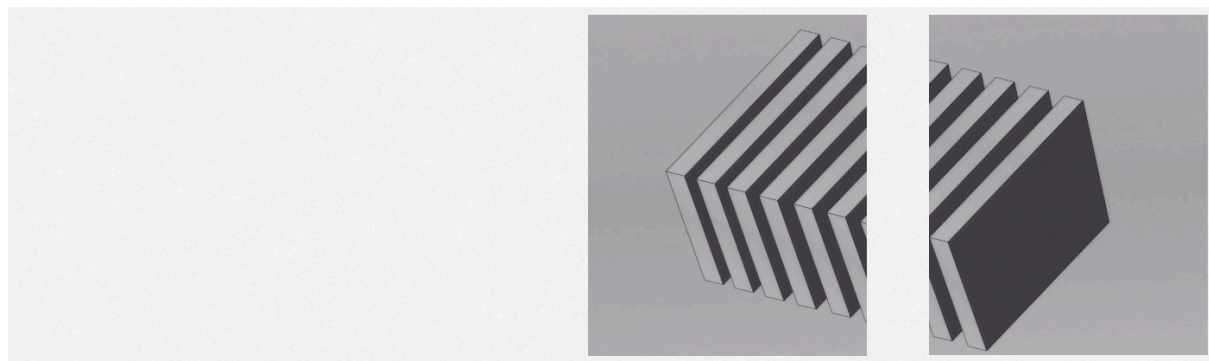




DIGITAL IMAGE PROCESSING

ELABORAZIONE DIGITALE DELL'IMMAGINE

Credits: 8 CFA / 8 ECTS

Aims and Learning Outcomes

This course explores digital image processing as a field of research and design at the intersection of visual culture, computational technologies, artificial intelligence and systems for representing knowledge. It aims to develop advanced technical and design skills while improving the ability to critically examine the processes through which images are produced, transformed, selected, classified and interpreted.

Alongside the principles of digital imaging and image acquisition and processing techniques, the course will examine the organisation of visual datasets, comparative image analysis, AI-assisted classification, image embeddings and data visualisation. Particular attention will be placed on the cultural, methodological and epistemological implications of these approaches, with an emphasis on the relationship between computational procedures, critical interpretation and the construction of visual narratives.

Methodologies and Project Development

Teaching will combine theoretical lectures, technical exercises and a studio-based research project. Students will be supported in formulating a research question, defining a visual corpus, selecting and documenting sources, choosing appropriate analytical procedures, and developing a coherent visual outcome.

Methods explored may include image-embedding analysis, clustering and dimensional-reduction techniques, including t-distributed stochastic neighbour embedding (t-SNE), as well as visualisation systems designed to reveal patterns, differences and distributions within image collections. The use of these tools will be accompanied by critical reflection on data selection, model limitations, and the distinction between computational proximity and historically or culturally meaningful relationships.

Projects may draw on artistic imagery, visual archives, cartographic materials, photographic documentation or other image collections relevant to research and cultural communication. Cultural heritage will constitute one possible field of application, without committing the course to any particular external partner or collaborative undertaking. Any further work involving institutional archives or collections, or activities undertaken jointly with external organisations, will be considered only where the requisite access conditions, permissions and arrangements with the relevant parties are in place.

Final Project and Assessment Criteria

The final assessment will consist of an individual or group project documenting the research and experimental process in a coherent and critically informed outcome. The submission will comprise the visual or design result, an account of the sources and dataset, documentation of the procedures employed, an interpretation of the findings, and a critical understanding of the limitations and potential of the methods adopted.

The final grade will be awarded on a 30-point scale, according to the following criteria:

- **Research and source selection: up to 6/30.** Relevance of the research, quality of sources, and coherence and organisation of the visual corpus.
- **Technical and methodological competence: up to 6/30.** Appropriate use of digital tools, methodological rigour, and alignment between methods and objectives.
- **Critical analysis and interpretation: up to 6/30.** Ability to interpret findings, formulate substantiated observations, and recognise the potential and limitations of the methods employed.
- **Design quality and visual communication: up to 8/30.** Originality, formal coherence, communicative effectiveness, and overall quality of the visual outcome.
- **Documentation and independent working practices: up to 4/30.** Completeness of documentation, autonomy in project development, and awareness of methodological decisions.

The final grade will reflect the overall quality of the project, the rigour of the research process, and the student's ability to integrate technical competence, visual design and critical reflection. In accordance with the learning outcomes of the 8-CFA pathway, greater depth of research, methodological autonomy and structured critical documentation will be expected.

Essential Bibliography

Drucker, Johanna. *Graphesis: Visual Forms of Knowledge Production*. Cambridge, MA: Harvard University Press, 2014.

Manovich, Lev. *Software Takes Command*. New York: Bloomsbury Academic, 2013.

UNESCO. *Recommendation on the Ethics of Artificial Intelligence*. Paris: UNESCO, 2021.

Digital resources: Google Arts & Culture Lab, *t-SNE Map*; QGIS; Google Teachable Machine; tools for computational image analysis and data visualisation.

The bibliography may be supplemented with further readings and resources in response to the research directions and technical methods explored during the course.

Prof. Alfonso Fraia