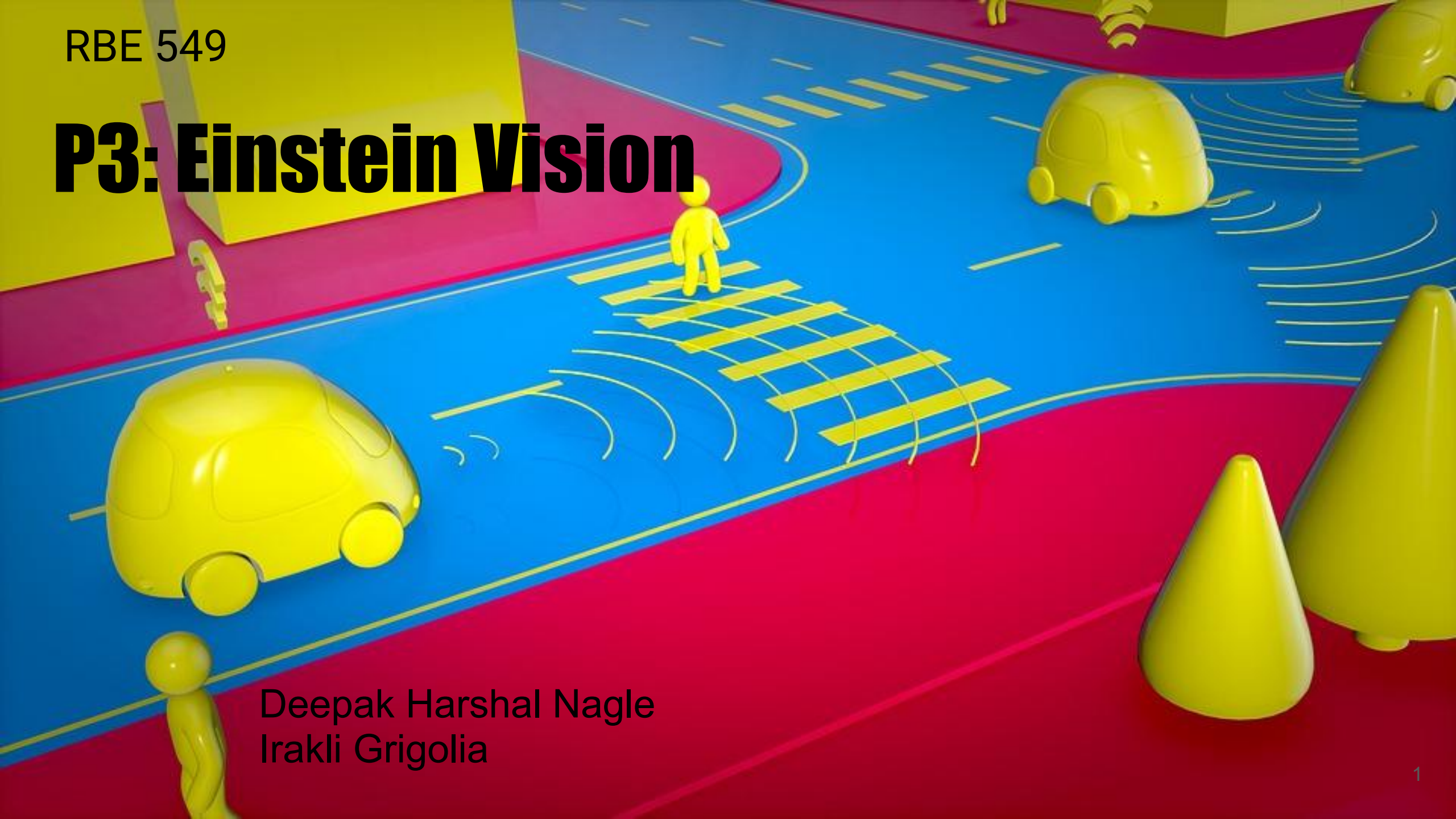
RBE 549

P3: Einstein Vision



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Overview:

1. Vehicle detection, classification using YOLOv7, 3-D bounding boxes, classical approaches

2. Lane Detection Using YOLOPv2 and classical approaches

3. Monocular Depth Estimation using Transformer based MIDAS

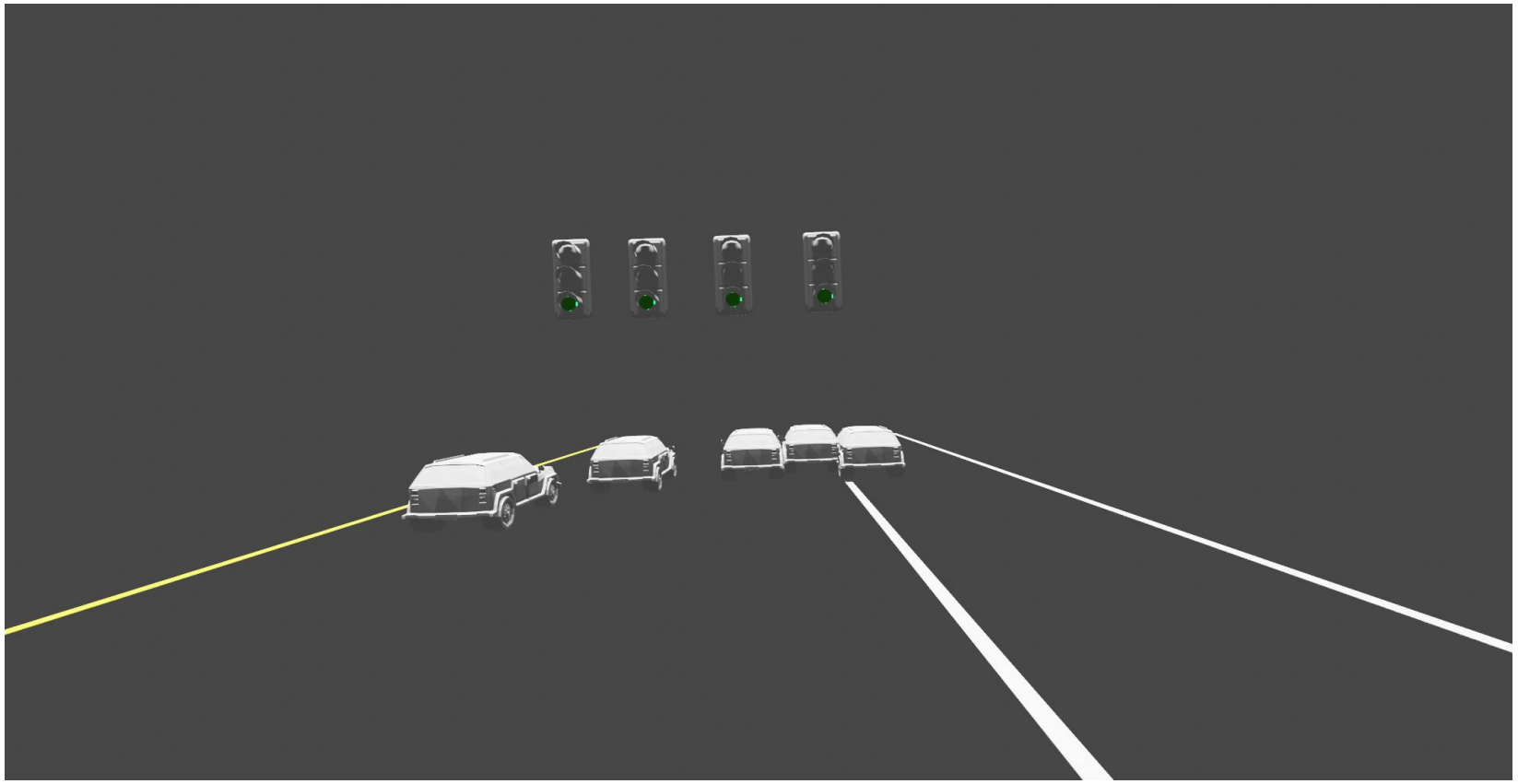
4. Road Signs using YOLOv3

5. Traffic lights using YOLOv5

6. Other objects, Blender tricks

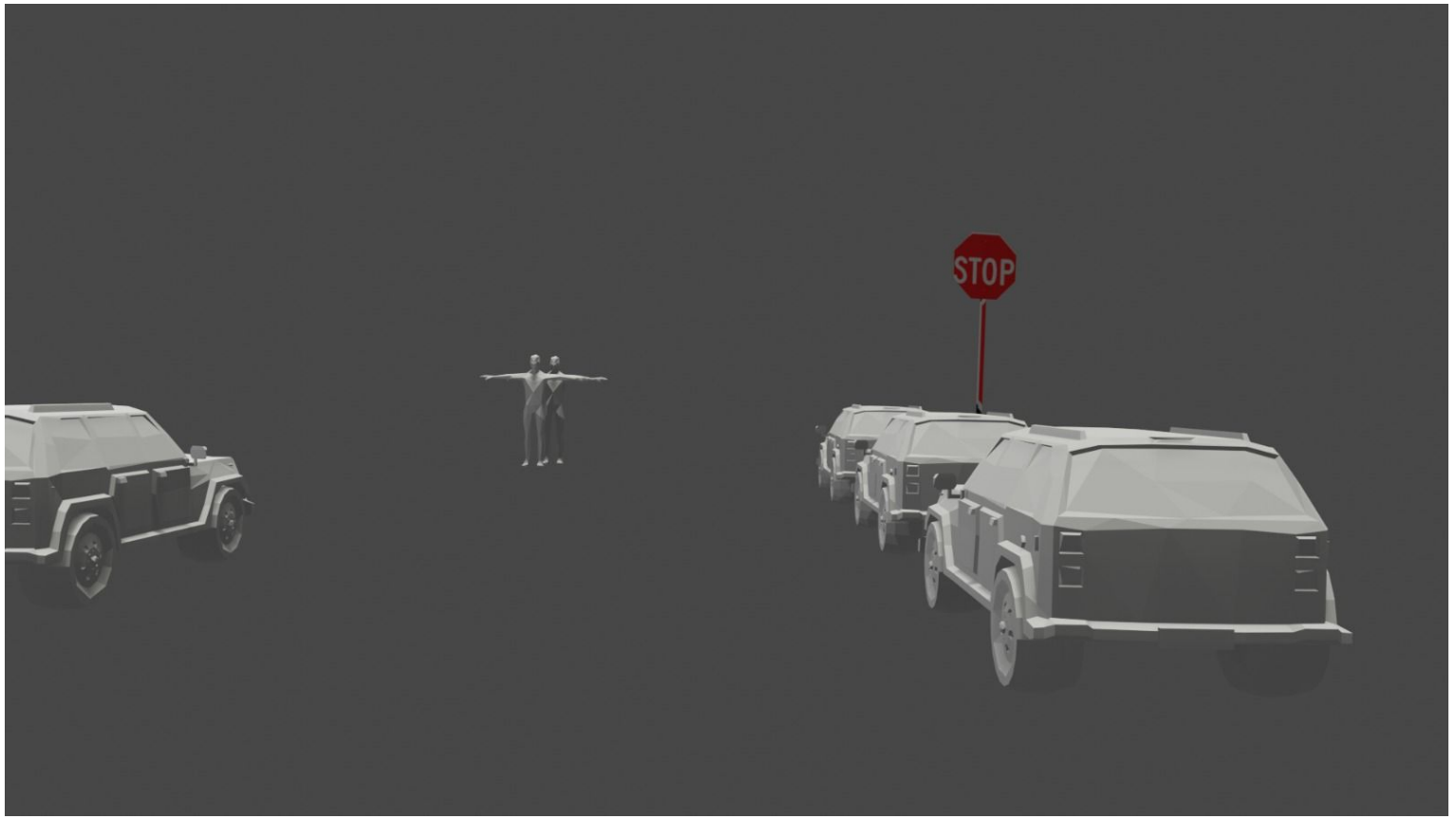
Lanes - YOLOPv2 and classical approaches

- YOLOPv2 and LaneNet were used for lane detection
- We detected the lane points from the images, projected them in 3-D and rendered them on blender



Road Signs

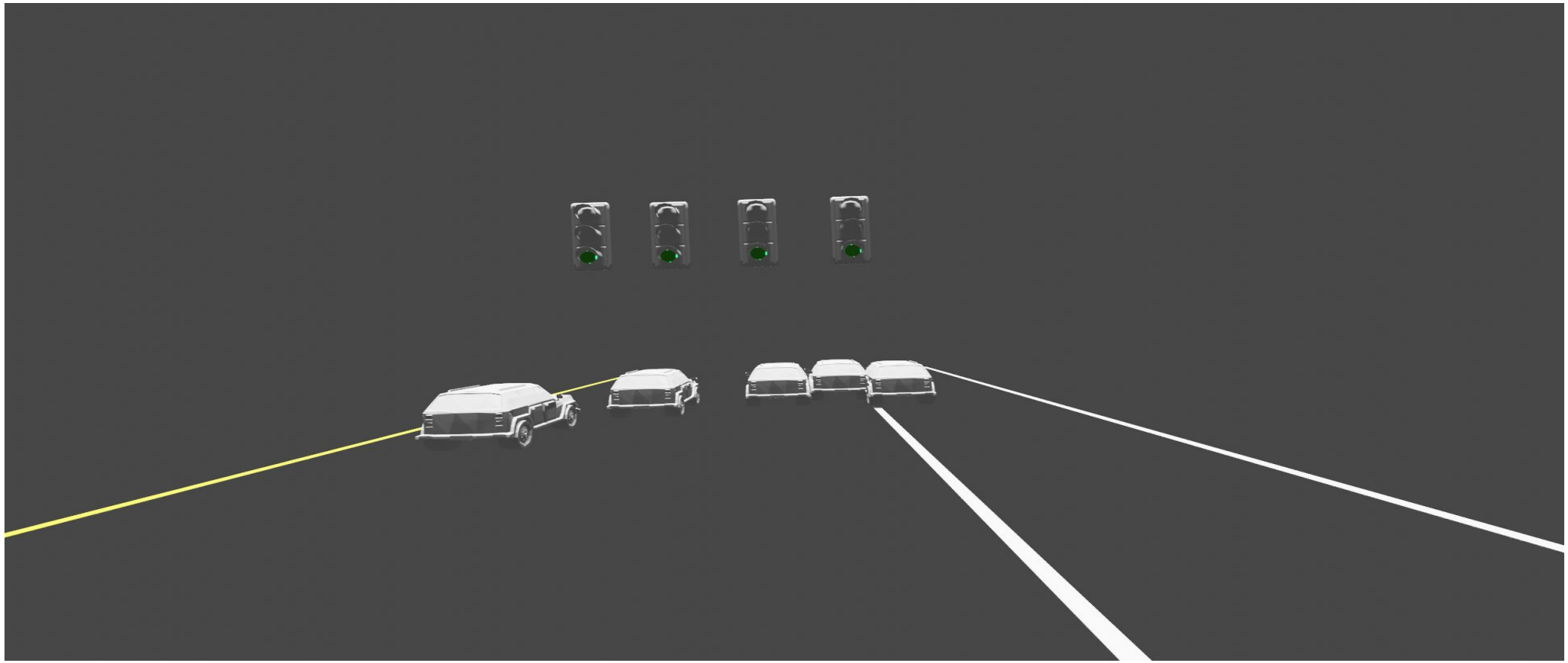
- Detected Road signs using YOLOv3
- Addition of an extra plane for pasting the .png image on blender Road signs



Traffic Light

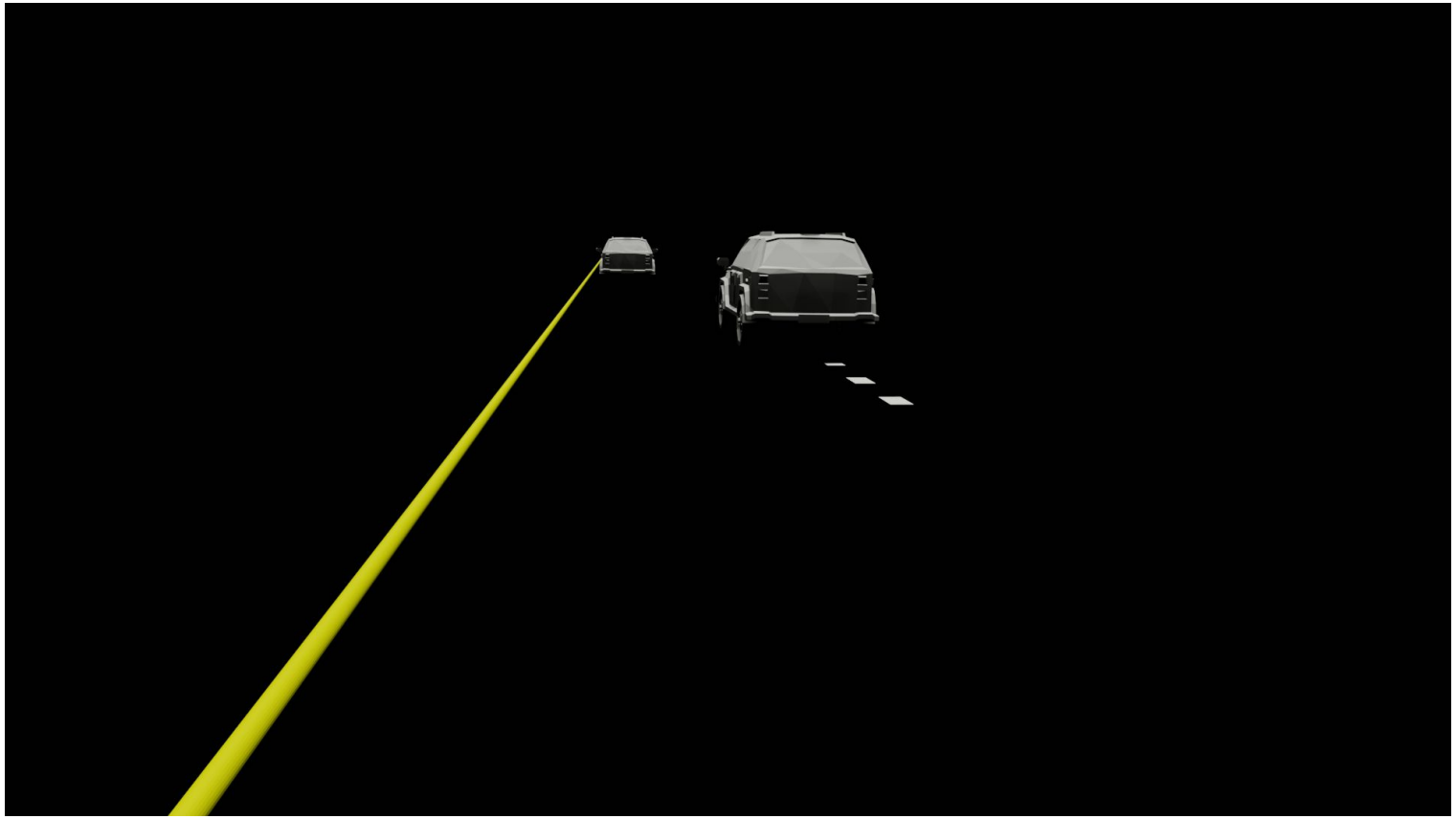
a

1. Used MS COCO-based YOLOv3 to detect the traffic lights
2. Created different assets for different lights and performed color thresholding



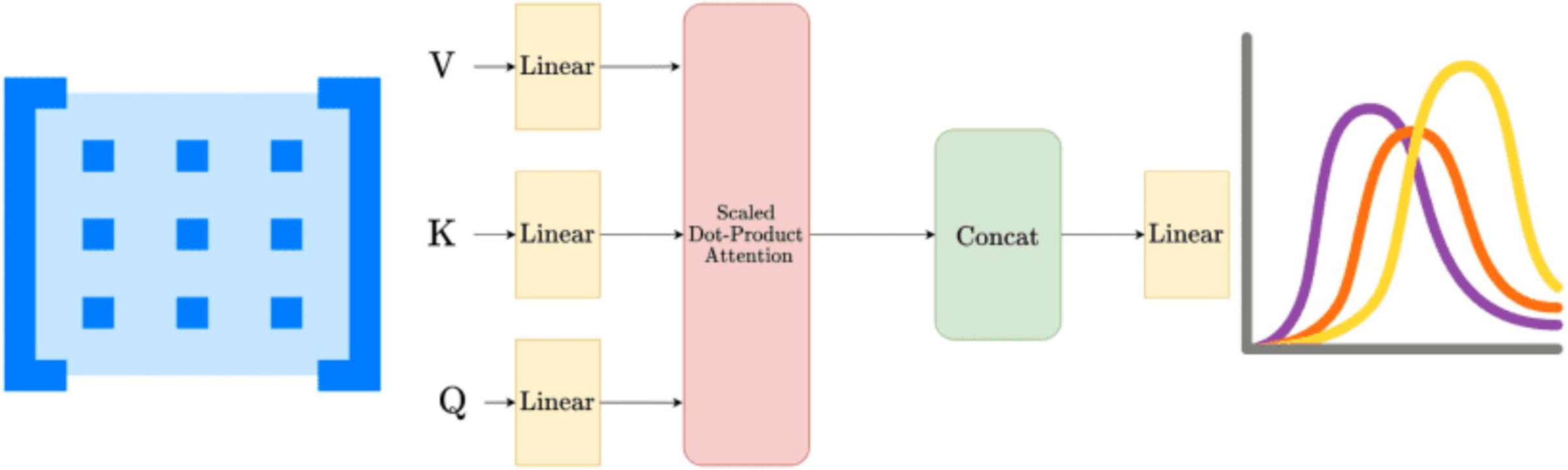
Vehicle detection, classification using YOLOv7

- Yolov7 2D model was used for Vehicle Detection and classification
- Compared it with YOLO3D Inference model



Monocular Depth Estimation using Transformer based MIDAS

1. Transformers give higher accuracy because of higher order semantics



- In the video, THE CARS SHAKE!!!

→ intensities change from frame to frame

NORMALIZE THE DATA!

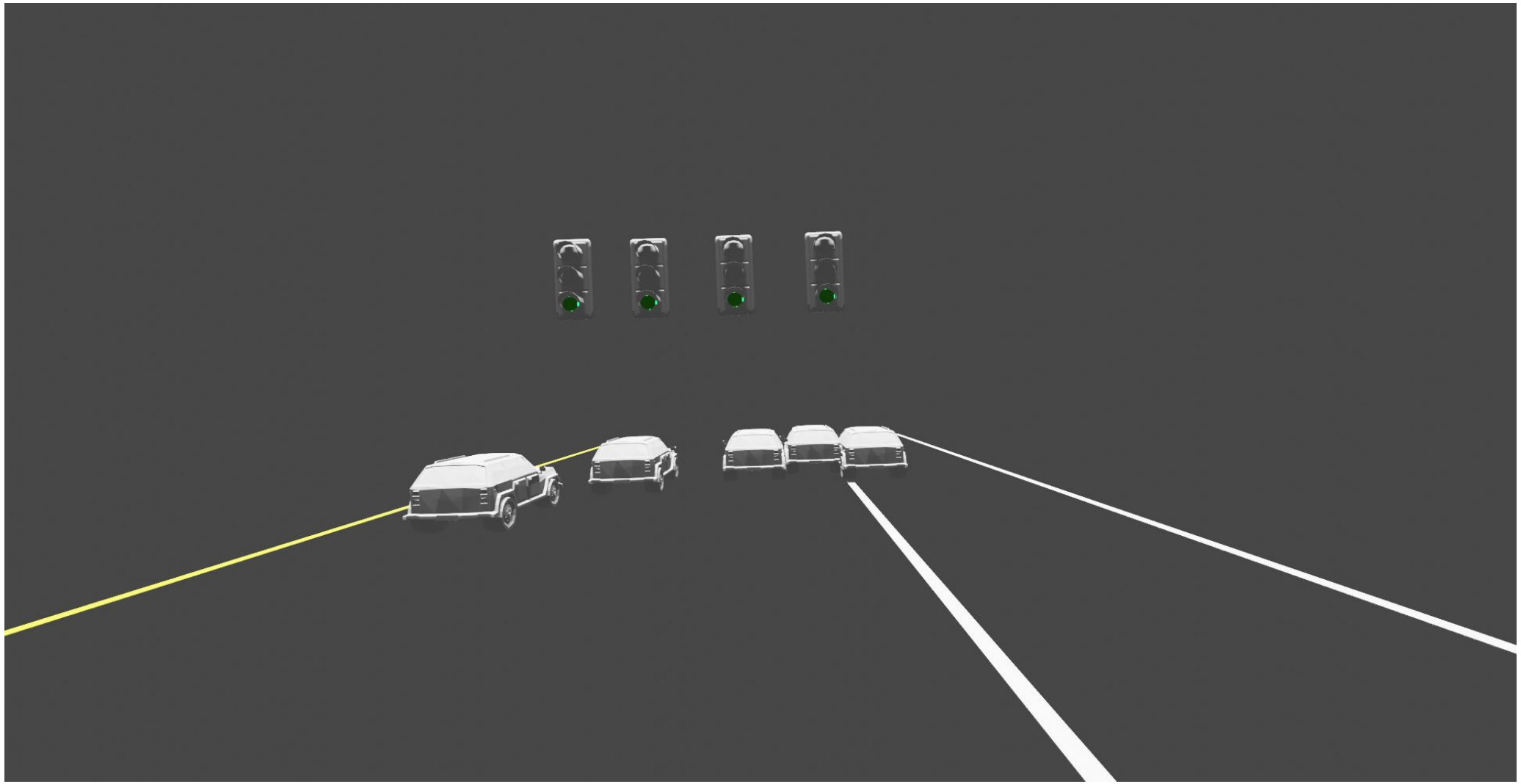
Get Mean Depths!

- Cars are too far/too close:

→ The depth scale (intensities) is different from x-y scale

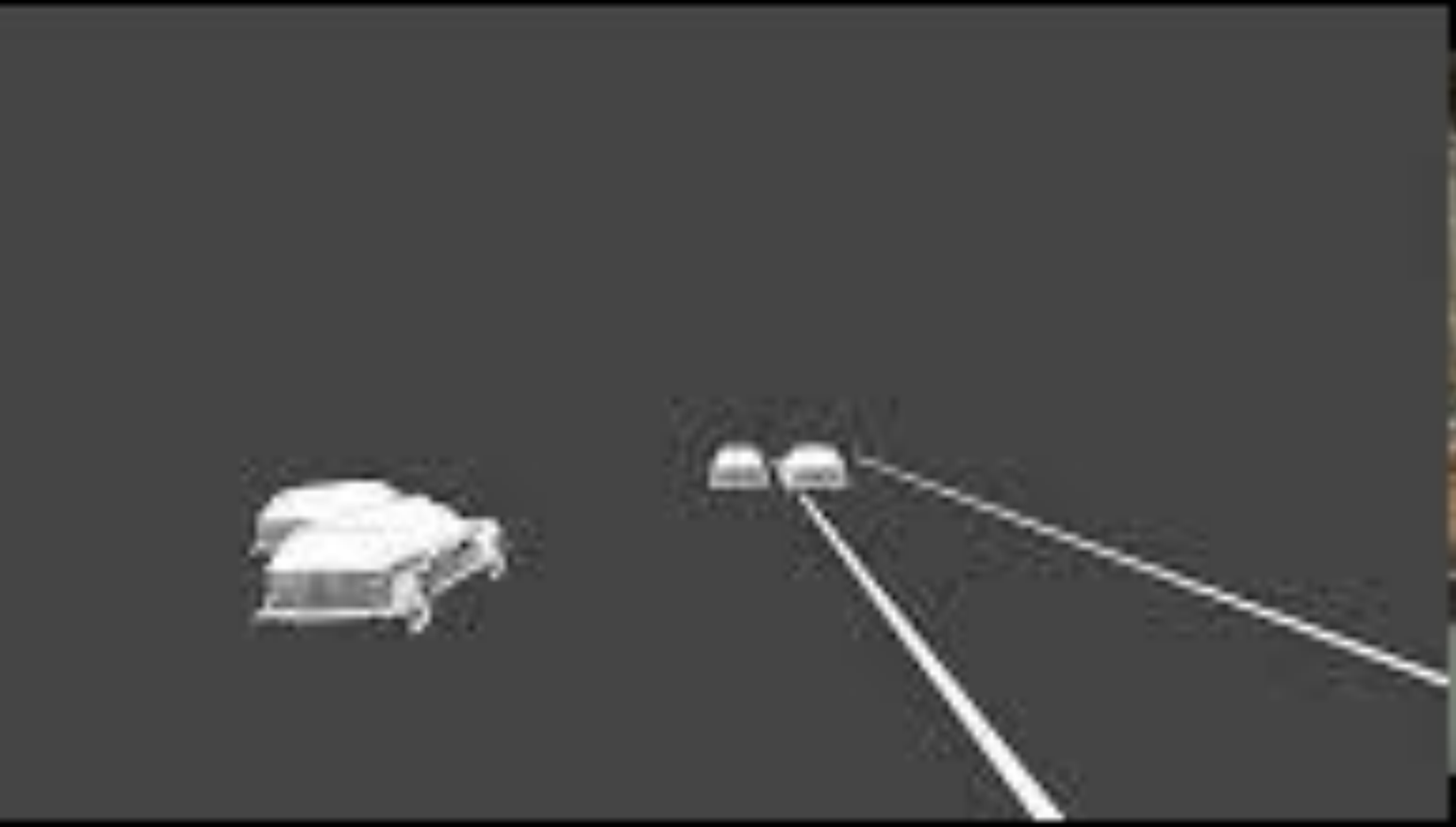
Rescale and fine tune the depths separately!

Farther objects appear at same depth



Avoid linear depth variation, instead fit exponents

```
mean_depth = A * np.exp(-B * np.mean(cropped_image))
```



REFERENCES

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2. Lane Detection: https://github.com/IrohXu/lanenet-lane-detection-pytorch
3. Monocular Depth Estimation: https://github.com/isl-org/MiDaS
4. Object Detection: Cars, Trucks, Traffic Lights, Road Signs: https://github.com/xiaogangLi/tensorflow-MobilenetV1-SSD
5. Object Detection: Cars, Trucks, Traffic Lights, Road Signs: https://github.com/WongKinYiu/yolov7
6. Object Detection: Traffic Lights: https://github.com/sovit-123/Traffic-Light-Detection-Using-YOLOv3
7. Object Detection: Road Signs: https://github.com/Anant-mishra1729/Road-sign-detection
8. YOLO 3-D bounding boxes: https://github.com/ruhyadi/YOLO3D
9. Pedestrian keypoint detection: https://github.com/ZheC/Realtime/Multi-Person/Pose/Estimation


Thank you!
100m
48
mph
Self-Driving