

Seminar: Robot Perception for Navigation

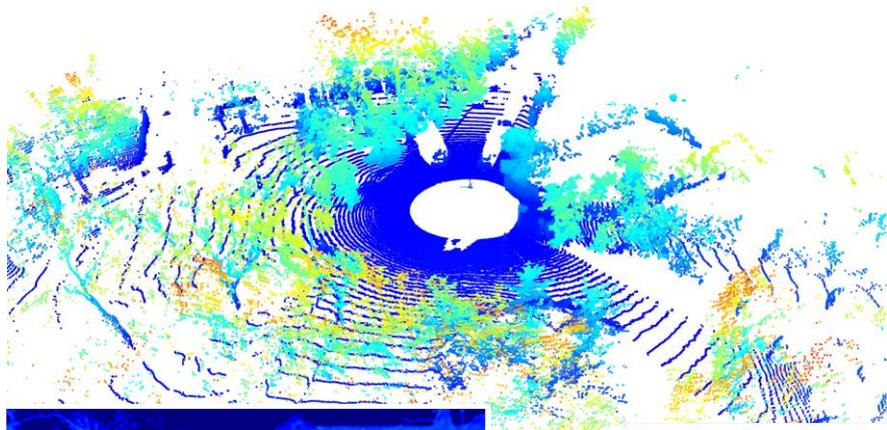
**Dr. Tim Welschehold, Johannes Meyer,
Adriana Gomez, Jannik Zürn, Shengshao Yan,
Kürsat Petek, Chenguang Huang**



Robots need to perceive the environment



High Variability in Inputs



Requirements for the Seminar

- Be registered for the seminar
- Send us your list of paper preferences by
Date: Friday, October 31st 2022
- Seminar will be a “Blockseminar” on one or two days in the end of the semester
- “How to give a talk”-talk on one date TBD (early-mid december)

Requirements for the Seminar

- Rather advanced topics of state-of-the-art research in Robotics and Deep Learning
- You should be proficient in
 - Mobile Robotics
 - Deep Learning

Requirements for the Seminar

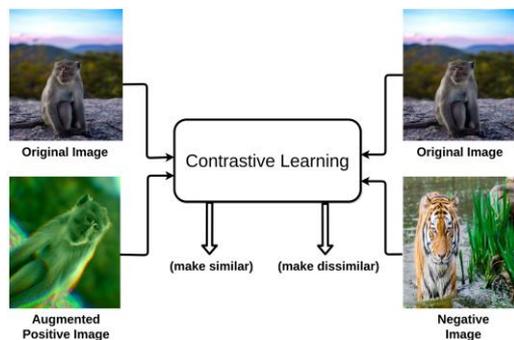
- Write a 2-page* summary of your assigned paper, discuss it with your supervisor by
Date: Wednesday, December 14th 2022
- Give a 20 minute talk with a 10 minute discussion
Date: TBD (assumed in-person)
- Finalize your summary (3-page*) by adding ideas on how another approach could be integrated or what similarities to other presented approaches are
Date: two weeks after the presentation

* excluding references

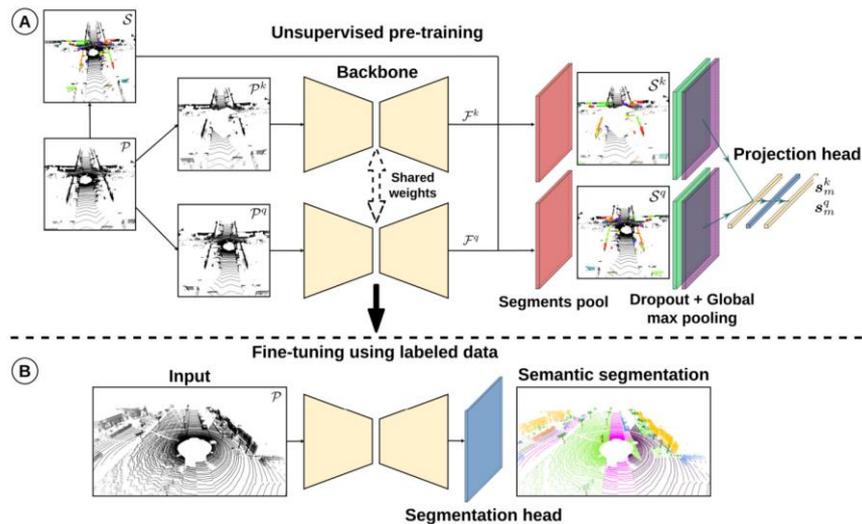
List of Papers

ID	Supervisor	Titel
1	Johannes	SegContrast: 3D Point Cloud Feature Representation Learning Through Self-Supervised Segment Discrimination
2	Johannes	Unsupervised Class-Agnostic Instance Segmentation of 3D LiDAR Data for Autonomous Vehicles
3	Johannes	Real-Time Multi-Modal Semantic Fusion on Unmanned Aerial Vehicles
4	Adriana	CMX: Cross-Modal Fusion for RGB-X Semantic Segmentation with Transformers
5	Adriana	Semantic Segmentation for Thermal Images: A Comparative Survey
6	Jannik	Lane-Level Street Map Extraction from Aerial Imagery
7	Jannik	Objects that Sound
8	Shengchao	Learning robust perceptive locomotion for quadrupedal robots in the wild
9	Shengchao	Learning High-Speed Flight in the Wild
10	Kürsat	BEVFusion: A Simple and Robust LiDAR-Camera Fusion Framework
11	Kürsat	Unsupervised Semantic Segmentation by Contrasting Object Mask Proposals
12	Chenguang	Grounded Language-Image Pre-Training
13	Chenguang	Scaling Open-Vocabulary Image Segmentation with Image-Level Labels

1: SegContrast: 3D Point Cloud Feature Representation Learning Through Self-Supervised Segment Discrimination



A Survey on Contrastive Self-Supervised Learning



Supervisor: Johannes

2: Unsupervised Class-Agnostic Instance Segmentation of 3D LiDAR Data for Autonomous Vehicles

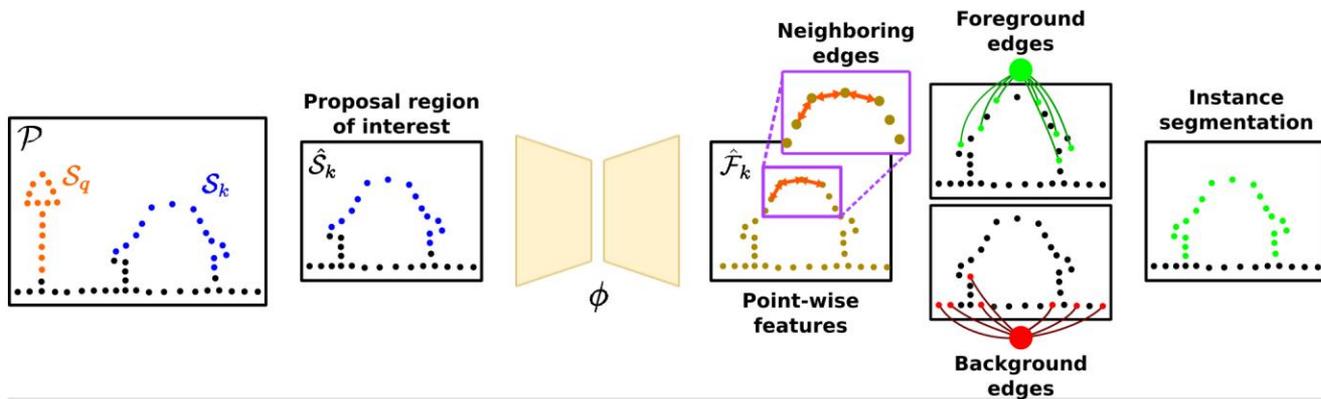


Fig. 2: Given a point cloud \mathcal{P} and set of instance proposals \mathcal{I} , we iterate over each proposal S_k defining a region of interest \hat{S}_k around the proposal. We extract point-wise features $\hat{\mathcal{F}}_k$ for this proposal region using a network ϕ pre-trained with SegContrast [28]. Then, we build a graph weighting the neighborhood edges with the features affinity, and the foreground and background edges given the sampled seeds. Finally, we apply a min-cut over the graph to segment the instance from the background.

Supervisor: Johannes

3: Real-Time Multi-Modal Semantic Fusion on Unmanned Aerial Vehicles

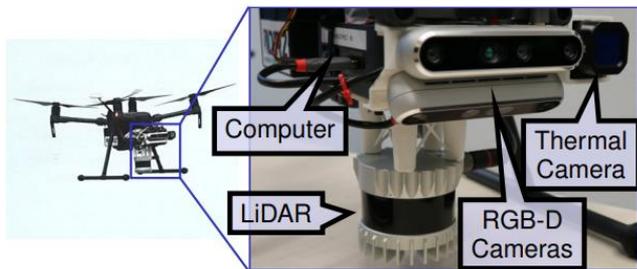


Fig. 2: UAV system setup and hardware design.

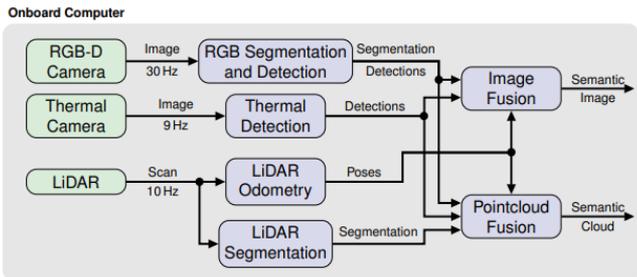
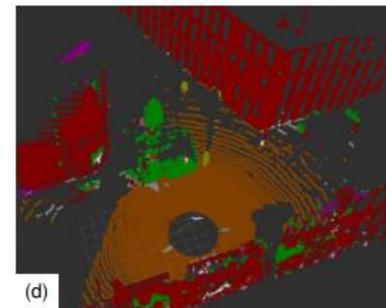
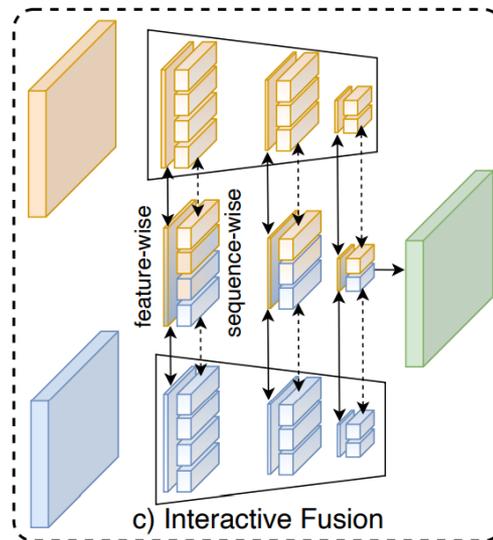
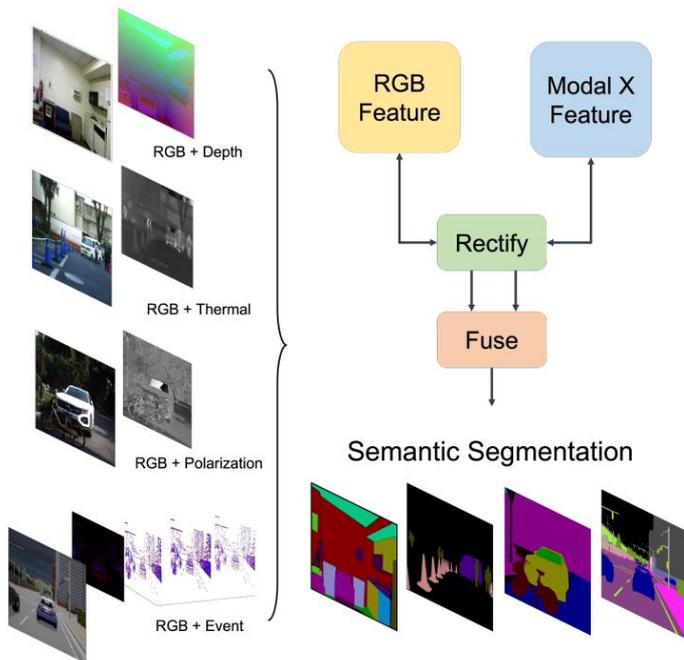


Fig. 3: Perception system overview.

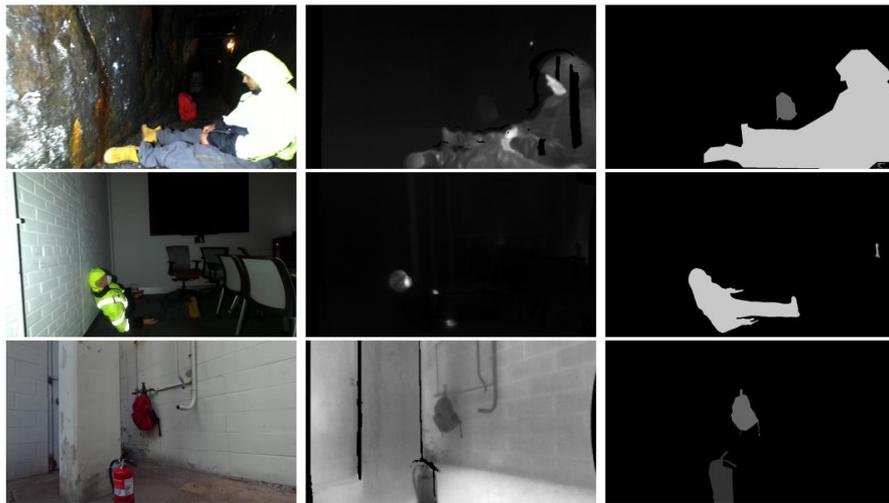
Supervisor: Johannes

4: CMX: Cross-Modal Fusion for RGB-X Semantic Segmentation with Transformers



Supervisor: Adriana

5: Semantic Segmentation for Thermal Images: A Comparative Survey

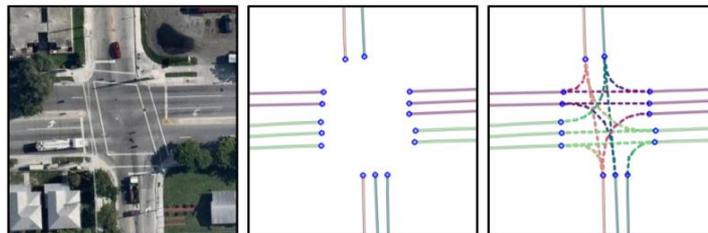


Supervisor: Adriana

6: Lane-Level Street Map Extraction from Aerial Imagery



(a) Example of a lane-level street map



Input Aerial Imagery



Extract Lanes at Non-Intersection Area



Extract Turning Lanes at Intersections

(b) Mapping pipeline for lane-level street map extraction

Supervisor: Jannik

7: Objects that Sound



(a) Input image with sound



(b) Where is the sound?

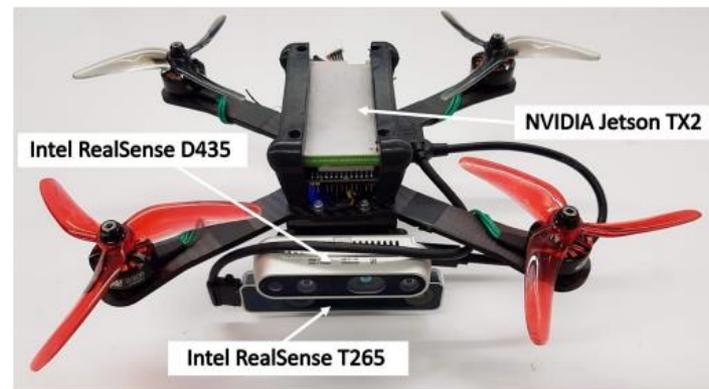
Supervisor: Jannik

8: Learning robust perceptive locomotion for quadrupedal robots in the wild



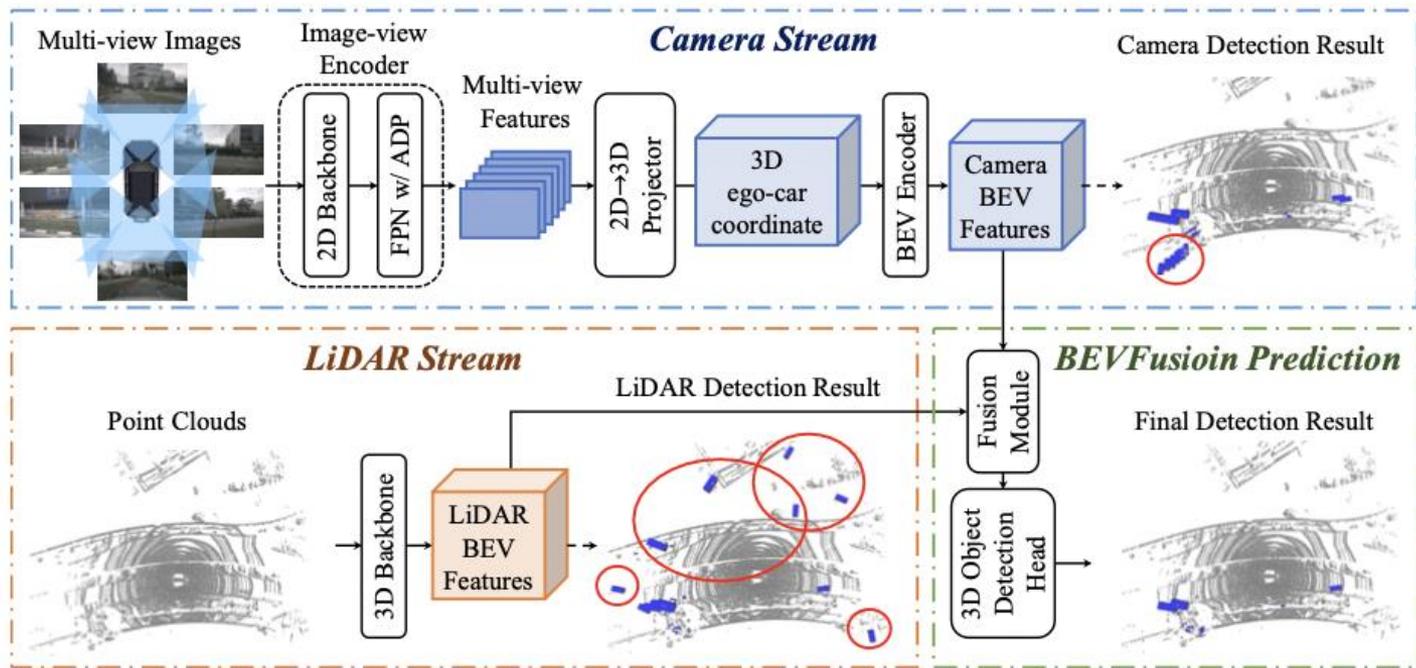
Supervisor: Shengshao

9: Learning High-Speed Flight in the Wild



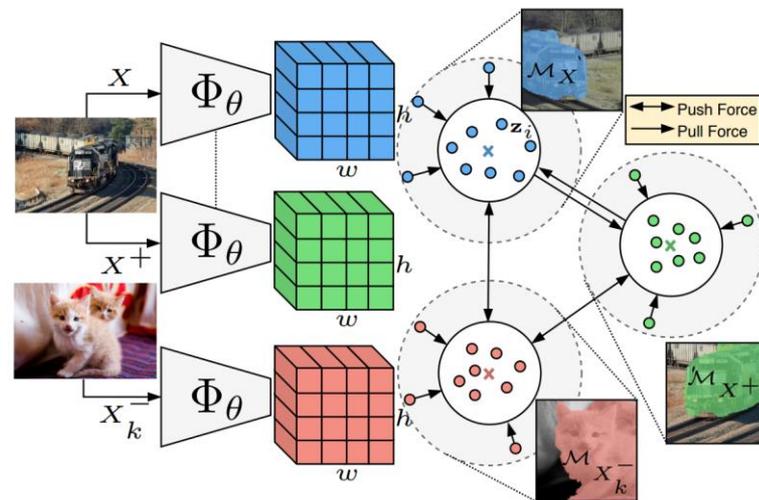
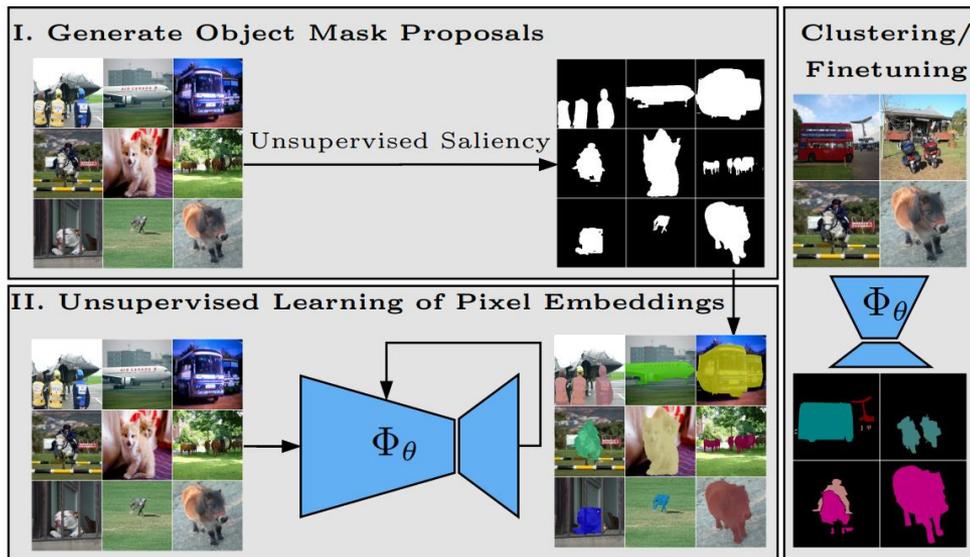
Supervisor: Shengshao

10: BEVFusion: A Simple and Robust LiDAR-Camera Fusion Framework



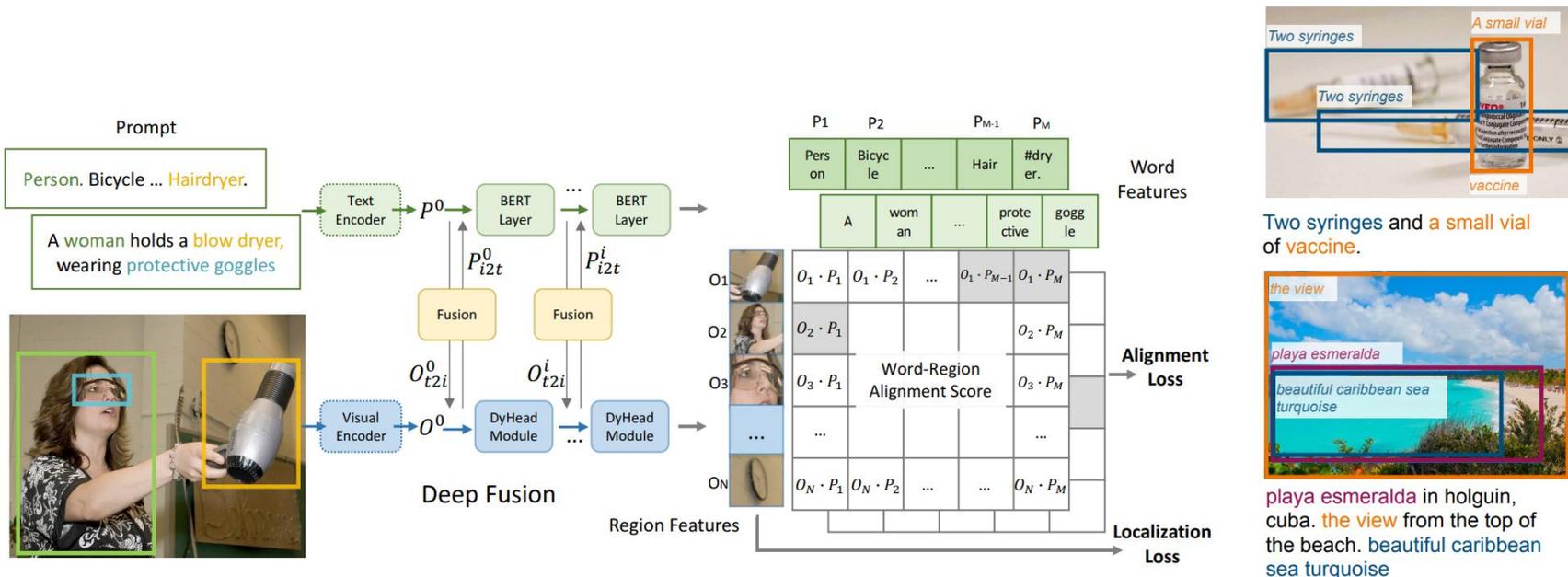
Supervisor: Kürsat

11: Unsupervised Semantic Segmentation by Contrasting Object Mask Proposals



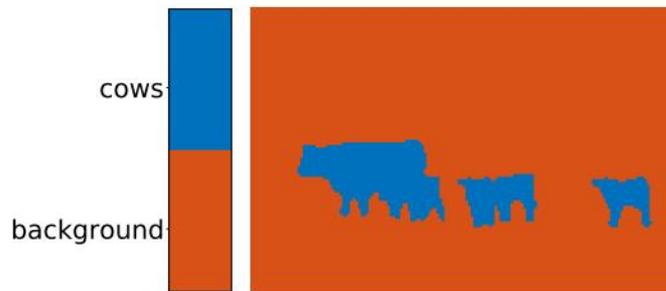
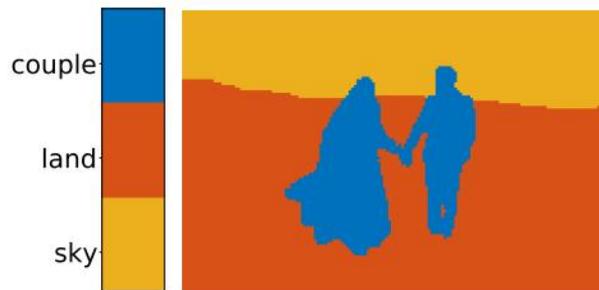
Supervisor: Kürsat

12: Grounded Language-Image Pre-Training



Supervisor: Chenguang

13: Scaling Open-Vocabulary Image Segmentation with Image-Level Labels



Supervisor: Chenguang

Next steps

We will publish the list of papers on our webpage

http://ais.informatik.uni-freiburg.de/teaching/ws22/robot_perception_navigation/

Course type	Booking period 1 (includes de- registration)	Seat allocation	Booking period 2 (includes de- registration)	De-registration period
(Pro)Seminars in Computer Science	17. Oct. till 24. Oct. 2022 <i>(Submission of booking requests with priorities)</i>	25. Oct. 2022 <i>(Manual check and adjustment by lecturers)</i> 26. Oct. 2022 <i>(seat allocation and check)</i>	27. Oct. 2022 <i>till 2 pm: Release of information for students</i> <i>from 2 pm: de-regsitration possible</i>	28. Oct. 2022 <i>De-registration possible</i> <i>Afterwards, no more de- registration possible!</i>



Startseite

Schnellzugriff

Aktuelles
Forschung
Datensätze
Forschungsprojekte
Studierendenprojekte
Lehre
WS 2022/23
Vorlesung: Betriebssysteme
Robot Mapping
Seminar: Robot Perception for Navigation
Praktikum/Laboratory: FreiCAR - Practical Autonomous Driving
SS 2022
WS 2021/22
SS 2021
WS 2020/21
SS 2020
WS 2019/20
SS 2019
WS 2018/19
SS 2018
WS 2017/18

Seminar Robot Perception For Navigation - WS 2022/23

Seminar Robot Navigation

Requirements & Information

- Organizer: [Dr. Tim Welschehold](#)
 - Co-Organizers: [Johannes Meyer](#), TBD
 - The first meeting will take place on Monday, October 17th 2022 at **15:00-16:00** in an online zoom meeting [link](#)
 - Students are requested to:
 - **Write a two-page abstract (prior to the talk) of the assigned paper.**
 - **Prepare a talk of 20 minutes.**
 - **Write a finalized three-page abstract**, in which they additionally discuss connections from their paper to others presentend in the seminar.
- Everything is supposed to be done in English.
- The two-page summary is due on **Wednesday, December 14th, 2022.**
 - The Seminar will be held as a "Blockseminar" in the end of the Semester. The slides should be discussed with the supervisor two weeks before the presentation. The Presentations will take place on TBA.

List of Seminar Topics:

1. [SegContrast: 3D Point Cloud Feature Representation Learning Through Self-Supervised Segment Discrimination](#)
2. [Unsupervised Class-Agnostic Instance Segmentation of 3D LiDAR Data for Autonomous Vehicles](#)
3. [Real-Time Multi-Modal Semantic Fusion on Unmanned Aerial Vehicles](#)
4. [CMX: Cross-Modal Fusion for RGB-X Semantic Segmentation with Transformers](#)
5. [Semantic Segmentation for Thermal Images: A Comparative Survey](#)
6. [Lane-Level Street Map Extraction from Aerial Imagery](#)
7. [Objects that Sound](#)
8. [Learning robust perceptive locomotion for quadrupedal robots in the wild](#)
9. [Learning High-Speed Flight in the Wild](#)
10. [BEVFusion: A Simple and Robust LiDAR-Camera Fusion Framework](#)
11. [Unsupervised Semantic Segmentation by Contrasting Object Mask Proposals](#)
12. [Grounded Language-Image Pre-training](#)
13. [Scaling Open-Vocabulary Image Segmentation with Image-Level Labels](#)

Next step: After seat allocation

Send mail with your paper preference to

robot-perception-navigation@cs.uni-freiburg.de

e.g.

["Name", 3, 1, 4, 5, 6, 8, 2, 7, 9, 9, 9, 9, 9, 9]

Thank you for your attention!