Fachhochschule Dortmund
University of Applied Sciences and Arts

Ruhr Master School
of Applied Sciences

we focus on students

Extended Reality (XR)

Compulsory elective module in the Master's degree programmes

Biomedizinische Informationstechnik, Informationstechnik and for Ruhr Master School

Summer term 2025

Prof. Dr.-Ing. Karsten Lehn
Karsten.Lehn@fh-dortmund.de

Teaching language:
Englisch

Max. number of participants from RMS: 6

Video of Extended Reality (XR) Course (in German)

https://video.fh-dortmund.de/video/Extended-Reality-28XR29-in-der-Lehre/80b40b47663cfc6aecc25b895e65eff0

Extended Reality (XR) in der Lehre

Teilen

Prof. Dr.-Ing. Karsten Lehn

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Variant for Ruhr Master School

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Extended Reality (XR) for Ruhr Master School (RMS)

- 5 ECTS – Other variants potentially possible
- Fixed dates:
  - One attendance date in the first week of lectures: Introduction and borrowing of headset - In presence in Dortmund
  - One online attendance date in the third week: Unity introduction
  - Block week - In presence in Dortmund
  - Last week of lectures: Results presentation and return of the headset - In presence in Dortmund
  - Detailed schedule will be communicated as soon as the timetable is available
- Mainly self-directed learning using the XR Toolbox, lecture material and learn.unity.com
- Main task: Development of a Unity XR project of your choice in consultation with the lecturer
  - Scientific basis in a defined area, e.g. from your degree programme or another interesting field
  - Scientific reference to the lecture content

Learning Outcomes/ Competences

- The students can explain Extended Reality (XR) terms, concepts and human perceptual aspects in a scientific way. They can differentiate instances of Extended Reality (XR), especially Virtual Reality (VR) und Augmented Reality (AR).
- The students can prepare, present, analyze and evaluate selected scientific findings and insights. They can scientifically describe the functionality of the building blocks of an XR system.
- Moreover, they can classify and explain the role of these components in their interaction with users for generating immersive experiences in a virtual or augmented world. The students can combine their knowledge with current scientific findings and insights und their background in informatics and programming to develop application concepts and prototypical XR applications.

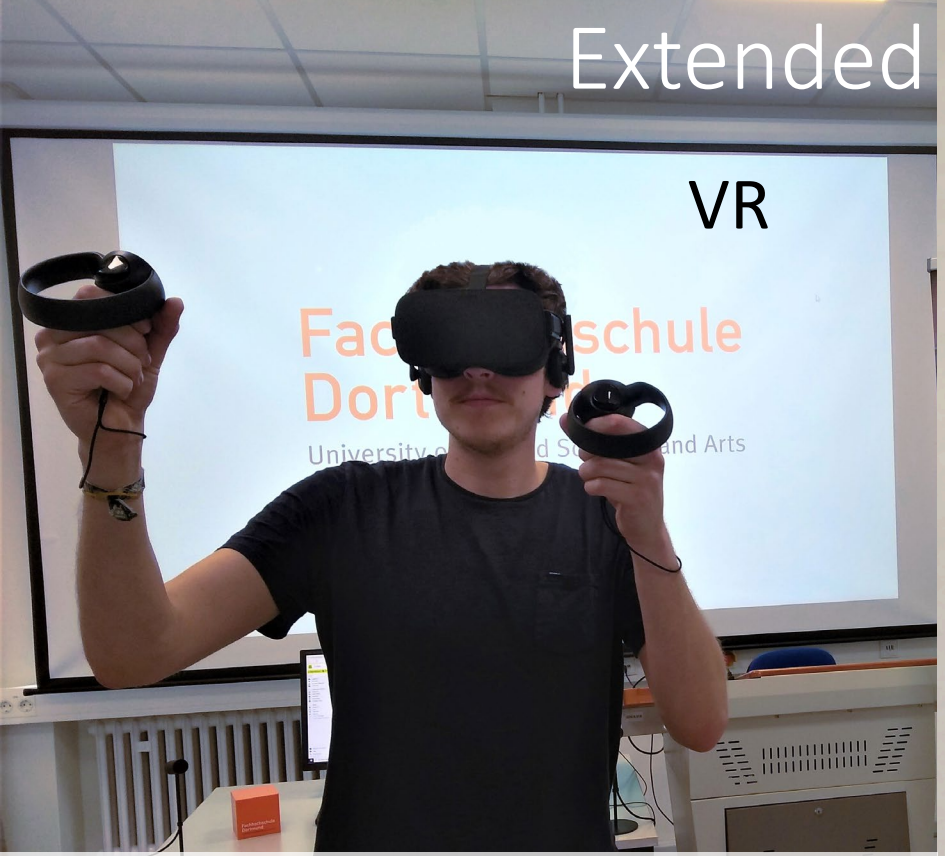
HW Requirements

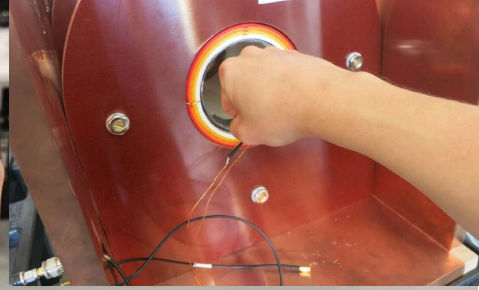
- Mobile computer (Notebook) that meets the requirements at the following link. https://docs.unity3d.com/Manual/system-requirements.html
  - USB-C
- For some augmended reality applications, students might need a suitable Android mobile phone
  - Requierements: https://docs.unity3d.com/Manual/system-requirements.html
- Some virtual reality headsets, virtual reality viewers for mobile phones can be borrowed during the course

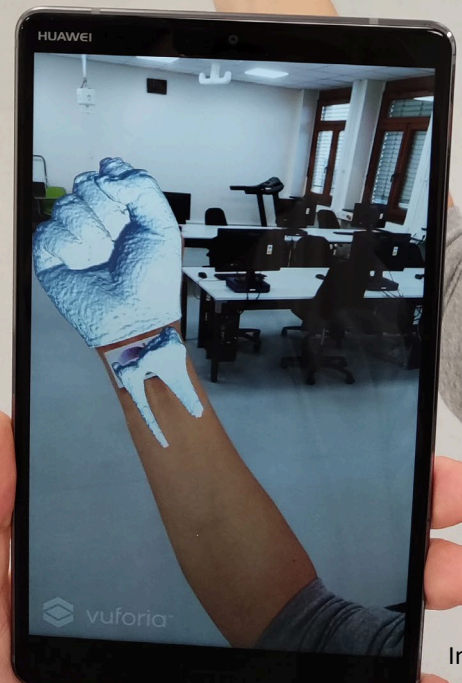
Extended Reality(XR)

VR

AR







Mixed Reality (MR)

Real Env.	Augmented Reality (AR)	Augmented Virtuality (AV)	Virtual Env.

Image: Matthias Feldbrügge

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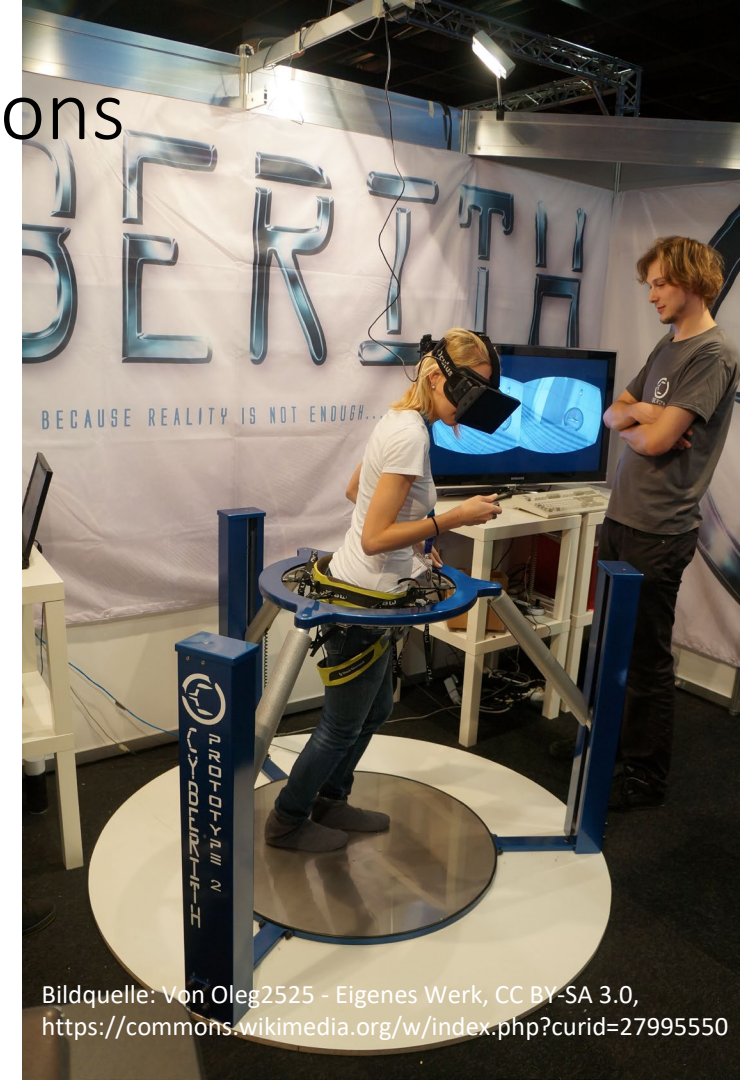
Innovative XR Applications

- How do innovative and new XR application conceps look like?
- Which are important human-factor aspects?
- Which are important technological aspects?

Bildquelle: Von Marc Lee - Einsgoeins, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=45934349



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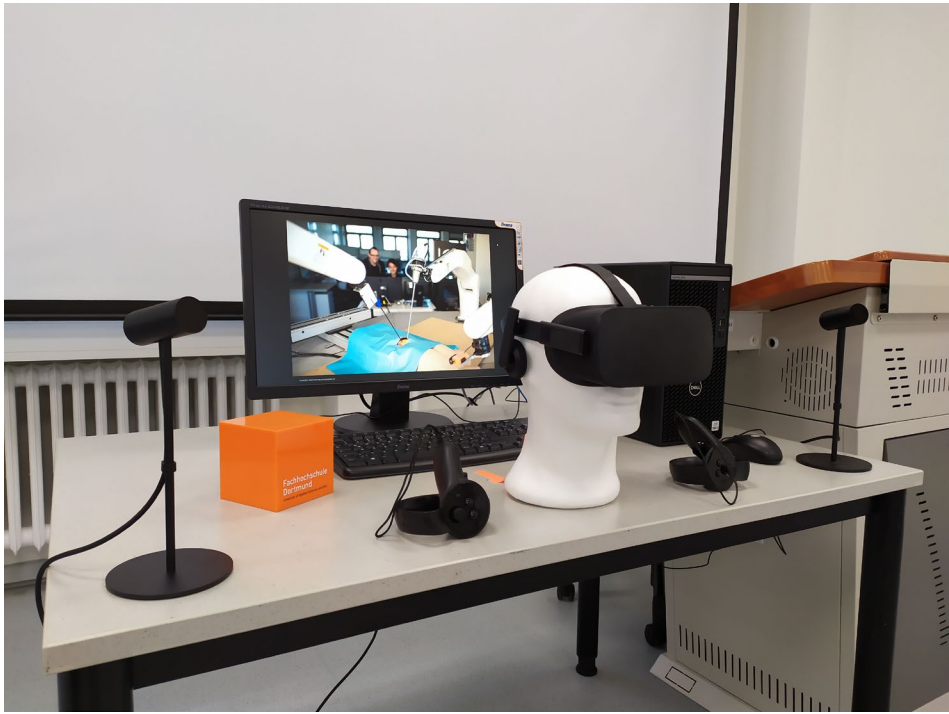
Contents

- Introduction and differentiation
- Extended Reality (XR) applications
- Tracking
- Aspects of human perception
- XR input and output devices
- Aspects of human-computer Interaction



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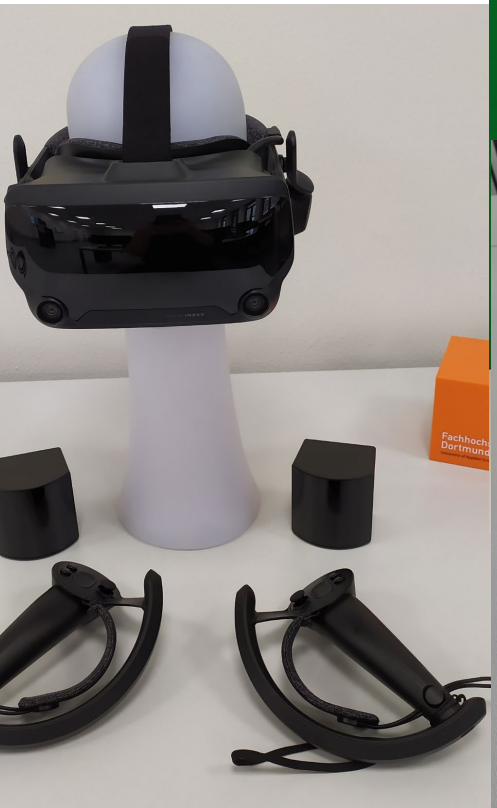
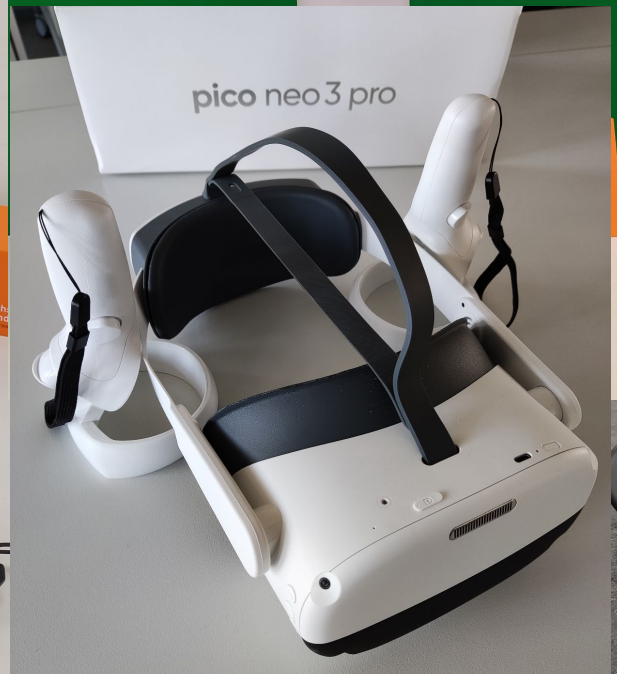
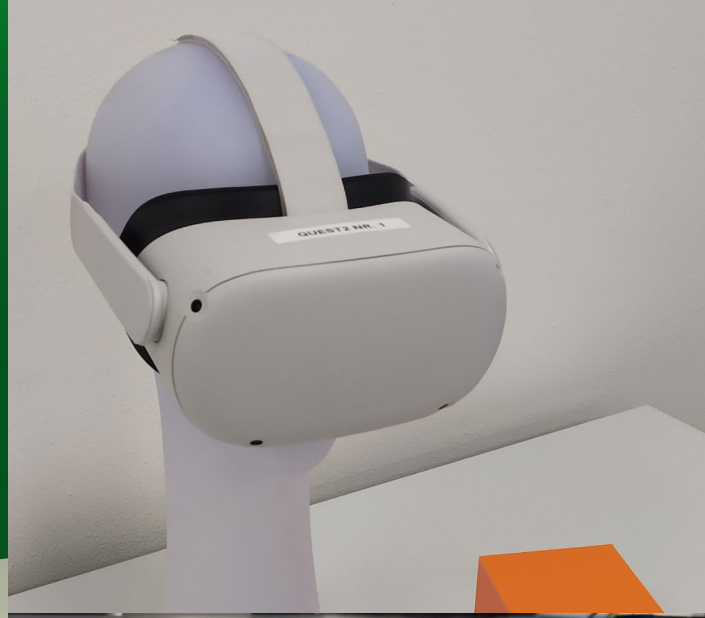
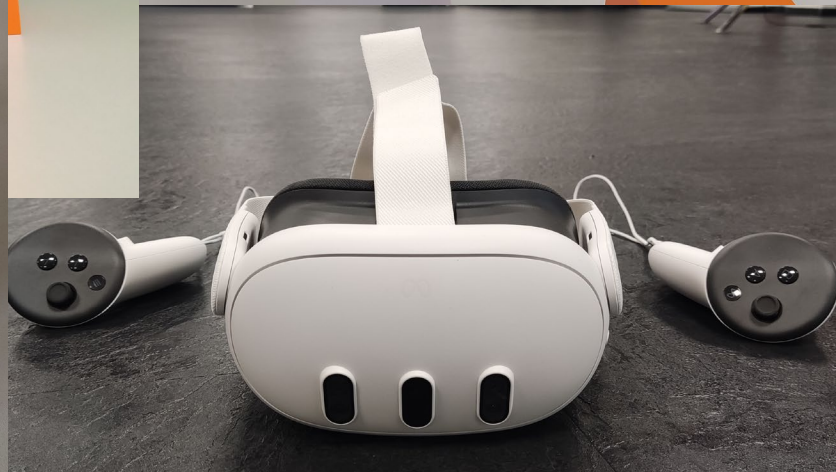
XR headsets









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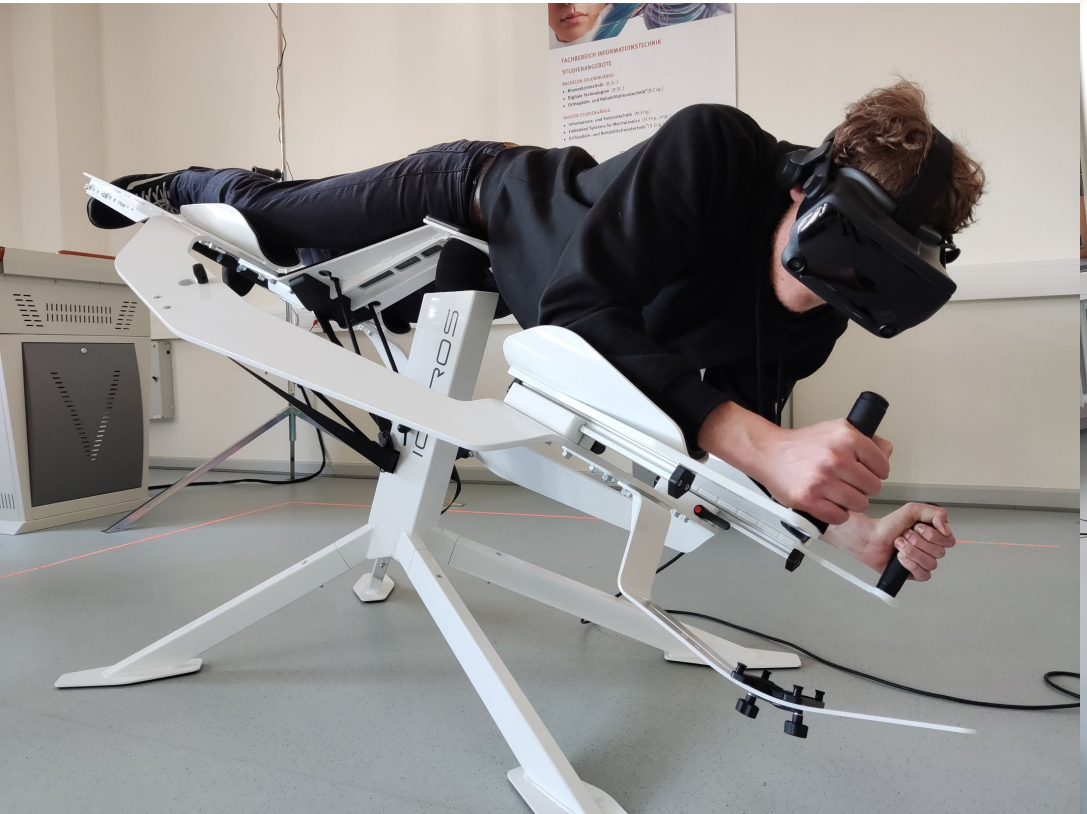
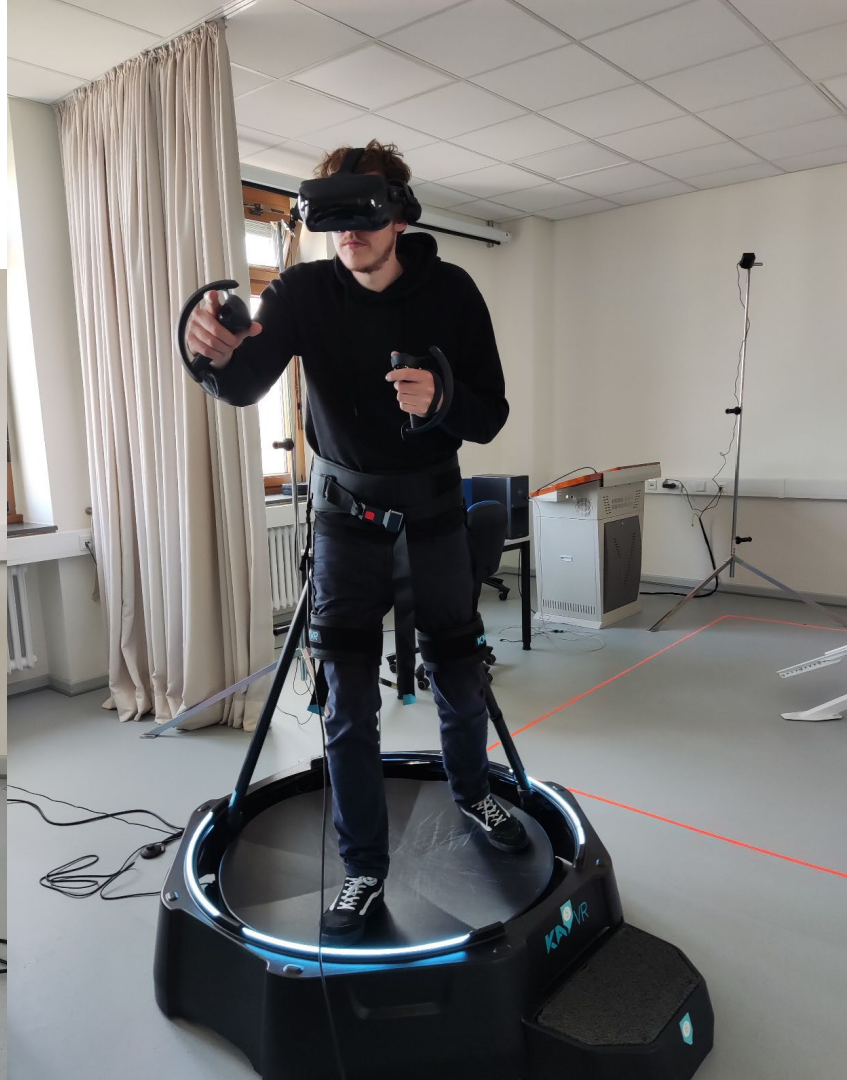
XR technology





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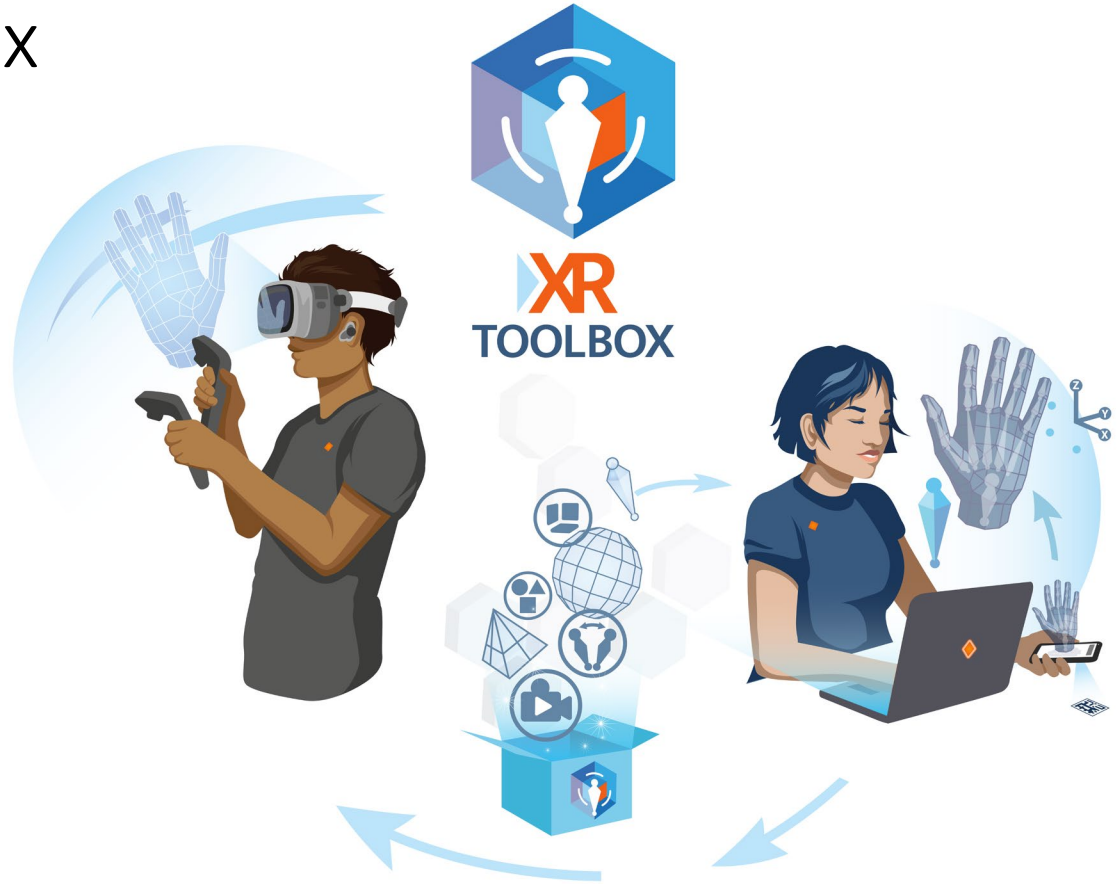
XR Toolbox

- Support for induction and implementation through the XR Toolbox, which was specially developed for the faculty of information technology.
- Tutorials, Videos (German language)
- Applications as demos and toolbox item
- Only for Unity 2021 LTS



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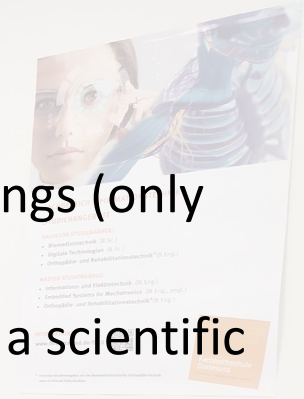
Course

we focus on students



- Experience-oriented teaching
- Analyzing and presenting current scientific XR findings (only XR and XR2)
- Concepting of innovative XR applications based on a scientific background (only XR)
- Prototyping and evaluating an XR application (XR2 and RMS)
- Using AR and VR devices
- Software development (programming) using a game engine
- Project work
- Working in teams (depending on number of participants)

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Literature

- Jerald, Jason (2016). The VR Book: Human-Centered Design for Virtual Reality (Acm Books). Morgan & Claypool Publishers-Acm.
- LaValle, Steven M. (2023). Virtual Reality. Als E-Book verfügbar unter http://lavalle.pl/vr/.
- Schmalstieg, Dieter, Höllerer, Tobias (2016). Augmented Reality: Principles and Practice. Boston: Addison-Wesley.