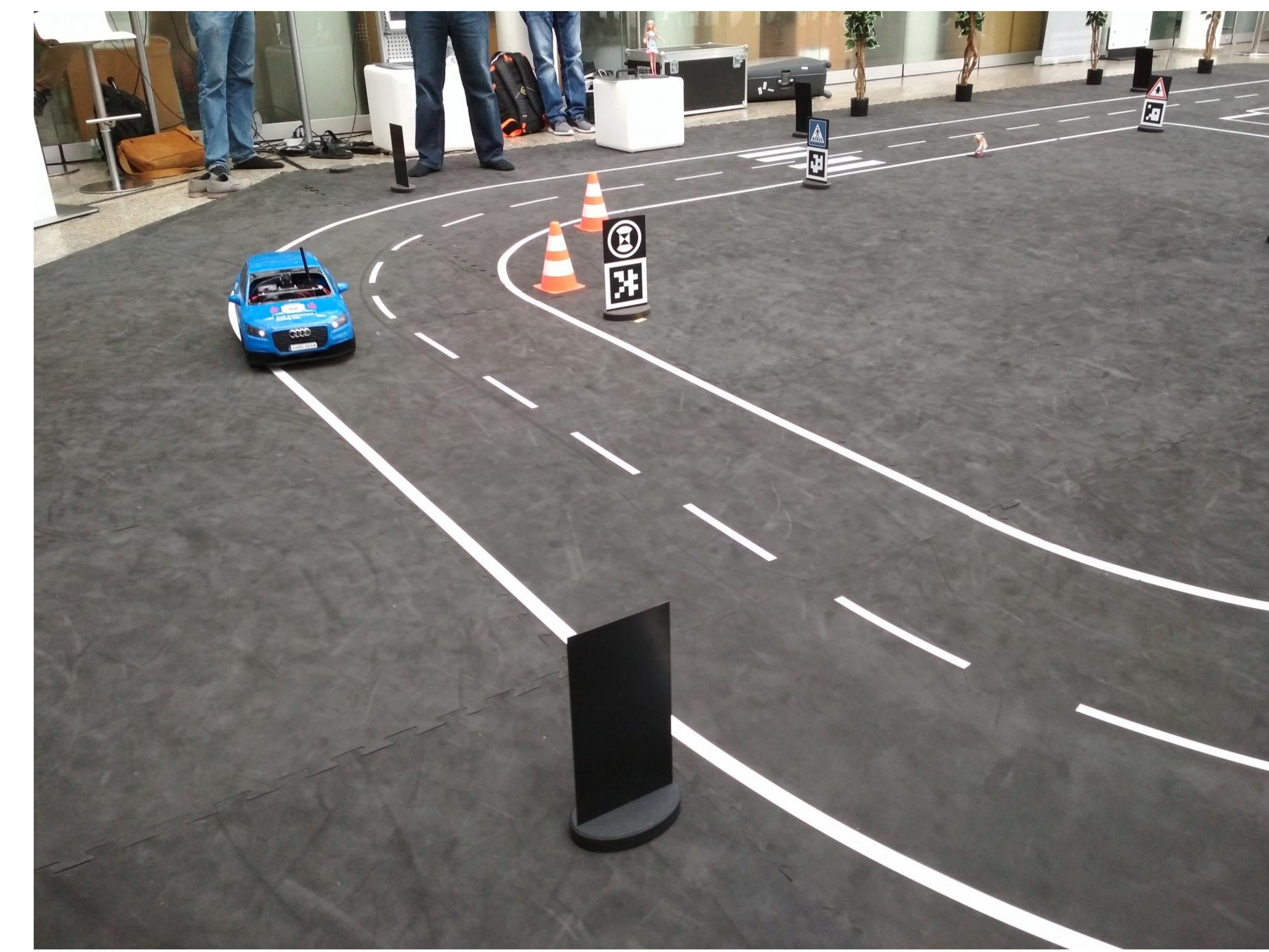


Semantic Road Segmentation for 1/8 Scale Car

Eirik Fagerhaug, Novian Habibie

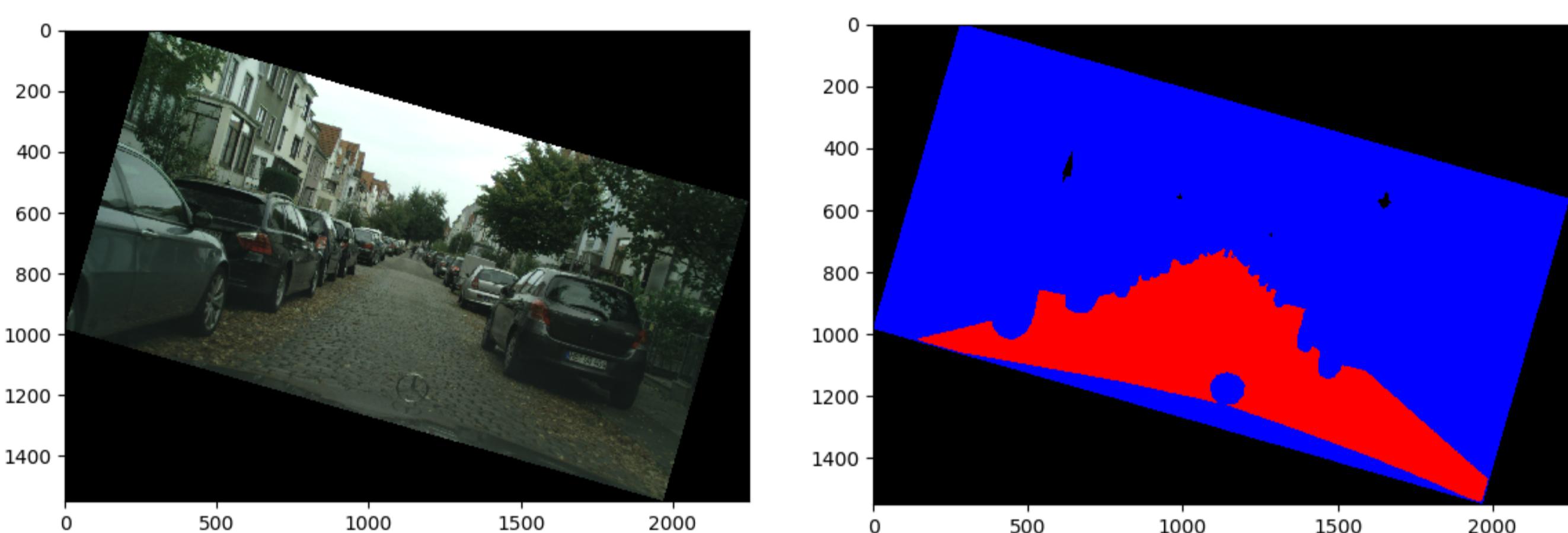
Project goals

- Detect the road in input images using semantic segmentation.
- Scaled-down Deep Neural Network to fit in limited resources (race car model).
- Create annotated ground truth of simulation track semi-automatically.



FCN for Semantic Segmentation

- Main model : Scaled-down FCN32.
- Also trained high-spec DNN : DeepLab.
- Pre-experiment training using Cityscape dataset. Simplified segment classes : road and non-road.
- Use data augmentation : rotate, scale, resize brightness, contrast, gamma, saturation.



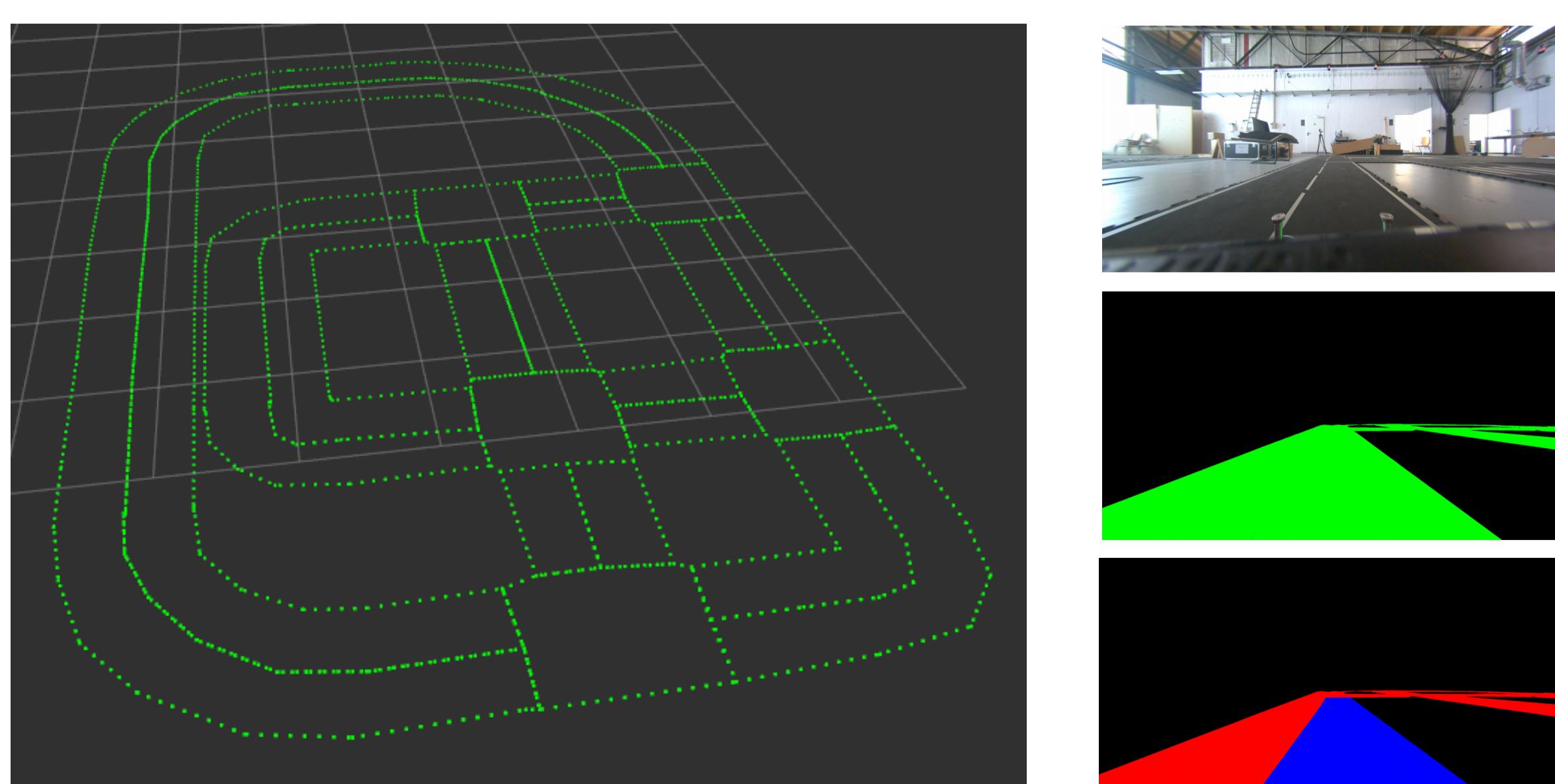
Environment Representation

- Remote-controlled 1/8 car model (manual driving).
- Right side driving.
- Input as sequence of images from Basler camera.
- Hand-assembled car track, indoor.
- Using motion capture system as position tracking.



Semi-Automatic Dataset Generation

- Car track map as set of polygons, captured manually using marker wand. Interpolated to get smoother polygons. Refined by hand
- Record (undistorted) raw images with calibrated camera and pos of car from MoCap system as ROS bagfiles
- Create label images by backproject seen polygons in camera field-of-view w.r.t pose of car to 2D images.
- Provide two types of label images:
 1. 1-class : only road and non-road.
 2. 3-class : current lane, intersection, other lanes.



Result

- 8698 set of data (raw image, 1-class, 3-class) from 6240.890 seconds of ROS bagfiles.
- Live ground truth visualization (label image & seen polygons).
- Fast road segmentation using scaled-down FCN32 (~0.015 second/image) on GPU (NVIDIA 1060).

