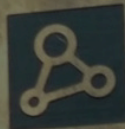




GRAZPER

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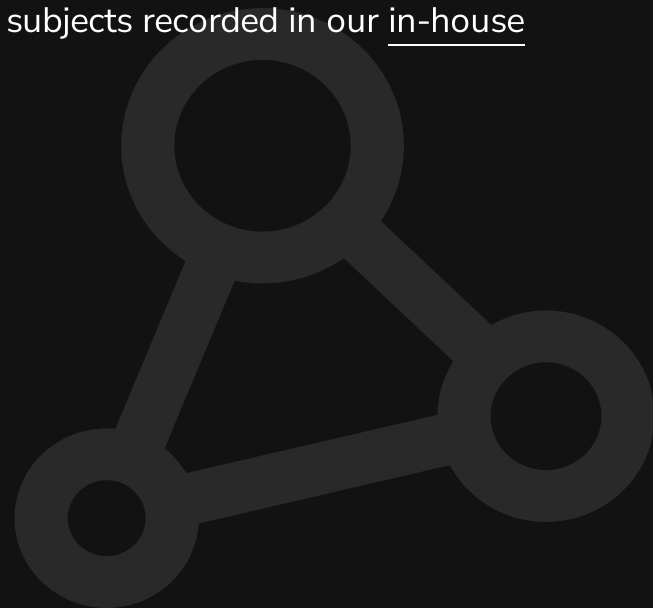
Master thesis proposals

About Grazper

- Our primary system, Realm3D is a multi-camera setup for real time 3D pose estimation.
- For each camera we output multi-person 2D pose estimation.
- 2D pose estimates are gathered and combined to form a 3D pose estimate.
- This is possible because cameras are precisely synchronized and calibrated.
- Networks are trained on a dataset made with 16 cameras and multiple subjects recorded in our in-house recording studio.

Key challenges

- Improving quality of the dataset.
- Calibration.
- Using the real time 3D poses in other applications.
- Improving 3D tracking.



What we are looking for

- Motivated ambitious student looking for a master thesis project/internship.
- Interested in solving real-world computer vision problems using cutting edge tools and state of the art models.
- Opportunity to work on cutting edge technology within computer vision and machine learning.
- Experience in Python coding.
- Mentorship by experienced engineers.
- Unique dataset for 2D and 3D pose estimation.
- Unique recording studio with 16 synchronized cameras.
- Send us your CV and proposition [here!](#)



Suggested research topics

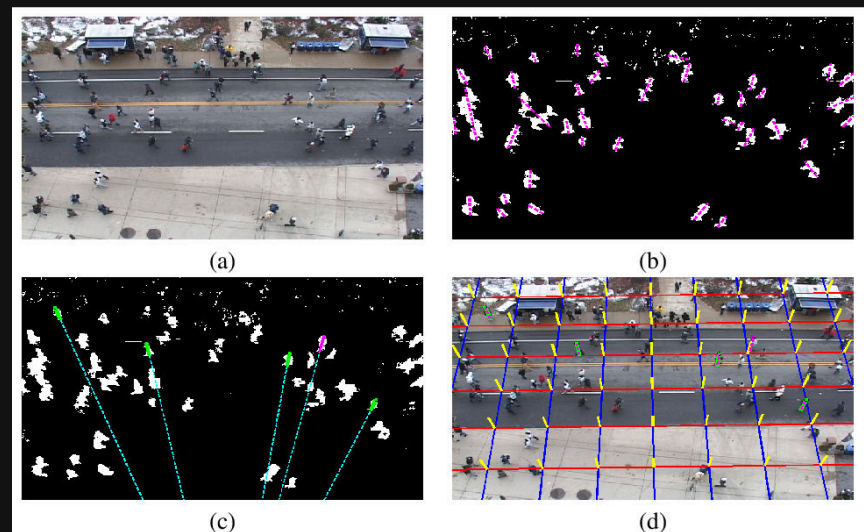


Automatic calibration

- Cameras need precise calibration but sometimes get moved accidentally.
- Design a system to identify when a camera is no longer calibrated.
- Recalibrate automatically using features in the scene.

Key technologies

- Camera calibration.
- Classical computer vision.
- Photogrammetry.



Automatic 3D annotation

- Dataset consists of videos from 16 camera angles, annotated with 3D poses.
- Annotation can be performed automatically by first performing 2D pose and then combining information from all angles.
- Improve annotation system for robust estimation and efficient global optimization.

Key technologies

- Numerical optimization.
- Statistical modeling.
- Mathematical modeling.



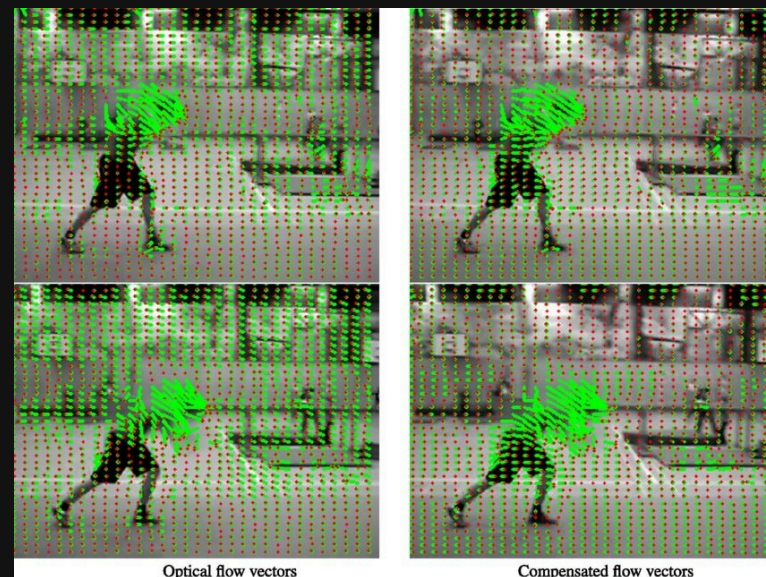


Optical flow tracking

- Grazper has an annotation tool for manually annotating our in-house dataset.
- Incorporate optical flow into our existing tool.
- Improvements based on the specific domain of the dataset.

Key technologies

- Optical flow.



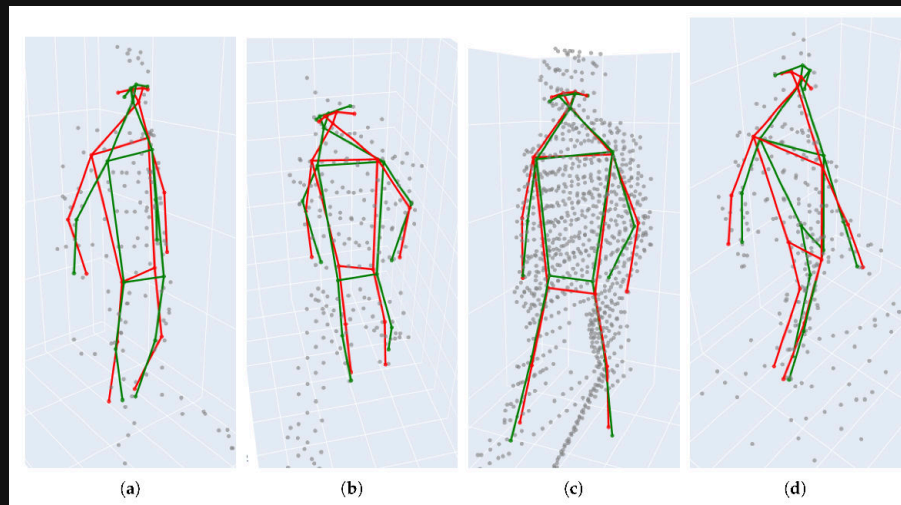
[Jain, Mihir & Jégou, Hervé & Bouthemy, Patrick. \(2015\). Improved Motion Description for Action Classification.](#)

Advanced 3D tracking algorithms

- Grazper currently uses a Kalman filter for 3D tracking (turning 2D poses into 3D poses).
- Experiment with advanced tracking algorithms such as particle filters or neural network-based trackers.
- Incorporate natural priors.
- Make high performance implementation.

Key technologies

- Particle filters.
- Machine learning.
- Mathematical modeling.

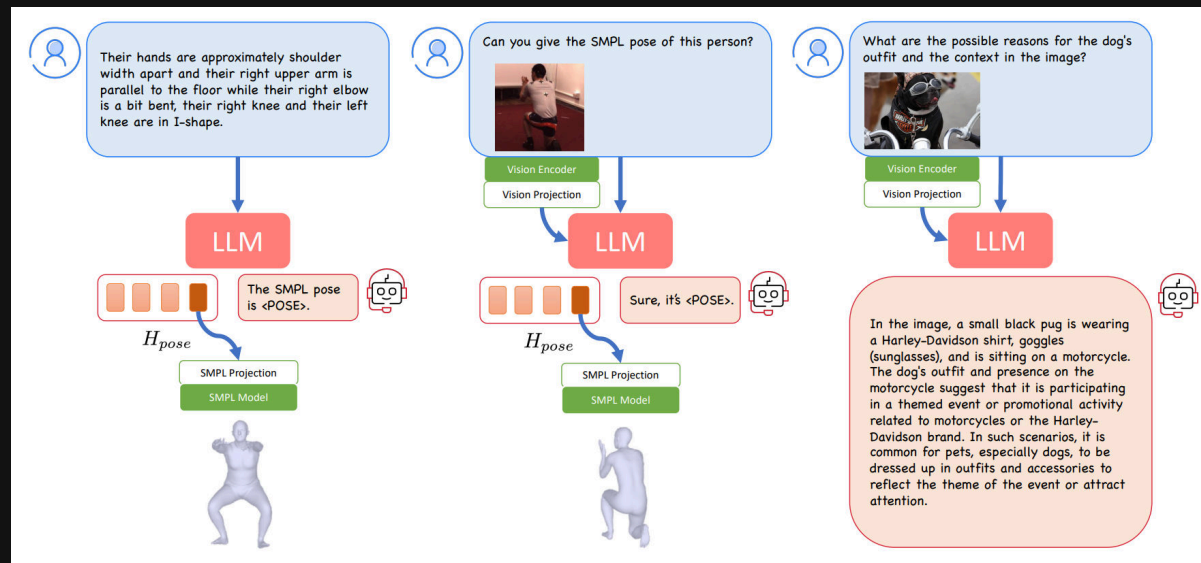


Human poses and LLMs

- Combine LLMs and human poses.
- Train on publicly available data.

Key technologies

- LLMs.
- Machine learning.
- Transformers.

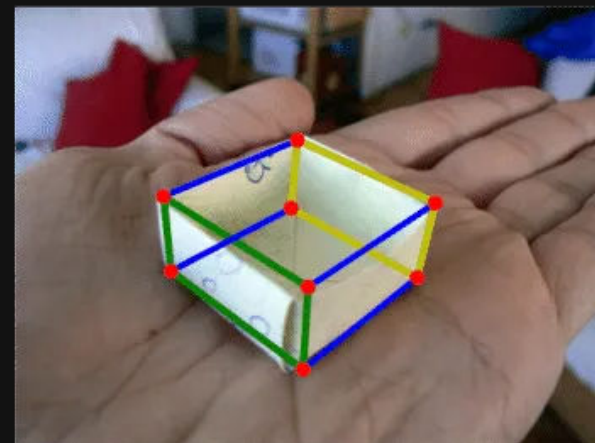
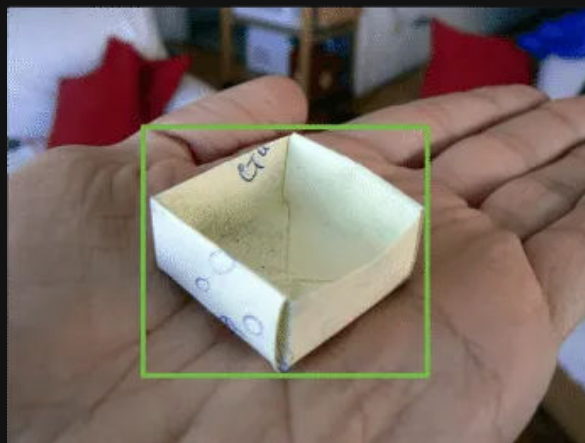


3D object detection

- 3D object detection and tracking.
- Apply existing techniques to our specific domain.

Key technologies

- Detection and segmentation models.
- Computational geometry.



Monocular 3D tracking

- Monocular (single camera) 3D pose estimation models lack absolute coordinate information.
- Use natural priors to obtain absolute coordinates of monocular 3D pose estimates.

Key technologies

- Pose estimation.
- Machine learning.

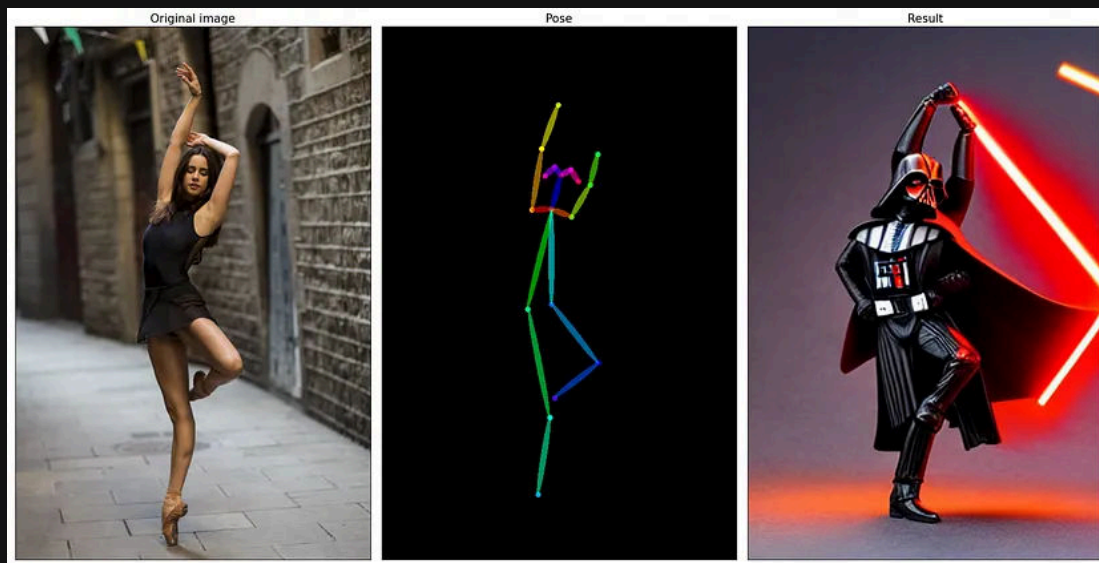


Generative AI dataset augmentation

- Dataset has limited number of characters and always same background.
- Investigate how we can use diffusion models with our existing dataset.

Key technologies

- Generative AI.
- Diffusion models.
- Machine learning.



You decide!

- If you have an exciting idea for a master thesis project that you think fits in well with our company, don't hesitate to tell us!

