COMILLAS
UNIVERSIDAD PONTIFICIA
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Syllabus
2025 - 2026

GENERAL INFORMATION

Data of the subject	
Subject name	Data Visualization
Subject code	DTC-MBD-516
Mainprogram	Master in Big Data Technologies and Advanced Analytics
Involved programs	Máster Universitario en Big Data [First year] Máster Universitario en Ingeniería de Telecomunicación + Máster Universitario en Big Data [Second year] Máster Universitario en Ingeniería de Telecomunicación [Second year]
Level	Postgrado Oficial Master
Quarter	Semestral
Credits	3,0 ECTS
Type	Obligatoria
Department	Department of Telematics and Computer Sciencies
Coordinator	Manuel Eusebio de Paz Carmona
Schedule	Check timetable at horarios.comillas.edu
Office hours	To be agreed with subject teachers upon request by email.
Course overview	Questions and tutorials will be held after classes or during the following hours: Mon-Thurs 18-21 by appointment by email.

Teacher Information	
Teacher	
Name	Manuel Eusebio de Paz Carmona
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Profesores de laboratorio	
Teacher	
Name	Carlos Miguel Vallez Fernández
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DESCRIPTION OF THE SUBJECT

Contextualization of the subject

Prerequisites

Basic knowledge of Python programming, handling of virtual environments and management of libraries and development packages. Optionally, Conda can also be used as a programming context for Python.

Course contents

Contents

Brief description of the contents of the subject:

Topic 1: Introduction to visualisation

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

Theme 2: Visualisation basics

- Same facts, different stories
- Grammar of graphs
- Graphics semantics
- Types of graphs
- Enhancing a graph
- Multidimensional visualisations
- Design tools and environments
- Success stories

Topic 3: Programmatic visualisation

Through the use of different programming languages and/or frameworks, the following aspects are covered:

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

Topic 4: Business tools

- Building dashboards with multipurpose tools according to trends (e.g. Tableau, PowerBI, Qlick,...)
- Multipurpose tools in SaaS mode

Topic 5: Visualisation of real-time metrics

- Introduction to real time and comparison with batch
- Trends in tools for building monitoring dashboards

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.

Grading

Assessment Criteria by Examination Session

The mark for the ordinary examination session of the module shall be obtained as follows:

- 70% shall be the mark from theoretical and practical examinations on the tools.
- 20% shall be the mark from practical group work.
- 10% shall be the mark from examinations/activities carried out in the classroom.

The mark for the extraordinary examination session:

- 70% shall be a theoretical/practical examination on the tools and visualisation fundamentals covered during the course.
- 20% shall be the mark from practical group work that has been submitted.
- 10% shall be the mark from examinations/activities carried out in the classroom.

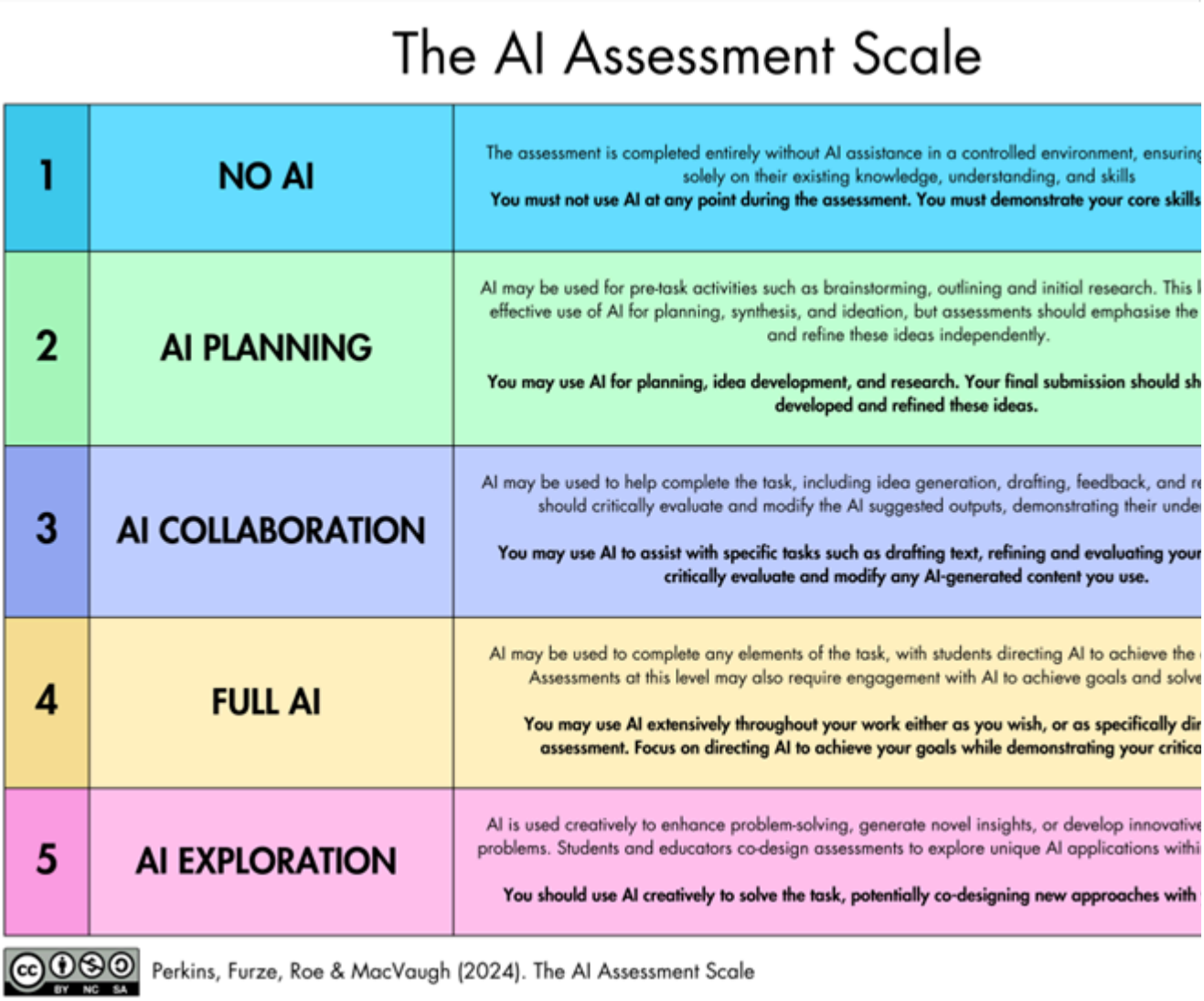
To pass the module, students must achieve at least 5 points out of 10 in the final examination block in the ordinary session and in the individual practical examination of the extraordinary session.

Policy on the use of artificial intelligence tools in the module

The use of AI to create complete works or relevant parts, without citing the source or tool (and the other elements requested and detailed below) or without being expressly permitted in the work description, shall be considered plagiarism and regulated in accordance with the University's General Regulations.

The use of any AI and/or communication software with a person or AI during the completion of class tests/quizzes and during the completion of the partial examination or any test-type activity is expressly prohibited. Failure to comply with this rule shall be considered plagiarism and regulated in accordance with the University's General Regulations.

This module incorporates a clear policy regarding the use of artificial intelligence (AI) tools, which aims to ensure academic integrity, foster the development of individual competencies and ensure that the learning assessed is attributable to the student. In order to facilitate the interpretation and application of this policy, the **AI Assessment Scale** proposed by Perkins, Furze, Roe & MacVaugh (2024) shall be adopted as a framework of reference. This scale contemplates five levels of AI integration based on the degree of assistance permitted, which are 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 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**
2	AI PLANNING	AI may be used for pre-task activities such as brainstorming, outlining and initial research. This l effective use of AI for planning, synthesis, and ideation, but assessments should emphasise the and refine these ideas independently. **You may use AI for planning, idea development, and research. Your final submission should sh developed and refined these ideas.**
3	AI COLLABORATION	AI may be used to help complete the task, including idea generation, drafting, feedback, and r should critically evaluate and modify the AI suggested outputs, demonstrating their unde **You may use AI to assist with specific tasks such as drafting text, refining and evaluating your 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 Assessments at this level may also require engagement with AI to achieve goals and solve **You may use AI extensively throughout your work either as you wish, or as specifically dir assessment. Focus on directing AI to achieve your goals while demonstrating your critica**
5	AI EXPLORATION	AI is used creatively to enhance problem-solving, generate novel insights, or develop innovative problems. Students and educators co-design assessments to explore unique AI applications withi **You should use AI creatively to solve the task, potentially co-designing new approaches with**

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

For each type of activity in the module, the following levels shall apply by default:

Support for studying teaching materials, resolving doubts or clarification on procedures: **Level 4 – Full AI**.
The student may freely employ AI tools to assist their understanding, provided that this assistance does not substitute their learning process.

Assessable questionnaires completed in class: **Level 1 – No AI**.
These activities must be resolved without any type of technological assistance, using exclusively the knowledge acquired.

Assessable work or exercises completed and submitted during class time: **Level 1 – No AI**.
Similarly, all work is required to come directly from the student without assistance.

Assessable work or exercises with a deadline of several days: **Level 3 – AI Collaboration**.
The use of AI tools is permitted to assist specific tasks such as writing, restructuring or revision. Nevertheless, the student must critically evaluate and modify any AI-generated content they decide to incorporate, taking responsibility for its quality and veracity.

Additional conditions and warnings

In addition to the above scenarios, the following conditions are contemplated:

Flexibility under academic instruction: These usage scenarios may be modified at any time by express indication of the academic staff, depending on the nature and objectives of each activity.
Likewise, the academic staff may require the **submission of the interaction history with the AI tool** used as part of the supporting documentation.

Mandatory oral assessment when necessary: The academic staff reserve the right to conduct an **individual oral assessment** of the work presented, in **any case and at any level**, in order to verify the authorship of the content submitted and the understanding of the knowledge subject to assessment.

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

Search engines with embedded generative functions.

Plugins for office or programming applications that include AI assistants.

Locally deployed or open-source models.

Any technology that provides automated generation of text, code, images, calculations or other type of content relevant to the module.

In short, **any type of generative assistance** shall be considered subject to these regulations, regardless of its origin or format of use.

WORK PLAN AND SCHEDULE

Activities	Date of realization	Delivery date
Reading and study of theoretical content	After each class	
Resolution of the proposed problems or discussions and preparation of the proposed practices.	After each tool block	Until the finishing of the next block
Preparation of the quizzes	During all the semester	

BIBLIOGRAPHY AND RESOURCES

Basic References

Visualisation Theory:

- The Grammar of Graphics. Wilkinson, Leland. 2005
- The Visual Display of Quantitative Information. Edward Tufte. 1983

Programmatic Tools:

- Matplotlib for Python Developers. Sandro Tosi. 2009

Multipurpose tools:

- Practical Tableau. Ryan Sleeper. 2018
- Microsoft Power BI Complete Reference. Manuel Quintana. 2018

Real-time tools:

- Kibana Essentials. Yuvraj Gupta. 2015

Complementary References

Other complementary bibliography of special interest:

- Telling stories with data. Cole Nussbaumer Knaflic. 2015
- R Graphics Cookbook. Winston Chang. 2018