



# Seminar: Deep Learning for Inverse Problems in Medical Imaging (IN2107)

Dr. Lina Felsner | Dr. Sevgi Gökçe Kafalı | Prof. Julia Schnabel

I32 – Chair for Computational Imaging and AI in Medicine - **CompAI**  
Faculty of Informatics and Institute for Advanced Study

I31 - Chair of Artificial Intelligence in Healthcare and Medicine - **AIM**  
School of Computation, Information and Technology

# Meet the Team



Lina Felsner



Sevgi Gökçe Kafalı

# Chair for Computational Imaging and AI in Medicine



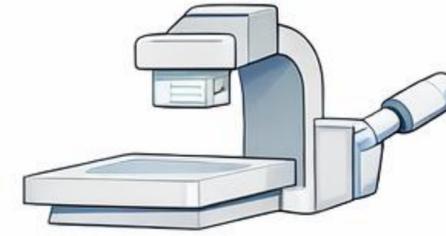
# Chair of Artificial Intelligence in Healthcare and Medicine





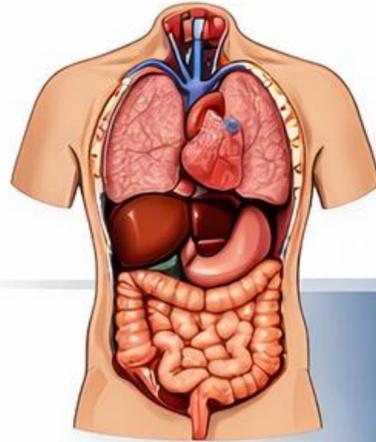
# INVERSE PROBLEMS

## IN MEDICAL IMAGING



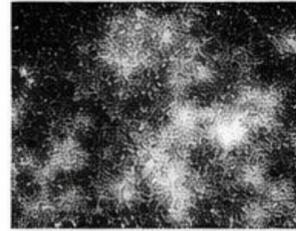
### REAL OBJECT

Patient Anatomy



Forwards Model

Measurements



### NOISY DATA

Imaging Signals  
(k-space, projections, echoes)



## INVERSE PROBLEM

How to reconstruct the true image?  
What is the hidden information?

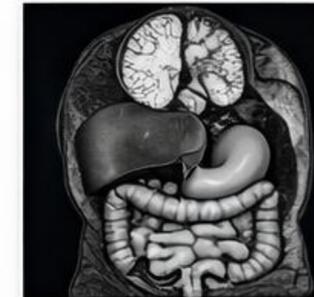
### CHALLENGES

- Noise & Artifacts
- Undersampling
- Motion Blur
- Ill-posedness



+ Reconstruction Algorithm

### RECONSTRUCTED IMAGE



Estimated Anatomy

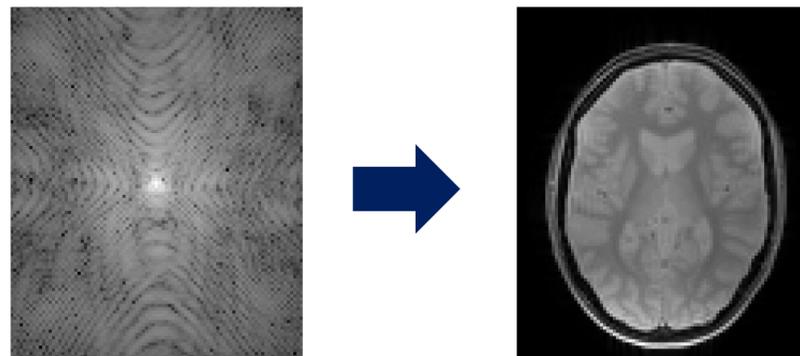
# Inverse Problems in Medical Imaging

$$y = Ax + n$$

MRI, CT, PET  
Reconstruction &  
Artefact Correction

Recent research  
directions

Emerging trends &  
Clinical applications



# Course Objectives

- **Understand**
  - What are inverse problems in medical imaging?
  - How can they be solved with deep learning?
  - What are recent research directions?
- **Learn**
  - How to read, analyze and discuss a research paper
  - How to present a complex research topic to a broad audience
  - How to design and present a research poster
- **Participants need to**
  - Present a paper
  - Present a poster in a poster session at the end of the semester
  - Actively participate in the discussions
- **Evaluation**
  - Attendance
  - Presentation and poster
  - Active participation in discussions

# Registration

- Matching system:

Or

- Email to:  
[lina.felsner@tum.de](mailto:lina.felsner@tum.de)  
[s.kafali@tum.de](mailto:s.kafali@tum.de)

