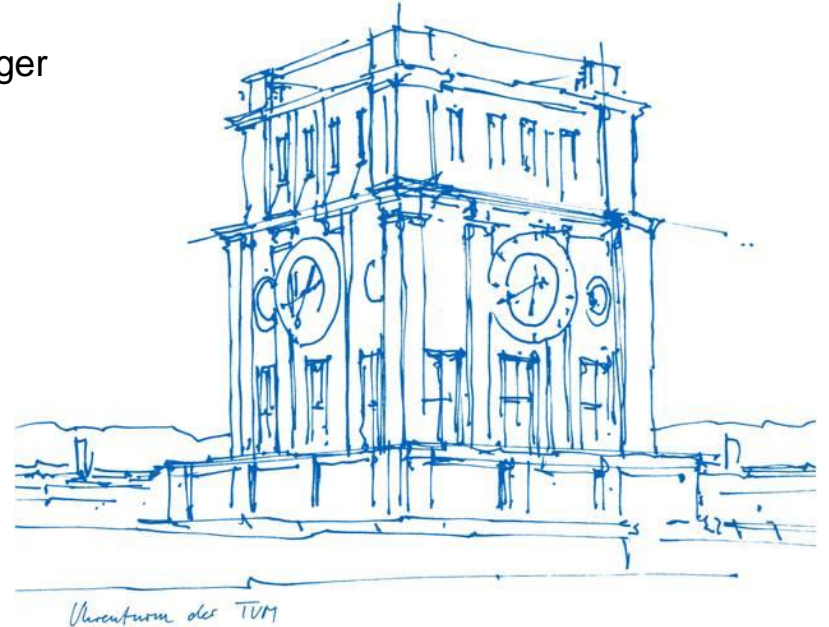


ML-Neuro Seminar Summer 2023: Kickoff

Anne-Marie Rickmann, Nuno Wolf, Morteza Ghahremani,
Bailiang Jian, Fabian Bongratz, Prof. Dr. Christian Wachinger

Lab for Artificial Intelligence in Medical Imaging
Department of Radiology / Faculty of Informatics
Technical University of Munich

24 April 2023



Agenda

- Introduction
- Usage of ChatGPT
- Timeline
- Organization and expectations
- Distribution of papers
- Q & A

Lab for Artificial Intelligence in Medical Imaging

@TUM Informatics

@Klinikum rechts der Isar, Department of Radiology

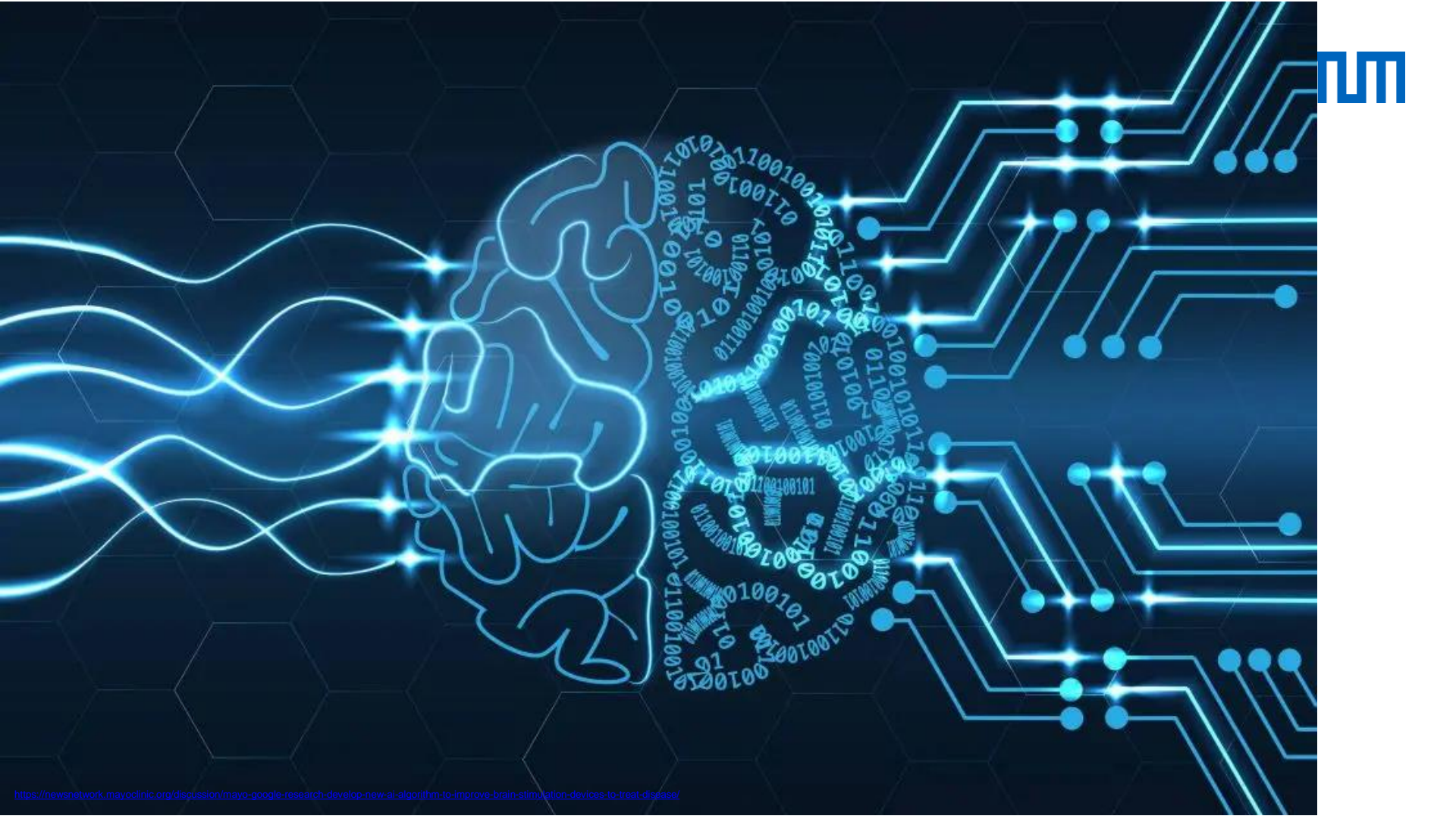
@LMU Department of Child and Adolescent Psychiatry

ai-med.de

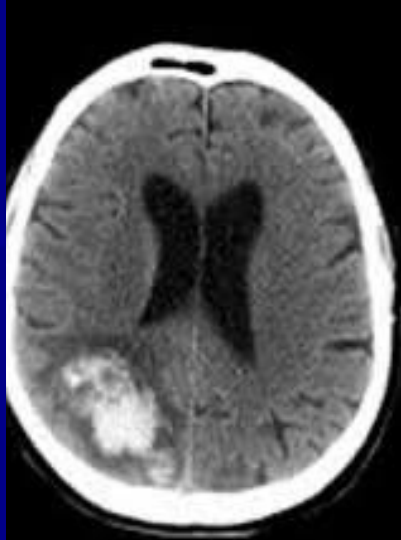
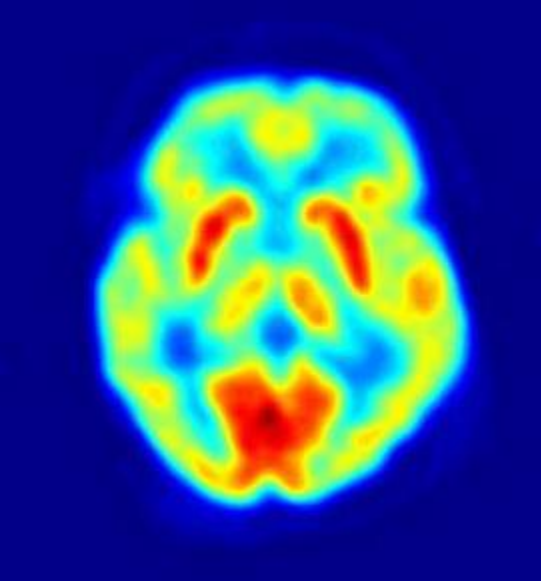
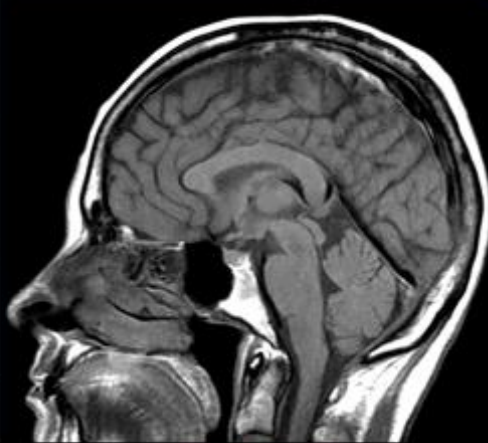
github.com/ai-med



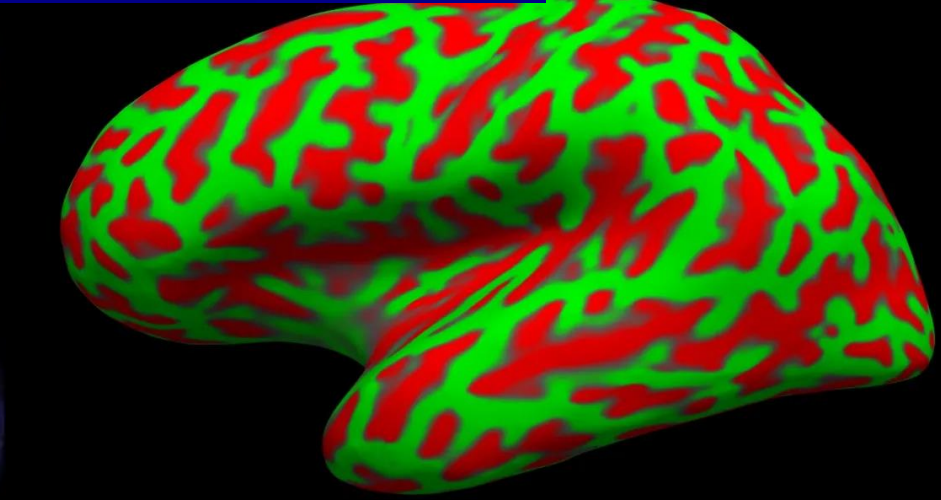
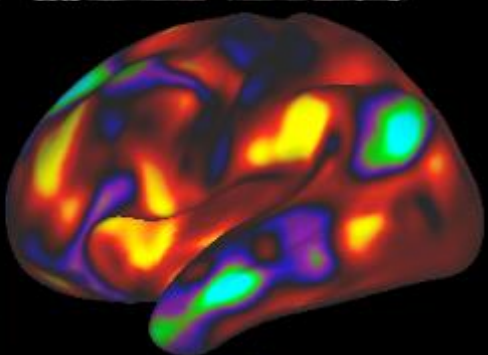




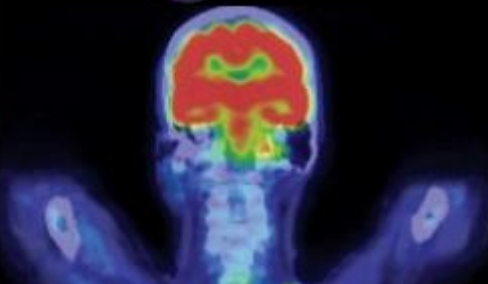
MRI



CT

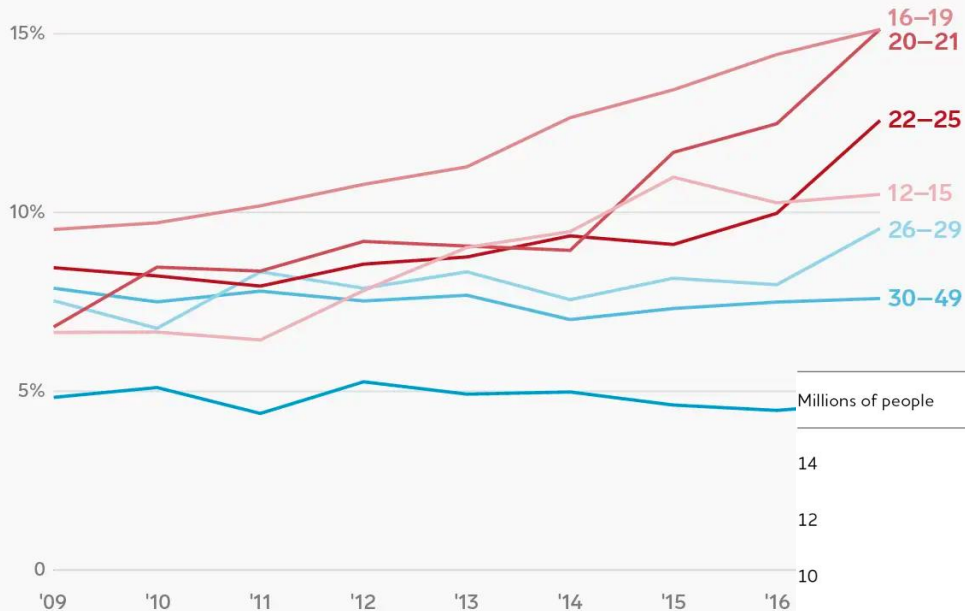


PET



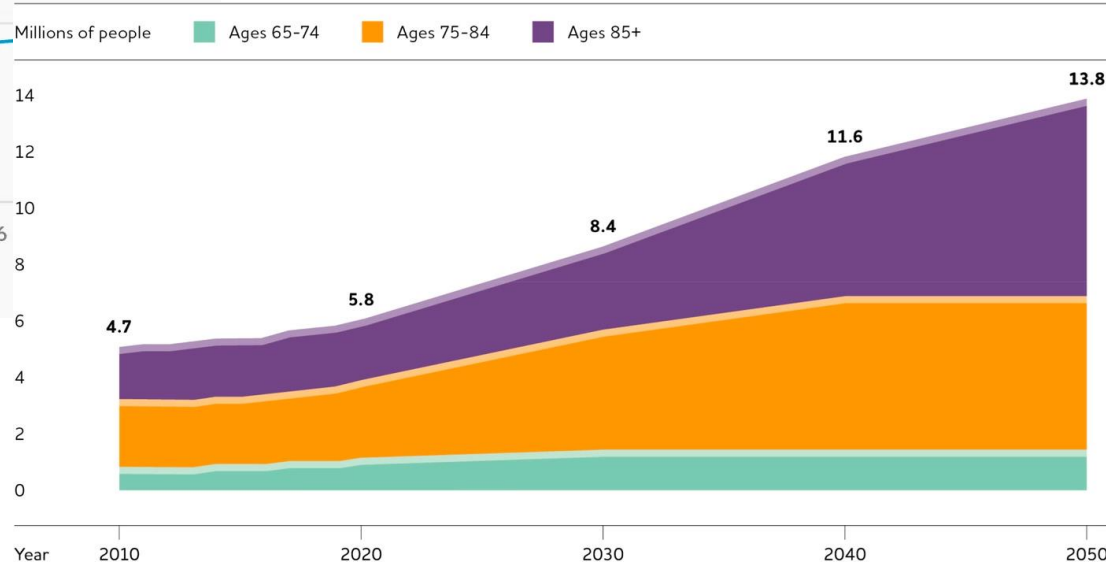
Depression rates by age, 2009–2017

Percent of population in each **age group** that has reported a Major Depressive Episode



Source: Journal of Abnormal Psychology, Twenge et al.

Alzheimer's disease



Neuroimaging data



Machine learning



Computer Science



Neuroscience

Machine learning

Neuroimaging data



ChatGPT

- Brainstorming: outlines, arguments
- Research assistance: additional supervisor (with a lot of time and patience :))
- Writing support

- Mention use of chatGPT. Key chatGPT prompts are to be listed at the end of the blog post.
- chatpdf.com
- Grading based on the quality (independent of using chatGPT)

Warnings:

- Beware of hallucinations
- 10min discussion: ChatGPT cannot help you there. You need to understand the topic.

Platforms

Wiki

- <https://wiki.tum.de/display/mlneuro>
- General information about the seminar
- Links to papers
- Additional material (e.g., exemplary blogs)

Pages | Seminare | Machine Learning in Neuroimaging (ML-Neuro)

ML-Neuro, WiSe 2022/23

Master seminar Machine learning in Neuroimaging

ML-Neuro

Master Seminar (IN2107)
WS 22/23
Lab for Artificial Intelligence in
Medical Imaging (AI-med)
Pre-course meeting: July 13, 1pm

Lehrstühle: Prof. Dr. Christian Beckinghoff, Anna Maria Hickmann, Tom Nauw, Prof. Fabian Bongers

Contact

If you have any questions regarding the seminar contact contact@ai-med.de

Announcements

- Deadline for registration in October 4, 2022, 03:00.
- August 5, 2022: Meeting results have been released.
- The pre-course meeting takes place on July 13, 2022 at 1pm via Zoom (link can be found on TUM Online). Slides are 10:11.

Moodle

- Platform for communication
- Questions & Discussion

Startseite | Meine Startseite | Hilfe

Lernplattform Moodle
Technische Universität München

Master-Seminar - Machine Learning in Neuroimaging (IN2107)

Kurs | Aktivität

Ankündigungen und Nachrichten

Foren durchsuchen

Thema 1	Beginnen von	Letzter Beitrag	Antworten
☆ ML-Neuro Seminar: List of papers released	Fabian Bongers 17. Okt 2022	Fabian Bongers 17. Okt 2022	0 1
☆ ML-Neuro Seminar WiSe 2022/23	Fabian Bongers 8. Aug 2022	Fabian Bongers 8. Aug 2022	0 1
☆ Assignment of Papers	Fabian Bongers 12. Aug 2022	Fabian Bongers 12. Aug 2022	0 1

Timeline



Timeline



- General introduction
- Distribution of topics

Timeline



- Individual work on the assigned topic / paper
- Meeting with supervisor
 - Optional but recommended
 - Discussion of current state, e.g., preliminary headlines, subsections, core messages

Timeline



- Presentations (live, in-person)
- Hand-in of blog post (two weeks after the seminar)

Expectations

- Being able to read a paper in a structured way
- Explanation of complex ideas in an understandable blog post
- Usage of modern AI tools (ChatGPT) in a deliberate way
- Presentation of research findings to a technical audience

What to deliver?

- Paper presentation
70% of final grade
- Blog post (~4 pages DIN A4) about the selected paper, see [these](#) guidelines
30% of final grade

Paper presentation

- 20 min. presentation, 10 min. discussion (will influence grade)
- Rule of thumb: 1–2 minutes per slide → 10–20 slides
- In-person
- Talks are held in English
- Technical audience: use appropriate language
- Hand-in of slides via wiki (restricted access page) until **12 June 23:59**
- Recommended structure:
 - Introduction
 - Overview / Outline
 - Method description
 - Experiments and results
 - Personal comments
 - Summary

Blog post

- Written and posted in the wiki
- Approx. 4 pages
- Mostly non-technical language
- Primarily self-made figures!
- Published on wiki
- Deadline: **28 June 2023** (two weeks after presentations)

Paper assignment: see wiki

Topics

Paper ID	Title	Published in	Link	Additional material	Supervisor	Student
1	Local Spatiotemporal Representation Learning for Longitudinally-consistent Neuroimage Analysis	NeurIPS	https://proceedings.neurips.cc/paper_files/paper/2022/file/57da65da25d0ae77e0129e246f558851-Paper-Conference.pdf		Christian Wachinger	Smaranda-Daria-Maria Bogoi
2	Forecasting individual progression trajectories in Alzheimer's disease	Nature communications	https://www.nature.com/articles/341467-023-35712-6		Christian Wachinger	Danya Liu
3	A multidimensional ODE-based model of Alzheimer's disease progression	Nature scientific reports	https://www.nature.com/articles/341598-023-29383-6		Fabian Bongratz	Barış Sozudođru
4	A large-scale comparison of cortical thickness and volume methods for measuring Alzheimer's disease severity	NeuroImage: Clinical	https://www.sciencedirect.com/science/article/pii/S2213158216300938		Fabian Bongratz	Ina Dempel
5	Brain Age Estimation From MRI Using Cascade Networks With Ranking Loss	NeuroImage	https://ieeexplore.ieee.org/document/84468717denied		Morteza Ghahremani	Zaid Efraji
6	Deep Transfer Learning Approaches in Performance Analysis of Brain Tumor Classification Using MRI Images	Journal of Healthcare Engineering	https://www.hindawi.com/journals/jhe/2022/3204367/		Morteza Ghahremani	Christian Pesch
7	FastSurferV3NN: Building resolution-independence into deep learning segmentation methods—A solution for HighRes brain MRI	NeuroImage	https://www.sciencedirect.com/science/article/pii/S1053811922000623		Fabian Bongratz	Micaht Umut Onat
8	SynthSeg: Segmentation of brain MRI scans of any contrast and resolution without retraining	Medical Image Analysis	https://www.sciencedirect.com/science/article/pii/S1361841523000506		Anne Ridmann	Milan Cupac
9	Toward a unified framework for interpreting machine-learning models in neuroimaging	Nature protocols	https://ocamlab.github.io/pdfs/Konoutou2020.pdf		Christian Wachinger	Marwa Trigui
10	Deep Structural Causal Shape Models	ECCV	https://link.springer.com/chapter/10.1007/978-3-031-26075-0_28		Nuno Wolf	Xin Zhou
11	Diffusion Models for Medical Image Analysis: A Comprehensive Survey	Arxiv	https://arxiv.org/abs/2211.07804		Nuno Wolf	Yusuf Emre Genc
12	Hyper-convolutions via implicit kernels for medical image analysis	Medical Image Analysis	https://arxiv.org/abs/2202.02791		Anne Ridmann	Markus Karmann
13	HAMMER: Hierarchical Attribute Matching Mechanism for Elastic Registration	IEEE Transactions on Medical Imaging	https://ieeexplore.ieee.org/abstract/document/1176091		Bailiang Jian	Zeynep Yelstiren
14	4D-HAMMER: Measuring temporal morphological changes robustly in brain MRI images via 4-dimensional template warping	NeuroImage	https://www.cbica.upenn.edu/xblia/papers/122.pdf		Bailiang Jian	Johannes Kirmayr
15	ResNet-LDDMM: Advancing the LDDMM Framework Using Deep Residual Networks	IEEE Transactions on Pattern Analysis and Machine Intelligence	https://arxiv.org/abs/2102.07951		Bailiang Jian	Tim Dang

Questions?