full responsibility for its quality and accuracy.

Additional Conditions and Disclaimers

In addition to the scenarios described above, the following conditions apply:

1. **Flexibility under instructor guidance:** The usage scenarios may be modified at any time at the explicit discretion of the course instructor, depending on the nature and objectives of each activity. Furthermore, the instructor may request the submission of the interaction history with the AI tool used, as part of the supporting documentation.
2. **Mandatory oral assessment if required:** The instructor reserves the right to conduct an individual oral examination of the submitted work, in any case and at any level, in order to verify the authorship of the content and the student's understanding of the knowledge being assessed.



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3. **Scope of the policy:** This policy is not limited to the use of commercial language model (LLM) interfaces such as ChatGPT, Copilot, or Gemini. It also applies to:

- Search engines with embedded generative features
- Office or programming application plugins that include AI assistants
- Locally deployed or open-source models
- Any technology capable of automatically generating text, code, images, calculations, or other types of content relevant to the course

Ultimately, any form of generative assistance shall be considered subject to this policy, regardless of its origin or format of use.

BIBLIOGRAPHY AND RESOURCES

Basic Bibliography

It's provided together with the documentation in each thematic block.

In compliance with current regulations on the **protection of personal data**, we would like to inform you that you may consult the aspects related to privacy and data that you have accepted on your registration form by entering this website and clicking on "download"

<https://servicios.upcomillas.es/sedeelectronica/inicio.aspx?csv=02E4557CAA66F4A81663AD10CED66792>