

# Image and data analysis

## Fachrichtung Medizinische Bild- und Datenverarbeitung

Bernhard Kainz

# Medial imaging

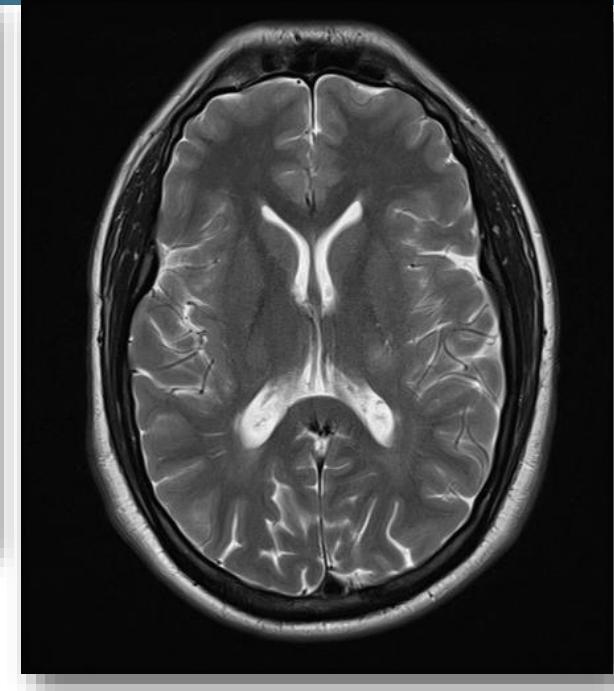
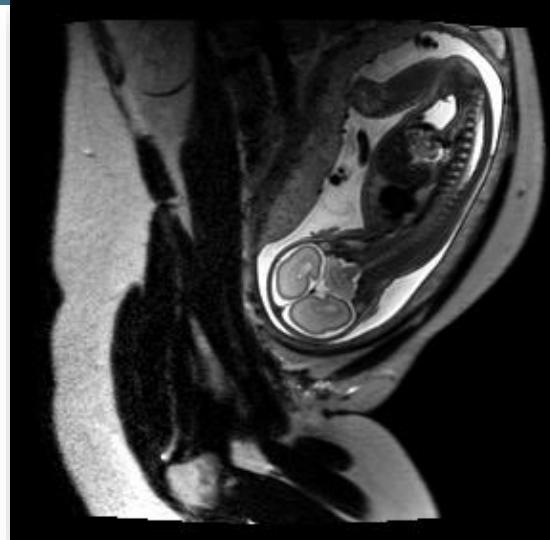
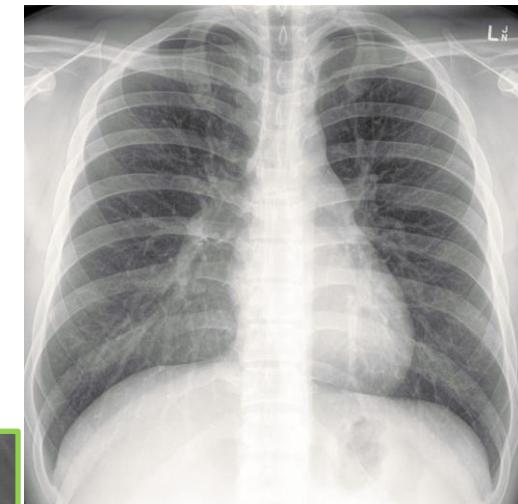
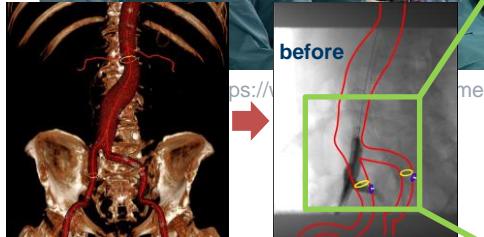
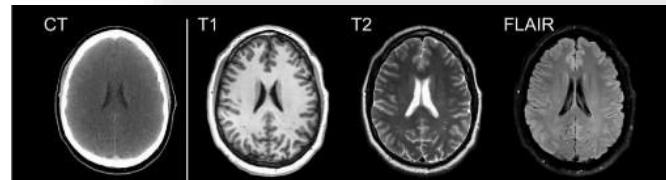
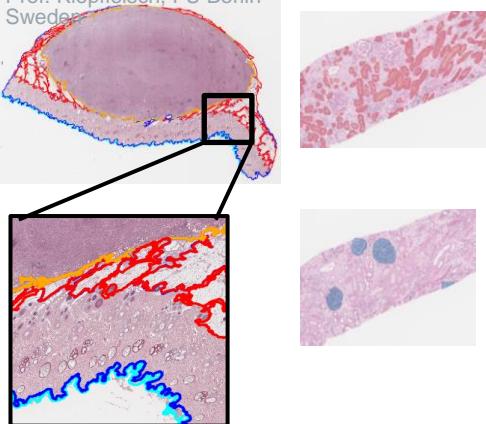
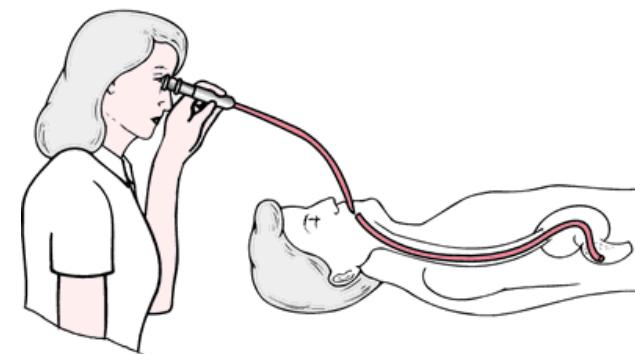
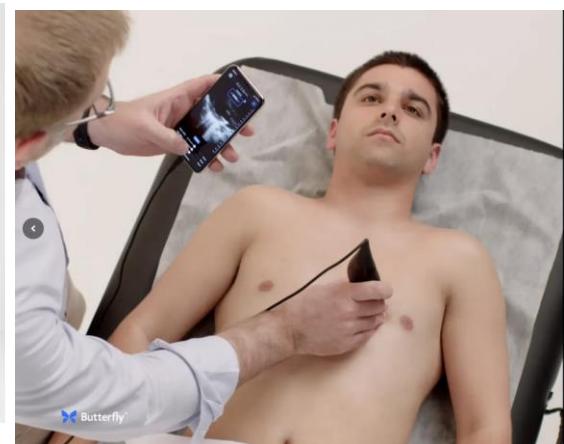


Image courtesy: Prof. Falkenberg, Sahlgrenska, Sweden

**EXACT**



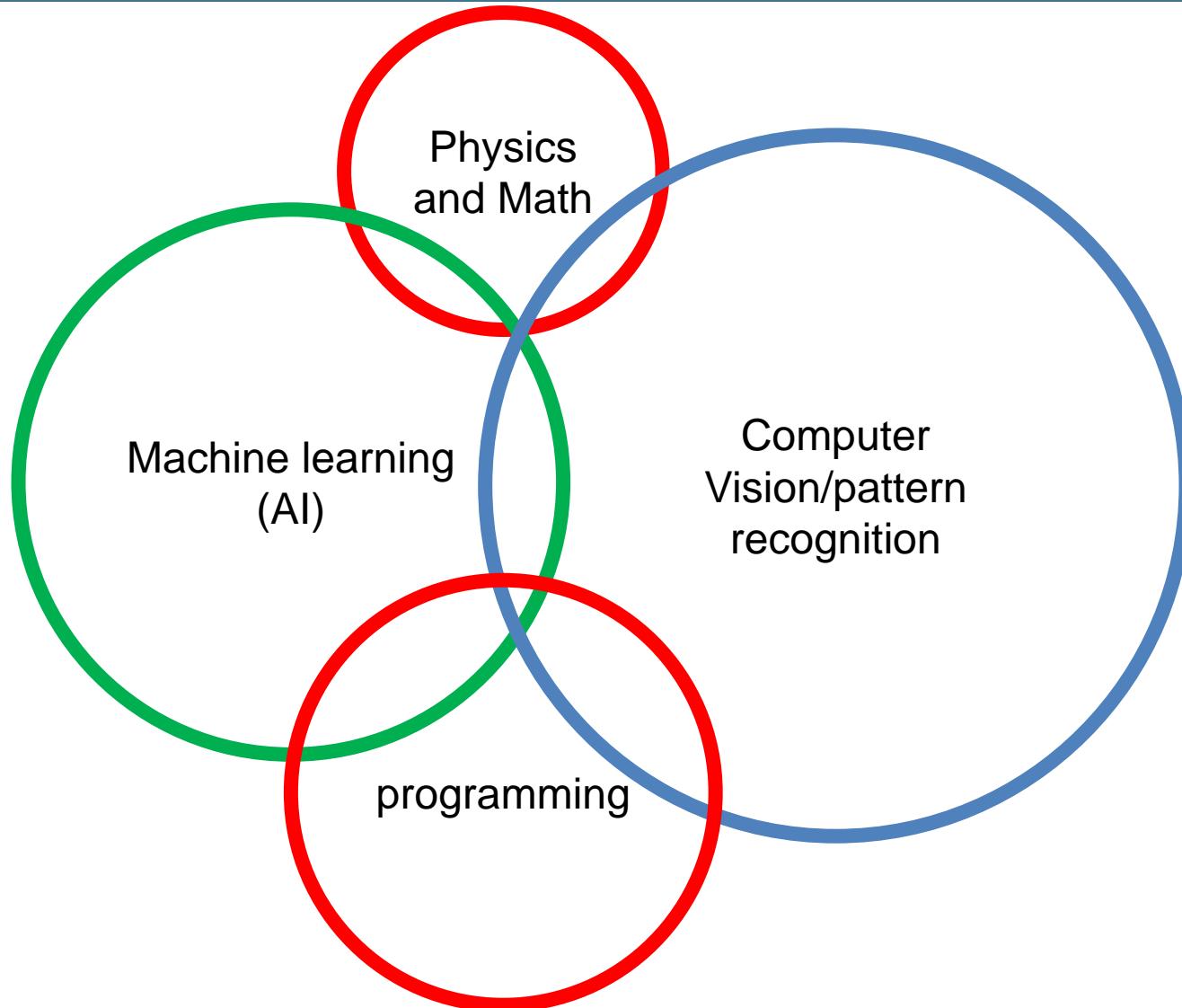
# Medical imaging

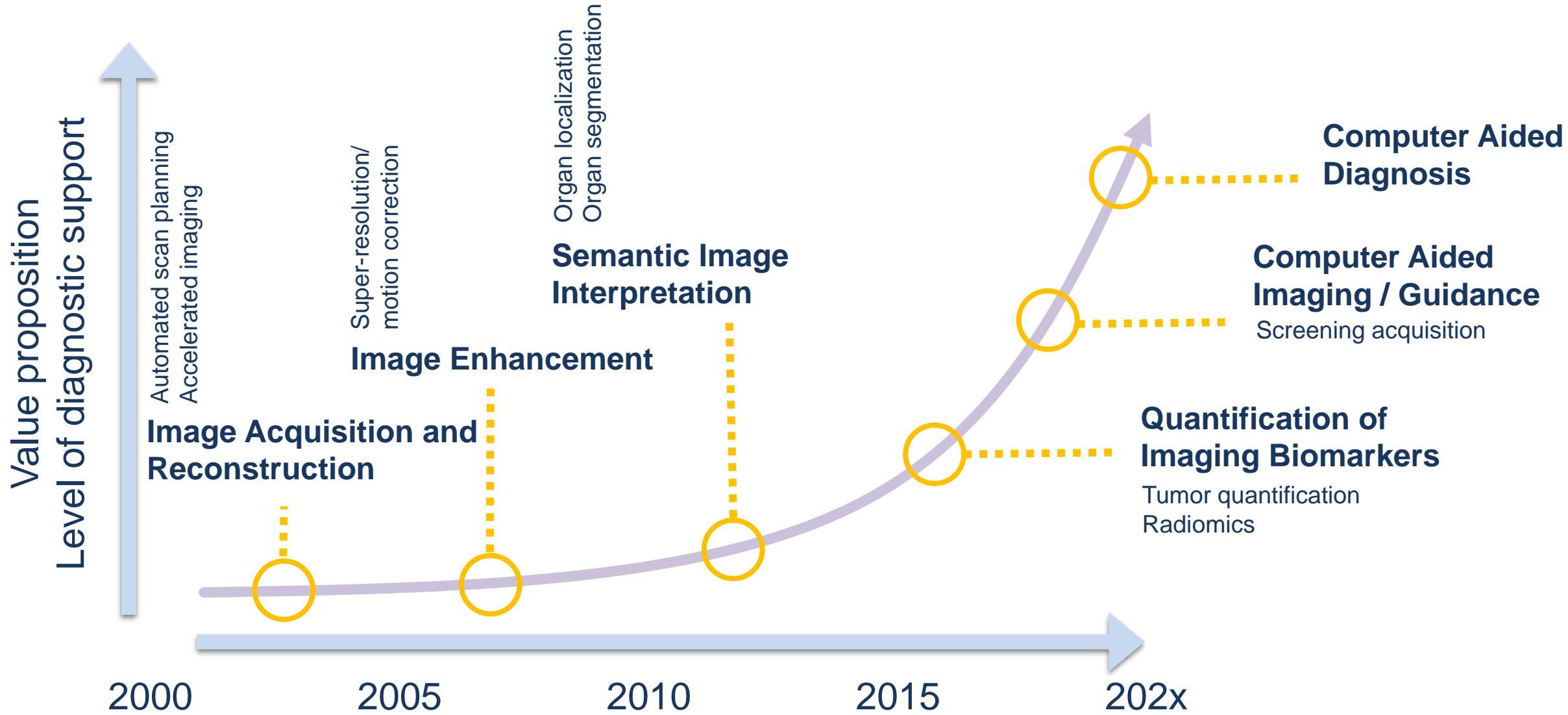


# Choices

Dept. AIBE  
<https://aibe.tf.fau.de/>

Dept. Computer Science  
<https://lme.tf.fau.de/>

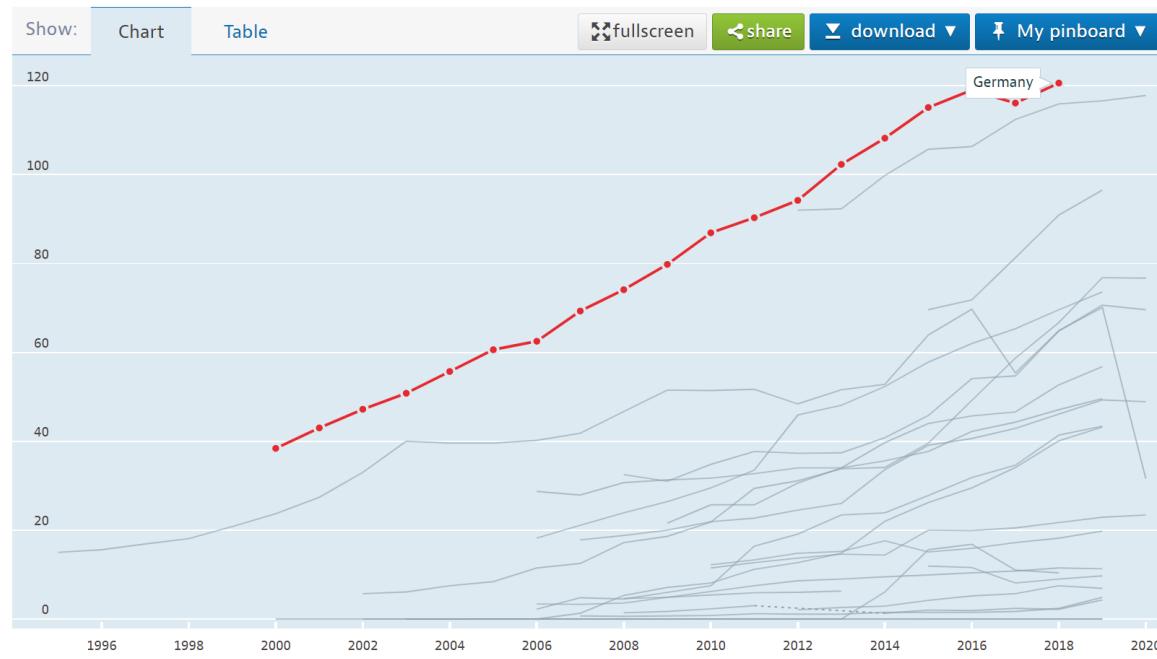




# Future relevance?

## OECD use of MRI 1996-2020

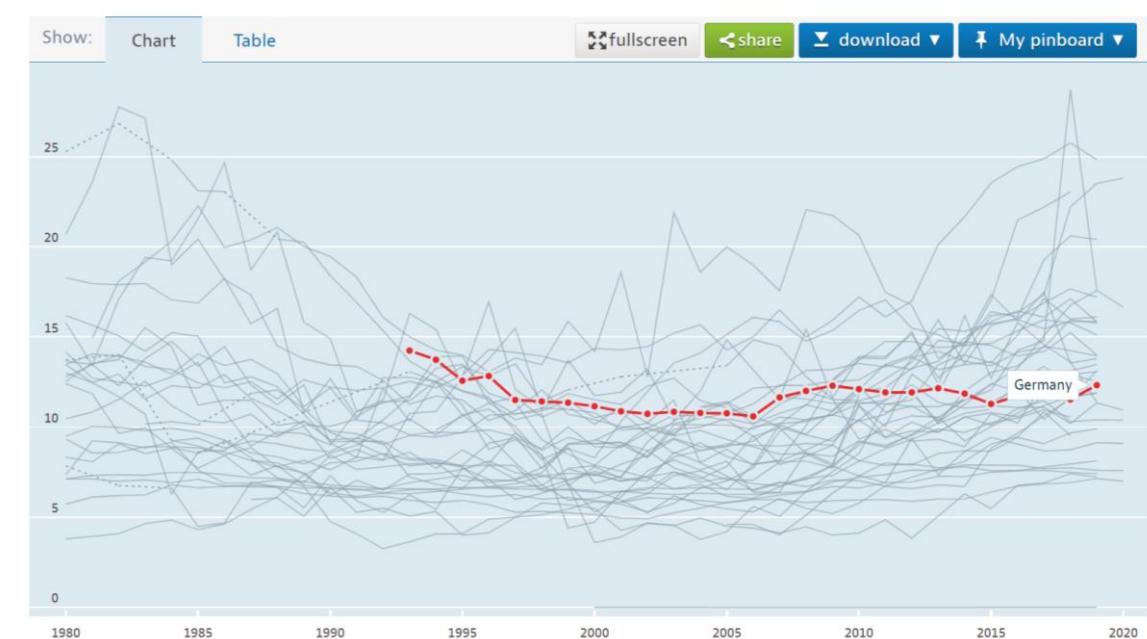
Magnetic resonance imaging (MRI) exams In ambulatory care providers, Per 1 000 inhabitants, 1995 – 2020 Source: Health care utilisation



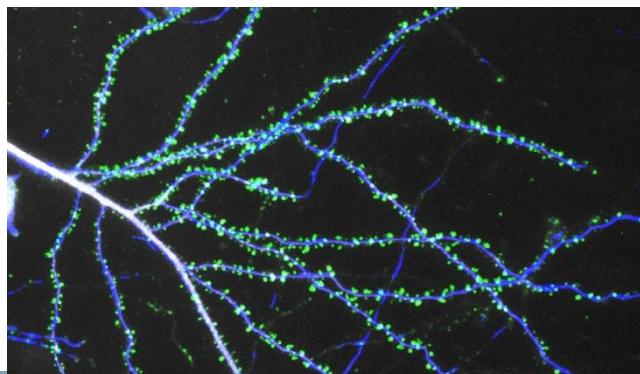
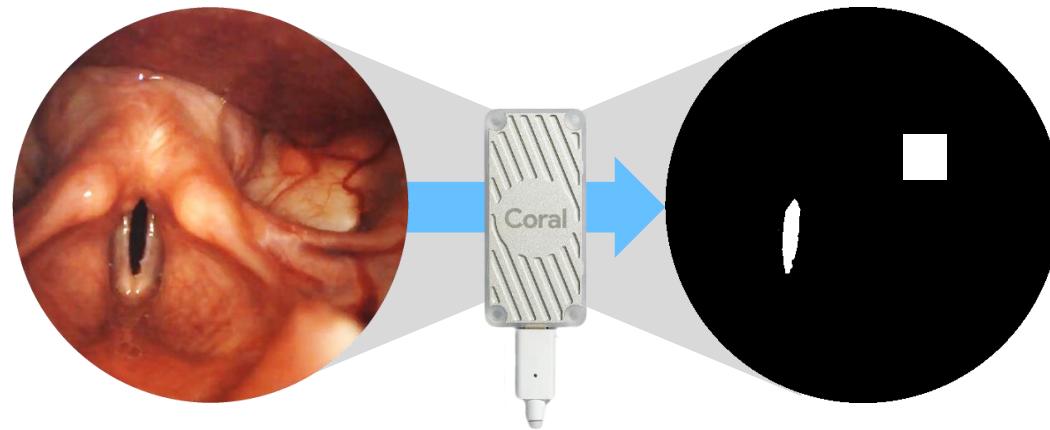
## OECD medical graduates 1980-2020

Medical graduates Total, Per 100 000 inhabitants, 1980 – 2020

Source: Health care resources



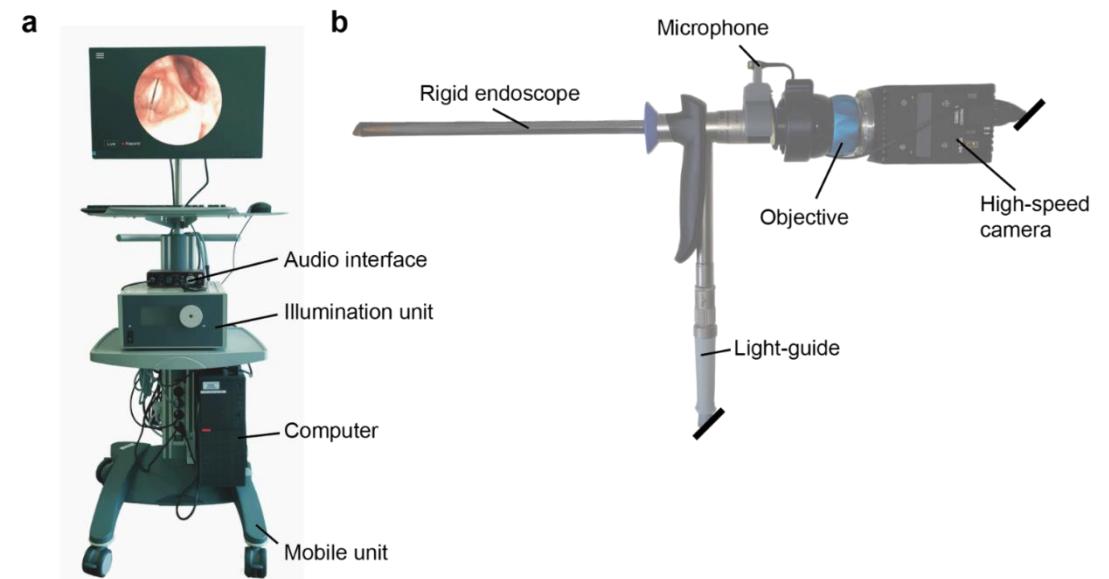
## Data analysis – ANKI lab



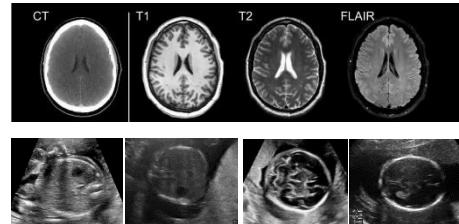
Revolutionizing  
neuroscience  
research through  
AI-driven  
neuroanatomical big  
data analysis

## OpenHSV

AI-powered, Open Source system for high-speed videoendoscopy to quantify and monitor voice physiology



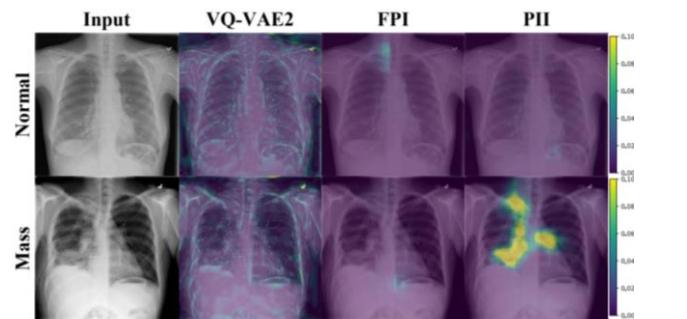
# Image analysis – IDEA lab



Multi-modal imaging

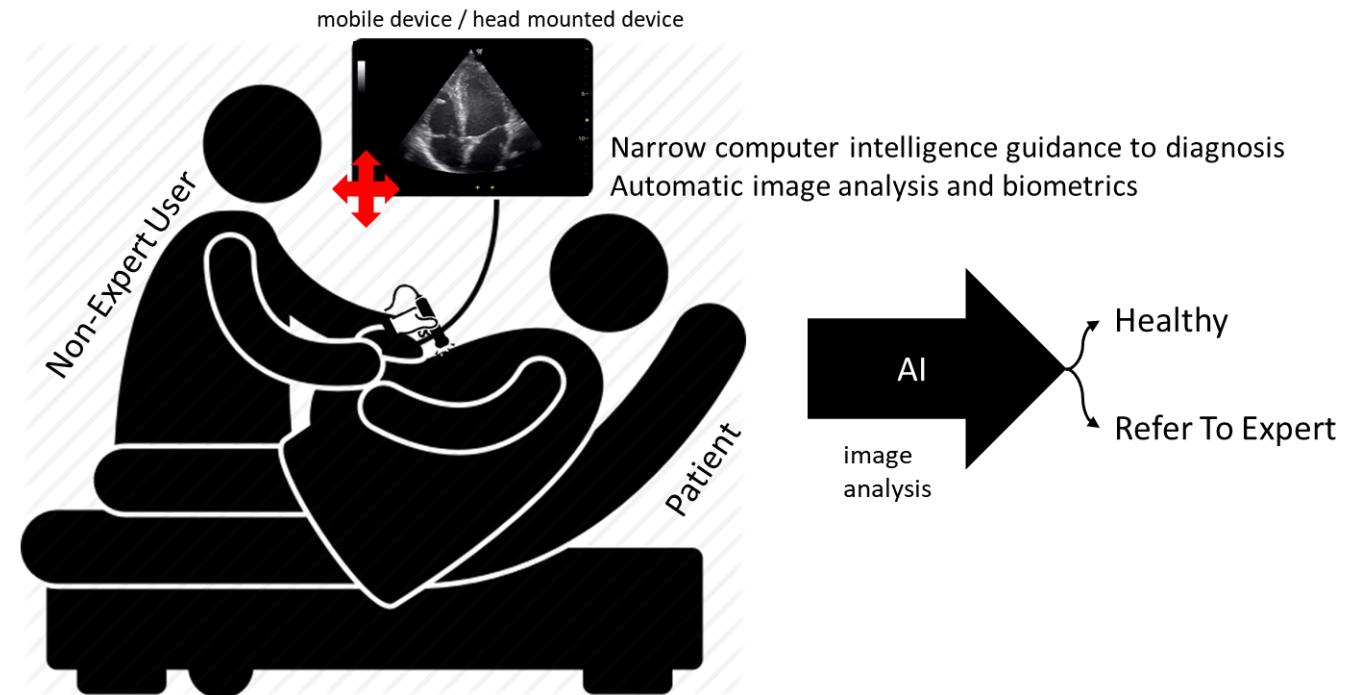


Ultrasound imaging



Normative Machine Learning  
/anomaly detection

Front line personnel (nurses, first responders, doctors, patients)



# Pattern recognition lab

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Recognition  
Lab[Overview](#) ▾ [Team](#) ▾ [Research](#) ▾ [Teaching](#) ▾ [Lab](#) ▾

## Pattern Recognition Lab

Pattern Recognition Lab, Computer Science, Friedrich-Alexander-Universität Erlangen-Nürnberg



## Welcome to the Pattern Recognition Lab!

Researchers and students at Pattern Recognition Lab (LME) work on the development and implementation of algorithms to classify and analyze patterns like images or speech. The research is mostly interdisciplinary and is focussed on medical- and health engineering. The LME has close national and international collaborations with other universities, research institutes and industrial partners.

## Research Areas

- [Cognitive Computational Neuroscience](#)
- [Computer Vision](#)

## Contact

Mail: [cs5-info@lists.fau.de](mailto:cs5-info@lists.fau.de)

Phone: +49-9131-85-27775

Fax: +49-9131-85-27270

## Secretary:

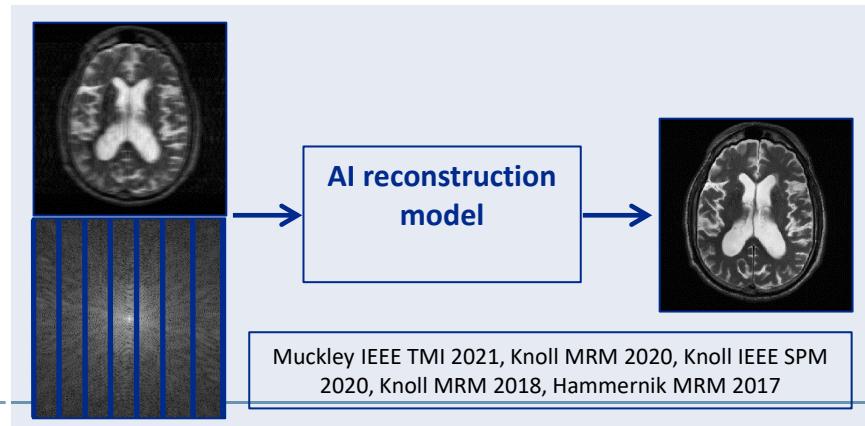
Due the current limitations, the office hours may vary. Please make an appointment by e-mail.

Monday: 8:00 - 12:15

Tuesday: 8:00 - 16:45

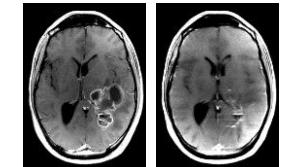
# Data analysis – Computational imaging lab

*Machine Learning in Medical Engineering ; MRI in the era of AI (florian.knoll@fau.de)*

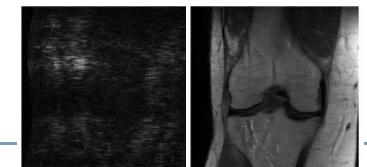


## Ongoing challenges

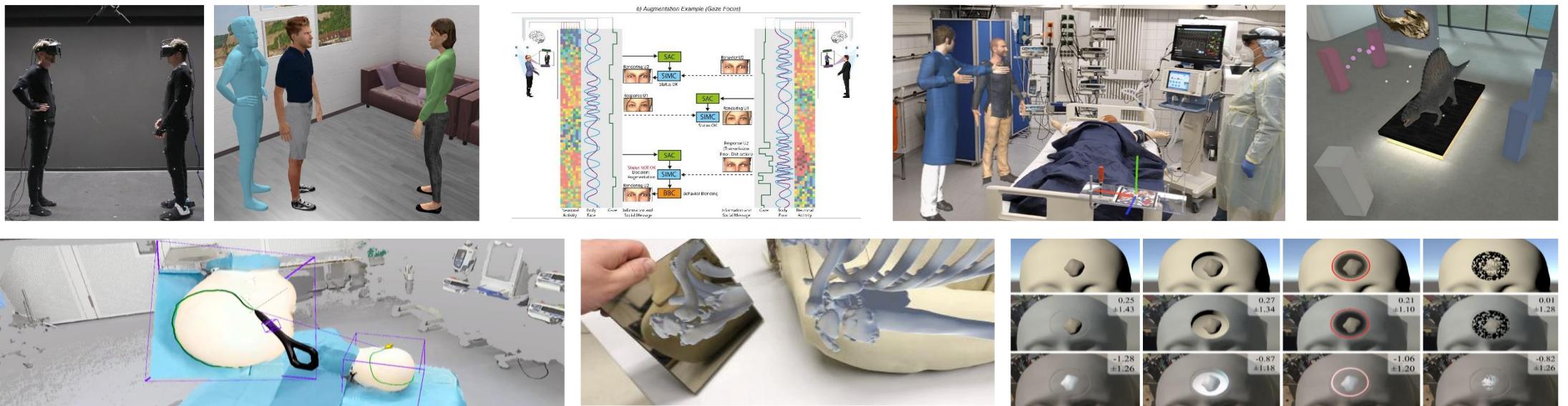
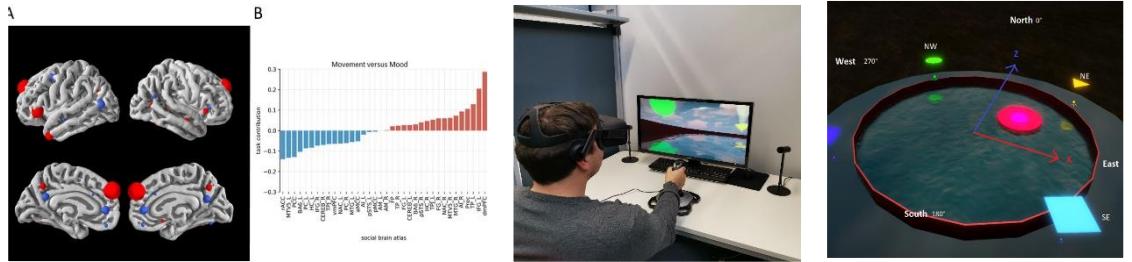
Missing image features



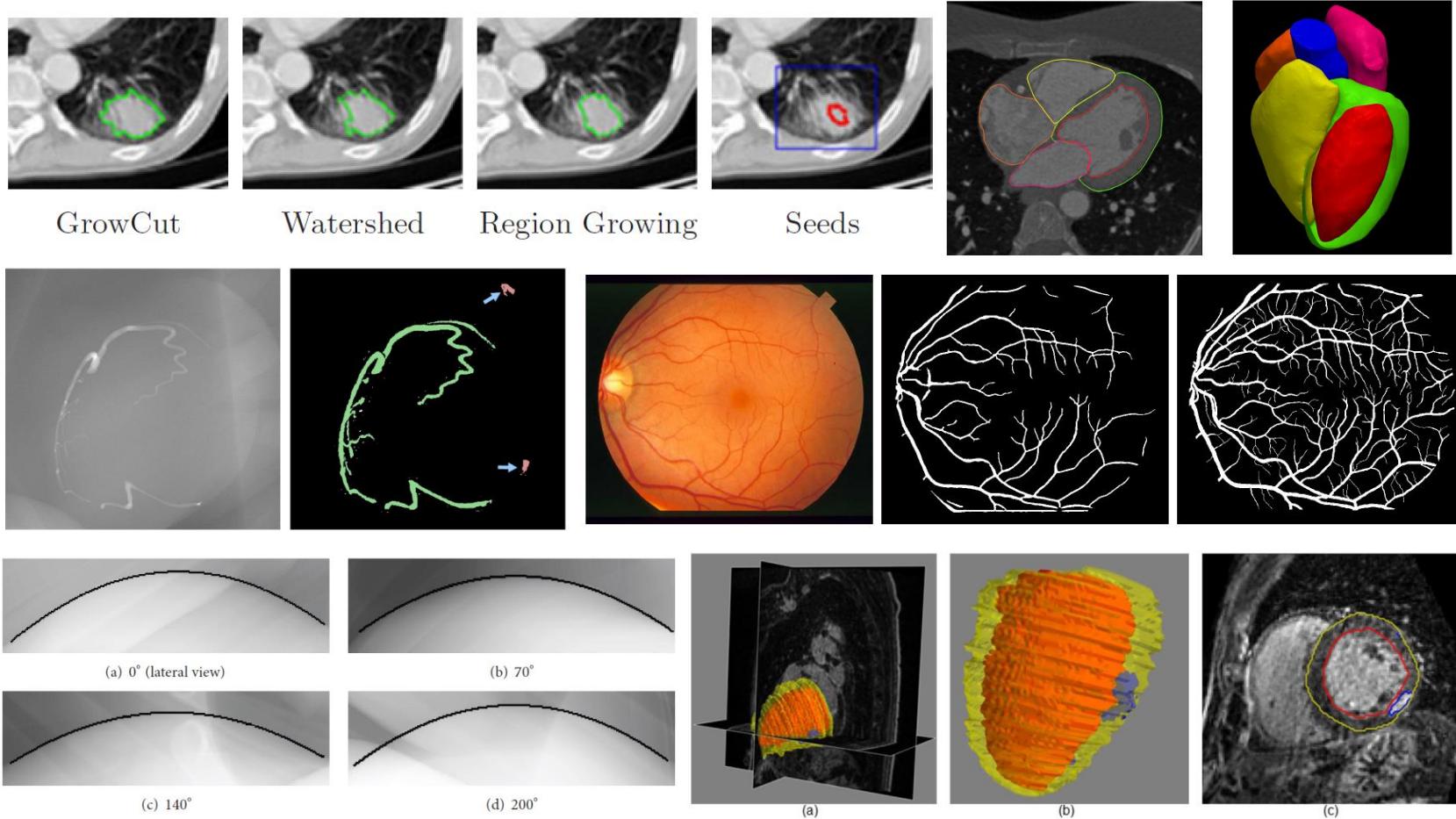
Robustness/stability



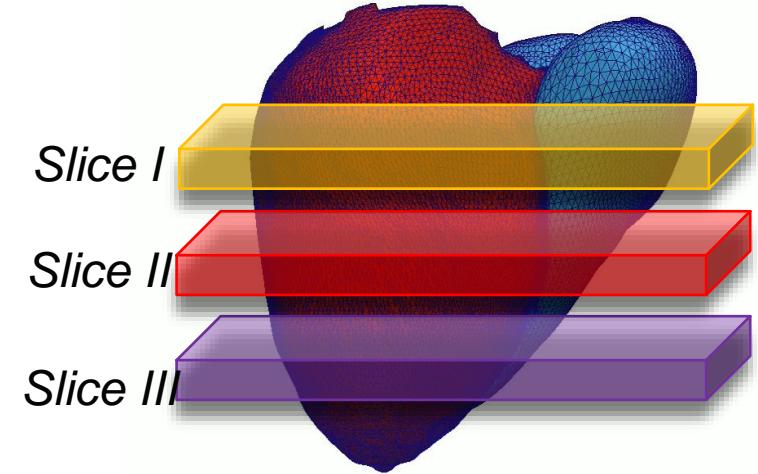
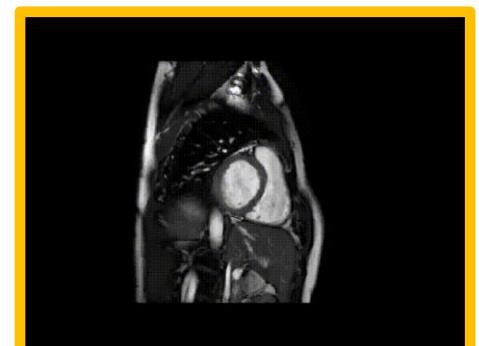
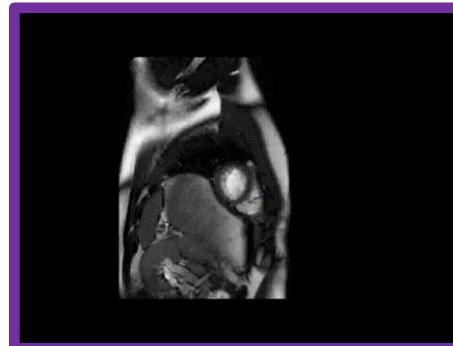
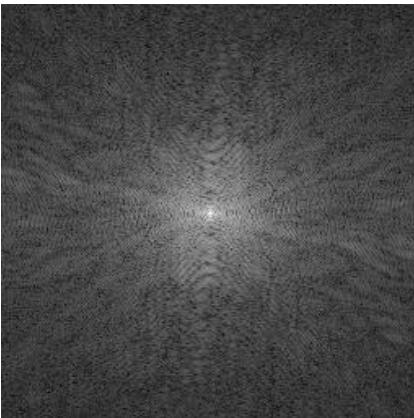
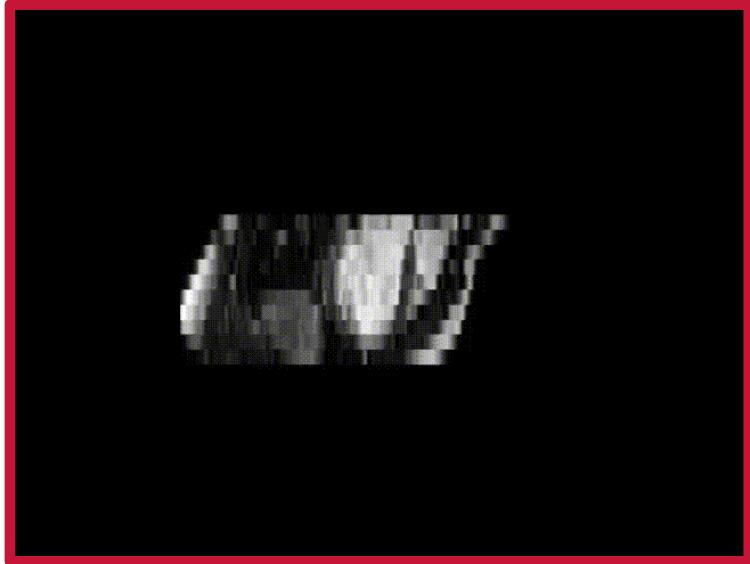
# Data analysis – HEX lab



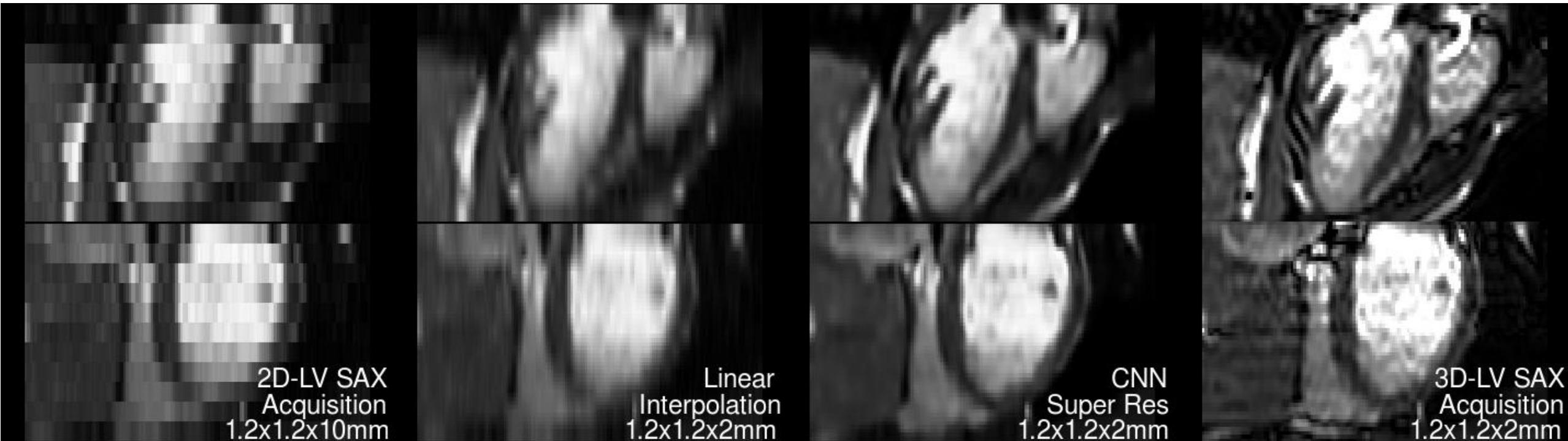
# Radiomics



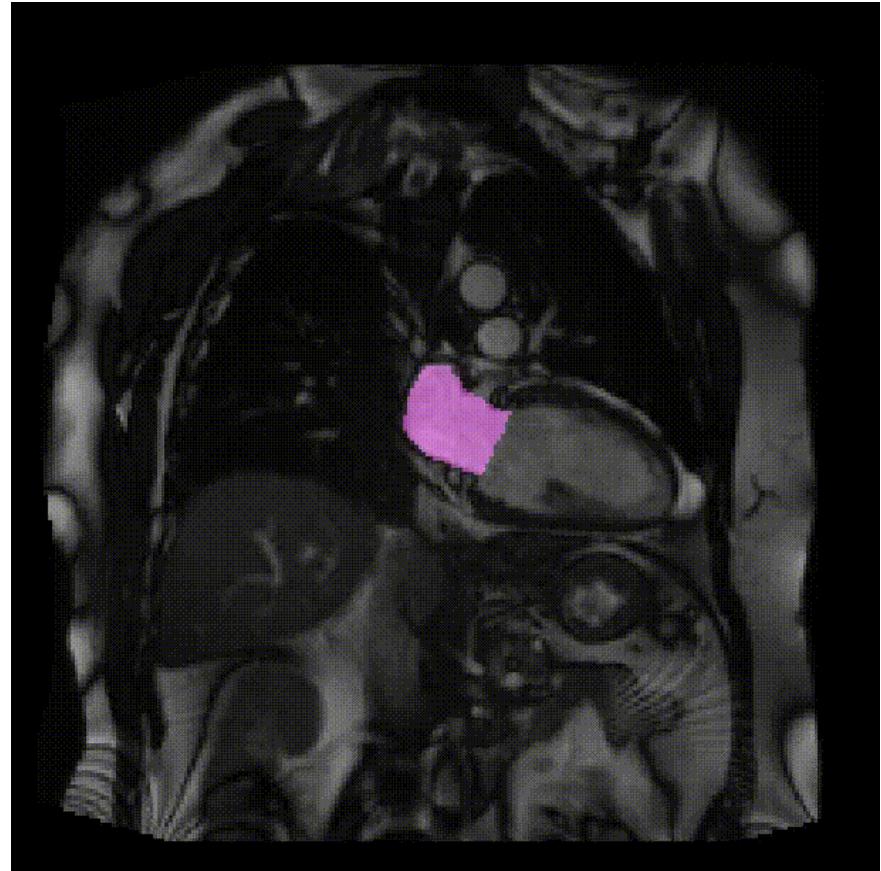
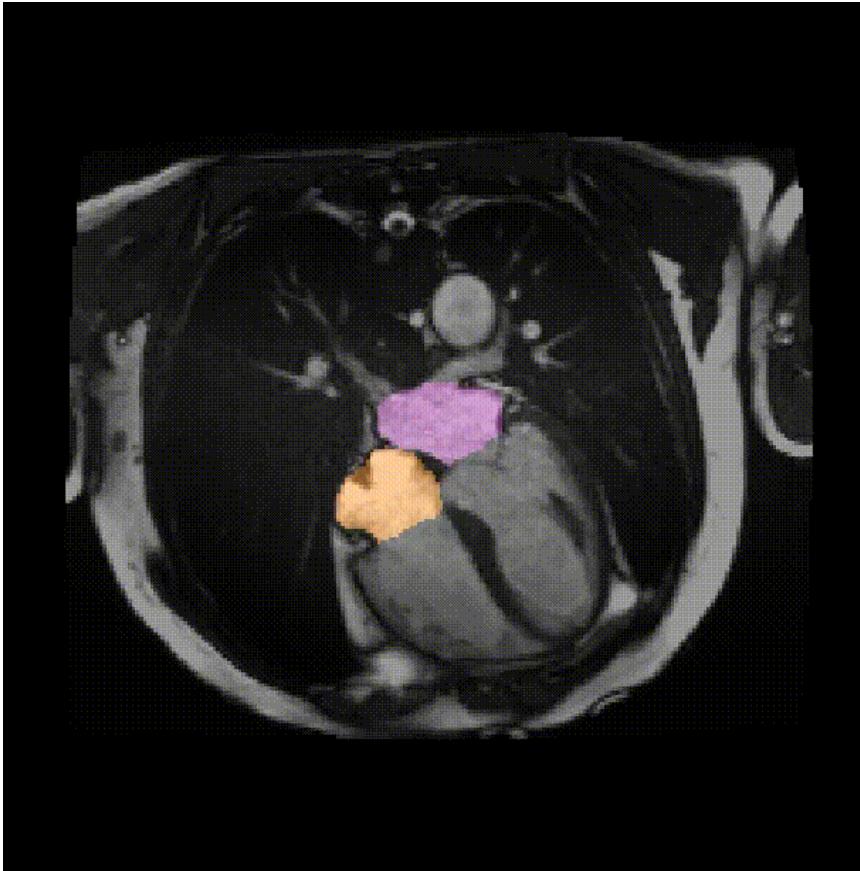
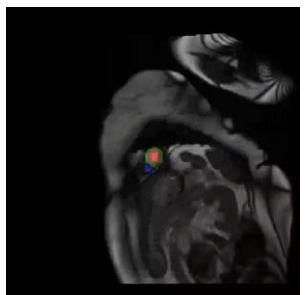
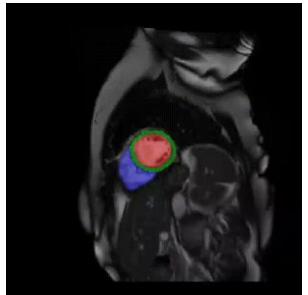
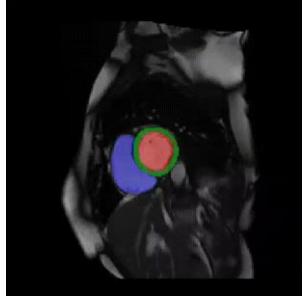
## Data analysis - MRI



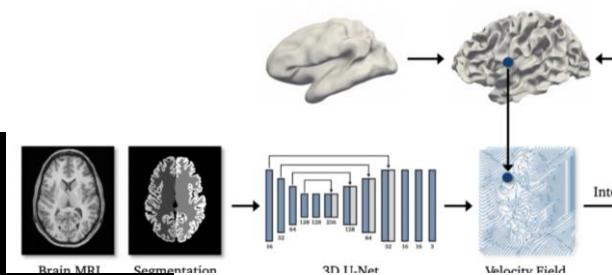
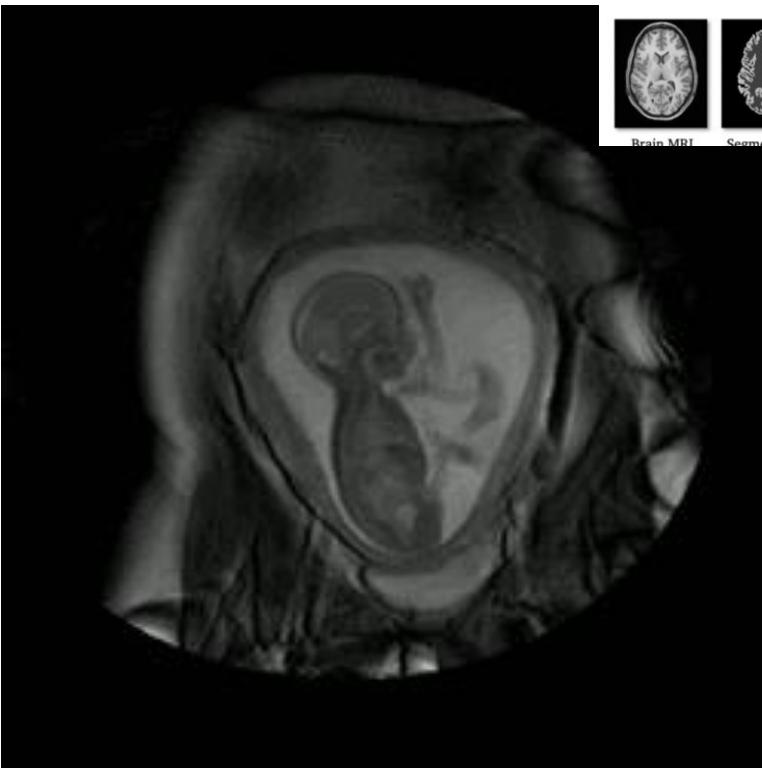
# Data analysis - MRI



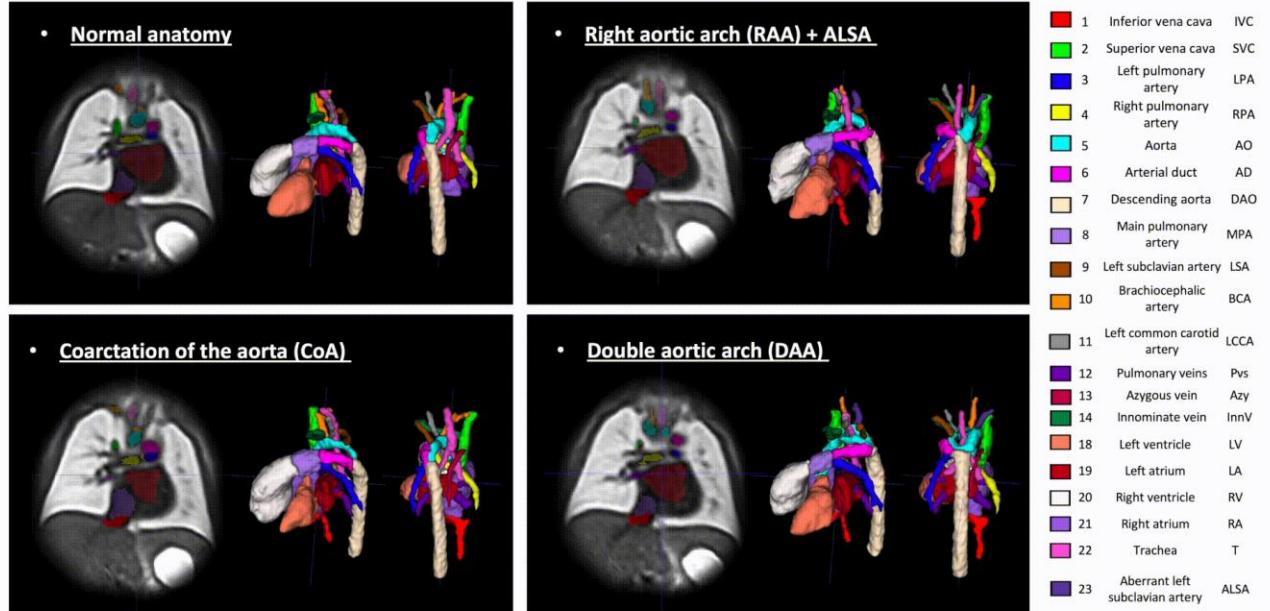
## Data analysis - MRI



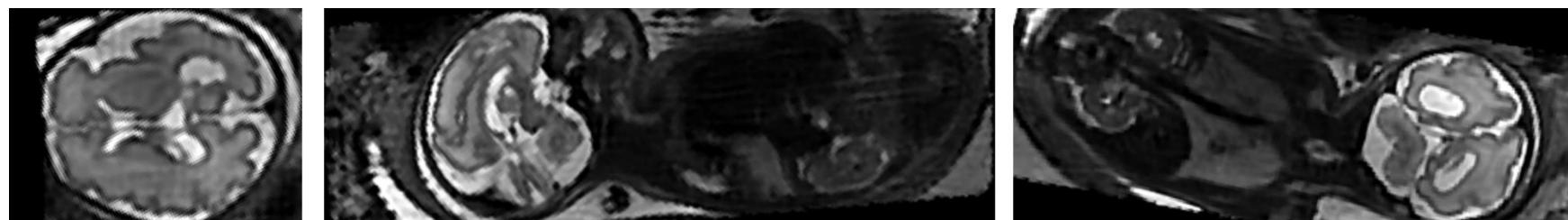
# Data analysis - MRI



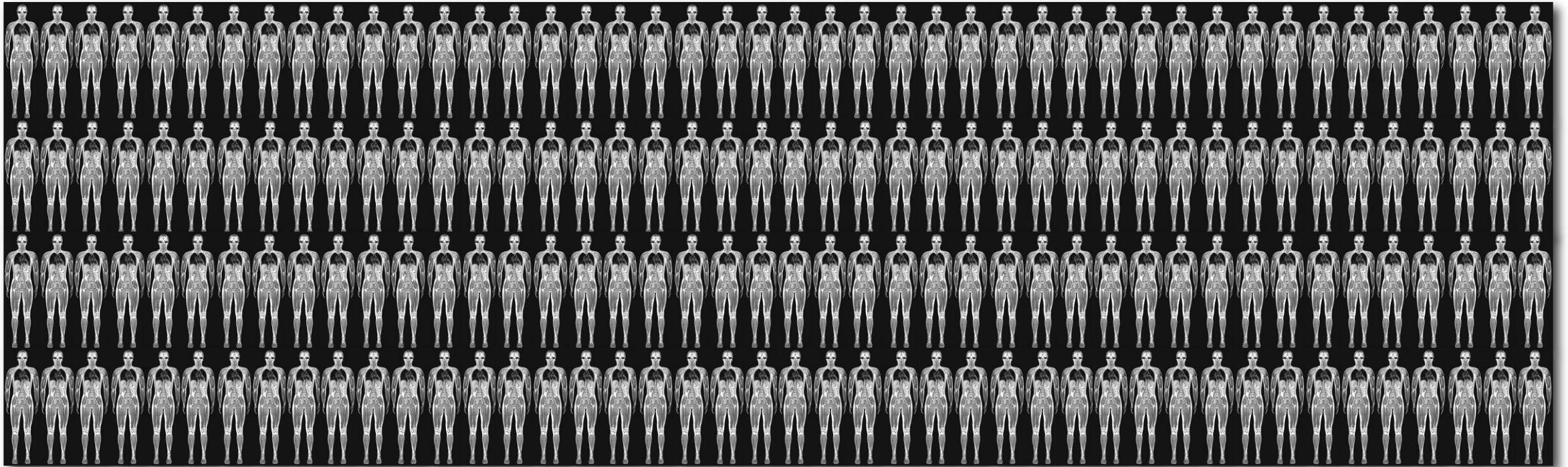
3D MRI atlases of the fetal heart



Cardiac atlas by Alena Uus, Milou van Poppel and David Lloyd: [https://gin.g-node.org/SVRTK/fetal\\_mri\\_atlases](https://gin.g-node.org/SVRTK/fetal_mri_atlases)



# Data analysis



# Outlook

- Image and data processing is an exciting branch of Medical Engineering
- In this branch you will learn
  - how images are created / calculated
  - how to evaluate large amounts of data
  - how Big Data technologies like "Deep Learning" work
- Special courses can be chosen:
  - X-ray / CT
  - Magnetic resonance tomography
  - PET / SPECT
  - Ultrasound imaging
  - advanced computer vision methods for image analysis and representation learning