Praktikum on 3D Computer Vision

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Introduction

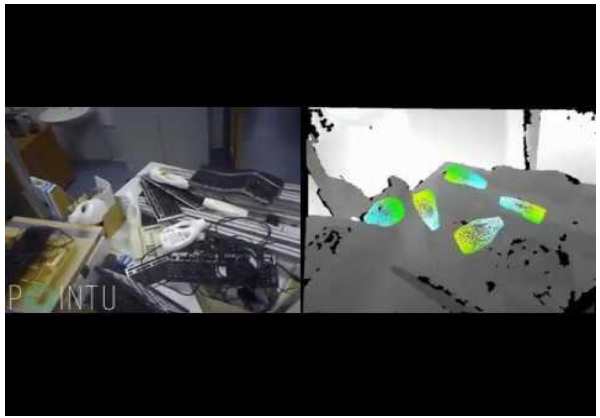
- 3D Computer Vision

  Scene understanding
  - 6D object pose estimation
  - SLAM, Structure from Motion
  - 3D reconstruction
  - Camera pose / re-localization
  - Nerf, 3D rendering
  - Semantic segmentation / understanding
  - Depth prediction, stereo

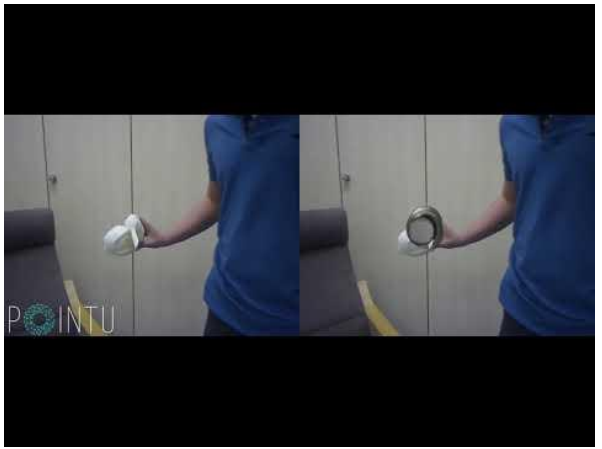
  Human understanding
  - 3D body / hand / face pose estimation
  - 3D Head / body modeling
  - ..

- Application in Robotics
  - Grasping and Manipulation
  - Navigation
  - Obstacle avoidance

- Augmented Reality
  - Render virtual/augmented content on real objects of known shape or pose



3D Object Detection and tracking



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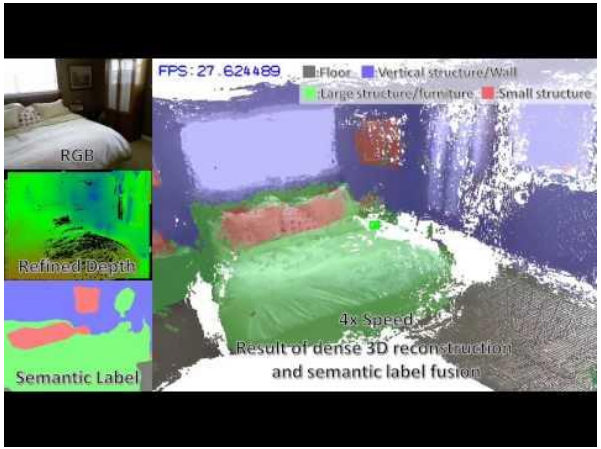
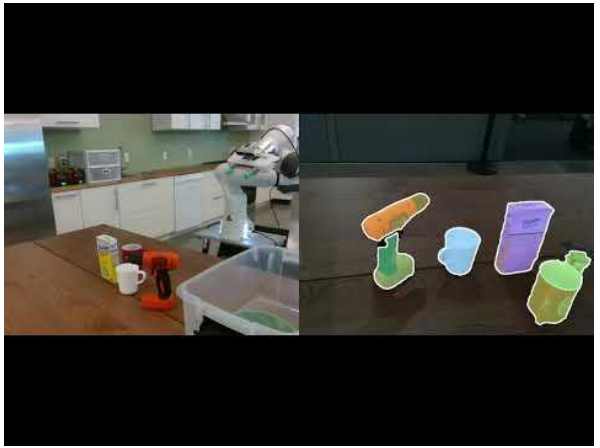


Depth Prediction, Semantics and SLAM

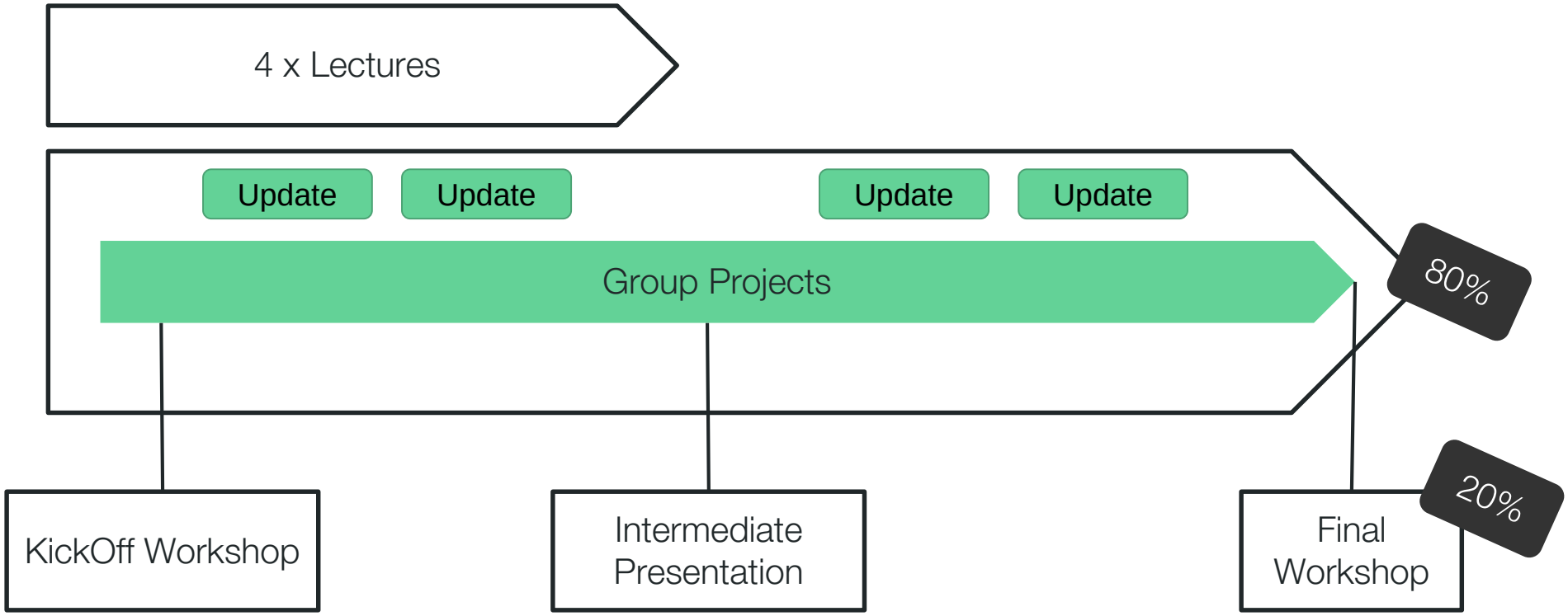


Robotics

Goals of the Praktikum

- Learn about the **state of the art in 3D computer vision**
- Familiarize with **practical aspects and use cases** of typical 3D perception tasks (3D feature extraction and learning, surface matching and 3D reconstruction, 3D object localization and pose estimation, SLAM, ..)
- **Develop an end-to-end project in a team** aiming to solve a relevant and challenging problem in 3DCV
- Learn to **explain and disseminate your work** to a customer and in tech talks

Course structure



Teams

- Students are grouped **in teams of 3-4** and evaluated jointly
- Registered students can **indicate project preference and preferred team partner** after project announcements
- Students will be assigned to a team and project that **best fits the indicated preference & background**

- **7-8 teams**
- Each project has been **assigned**
  - One tutor who will be the **customer** who hired the team to work on the project. You need to prepare 4 regular project updates to present.
  - One tutor as an expert **advisor** that will assist the team during project development. You should contact her/him after the project assignments.

Tentative schedule

Lecture period: 16.10.2023 – 09.02.2024

Time: Fridays 14.00 - 15.30
Place: Seminar Room 03.13.010

20.10	Introductory talk & Project presentations
27.10	Project assignments
3.11	Project KickOffs
CVPR Break	
17.11	Lecture I & Project Updates
24.11	Lecture II
1.12	Lecture III & Project Updates
8.12	Lecture IV
15.12	Mid-term Presentations
Christmas Break	
12.1	Project Updates
26.1	Project Updates
9.2	Final Workshop

Prerequisites

- Required: 1+ computer vision-related course
  - Tracking and Detection in CV (IN2357)
  - Computer Vision I: Variational Methods,
  - Computer Vision II: Multiple View Geometry (IN2228)
  - Robotic 3D Vision, Convex Optimization for ML and CV, Probabilistic Graphical Models in CV
  - ...
- Required: 1+ deep-learning-related course
  - Introduction to Deep Learning (I2DL) (IN2346)
  - Machine Learning (IN2064)
  - ...
- Suggested:
  - 1+ projects in the domain of CV/ML

Registration

TUM Matching System

- Send motivation letter, CV & transcript (not mandatory, but highly recommended) to: **p3dcv@mailnavab.informatik.tu-muenchen.de** (03.07 - 19.07)
- Register in Matching-System: https://matching.in.tum.de (until 19.07.)

Questions?

Web. https://www.cs.cit.tum.de/camp/teaching/practical-courses/praktikum-on-3d-computer-vision-ws-2023-24/

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