

Modulprofil

Prüfungsnummer

5173100

Dauer

1 Semester

Häufigkeit des Angebots

Jedes Wintersemester

SWS

4

ECTS-Credits (CP)

5.0

Workload

Angeleitete Studienzeit:

Präsenzzeit: 60 Std.

Selbststudienzeit: 90 Std.

Gesamt: 150 Std.

Lehrveranstaltungsart(en)

Seminaristischer Unterricht

Lehrsprache

Englisch

Organisation

Modulverantwortung

Prof. Dr. Dominik Seuß

Dozierende

Prof. Dr. Dominik Seuß

Verwendbarkeit

MAI

Studiensemester

2. Semester

Art des Moduls

Pflichtmodul

Verpflichtende Voraussetzungen gemäß SPO

None

Empfohlene Voraussetzungen

None

Inhalte

This lecture course provides a foundational and comprehensive introduction to the field of Computer Vision, covering both traditional image processing techniques and modern Deep Learning-based approaches. The focus is on understanding the theoretical principles underlying key algorithms, while also examining their applicability to real-world problems.

Students will explore the strengths, limitations, and use cases of classical methods—such as edge detection, feature extraction, and image segmentation—as well as state-of-the-art machine learning techniques, including Convolutional Neural Networks (CNNs) and other deep learning architectures.

A strong emphasis is placed on bridging theory and practice. Real-world examples are drawn from domains such as medical image analysis, industrial inspection, and other safety-critical applications, where factors like robustness and explainability play a central role. Concepts from Explainable AI (XAI) are discussed in the context of interpreting and validating model behavior, particularly in high-stakes environments.

Theoretical knowledge is reinforced through practical exercises and programming assignments, enabling students to implement core algorithms and develop their own solutions to defined tasks. This integrated approach supports the development of both analytical thinking and technical proficiency.

Prüfung

Verpflichtende Voraussetzung gemäß SPO für die Teilnahme an der Prüfung

None

Art der Prüfung

Sonstige Prüfung (soP) gemäß
§§ 26, 27 APO

Dauer/Form der Prüfung

Portfolio

Die konkrete Festlegung der
abzuleistenden Prüfung erfolgt
im Studienplan

Prüfungssprache

Englisch

Voraussetzung für die Vergabe von Leistungspunkten

None

Lernergebnisse

By the end of this course, the students will be able to:

- Remember fundamental principles and key terminology related to traditional and deep learning-based Computer Vision methods.
- Understand the theoretical foundations and practical implications of major Computer Vision algorithms in various application contexts.
- Apply established Computer Vision techniques to solve basic real-world problems through programming assignments and projects.
- Analyze the strengths, limitations, and suitability of traditional versus deep learning approaches across diverse tasks.
- Evaluate and compare different Computer Vision models based on performance, computational efficiency, and application constraints.
- Create adapted or novel solutions by integrating existing algorithms into practical systems tailored to specific use cases.
- Apply research-informed methodologies to bridge the gap between theoretical models and industry-level implementations.

Literatur

- Szeliski, R. (2022). Computer vision: Algorithms and applications (2nd ed.). Springer.
- Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep learning. MIT Press.
- Chollet, F. (2021). Deep learning with Python (2nd ed.). Manning.
- Zhang, A., Lipton, Z. C., Li, M., & Smola, A. J. (2023). Dive into deep learning (2nd ed.). Retrieved from <https://d2l.ai>
- Khan, S., Rahmani, H., Shah, S. A. A., & Bennamoun, M. (2018). A guide to convolutional neural networks for computer vision. IEEE Transactions on Systems, Man, and Cybernetics: Systems, 49(1), 1–20. <https://doi.org/10.1109/TSMC.2018.2882141>