



Syllabus

Academic Year	2021/2022
Program	Data Science and Management
course	Data Visualization
Term	II semester
Year	1
SSD	ING-INF/05 - Sistemi di elaborazione delle informazioni
Credits	6

INSTRUCTIONAL GOALS	<p>The course provides an overview of the principles and latest tools of data visualization. Students will learn how data analysis and visualization should work together to create a powerful way for communicating data-driven findings, motivate analyses, and detect flaws. The course will offer the possibility to apply these techniques to create solutions and have an impact in real-world problems.</p>
INTENDED LEARNING OUTCOMES	<p>Knowledge and understanding:</p> <p>The course will provide the latest concepts, techniques and tools to develop a successful capability of illustrating the data accurately and effectively. Through the use of concrete examples students will learn how to extract, simplify and communicate meaningful information starting from raw data through the use of the latest visualization tools. They will learn how to choose the best form of visualization depending both on the data type and audience.</p> <p>Applying knowledge and understanding:</p> <p>At the end of the course the student is expected to</p> <ul style="list-style-type: none">• Understand the principles of effectively representing data (how to encode different data dimensions? With what perceptual effects? etc.)• Learn to constructively analyze and criticize a data visualization solution in light of purpose and audience.• Learn how to use the latest tools and software to design data visualization solutions.• Understand the basic principles of interactive interaction and develop the skills to implement interactive visualizations for the web. <p>Making judgements:</p> <p>Students will be able to think strategically on how to effectively visualize their data in order to simplify information while highlighting important ideas. Furthermore, they will develop the skills to recognize how different types of data visualization can distract, confuse or mislead, as well as suggest alternatives how the same data can be better presented.</p> <p>Communications Skills:</p> <p>Throughout the course the students will learn storytelling through visualization. In particular how to make the right data visualization choices to communicate their ideas clearly and effectively to diverse audiences. The course will stimulate communication through class discussions, oral presentations and group works.</p>



	<p>Learning skills: The course will empower students with techniques and tools that provide an accessible way to understand trends, outliers, and patterns in data. Learning how to leverage a software tool in order to effectively represent the data will also enable the students to extract better information and make more effective decisions.</p>
Pre-requisites	Basic knowledge of statistics and computer programming skills. Basic familiarity with R and Python is recommended.
Course content	<p>The course will cover the following topics:</p> <ul style="list-style-type: none">• Principles of visualization designs• Mathematical and algorithmic aspects of visualization (e.g., clustering, dimension reduction)• Data oriented data visualizations• Fundamental data visualization libraries in R and Python.• Interactive data visualization
Reference Books	Lecture notes, research papers and course material will be made available on the e-learning platform.
Teaching Methods	The course consists of lectures complemented by practical lab sessions and group project works.
Assessment	<p>There will be a written midterm exam, a written final exam and a project.</p> <p>In the midterm and final exams students are required to demonstrate that:</p> <ul style="list-style-type: none">• they have acquired a deep understanding of concepts and techniques for data visualization;• they can constructively analyze and criticize a data visualization solution;• they understand the basic principles of interactive interaction. <p>Midterm and final will count for 30% of the grade each. Students that will not take the midterm and final during the course are required to take an oral exam after the course, where they are required to demonstrate the same skills described above.</p> <p>In the project students are required to demonstrate that they are able to:</p> <ul style="list-style-type: none">• leverage software tools to design data visualization solutions;• develop interactive visualizations for the web;• analyze and assess critically strengths and weaknesses of different types of data visualization;• make appropriate data visualization choices in order to communicate their ideas clearly and effectively to diverse audiences. <p>The project will count for 40% of the grade.</p> <p>The overall assessment will take into account the level of knowledge and understanding of data visualization techniques acquired by the students; their capacity for thinking creatively and critically; their capacity to design and evaluate data visualization solutions, making critical judgements about these; and their capacity to deploy data visualization in order to present effectively findings and conclusions.</p>
