

**** Title ****

Virtual Worlds (VW)

**** CFU ****

6 [complementary]

**** Learning outcomes ****

The course will let students understand:

- The importance of virtual worlds for human / machine training.
- Geometric and AI concepts to virtually reconstruct real 3D objects.
- The possibilities of augmented reality.
- Concepts of learning driven by an objective reward function.
- Open-world perception models and optimizations for resource-constrained devices.

**** Syllabus ****

- Introduction to Virtual Worlds
- Virtual-to-Real matching for Immersive Augmented Reality (AR)
- Reinforcement Learning for Automated Assistance
- Building Digital Twins from Imaging Data
- AI for AR: models for pose estimation, tracking, and open-world perception
- Edge AI: model optimization for AR devices
- Hands-on practical sessions on ML frameworks and medical data

**** Course organization & Assessment****

Lectures: 70%

Laboratory / Practice: 30%

Assessment: final essay / project, plus oral examination.

Lectures introducing Computer Graphics and AI-driven solutions to digital health problems will be complemented by associated laboratory practices for an hands-on experience in implementing and validating the approaches on health datasets, using state of the art software libraries and toolkits.

**** Prerequisites ****

Programming (Python preferential); Calculus; Elements of probability and statistics; Artificial Intelligence fundamentals.