Advanced Topics in
3D Computer Vision
[IN2106, IN4023]

February 7, 2023

Preliminary Meeting

Dr. Benjamin Busam, Lennart Bastian, Niko Brasch, Junwen Huang, HyunJun Jung, Mert Karaoglu, Evin Pınar Örnek, Ege Oszoy, Mahdi Saleh, Hannah Schieber, Shishir Vutukur, Pengyuan Wang, Shun-Cheng Wu, Hao Yu, Guangyao Zhai

Feedback from previous Students

"AT3DCV is the best course I have ever taken at TUM. I really love this concept because we Master Students can get very detailed, fruitful, and patient supervision from researchers specialized in that field. As a master student who is about to graduate, I really recommend AT3DCV if you are a young fellow and want to do research someday in the future because in this course, you will get a LOT of support from the organizers and this really helps you enjoy research. I believe that is how and why we start doing research. We are being motivated instead of being pushed!"

Hanzhi Chen, MSc Robotics, Cognition, Intelligence

AT3DCV student in WS 2020/21

MCVM Team

Benjamin Busam

Shishir Vutukur

Nikolas Brasch

Mahdi Saleh

Shun-Cheng Wu

Junwen Huang

Hao Yu

Evin Pınar Örnek

Guangyao Zhai

Pengyuan Wang

Lennart Bastian
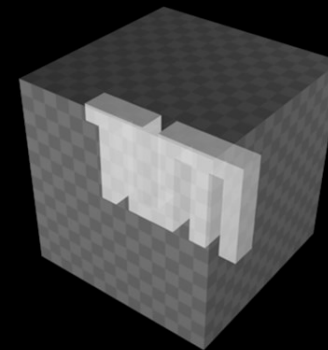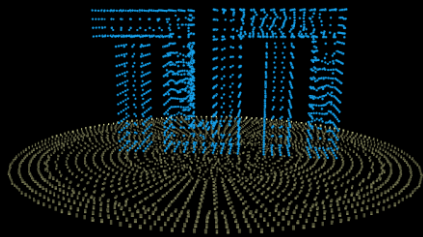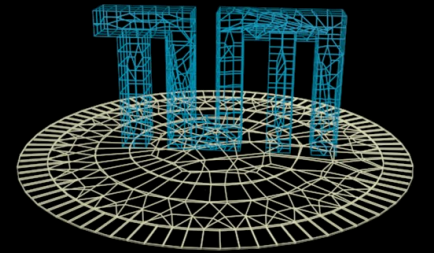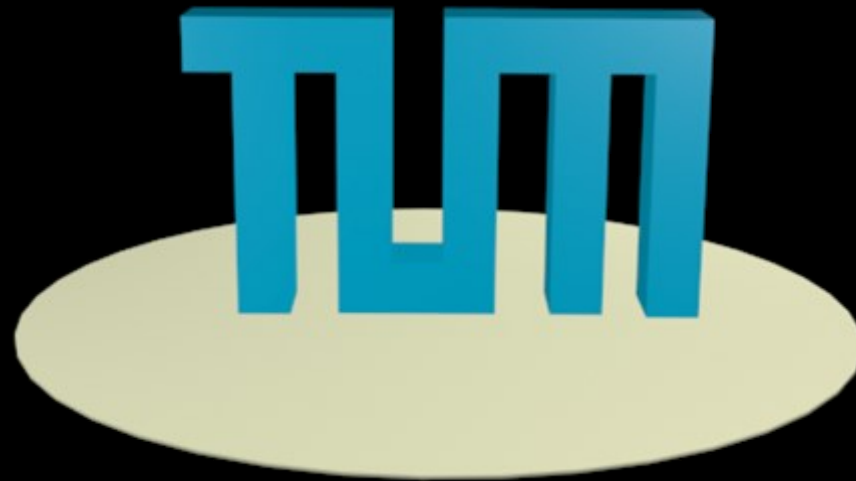
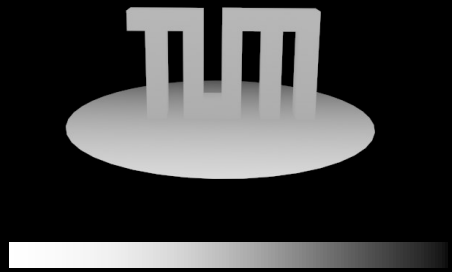HyunJun Jung

Hannah Schieber
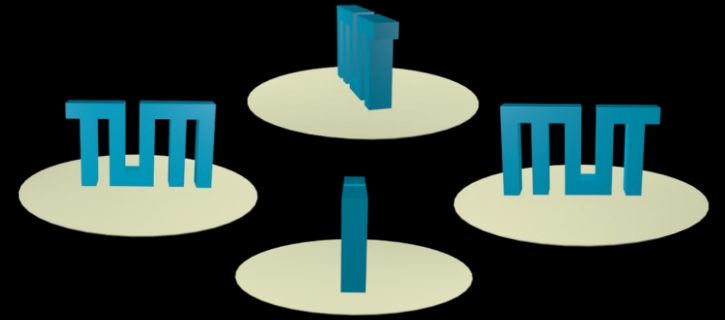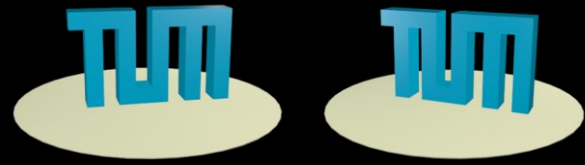
Mert Karaoglu

Ege Öszoy

TEAM   AWESOME!

3DV

Previous Projects

Garbage Evaporating Robot
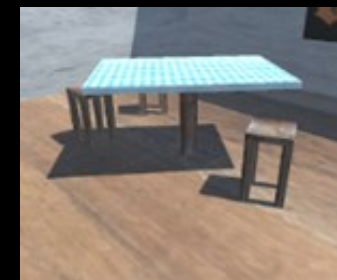
Garbage Evaporating Robot

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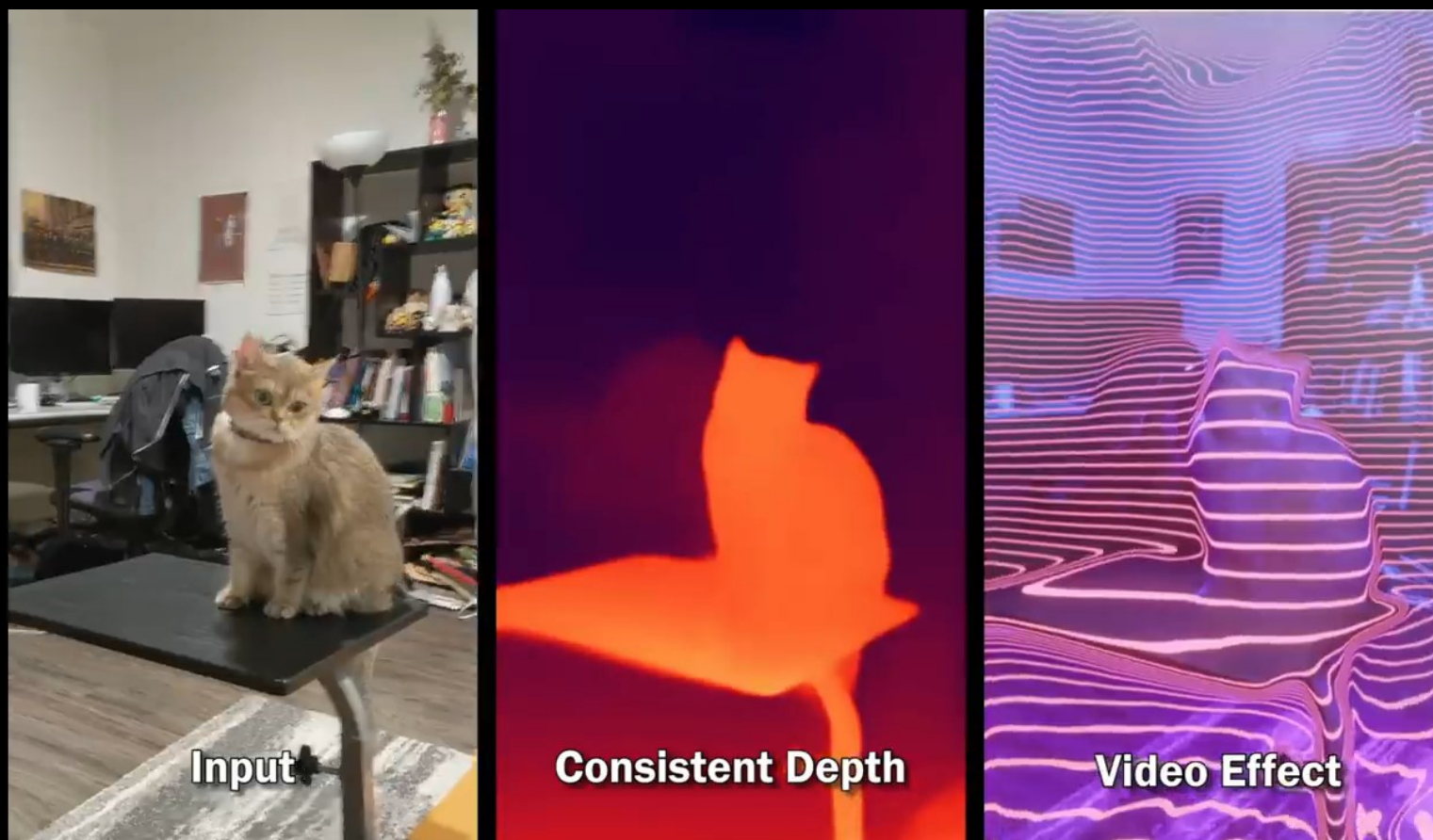
Temporally Consistent Depth [TCD]

Input • Consistent Depth • Video Effect

Luo, Huang, Szeliski, Matzen, Kopf. Consistent video depth estimation. SIGGRAPH 2020
Kopf, Rong, Huang. Robust Consistent Video Depth Estimation. CVPR 2021

TCD

MonoDepth2

ManyDepth

PackNet-SfM*

Ours

Consistency

★ TCD
[Ours]

+ PackNet-SfM*
[3]

+ SC-SfMLearner [4]

+ MonoDepth2 [1]

+ PackNet-SfM [3]

+ ManyDepth [2]
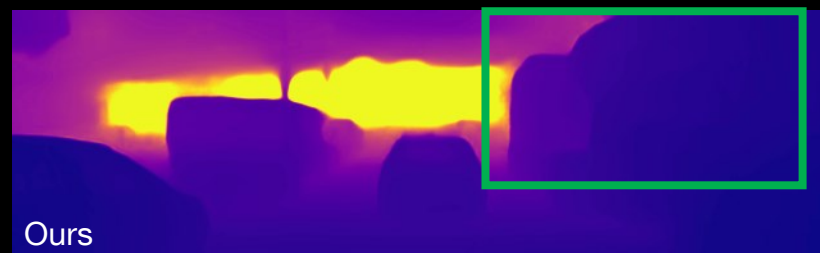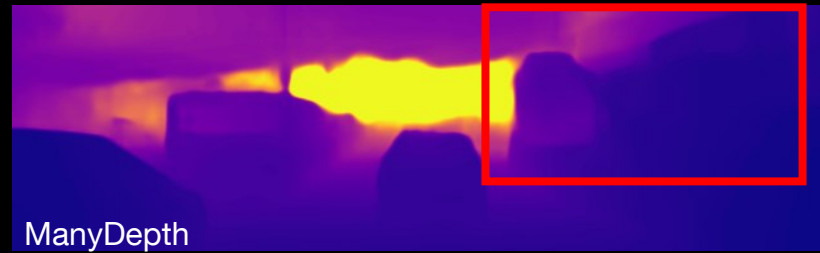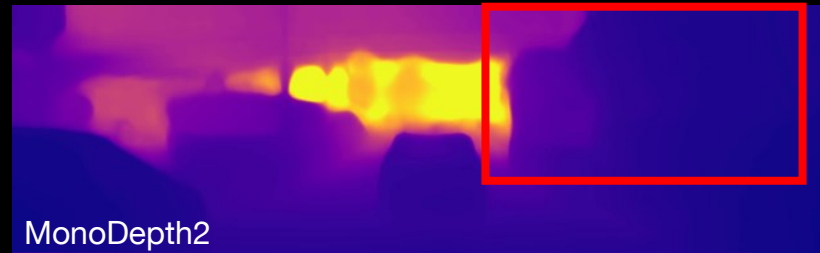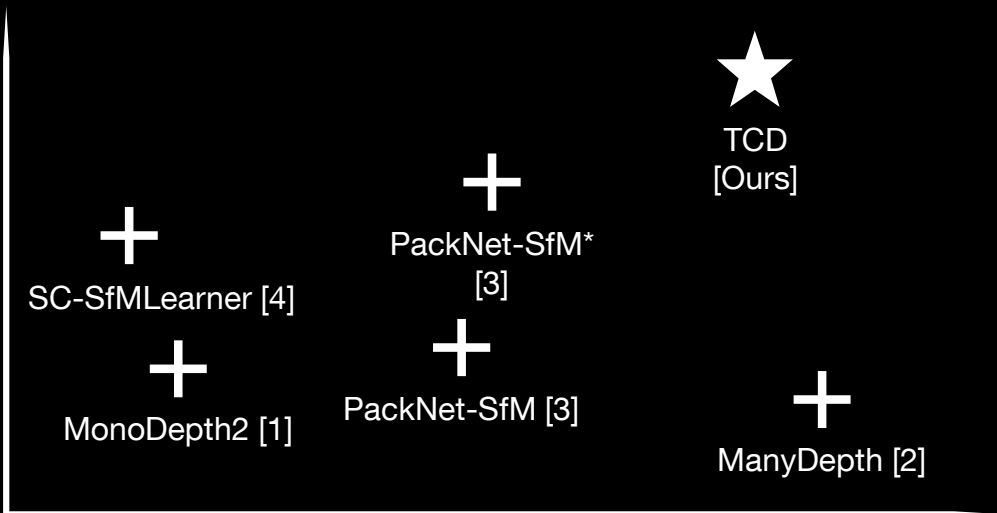
Accuracy

* velocity semi-supervision

[1] Digging into Self-Supervised Monocular Depth Prediction. Godard et al., ICCV 2020
[2] The Temporal Opportunist, Watson et al., CVPR 2021
[3] 3D Packing for Self-Supervised Monocular Depth Estimation, Guizilini et al., CVPR 2020
[4] Unsupervised Scale-consistent Depth and Ego-motion, Bian et al., NeurIPS 2019

Temporally Consistent Depth [TCD]

Ruhkamp, Gao, Chen, Navab, Busam. Attention meets Geometry: Geometry Guided Spatial-Temporal Attention for Consistent Self-Supervised Monocular Depth Estimation ICCVW 2021. 3DV 2021.
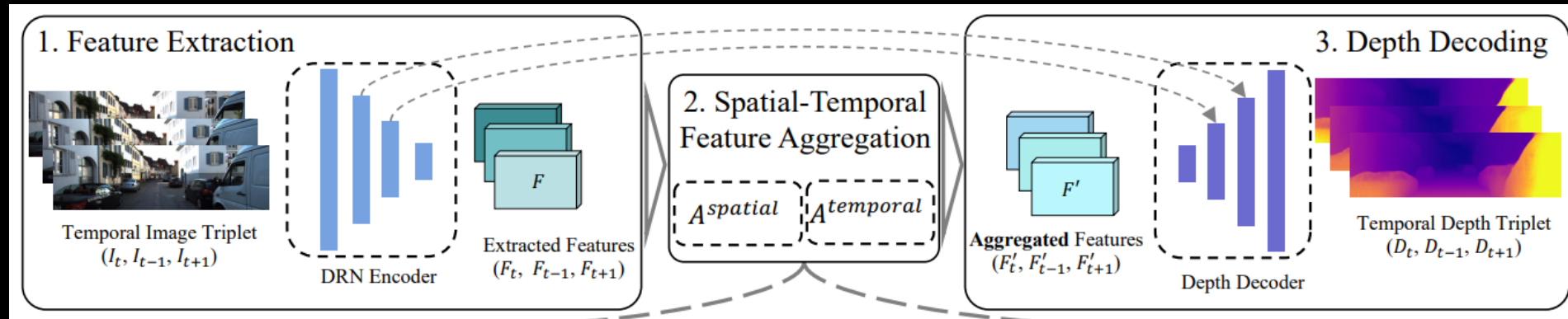
Sim-To-Real Transfer for Category-Level 6D Pose Estimation

Real Data

Synthetic Data

Depth

6D Pose Network

Real Images:
Challenging Depth

Synthetic Images:
Correct Depth

Ablation Study
- Real Depth
- True Depth
- Estimated Depth
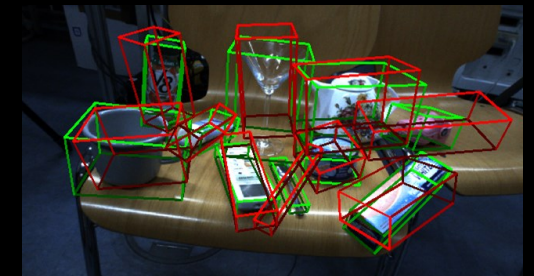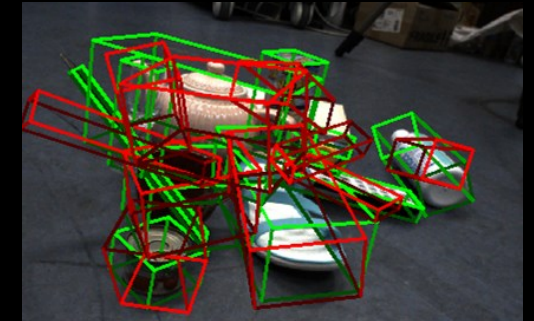
AT3DCV

Summer 2023

Course Structure

4x Lectures on 3DCV Topic

2x Individual Assignment

40%

Idea Workshop

Group Projects

55%

15%

Intermediate Presentation

Final Demonstration
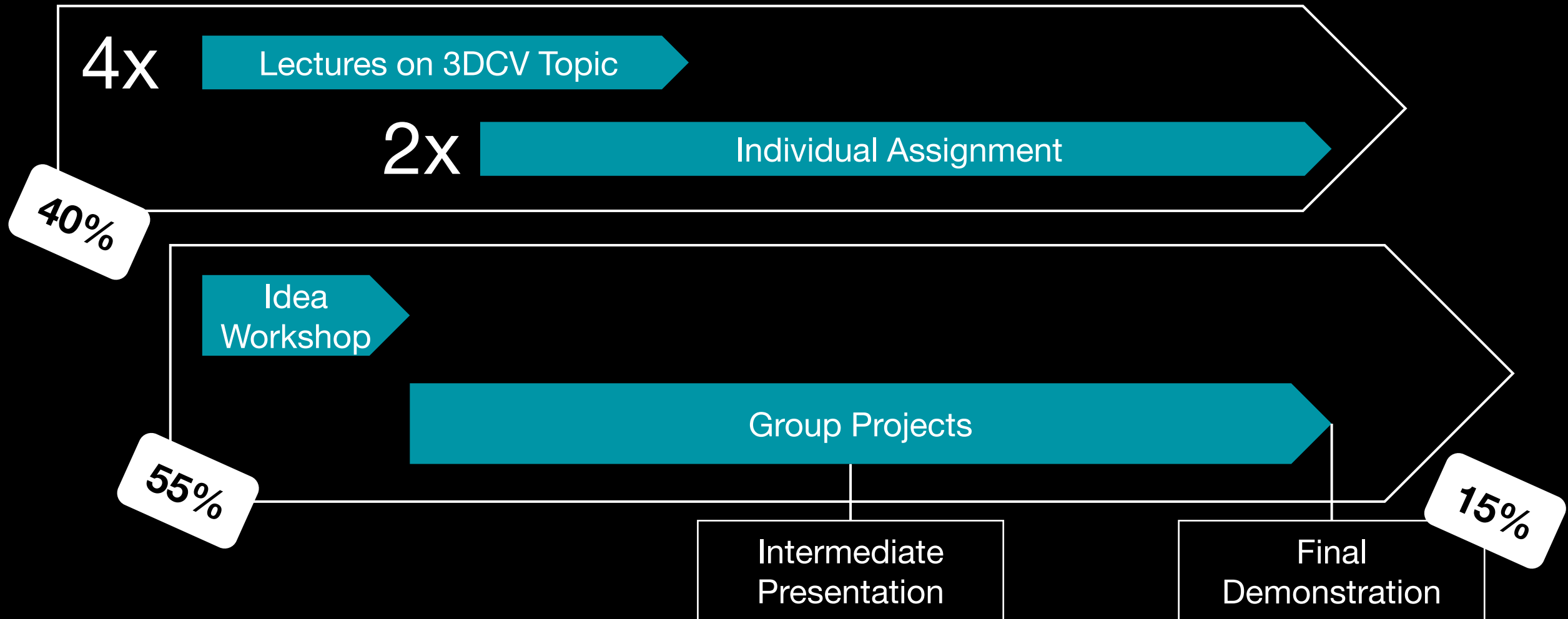
AT3DCV – Concept
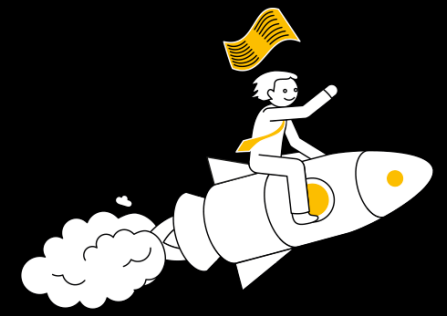
1. Theoretical + Practical Foundation

- "Flipped Class-room"
  - Pre-recorded lectures: to study in your own pace
  - Interactive Tutor sessions: your chance for discussion and questions (on lectures and assignments)
  - Pass 2 (out of 4) assignments (mostly practical and some theoretical parts)

2. Group projects:

Apply your 3DV and DL knowledge
- Very close tutoring
- "Researchy" projects
  - Projects are purposely not strictly defined
  - Be innovative and creative
  - Final workshop: combination of scientific poster-session and start-up pitch
  - Present your working demo/code/application/results

Application

- **2 stage process:**

  - Register in TUM Online
    https://docmatching.in.tum.de

  - Submit questionnaire and upload CV + Transcript
    https://docs.google.com/forms/d/e/1FAIpQLSc2iJ-2Oc3lwkxfAmjcsCV1tOKYoClhMKMbfggNeA5tiZOTAQ/viewform?usp=sf_link

  ➢ Deadline: 15th of February 2022

- Ca. 20 students will be selected (usually 100+ applications)

- Info on Course Website
    https://www.cs.cit.tum.de/camp/teaching/practical-courses/advanced-topics-in-3d-computer-vision-ss-2023

Course Dates

Individual Phase

18.04. Introduction Session
          Lecture Material
          + 4 Challenges are provided
25.04. Tutor Session
09.05. Individual Working Session

15.05. 23:59 CEST
          Hand in 2 of 4 Challenges

Group Phase

02.05. Group Project Introductions
16.05. Project Planning Session (Idea Workshop)

23.05. Group Meeting Slot
06.06. Group Meeting Slot
13.06. Group Meeting Slot
20.06. Group Meeting Slot
27.06. Mid-Term Presentations
04.07. Group Meeting Slot
11.07. Group Meeting Slot
18.07. Additional (Group Meeting) Slot

XX.07. Final (external) Workshop, TranslaTUM

In Person / Virtual – Hybrid

- Mostly onsite in person

- Option to attend virtually via zoom

- Tuesday at 14:00 in <u>MI 03.13.010</u>

Group Projects

- Groups of 3 students

- Students will be matched taking their preferences into account

- Project direction can be steered by the ideas of the group

- Project proposals will be discussed in workshop session

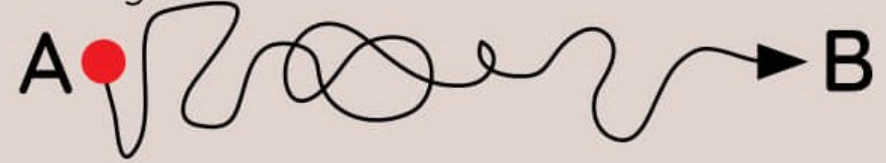- Projects either on real world problems OR open research questions

What we expect

Expectation:
A ● ─────────► B
Reality:
A ● 〰〰〰〰〰► B

- Interest in Computer Vision

- Independent and pro-active participation

- Actively asking for help [team members and tutors]

- Coding knowledge

- Team work towards achieving the group / project goals

Questions

E-Mail us on

at3dcv@mailnavab.informatik.tu-muenchen.de

Your MCM Team:

Benjamin Busam, Lennart Bastian, Niko Brasch, Junwen Huang, HyunJun Jung, Mert Karaoglu, Evin Pınar Örnek,

Ege Oszoy, Mahdi Saleh, Hannah Schieber, Shishir Vutukur, Pengyuan Wang, Shun-Cheng Wu, Hao Yu, Guangyao Zhai

Web:

https://www.cs.cit.tum.de/camp/teaching/practical-courses/advanced-topics-in-3d-computer-vision-ss-2023/