



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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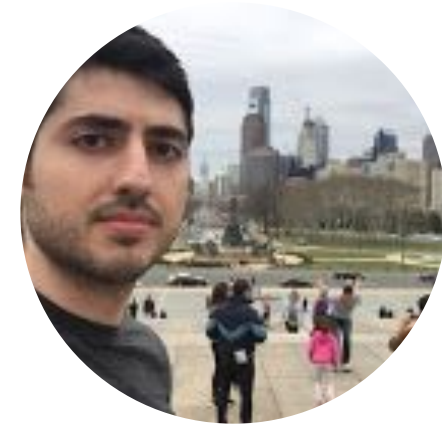
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**Deep Learning for Medical Applications**

**Course Regulations**



# Basic Info about the course

- **Type:** Master Seminar (IN2107)
- **Language:** English
- **SWS:** 2
- **ECTS:** 5 Credits
- **Webpage:**
  - <https://wiki.tum.de/display/dlma/DLMA%3A+Summer+2022>
- **Time:**
  - Thursdays, 10:00-12:00
- **Location:**
  - Virtual Meeting Room (Zoom)
  - ~~CAMP Seminar Room (03.13.010)~~
- **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 Papers Examples

Topic	No	Title	Conference/ Journal	Tutor	Student (Last name)	Link
Supervised (also semi/weakly) and Unsupervised (Self-supervised) Learning	1	MixMatch: A Holistic Approach to Semi-Supervised Learning	NeurIPS 2019	<a href="#">Tariq</a>	Ismail	<a href="#">PDF</a>
	2	ReMixMatch: Semi-Supervised Learning with Distribution Alignment and Augmentation Anchoring	ICLR 2020	<a href="#">SeongTae</a>	-	<a href="#">PDF</a>
	3	Unsupervised X-ray image segmentation with task driven generative adversarial networks	MedIA 2020	<a href="#">Shahrooz</a>	Bornholdt	<a href="#">PDF</a>
	4	f-AnoGAN: Fast unsupervised anomaly detection with generative adversarial networks	MedIA 2019	<a href="#">Shahrooz</a>	Lauenburg	<a href="#">PDF</a>
	5	Temporal cycle-consistency learning	CVPR 2019	<a href="#">Tobias</a>	Kondamadugula	<a href="#">PDF</a>
	6	Neural-Bayes: A Generic Parameterization Method for Unsupervised Representation Learning	arXiv 2020	<a href="#">Azade</a>	-	<a href="#">PDF</a>
	7	Automatic 3D BI-Ventricular Segmentation of Cardiac Images by a Shape-Refined Multi- Task Deep Learning Approach	TMI 2019	<a href="#">Shahrooz</a>	Valeriano Quiroz	<a href="#">PDF</a>
	8	A robust deep neural network for denoising task-based fMRI data: An application to working memory and episodic memory	MedIA 2020	<a href="#">Shahrooz</a>	Calik	<a href="#">PDF</a>
Efficient DL (Lightweight/Faster CNNs / Pruning)	9	Search for Better Students to Learn Distilled Knowledge	arXiv 2020	<a href="#">Azade</a>	Wang	<a href="#">PDF</a>
	10	MetaPruning: Meta-Learning for Automatic Neural Network Channel Pruning	ICCV 2019	<a href="#">Azade</a>	-	<a href="#">PDF</a>
Interpretable DL	11	Explaining Neural Networks Semantically and Quantitatively	ICCV 2019	<a href="#">Matthias Keicher</a>	Bordukova	<a href="#">PDF</a>
	12	Uncertainty and interpretability in convolutional neural networks for semantic segmentation of colorectal polyps	MedIA 2020	<a href="#">Tobias</a>	Dannecker	<a href="#">PDF</a>
	13	Restricting the flow: Information bottlenecks for attribution	ICLR 2020	<a href="#">Ashkan</a>	Elflein	<a href="#">PDF</a>
	14	Understanding deep networks via extremal perturbations and smooth masks	ICCV 2019	<a href="#">Ashkan</a>	Vagne	<a href="#">PDF</a>
Data Efficient DL (Augmentation, learning under noisy label)	30	FastAutoAugment	NeurIPS 2019	<a href="#">SeongTae</a>	Studeniyak	<a href="#">PDF</a>



# 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





# Evaluation

## Presentation 45%

- 20 minutes + 10 minutes Q&A
- Slides (Powerpoint, Latex, see website for templates)
- They should cover all relevant aspects of the paper
  - Motivation
  - Methodology
  - Experimental results
  - Take Home Message
  - Discussion
- 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+2020>



# Evaluation

## Blog Post (45%)

- Blog post explaining the main ideas of the paper.
  - Motivation + Contributions
  - Methodology
  - Results & Discussion
- You can refer to <https://bair.berkeley.edu/blog/> to get ideas
- 1000-1200 words paper summary + 200-300 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 blog post two weeks before presentation. There will be discussion until presentation
- **Examples from previous semester:** <https://wiki.tum.de/display/dlma/Blog%3A+Summer+2020>

## Attendance (10%)



[1] <https://wiki.tum.de/display/dlma/>

# How can you apply?

- Submit the registration form (on course webpage)

## DLMA Registration

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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://wiki.tum.de/display/dlma/DLMA%3A+Summer+2022>

**Don't forget to register at TUM matching system**

Register via [matching.in.tum.de](https://matching.in.tum.de)

