UNIVERSITÀ DI PISA

SCIENTIFIC AND LARGE DATA VISUALIZATION

DANIELA GIORGI

Anno accademico	2021/22
CdS	INFORMATICA
Codice	656AA
CFU	6

Moduli	Settore/i	Tipo	Ore	Docente/i
SCIENTIFIC AND LARGE DATA VISUALIZATION	INF/01	LEZIONI	48	MASSIMILIANO CORSINI DANIELA GIORGI

Obiettivi di apprendimento

Conoscenze
Throughout the class, the students will acquire knowledge in two different fields:

- Information visualization and infographics
- Scientific visualization and 3D Computer Graphics.

Topics: Fundamentals of data visualization. Visual perception. Best practices in data visualization. Visualization techniques for both scientific phenomena and abstract data. Visualization for machine learning. Representation models for geometric data. Basics of 3D rendering, lighting, and texturing.

Capacità
By the end of the course, the students will be able to

- illustrate and communicate data and results using visualization, also for complex and large datasets;
- represent, manipulate and display 3D data;
- use existing visualization libraries and software tools (e.g. Seaborn, Plotly, D3.js, Paraview).

Prerequisiti (conoscenze iniziali)
Basic notions of Linear Algebra, Geometry, Statistics.
Basic knowledge of Python, JavaScript+HTML.

Indicazioni metodologiche
The course will consist of both frontal lessons and hands-on labs.

Programma (contenuti dell'insegnamento)
The availability of data has been growing and growing in recent years, generated from sensors, mobiles, and so on. Visualization is what one needs to put data to good use: it allows one to analyse, explore and communicate possibly large and complex data in a meaningful way.
The course will introduce the fundamentals of information visualization. Information visualization often deals with abstract data, which do not have an obvious visual representation: think of the network connections of a social network. We will learn to decide what to visualize, how to abstract and encode data using different charts and graph types, and how to evaluate different solutions according to perception rules.
Then, we will learn how to visualize data in low-dimensional spaces, mainly 2D and 3D. We will discuss the fundamentals of Computer Graphics (including rendering, lighting, and texturing techniques). Finally, we will talk about scientific visualization, which concerns the graphical illustration of scientific data (for example, biological data), with the purpose of understanding and gleaning insights on the underlying phenomena.

Modalità d'esame
The exam will consist of a practical part (a project) and a theoretical part (an oral examination, after the delivery of the project).
The practical part is worth 20/30, and the theoretical part 10/30.

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