Master Seminar: Machine Learning in Neuroimaging

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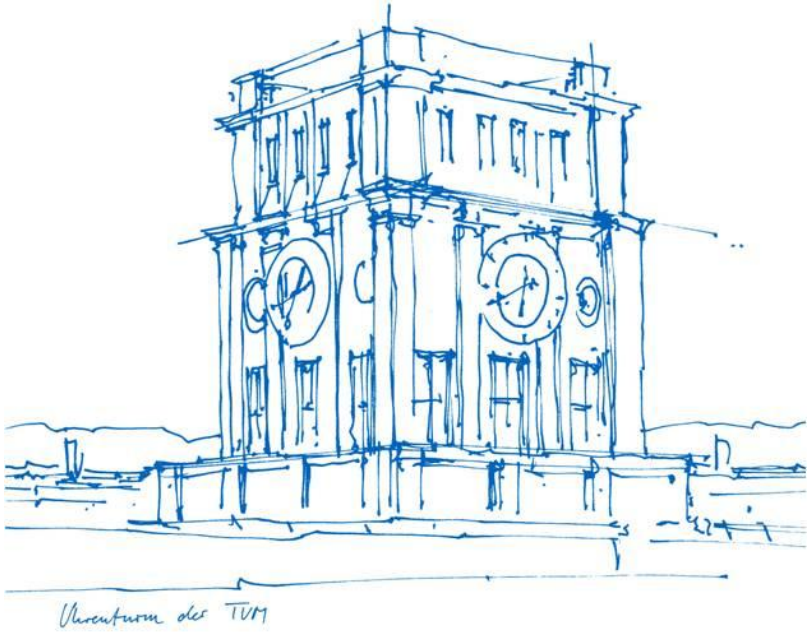
Lab for Artificial Intelligence in Medical Imaging

Department of Radiology / Faculty of Informatics

Technical University of Munich



06.02.2023, 2pm

Lab for Artificial Intelligence in Medical Imaging

@TUM Informatics

@Klinikum rechts der Isar, Department of Radiology

@LMU Department of Child and Adolescent Psychiatry

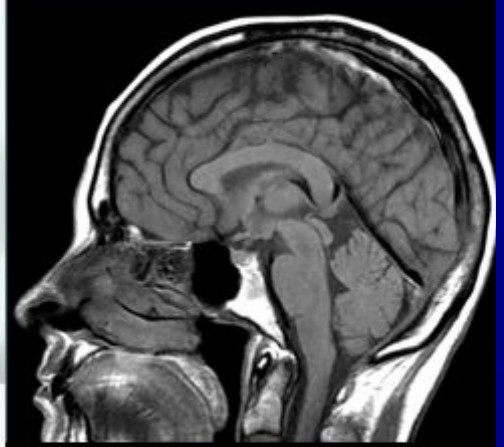
ai-med.de

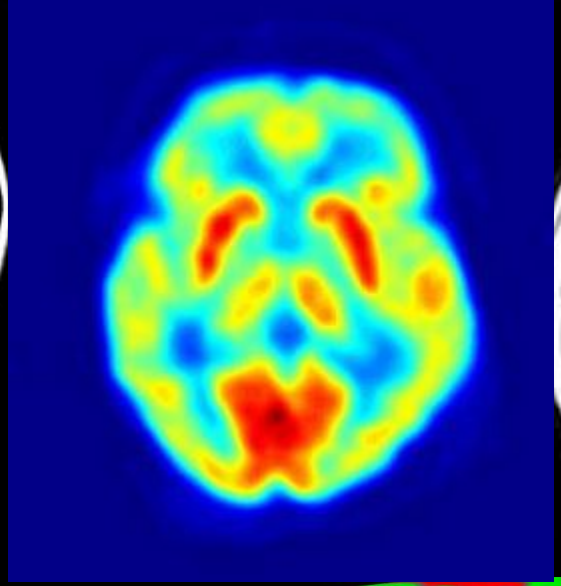
github.com/ai-med

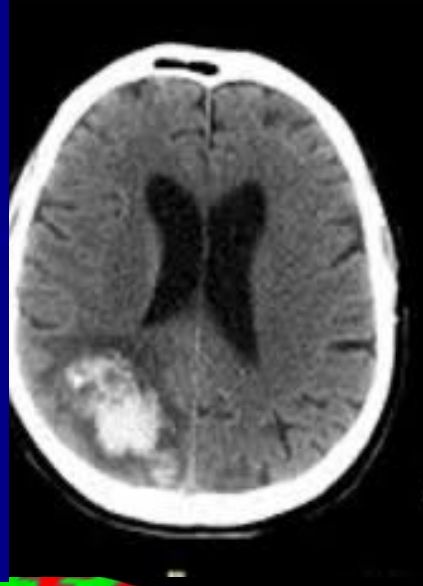
MRI

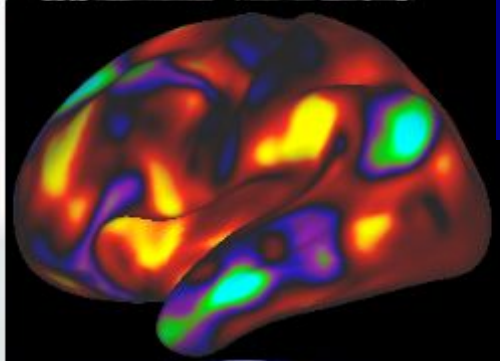
CT

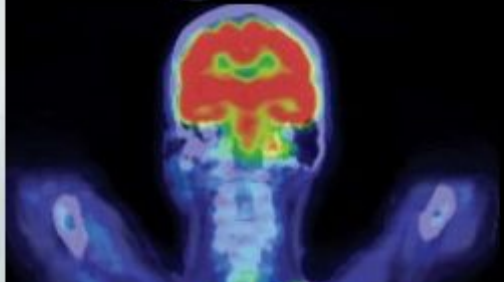
PET

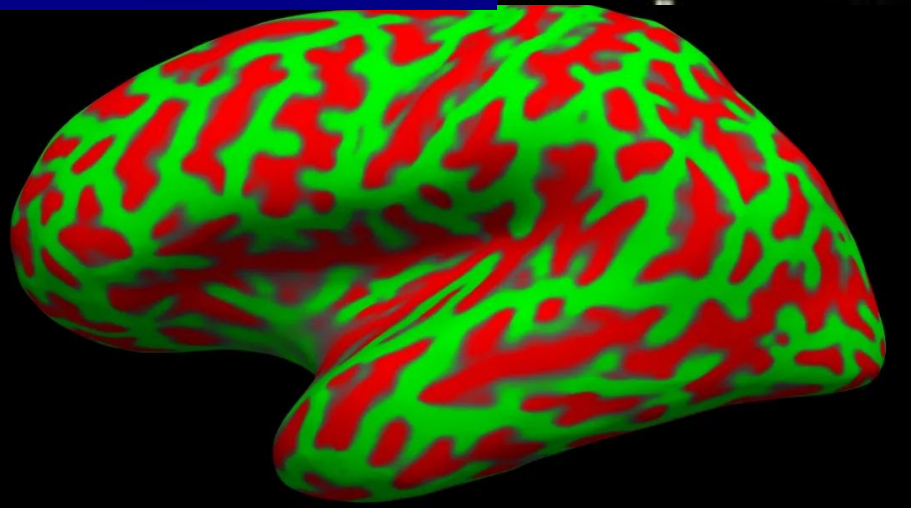


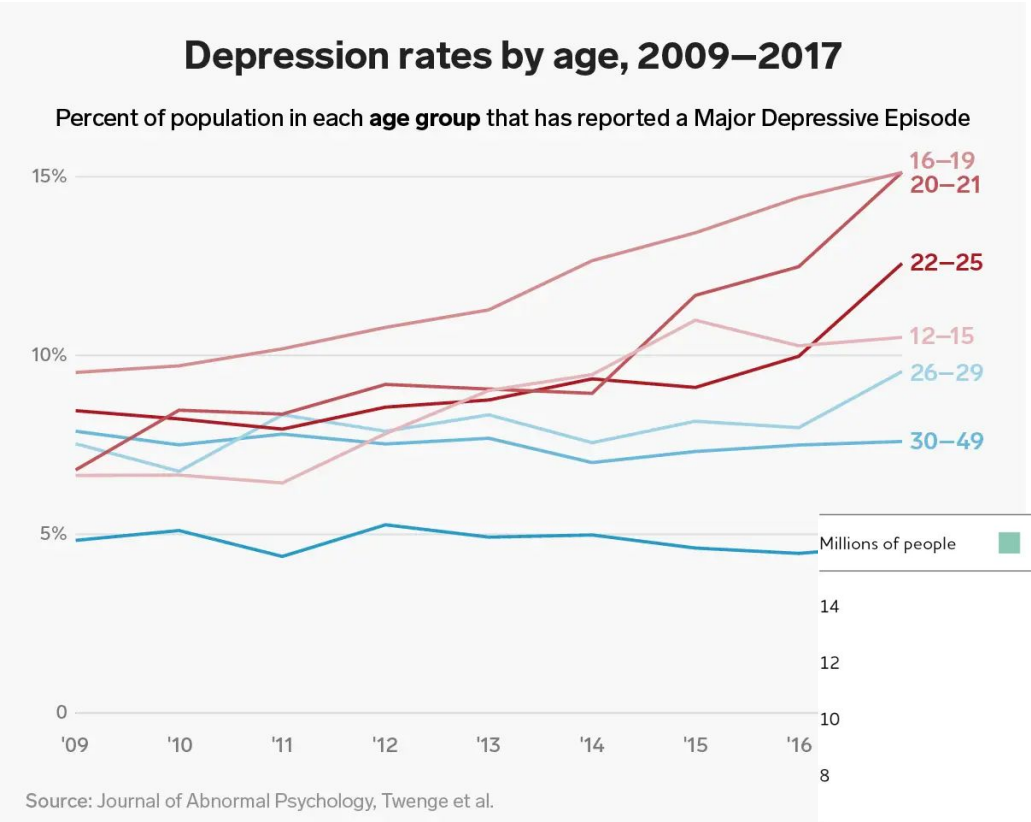




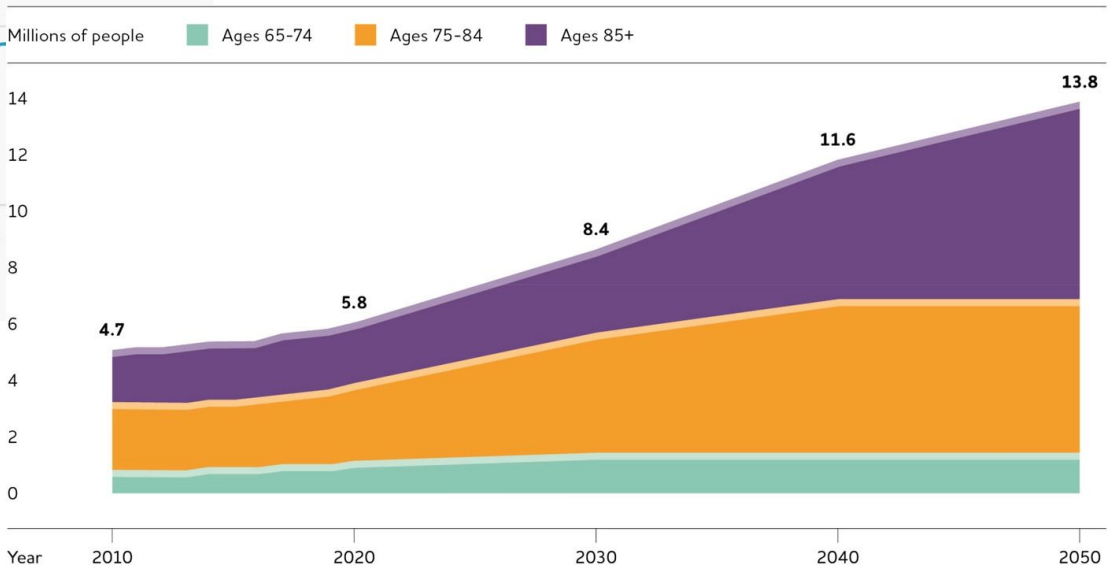






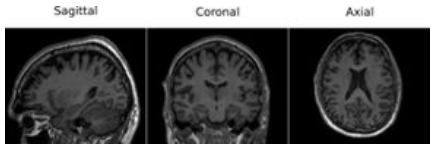


Alzheimer's disease

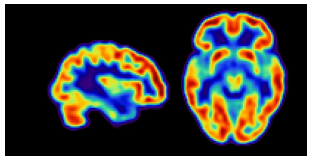


Hidden slide, just for drafting

Machine Learning in Neuroimaging



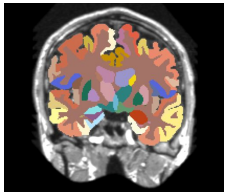
Magnetic resonance imaging (MRI)



Positron emission tomography (PET)

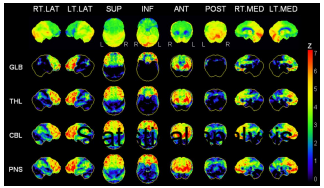
Medical Imaging

Shape modeling

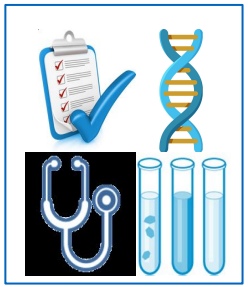


Brain segmentation

3D surface meshes



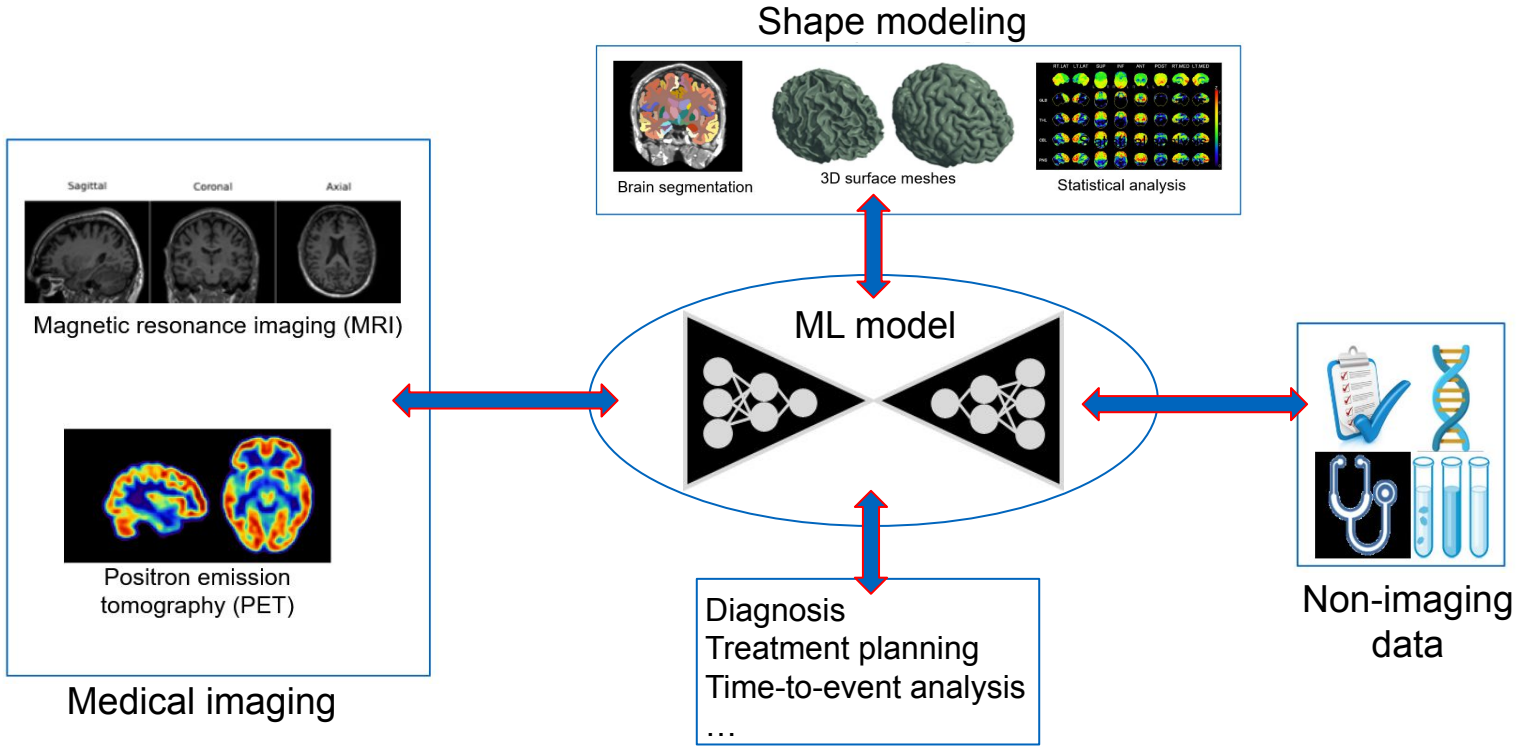
Statistical analysis



Non-imaging data

Diagnosis
Treatment planning
Time-to-event analysis
…

Machine Learning in Neuroimaging: Overview



Exemplary Topics

- Deep learning architectures (CNN, GNN, Transformer)
- Optimization techniques
- Multi-modal data analysis
- Disease prediction (e.g. Alzheimer’s)
- Supervised and unsupervised learning strategies (and in-between, e.g., semi-supervised)
- Statistical shape modeling
- Explainability of deep neural networks
- Causal inference

See also topics from last semester

Learning outcomes

- How to read a paper in a structured way?
- How to phrase complex ideas in an understandable blog post?
- How to present research findings to an audience?

What to deliver?

- Paper presentation (20 min. presentation, 10 min. discussion)

  50% of final grade
- Blog post (~4 pages DIN A4, working with ChatGPT encouraged) about the selected paper

  50% of final grade

Preliminaries (recommended)

- Machine learning principles (e.g. IN2357 Machine Learning for Computer Vision, IN2064 Machine Learning)
- Fundamentals of deep learning (e.g. IN2346 Introduction to Deep Learning)
- Good understanding of computer vision (e.g. IN2228 Computer Vision II: Multiple View Geometry)

Schedule

06.02.23: Pre-course meeting (today)

23.02.23: Matching results

April 4, 2023, 23:59: Deadline for deregistration

April: Kickoff (online, attendance mandatory), assignment of papers. Exact dates TBA.

During the semester: Meet your supervisor (not mandatory but recommended)

June 13/14, 2023, 9-13: Block seminar (LUTZ /Nigerstr., close to Klinikum rechts der Isar)

Attendance is mandatory

Contact

seminars@ai-med.de

Find these slides at https://wiki.tum.de/display/mlneuro (TUM Wiki)

Don’t forget to register in the matching system (matching.in.tum.de)!