



Wahlmodule EI Master

# Computer Vision

(EL470, 5 ECTS / 3 SWS)

In this course, we delve deep into the realm of computer-based vision to master not only the theory but also its practical applications. We start with various concepts for extracting, registering, and segmenting relevant image features. These techniques allow us to interpret image data in ways that go far beyond what the human eye can perceive.

In the second part of the lecture, we leverage the extracted image features for object classification and recognition. In addition to classical methods, we take a deeper look the topic of neural networks, concluding this section with an insight into current techniques in Generative AI for generating images and videos.

In the final part of the lecture, we focus on 3D reconstruction based on multi-camera recordings, a technique that forms the foundation for developing applications such as virtual and augmented reality.

We discuss various applications of computer vision (e.g., autonomous driving, medical technology, entertainment, surveillance) and learn to apply the techniques concretely in four practical exercises.

## Course Content

- Projective Geometry (2D, 3D)
- Camera Models and Calibration
- Feature Extraction and Matching
- Image Segmentation
- Classification and Detection
- Neural Networks
- Generative AI for Image and Video Generation
- 3D Reconstruction
- Point Cloud Processing



## Recommended Prerequisites for Participation

- Fundamentals of digital image processing
- Knowledge of programming in Python

## Recommended Literature

- D. Forsyth, J. Ponce: Computer Vision: A Modern Approach (2nd edition), Pearsons (2012).
- R. Szeliski: Computer Vision: Algorithms and Applications (2nd edition), Springer Verlag (2021).
- R. Hartley, A. Zisserman: Multiple View Geometry in Computer Vision (2nd edition), Cambridge University Press (2011).
- R. Gonzalez, R. Woods: Digital Image Processing (4th edition) , Pearson (2018).

## Moodle Enrollment, Start of the Course

If you are interested, you can enroll directly in the Moodle course, Computer Vision SS2024 (Flohr), using the password „**cv\_ss24\_flohr**“.

First lecture: **Wednesday, March 20, 2024, starting at 2:15 PM in room R2.093.**

This course will be held in **English**. Also the exam will be in English.

I am looking forward to seeing you in my course.

A handwritten signature in blue ink, appearing to read 'Fabian Flohr'.

### **Prof. Dr. Fabian Flohr**

Head of Intelligent Vehicles Lab (IVL)  
Department of Electrical Engineering and Information Technology  
Munich University of Applied Sciences  
Lothstr. 64 | 80335 Munich | Germany  
[iv.ee.hm.edu](mailto:iv.ee.hm.edu) | [fabian.flohr@hm.edu](mailto:fabian.flohr@hm.edu)

