



# Modern Computer Vision Methods

Introduction Session  
WS 2022/23 [ IN2107 ]

Dr. Benjamin Busam, Pengyuan Wang, Guangyao Zhai, Patrick Ruhkamp, Stefano Gasperini, Lennart Bastian, Shun-Cheng Wu, HyunJun Jung, Hannah Schieber, Hao Yu, Mert Karaoglu, Mahdi Saleh



# MCVM Team



Benjamin  
Busam



Patrick  
Ruhkamp



Mahdi  
Saleh



Shun-Cheng  
Wu



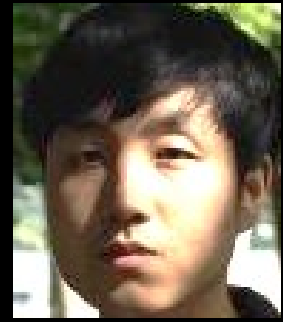
Stefano  
Gasperini



Hao  
Yu



Guangyao  
Zhai



Pengyuan  
Wang



Lennart  
Bastian



HyunJun  
Jung



Hannah  
Schieber



Mert  
Karaoglu





**TEAM**

**AWESOME!**



# MCVM

Course Structure

# Course Dates

- 24.10.2022 Introduction Session**
- 31.10.2022 Presentation Training**
- 07.11.2022 CVPR Break (Individual Preparation)
- 14.11.2022 Slot to meet with Supervisor
- 21.11.2022 Slot to meet with Supervisor
- 28.11.2022 **Object Poses + Robotic Grasping**
- 05.12.2022 **Neural Fields: NeRF Enhancements + Semantics**
- 12.12.2022 **3D Reconstruction**
- 19.12.2022 **Sensors + Text. Co-Modalities and Manipulation**
- 09.01.2023 **Invited Talk**
- 16.01.2023 **Scene Mapping & High-Level Understanding**
- 23.01.2023 **Point Cloud Registration**
- 30.01.2023 **Deformable Shapes**
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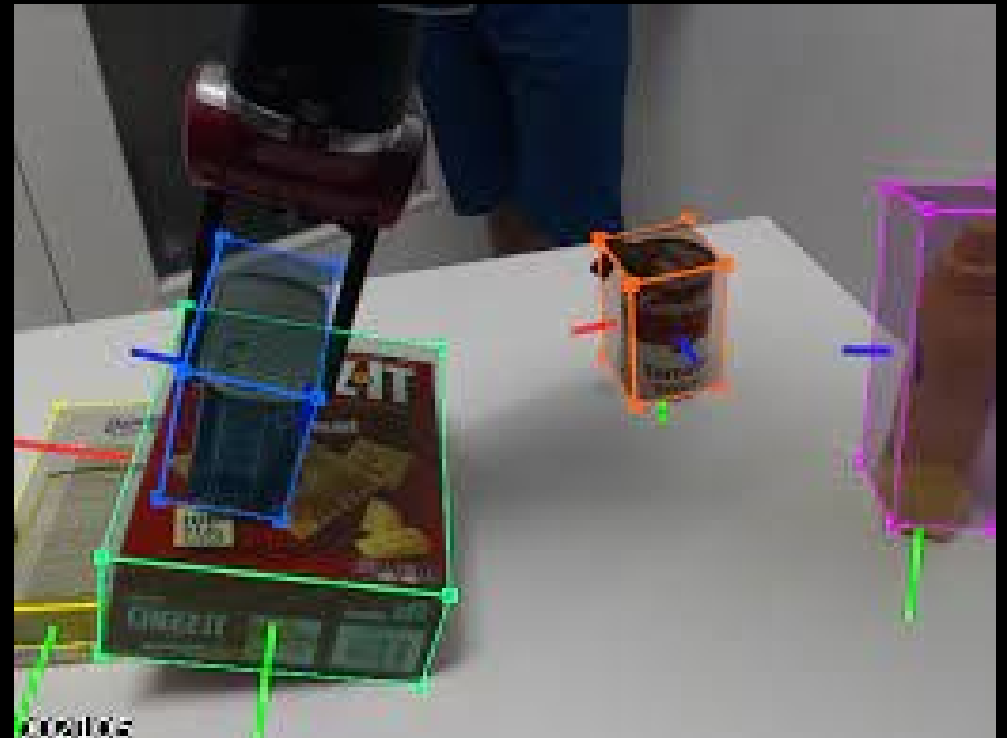
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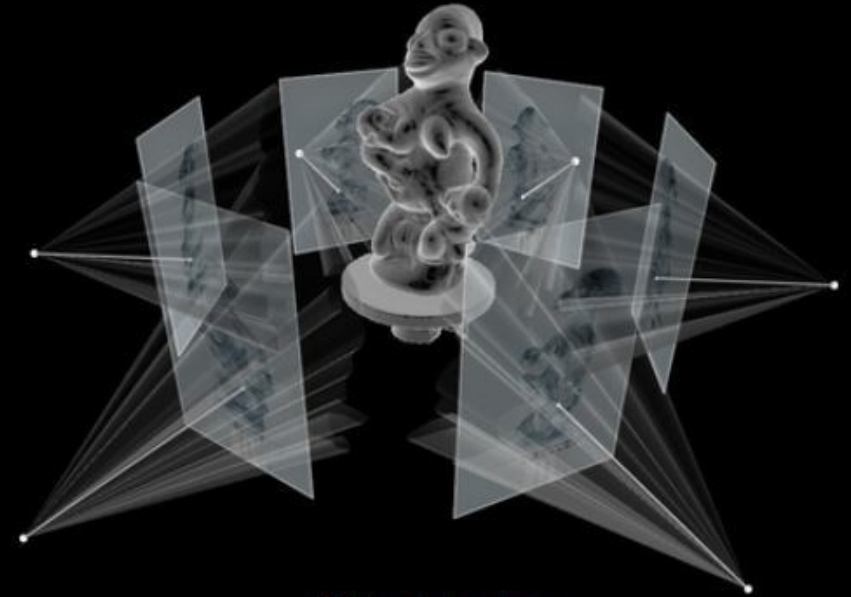
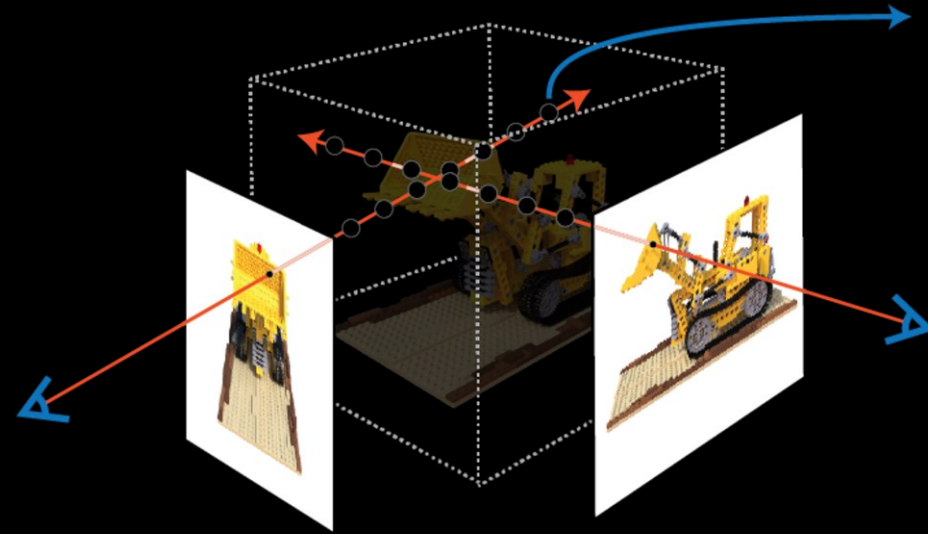
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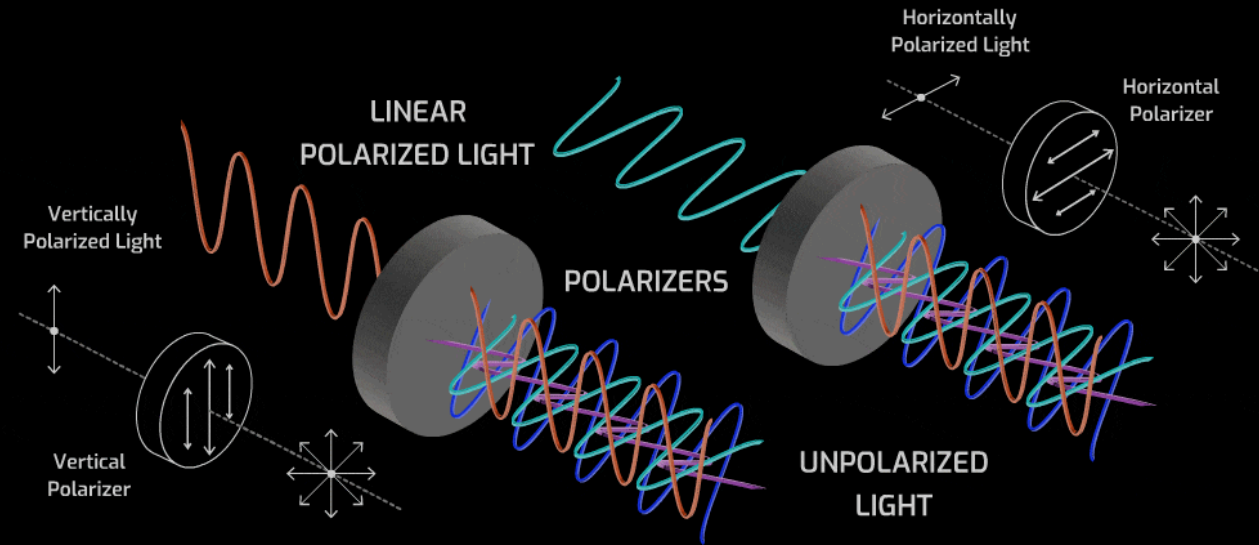
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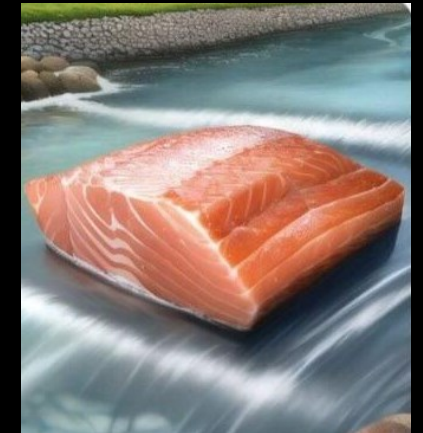


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„Salmon swimming in river“



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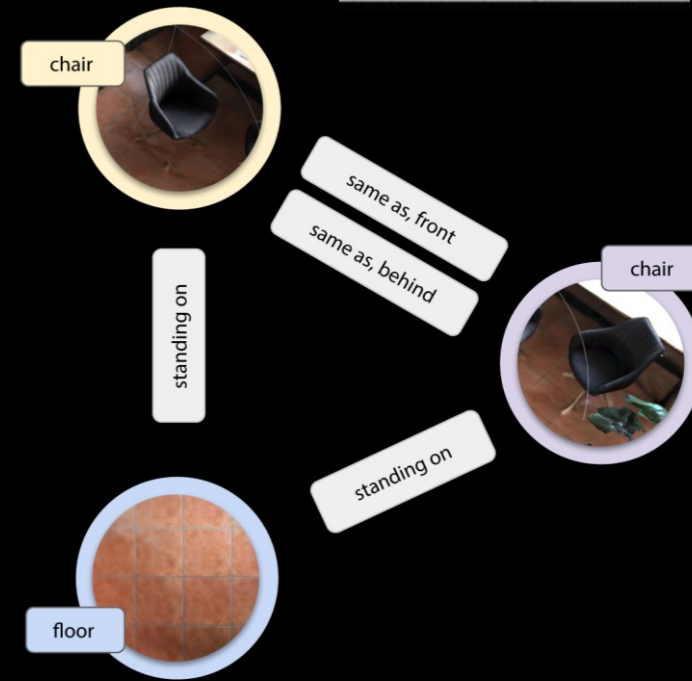
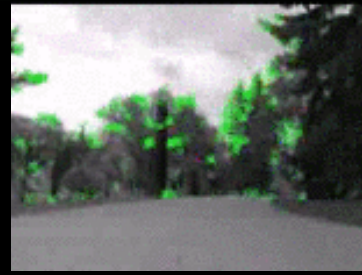
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Surprise, Surprise!

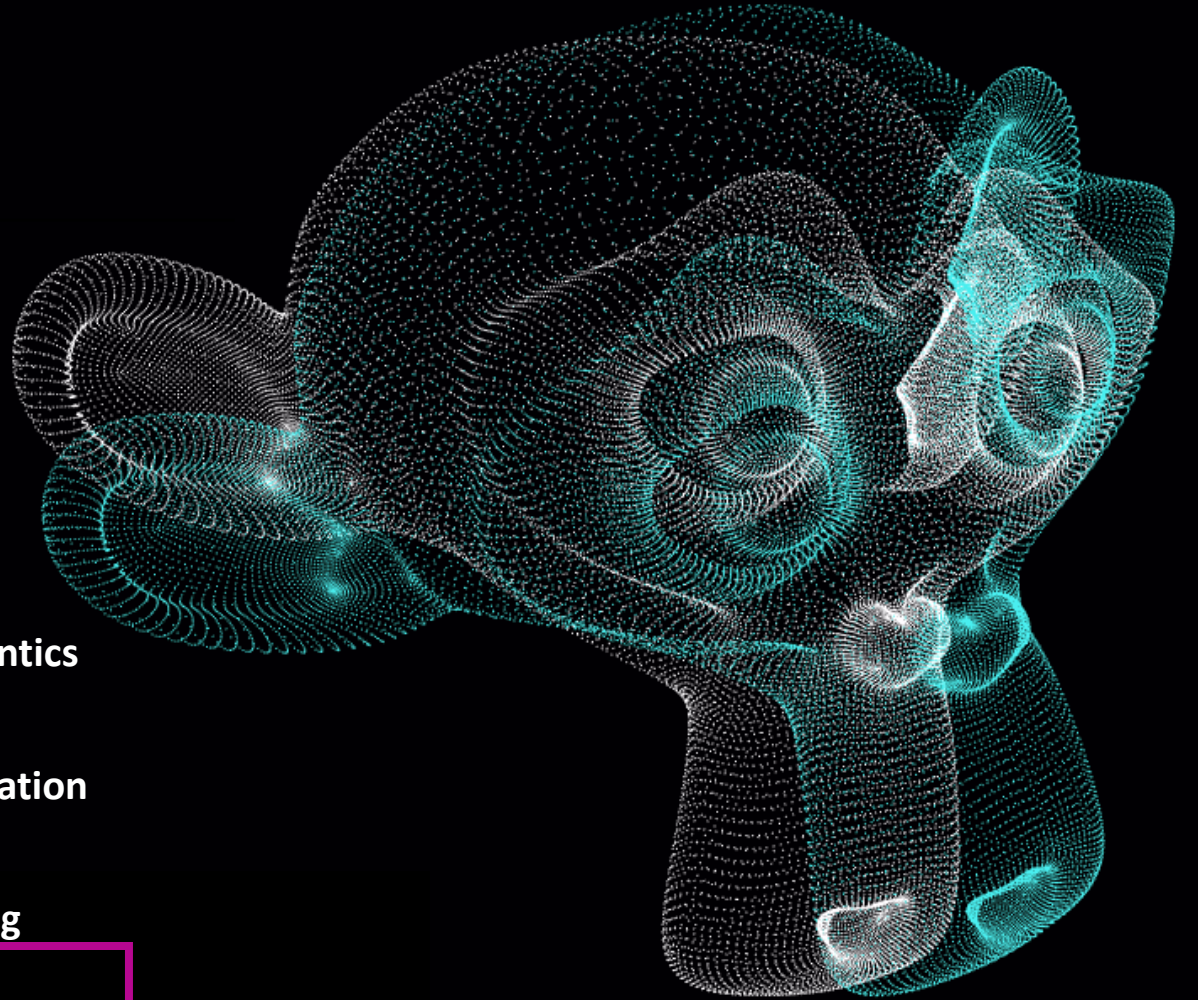
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# Paper Overview

Authors	Title	Conference / Publisher	Year	Supervisor
Chenyang Lei, Chenyang Qi, Jiaxin Xie, Na Fan, Vladlen Koltun, Qifeng Chen	Shape From Polarization for Complex Scenes in the Wild	CVPR	2022	HyunJun Jung
Abhijit Kundu, Kyle Genova, Xiaoqi Yin, Alireza Fathi, Caroline Pantofaru, Leonidas Guibas, Andrea Tagliasacchi, Frank Dellaert, Thomas Funkhouser	Panoptic Neural Fields: A Semantic Object-Aware Neural Scene Representation	CVPR	2022	Stefano Gasperini
Yuan Liu, Yilin Wen, Sida Peng, Cheng Lin, Xiaoxiao Long, Taku Komura, Wenping Wang	Gen6D: Generalizable Model-Free 6-DoF Object Pose Estimation from RGB Images	ECCV	2022	Pengyuan Wang
Xingguang Yan, Liqiang Lin, Niloy Mitra, Dani Lischinski, Daniel Cohen, Hui Huang	ShapeFormer: Transformer-based Shape Completion via Sparse Representation	CVPR	2022	Lennart Bastian
Francis Williams, Zan Gojcic, Sameh Khamis, Denis Zorin, Joan Bruna, Sanja Fidler Or Litany	Neural Fields as Learnable Kernels for 3D Reconstruction	CVPR	2022	Shun-Cheng Wu
Zihan Zhu, Songyou Peng, Viktor Larsson, Weiwei Xu, Hujun Bao, Zhaopeng Cui, Martin R Oswald, Marc Pollefeys	NICE-SLAM: Neural Implicit Scalable Encoding for SLAM	CVPR	2022	Patrick Ruhkamp
Hongtao Wen, Jianhang Yan, Wanli Peng, Yi Sun	TransGrasp: Grasp Pose Estimation of a Category of Objects by Transferring Grasps from Only One Labeled Instance	ECCV	2022	Guangyao Zhai
David Novotny, Ignacio Rocco, Samarth Sinha, Alexandre Carlier, Gael Kerchenbaum, Roman Shapovalov, Nikita Smetanin, Natalia Neverova, Benjamin Graham, Andrea Vedaldi	KeyTr: Keypoint Transporter for 3D Reconstruction of Deformable Objects in Videos	CVPR	2022	Mahdi Saleh
Can Wang, Menglei Chai, Mingming He, Dongdong Chen, Jing Liao	CLIP-NeRF: Text-and-Image Driven Manipulation of Neural Radiance Fields	CVPR	2022	Hannah Schieber
Shanlin Sun, Kun Han, Deying Kong, Hao Tang, Xiangyi Yan, Xiaohui Xie	Topology-Preserving Shape Reconstruction and Registration via Neural Diffeomorphic Flow	CVPR	2022	Lennart Bastian
Yang Li, Tatsuya Harada	Lepard: Learning Partial point cloud matching in Rigid and Deformable scenes	CVPR	2022	Mert Karaoglu
Zheng Qin, Hao Yu, Changjian Wang, Yulan Guo, Yuxing Peng, and Kai Xu	Geometric Transformer for Fast and Robust Point Cloud Registration	CVPR	2022	Hao Yu
Francesco Giuliari, Geri Skenderi, Marco Cristani, Yiming Wang and Alessio Del Bue	Spatial Commonsense Graph for Object Localisation in Partial Scenes	CVPR	2022	Shun-Cheng Wu
Barbara Roessle, Jonathan T. Barron, Ben Mildenhall, Pratul P. Srinivasan, Matthias Nießner	Dense Depth Priors for Neural Radiance Fields from Sparse Input Views	CVPR	2022	Patrick Ruhkamp



# In Person / Virtual – Hybrid

- Mostly onsite. Following government / TUM regulations
- In exceptional cases: virtual via zoom
- Mondays at 12 noon in MI 03.13.010



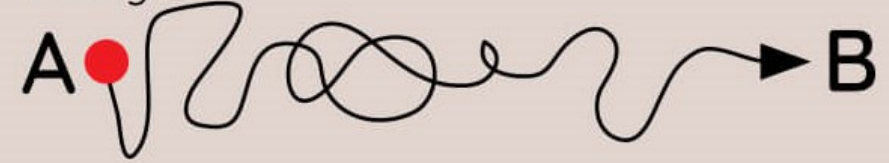
# What we expect from you

- Interest in Computer Vision
- Independent and pro-active participation
- Actively asking for help [ supervisor meetings ]
- Coding knowledge
- Illustrating methods with examples / demos

Expectation:



Reality:



# Goals

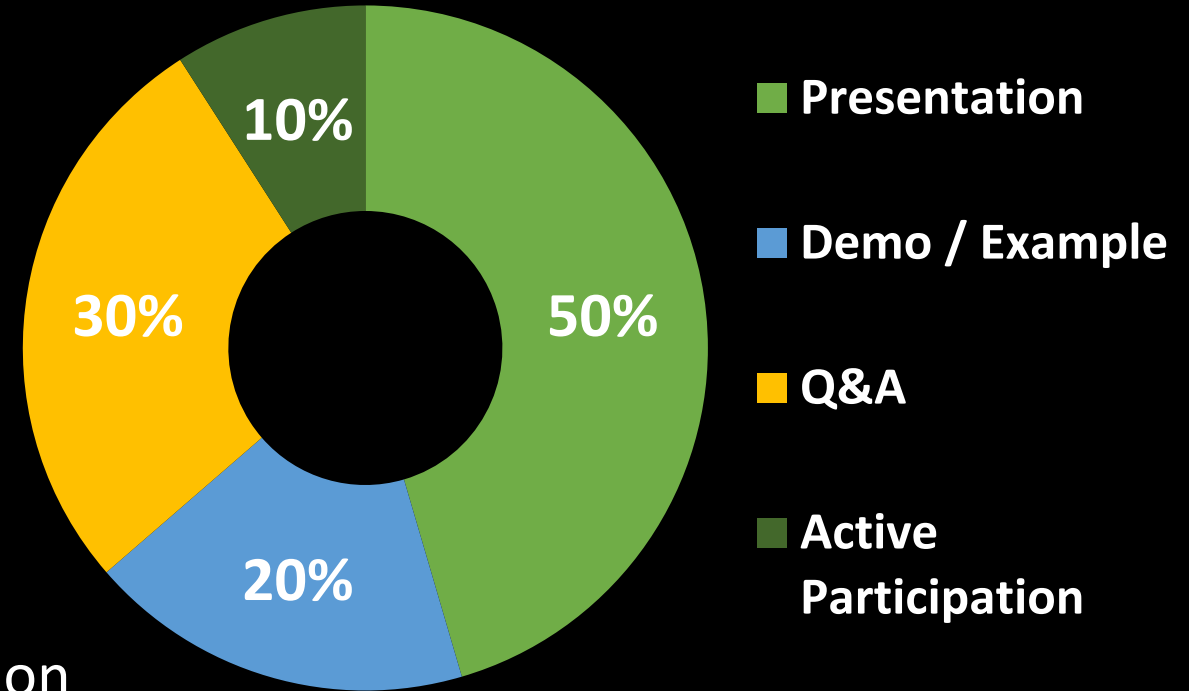
- Scientifically Learning about...
  - State-of-the-art Computer Vision
  - Current research challenges and applications
  - Communicate / discuss on most recent advantages with expert scientists
  - Hands-on experience with available code bases
- Skill training of...
  - Reading / understanding of a scientific work
  - Get overview of scientific field through literature research
  - Research talk in front of an audience, related Q&A



# Presentation

- Presentation: 20 ± 2 minutes talk + 10-15 minutes Q&A
- Content should cover
  - Introduction / Relevance of Problem
  - Context / Related Work
  - Main Contribution(s)
  - Experimental Results
    - Hands-on experience with code
  - Discussion
  - Future Work
- Presentation should be self-contained
- Attend all talks + active participation in other discussions

# Evaluation Criteria



- Quality of Presentation
  - Scientific Content of the Talk + Preparation
  - Quality of the Slides
  - Putting the Topic in Context (Related Work)
- Examples / Hands-on Code
- Scientific Discussion (Q&A)
- Independent Interaction / Active Participation in the Course



# Seed Paper Intros

MCVM WiSe 22/23

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05.12.2022	<b>Neural Fields: NeRF Enhancements + Semantics</b>	Dense Depth Priors + Panoptic Neural Fields
12.12.2022	<b>3D Reconstruction</b>	ShapeFormer + Neural Fields as Kernels
19.12.2022	<b>Sensors + Text. Co-Modalities and Manipulation</b>	Shape From Polarization + CLIP-NeRF
09.01.2023	<b>Invited Talk</b>	
16.01.2023	<b>Scene Mapping &amp; High-Level Understanding</b>	NICE-SLAM + Commonsense Graphs
23.01.2023	<b>Point Cloud Registration</b>	GeoTransformer + Lepard
30.01.2023	<b>Deformable Shapes</b>	KeyTr + Topology-Preserving Flows
06.02.2023	<b>Invited Talk</b>	

# Next Steps

## Paper Selection

<https://forms.gle/VDJXPftgoYJJ6ER28>

- Deadline: October 25, 2022
- We optimize for global happiness

*It's a Match!*



## Presentation Training

- Next Monday, October 31 at 12 noon in MI 03.13.010



# Questions



E-Mail us on

[mcvm@mailnavab.informatik.tu-muenchen.de](mailto:mcvm@mailnavab.informatik.tu-muenchen.de)

## Your MCM Team:

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## Web:

<https://www.cs.cit.tum.de/camp/teaching/seminars/modern-computer-vision-methods-ws-2022-23/>