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

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Chair for Computer Aided Medical Procedures & Augmented Reality

Team

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Master Seminar on
Deep Learning for Medical Applications

Course Regulations

Technische Universität München

JOHNS HOPKINS
WHITING SCHOOL
of ENGINEERING

Basic Info about the course

- **Type**: Master Seminar (IN2107)
- **Language**: English
- **SWS**: 2
- **ECTS**: 5 Credits
- **Webpage**:
  - https://wiki.tum.de/pages/viewpage.action?pageId=1523875999
- **Time**:
  - Thursdays, 12:00-14:00
- **Location**:
  - CAMP Seminar Room (03.13.010)
  - Virtual Meeting Room (Zoom)
- **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
12.05	Preliminary Meeting		
09.06	Few-shot Image Synthesis Image-to-Image Translation		Juan Carlos Climent Pardo Wang, Yihao
23.06	Vision Transformers Transformers for Segmentation Medical Visual Question Answering (VQA)		Demir, Ufuk Ganß, Marcel Demmel, Julia
30.06	Semi/self-supervised Methods for Vessel Segmentation Task Modelling in Meta-learning Unsupervised Domain Adaptation for Segmentation		Hasny, Marta Chenyang Li Fabian Scherer
07.07	Semi-Supervised Learning /Semi-Supervised Federated Learning Contrastive Learning/Trends in Self-Supervised Learning Unsupervised Anomaly Detection		Młynarczyk, Dominika Schreiber, Manuel Trotman, Rachelle
14.07	Neural Network Robustness (adversarial examples) Neural Network Verification		Çelik, Furkan Engstler, Paul
21.07	Shape-aware semi-supervised image segmentation Shape Completion Trends in Data Augmentation		Capelle, Finn Konov Mikhail Salah, Skander
28.07	Deep Learning-based medical image registration Representation Learning using Generative Models implicit neural representations with deformation		Zhang, Zichen Bohosyan, Aleks Bou Orm, Ali

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.
  If more than one session is skipped, 0.3 is deducted from the final grade.
- Blog post submission:
  - Initial draft: **1 week before** your presentation
  - Final draft: **Last session** of Presentations
- Presentation and blog post each account for 50% 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://wiki.tum.de/display/dlma/Presentations%3A+Summer+2022

Evaluation

Blog Post (45%)

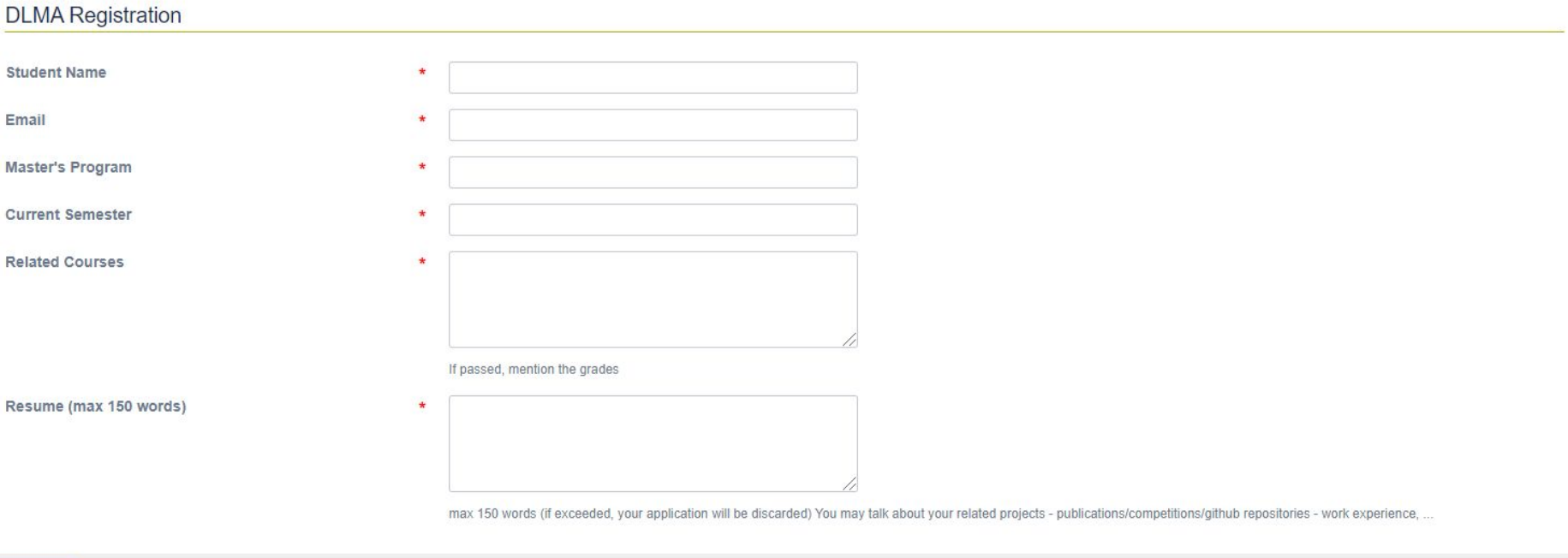
- Blog post explaining the main ideas of the paper.
  - Motivation + Contributions
  - Methodology
  - Results & Discussion
- 2000-2500 words topic summary + 300-500 words your own review
- Students will be requested to comment on each other's blog posts.
- The website where the posts will be uploaded 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://wiki.tum.de/display/dlma/Blog+post%3A+Summer+2022

Attendance (10%)

[1] https://wiki.tum.de/display/dlma/DLMA%3A+Winter+2022-2023

How can you apply?

- Submit the registration form (on course webpage)


DLMA Registration

Student Name *

Email *

Master's Program *

Current Semester *

Related Courses *

If passed, mention the grades

Resume (max 150 words) *

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:

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Don’t forget to register at TUM matching system

Register via matching.in.tum.de