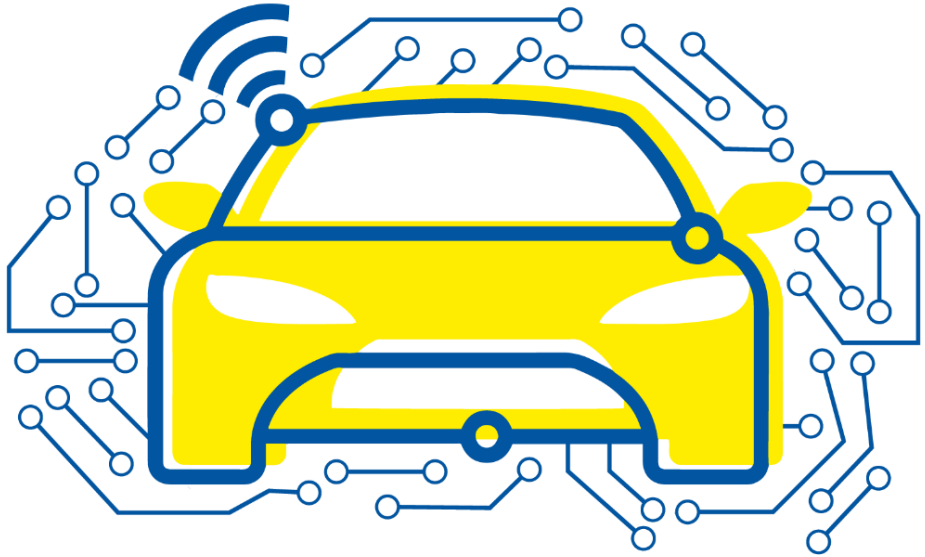
Automated and Connected Driving Challenges

Section 2 – Sensor Data Processing

Semantic Image Segmentation

Boosting Performance



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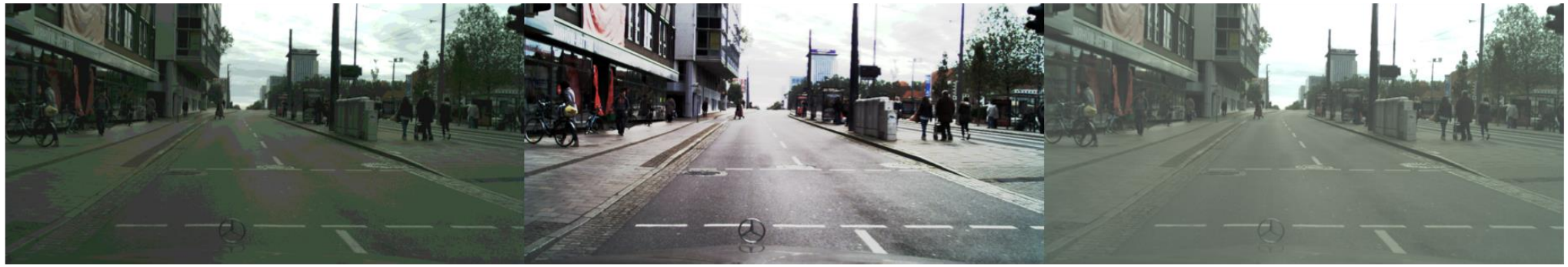
Semantic Image Segmentation – Boosting Performance

Data Augmentation

- Large ground truth datasets are expensive
- Use data augmentation to artificially increase the size of the dataset and make it more diverse
- Some augmentation methods can be applied to the input image without changing the label:

Original | Exposure | Color



Threshold | Contrast | Saturation

Source: Cityscapes / ika

Semantic Image Segmentation – Boosting Performance

Data Augmentation

- Large ground truth datasets are expensive
- Use data augmentation to artificially increase the size of the dataset and make it more diversified
- Other augmentation techniques also need modify the label

Original

Flipping

Source: Cityscapes / ika

Scale down

Scale up

Semantic Image Segmentation – Boosting Performance

Data Augmentation

How to combine several augmentation methods ?

- Combining several augmentation methods increases the diversity of the overall augmentation even more
- Google AutoAugment: **Augmentation Policy** [1]

- **Augmentation Policy**
  - Consists of several **subpolicies**
  - Each subpolicy consists of several **operations** (here two operations)
  - Each operation consists of one **augmentation method** and a **corresponding probability**
  - E.g. `random_constrast` with **probability** 0.75
  - The operations within one subpolicy are applied **in sequence**
  - Each **subpolicy is randomly chosen** during the augmentation of one sample

```
AUGMENTATION_POLICY = {
    "subpolicy0": [(random_contrast, 0.75),   (random_zoom, 0.75)],
    "subpolicy1": [(random_gamma, 0.75),      (random_zoom, 0.75)],
    "subpolicy2": [(random_noise, 0.75),      (random_zoom, 0.75)],
    "subpolicy3": [(random_brightness, 0.75), (random_zoom, 0.75)],
    "subpolicy4": [(random_gamma, 0.75),      (random_zoom, 0.00)],
    "subpolicy5": [(random_brightness, 0.75), (random_zoom, 0.00)],
}
```

Source: ika

⇨ **Randomness during augmentation increases the diversity**

Semantic Image Segmentation – Boosting Performance

Summary

- Artificially increase the size of the given dataset with **data augmentation**
- Many different **augmentation methods** for image data exist
- Augmentation methods can be applied within an **augmentation policy**

```
AUGMENTATION_POLICY = {
    "subpolicy0": [(random_contrast, 0.75),   (random_zoom, 0.75)],
    "subpolicy1": [(random_gamma, 0.75),      (random_zoom, 0.75)],
    "subpolicy2": [(random_noise, 0.75),      (random_zoom, 0.75)],
    "subpolicy3": [(random_brightness, 0.75), (random_zoom, 0.75)],
    "subpolicy4": [(random_gamma, 0.75),      (random_zoom, 0.00)],
    "subpolicy5": [(random_brightness, 0.75), (random_zoom, 0.00)],
}
```