SALONE DELL'ORIENTAMENTO 2025

#TOMORROW STARTS TODAY

CORSO DI LAUREA MAGISTRALE

INGEGNERIA INFORMATICA

COMPUTER ENGINEERING

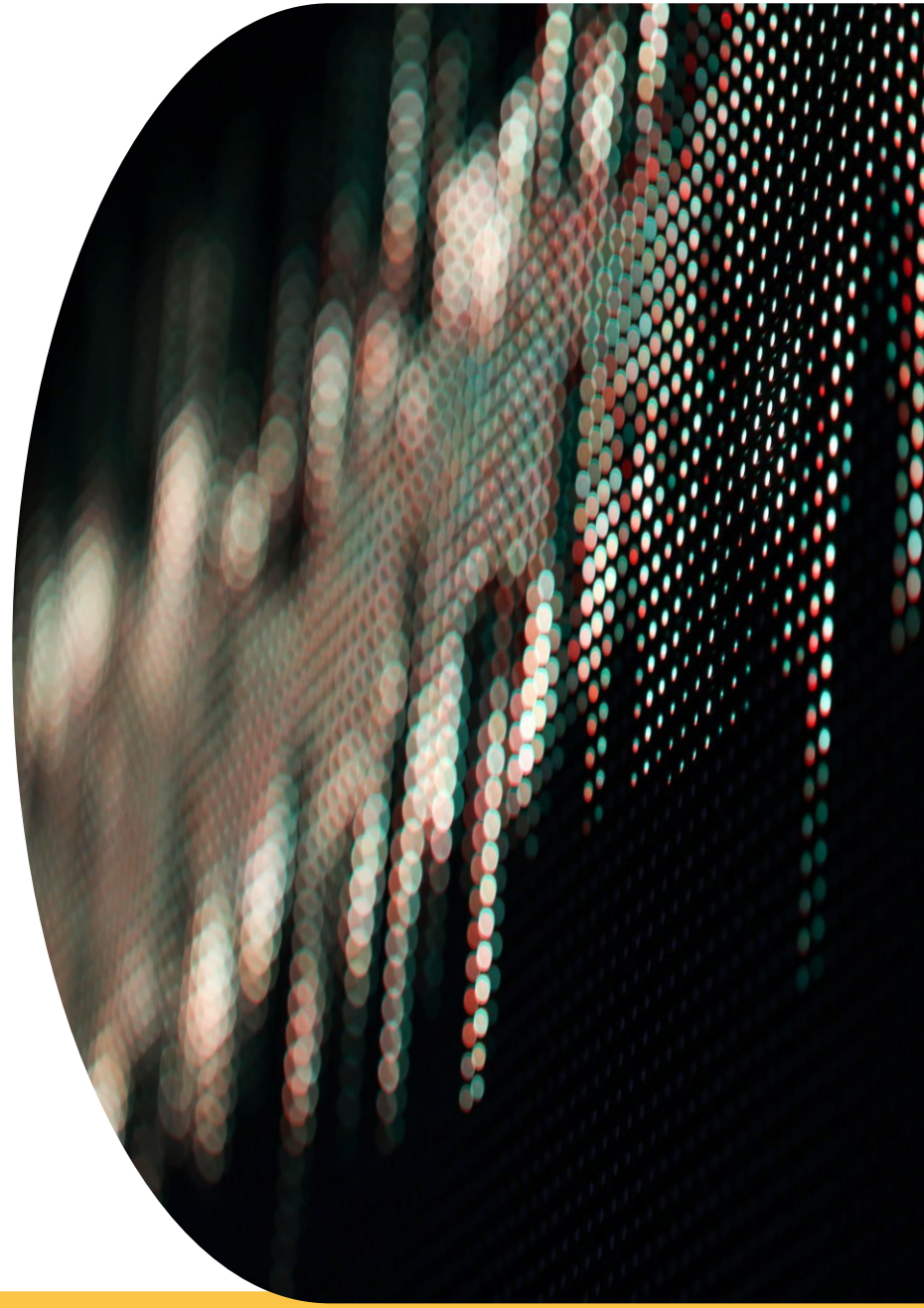
Politecnico di Torino

SCOPRI TUTTI I CORSI DI STUDIO A.A. 2025/26 www.polito.it

Presentazione dell'orientamento Grafica e Multimedia

Ore 13:30 – 14:30

Presentazione a cura di: Lia Morra
Interviene: Luca Piano



Educational objectives

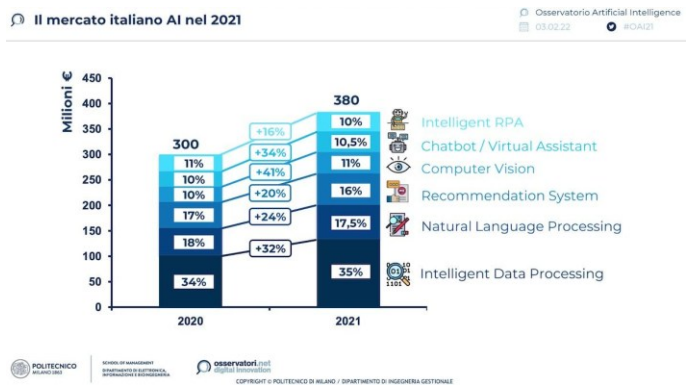
- The graphics and multimedia specialization aims at introducing in the computer engineering curriculum specific skills and know-how related to two areas:
  - **Computer graphics**, from «traditional» *3D modelling* and *computer animation* to emerging technologies such as *virtual, augmented and extended reality*
  - **Multimedia technologies**, from «traditional» *computer vision* to cutting-edge *machine learning* and artificial intelligence for *image*, *audio* and *video* processing
- with a strong **hands-on approach**

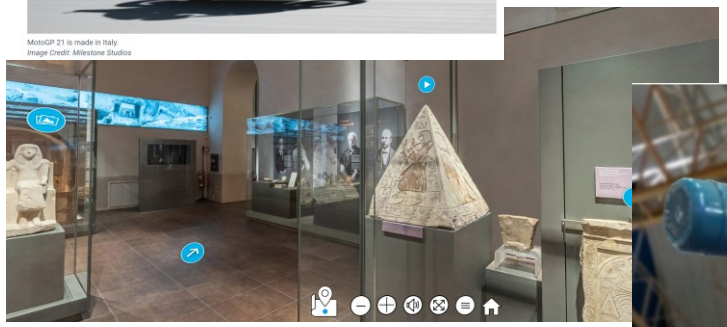
Professional profiles

- **Computer graphics and multimedia engineer**
  - Specializes in the creation of graphic and multimedia applications, ranging from interactive and real-time applications to platforms for the development of off-line multimedia content (e.g. computer animation movies)
  - Analyze the trade-offs between HW and SW to optimize the design of graphic and multimedia applications

- **Multimedia system engineer**
  - Critically selects the most suitable combination of hardware, software and network solutions for different application scenarios, from multimedia coding techniques to the transmission paradigm (client-server or peer-to-peer), from network protocol to service quality control techniques, from resource sizing to the way of measuring the quality perceived by the end user

Application areas





- Web, media and video industry
- Marketing
- Gaming and entertainment
- Cultural Heritage and Museums
- Industry 4.0/5.0
- E-commerce
- Applied machine learning and computer vision

Career paths

- 3D Developer, Technical Animator and Content Creator
- AR/VR/XR Engineer
- Machine Learning Engineer
- Computer Vision Specialist
- Game Developer
- (Real-time) Multimedia Systems Software Engineer
- Audio/Signal Progressing Software Engineer
- Audio Engineer
- Music Producer/Sound Designer
- Front-end developer
- HMI Specialist

What's new in 2025?

- Stronger focus on **learning by doing** approach with multi-disciplinary project works and hands-on labs
- Stronger emphasis on AI and Machine learning
  - applied AI and ML, especially in the context of multimedia
  - new course on **generative AI**
- Increasing focus on **internationalization**, incoming and outgoing
  - several courses will be taught in English
  - multiple opportunities and connections for thesis abroad

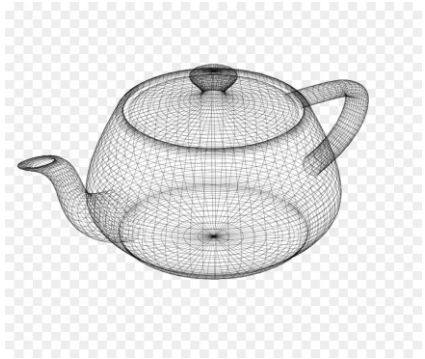
First year curriculum

Semester	Course	CFU
1	**Computer graphics**	6
	Architetture dei sistemi di elaborazione OR Computer architectures	10
	Data Science and Database Technology OR Data Science e Tecnologie per le basi di dati	8
	Computer Network technologies and services OR Tecnologie e servizi di rete	6
2	**Computer Animation**	6
	Image Processing and Computer Vision	6
	Ingegneria del software OR Software engineering	8
	Programmazione di sistema OR System and device programming	10

Bold = Courses specific to the Graphic and Multimedia Curriculum

Synthesis and analysis

Computer graphics
Models of human perception
Geometry of 3D models
Texture, color and illumination
Rendering
Photorealism



Modelling

Image processing
Segmentation
Enhancement
Restoration…

Synthetic image

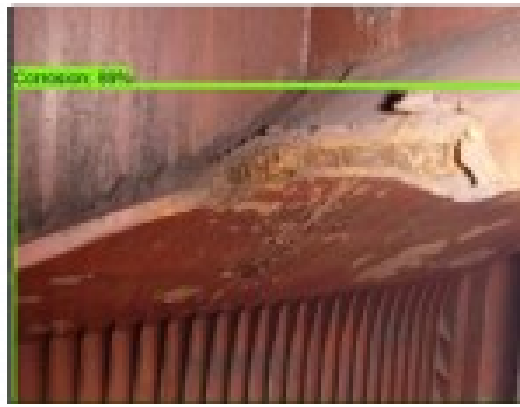
Real image

Computer graphics

- Provides the essential of computer graphics, i.e. of the generation of computer images and the development of graphics applications
- Illustrates the key techniques for producing virtual scenes, generating photorealistic images, managing 3D content, etc.
- Architectures, hardware devices, software, and algorithms specific to computer graphics will be described
- Introduces key aspects pertaining to the interaction between human and images, which plays a key role for a wide range of applications

Computer vision and image processing

- Provides fundamental knowledge related to image capture, including sensors and systems for image acquisition and their physical properties
- Introduces algorithms for image processing and understanding, including image frequency analysis, image enhancement and reconstruction, recognizing 2D and 3D objects, and motion analysis
- Through case studies and practical applications, provide the essential elements to design and implement computer vision applications in a variety of contexts



Computer animation

- Provides an overview of techniques and methodologies used to design and develop computer graphics 3D animations, starting from 3D scene modeling to light positioning, camera movements, character pose and animation, rendering and video coding
- Motion control techniques and collision management
- Posing and animation of virtual characters using kinematic chain, handling deformation
- Modelling deformable bodies and fluids; particle systems and flocking

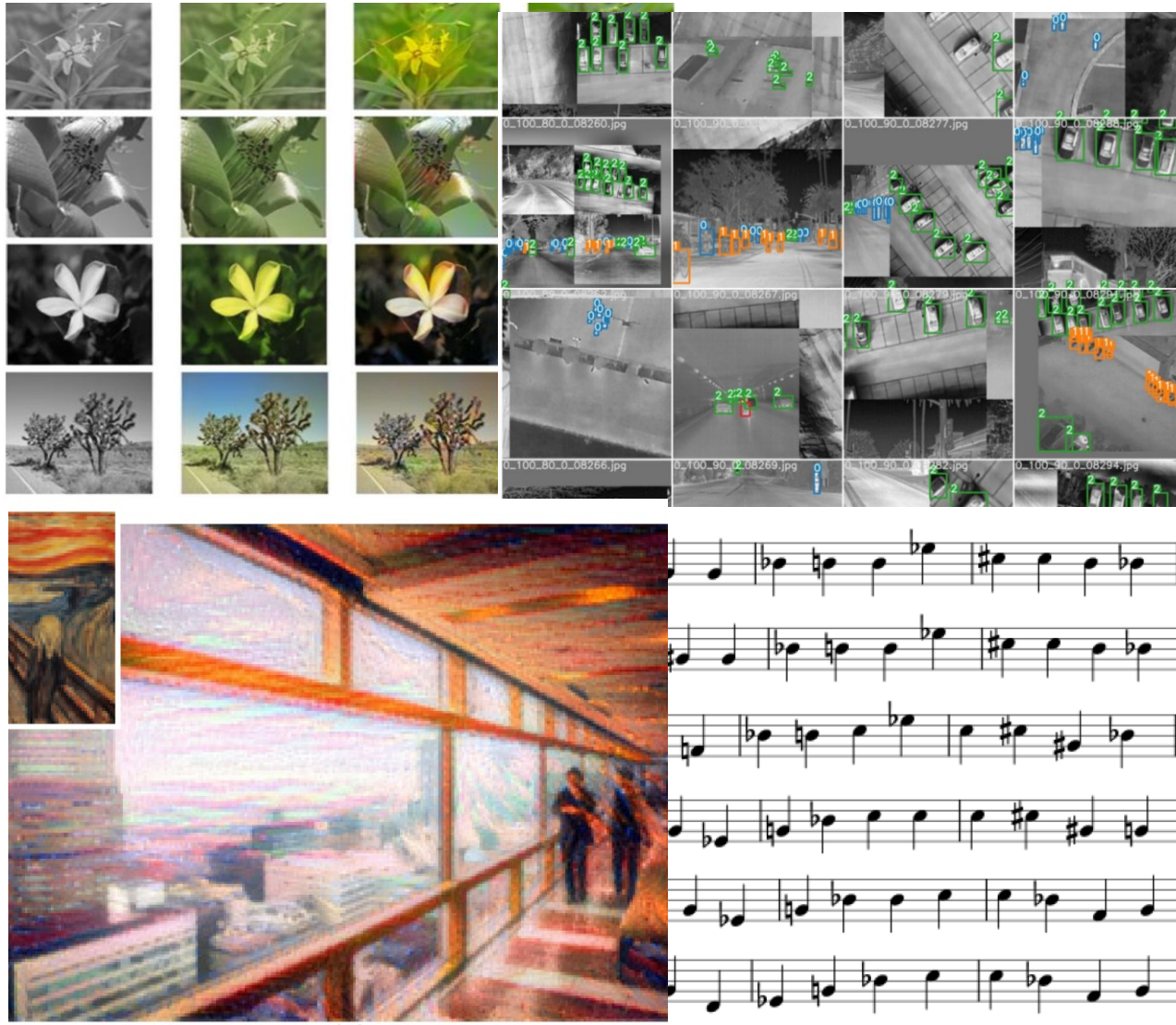
Second year curriculum

Semester	Course	CFU
1	**Machine Learning for vision and multimedia**	6
	Virtual and augmented reality	6
	Free choice 1	8
2	Free choice 2	6
1/2	Challenge OR Free Credits	12
	Thesis	22

Bold = Courses specific to the Graphic and Multimedia Curriculum

Machine learning for vision and multimedia

- Provides theoretical and practical introduction to machine and deep learning techniques for computer vision and processing of multimedia and complex data, such as signals, audio and video
- Introduces state-of-the-art libraries for designing, implementing and training deep neural networks from scratch
- Provides a basic introduction to generative models for images



From Virtual to eXtended reality

Virtual reality

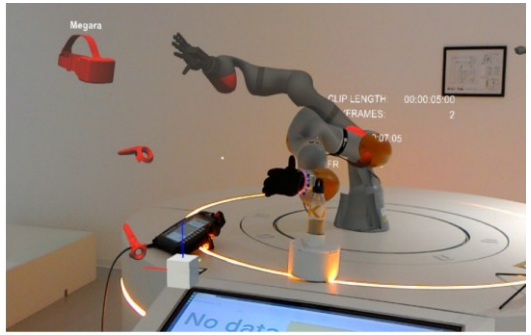
Users are immersed in a virtual world

No interaction with the physical world

Augmented and mixed reality

Virtual world is fused/overlayed with real world

Users can interact with virtual and real object



Extended reality

Generalization of mixed, virtual, and augmented reality

Shared, social, collaborative space

Virtual and augmented reality

- Introduction to immersive virtual reality and other modalities of integrating real and synthetic elements
- Virtual reality fundamentals
- Human-machine interaction paradigms
- Multimedia and multimodal interaction techniques
- How virtual reality devices work
- Hardware and software tools that enable real-time visualization of interactive 3D environments

View past projects at
https://cgvg.itch.io/

Free credits

Choice #1

- **Elaborazione dell'audio digitale**
- **GPU Programming**
- Human Computer Interaction
- Information system security
- Software engineering II

Choice #2

- **Internet media streaming**
- Web Applications I

Free credits

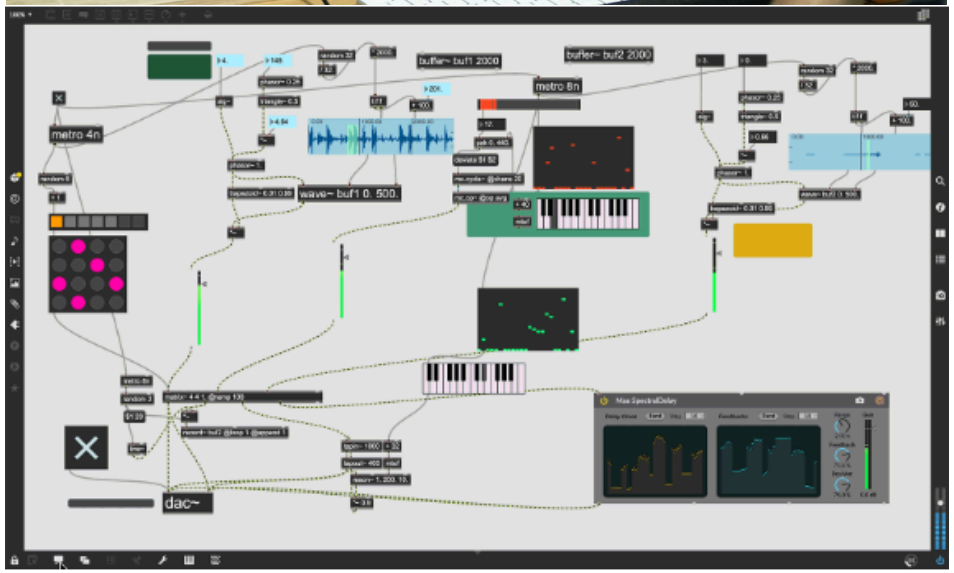
- **Generative artificial intelligence for graphics and multimedia**
- **Internet media streaming**
- **Elaborazione dell'audio digitale**
- **GPU Programming**
- **Game design**
- Web Applications II
- Human-Computer Interaction
- Large Language Models
- Robot learning
- ….

Internet media streaming

- Multimedia encoding techniques / formats for voice, audio, images, video
- Stereoscopic, 360°, HDR video
- Protocols, architectures and techniques for robust multimedia transmission
- Audio/videoconferencing
- HTTP streaming
- Large-scale multimedia communication platforms (Netflix, YouTube, Meta, …)
- Cloud-based multimedia systems

Digital audio processing

- Provides the main theoretical and practical skills for managing digital audio material in different scenarios with a particular attention to the processes of digitalization, synthesis, editing and real-time processing
- Provides fundamental knowledge and skills related to:
  - Acoustics and psychoacoustics
  - Audio feature extraction and analysis
  - Audio synthesis and MIDI
  - Digital audio effects
  - Digital audio editing and mixing
  - Web Audio programming
  - Digital audio codecs and formats (MPEG, Dolby)



Generative AI for graphics and multimedia

- Introduces advanced generative artificial intelligence techniques for the processing and creation of graphic and multimedia contents, such as generative models (GAN and diffusion model) and use of reinforcement learning in generative models
- Explores the use of generativeAI techniques for the generation and manipulation of multimedia content and graphical assets (virtual humans, 3D environments)

G&M vs. other (closer) paths

	Grafica e Multimedia	Software	AI & DA	Cinema
1st Year	Computer Architectures	Computer Architectures	Computer Architectures	Cinema immersivo
	Data Science & Db Tech	Data Science & Db Tech	Data Science & Db Tech	**Elaborazione Audio Digitale**
	Computer Network Tech	Computer Network Tech	Computer Network Tech	Future Story Telling
	Computer graphics	**Information systems**	**Big Data**	**Realtà virtuale**
				Choice 1 (1/2)
	Software Engineering	Software Engineering	Software Engineering	**Computer Animation**
	Image Processing and Vision	**Wep App I**	**Web App I**	Ingegneria del suono
	Sys & device programming	Sys & device programming	Sys & device programming	Sistemi elet. Prod. E Distrib.
	Computer Animation	**Formal Languages**	**Machine Learning**	**Game design and game thinking**
2nd Year	**Machine Learning for Vision and Multimedia**	**IS Security**	**IS Security**	Digital Strategy
	Virtual and augmented reality	**Software Engineering II**	**Advanced ML**	Digital Interaction Design
	Choice 1	Choice 1	Choice 1	VFX and animation for film
	Free credits	Free credits	Free credits	
	Choice 2 (Internet Video Stream. or Web App I)	Choice 2	Choice 2	Choice 2
	Thesis/stage	Thesis/stage	Thesis/stage	Thesis/stage

Politecnico di Torino

COLLEGIO ICM

Aperitivo di benvenuto

Martedì **1 aprile** 2025 H. **17:30**

2° piano Dipartimento **DAUIN**, **Corso Castelfidardo 34/d** (ingresso lato MixTo)

Occasione perfetta per fare nuove conoscenze, scoprire i laboratori del collegio ICM ed incontrare i docenti dei relativi corsi di studio!