



Chair for Computer Aided Medical Procedures (CAMP)
Master Seminar on
Deep Learning for Medical Applications

Shahrooz Faghihroohi, Azade Farshad, Yousef Yeganeh,
Prof. Dr. Nassir Navab



Chair for Computer Aided Medical Procedures & Augmented Reality



Team



Dr. Shahrooz Faghihroohi

Senior Research Scientist
shahrooz.faghihroohi@tum.de



Yousef Yeganeh

Senior Research Scientist
y.yeganeh@tum.de



Dr. Azade Farshad

Senior Research Scientist
azade.farshad@tum.de





Chair for Computer Aided Medical Procedures (CAMP)
Master Seminar on
Deep Learning for Medical Applications

Course Regulations



Basic Info about the course

- **Type:** Master Seminar (IN2107)
- **Language:** English
- **SWS:** 2
- **ECTS:** 5 Credits
- **Webpage:**
 - <https://collab.dvb.bayern/display/TUMdlma/DLMA%3A+Summer+2024>
- **Time:**
 - Thursdays, 12:00-14:00
- **Location:**
 - Seminar Room (03-10-11)
- **Requirements:**
 - Background in Machine/Deep Learning.



Objective

- **Read, present, and discuss** many challenges present in Medical Applications of Deep learning:
 - Understanding and Interpreting Predictive Models, Safety of Predictive Models—> Interpretable DL, Explanation, Uncertainty, Robustness
 - Handling few amount of labeled data —> Transfer Learning, Semi-/Weakly- Supervised Learning, Meta-Learning, Augmentation, Active Learning, Learning under Noisy Labels
 - Handling class Imbalance —> Special loss functions
 - Handling Multi-Modal Data —> Graph Convolutional Networks
 - Handling Intra/Inter-Scanners Variability —> Domain Adaptation
 - Incorporating Prior Knowledge —> Shape Models/Geometric Constraints
 - Security of Predictive Models —> Adversarial examples
 - ...



Discussed Topics Examples

Date	Session: Topics	Slides	Students
15.06	Recent Trends in Medical Image Segmentation 3D vessel segmentation Structural Continuity in Segmentation		Huang, Pei-Ran Sauer, Bjarne Güvercin, Göktug
22.06	Exploring Latest Unsupervised Computer Vision Models for Segmentation Self-supervised Volume Segmentation Self-supervised graph representation learning		Klausen, Tobias Altunbas, Begüm Oytun Demirbilek
29.06	Image Superresolution Using Generative Models Sound and Music Generative Models Sensorless US compounding		Schauer, Robert Victor Dzhagatspanyan Sharma, Devansh
6.07	Application of Diffusion Models for Medical Imaging Image to image translation with diffusion models Sampling Methods in Diffusion Models		Cheng, JiaJian Trigui Amal Yeşilkaynak, Vahit Buğra
13.07	Converting weights of 2D Vision Transformer for 3D Image Classification Natural Language Explanations for Vision and Vision-Language tasks non-rigid 2d-3d registration Image Stitching Using Unsupervised/Semi-Supervised Learning		Ben Chaaben, Zeineb Marin Ruiz, Jorge Yang, Shucheng Güven Erkaya
20.07	Physics-inspired Neural Networks Counterfactual Modelling Confidence segmentation		Wagner, Jakob Pennig, Lars Yakal, Furkan



Conferences & Journals

- CVPR: Conference on Computer Vision and Pattern Recognition
- ICLR: International Conference on Learning Representations
- ICML: International Conference on Machine Learning
- NeurIPS: Neural Information Processing Systems
- ECCV/ICCV: European/International Conference on Computer Vision
- TMI: IEEE Transaction on Medical Imaging
- MedIA: Medical Image Analysis (Elsevier)
- TPAMI: IEEE Transactions on Pattern Analysis and Machine Intelligence
- Nature: world's leading multidisciplinary science journal
- MICCAI: Medical Image Computing and Computer Assisted Intervention
- BMVC: British Machine Vision Conference
- MIDL: Medical Imaging with Deep Learning



Logistics

- Presentation: Max. 25 Minutes
- Q&A: 5-10 Minutes
- Number of slides: Approximately 20 - 30
- Attendance is mandatory, however, being absent for one session is allowed.
- Blog post submission:
 - Initial draft: **Before** your presentation
 - Final draft: **Last session** of Presentations
- Presentation and blog post each account for 45% of the total grade



Evaluation

Presentation 45%

- 25 minutes + 5 to 10 minutes Q&A
- Slides (Powerpoint, Latex, see website for templates)
- They should cover all relevant aspects of the topic
 - Motivation/ Big picture
 - Methodology of the topic-related state-of-the-art papers
 - Experimental results
 - Discussion
 - Student's Review
- Self-contained (review of state of the art is necessary!)
- Presentation guidelines will be released later.
- **All students are expected to attend all presentations and interact during Q&A**
- **Examples from previous semester:**

<https://collab.dvb.bayern/display/TUMdlma/Presentations%3A+Summer+2023>



Evaluation

Blog Post (45%)

- Blog post explaining the main ideas of the paper.
 - Motivation + Contributions
 - Methodology
 - Results & Discussion
- 2500-3000 words topic summary + 300-500 words your own review
- Students will be requested to comment on each other's blog posts.
- The website where the posts will be uploaded is [1].
- You can later privately share your blog posts in other websites as well (eg Medium).
- Upload the first draft of blog post one week before presentation. There will be time to modify it until the last presentation session.
- **Examples from previous semester:** <https://collab.dvb.bayern/pages/viewpage.action?pageId=309631360>

Attendance (10%)



[1] <https://collab.dvb.bayern/display/TUMdlma/DLMA%3A+Summer+2024>

How can you apply?

- Submit the registration form (on course webpage)

DLMA Registration

Student Name	*	<input type="text"/>
Email	*	<input type="text"/>
Master's Program	*	<input type="text"/>
Current Semester	*	<input type="text"/>
Related Courses	*	<input type="text"/>
		<small>If passed, mention the grades</small>
Resume (max 150 words)	*	<input type="text"/>

max 150 words (if exceeded, your application will be discarded) You may talk about your related projects - publications/competitions/github repositories - work experience, ...

Deadline for submitting the registration form: Same as the Matching System



Important Dates

Deadline for submitting the registration form:

Same as the Matching System

You can find these slides and other info on the course website:

<https://collab.dvb.bayern/display/TUMdlma/DLMA%3A+Summer+2024>

Don't forget to register at TUM matching system

Register via matching.in.tum.de

