

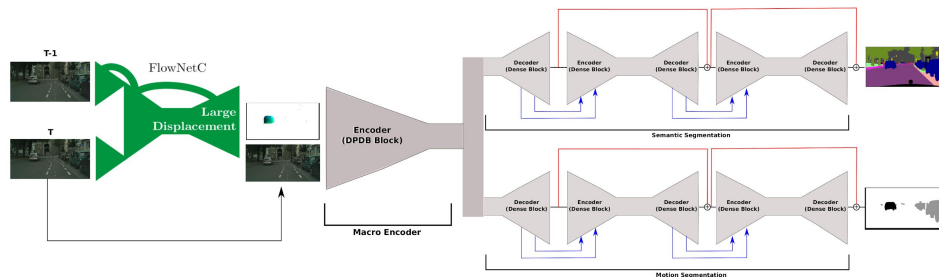
# Final projects - CV

1. Efficient semantic segmentation
2. Modalities for segmentation
3. IoU loss and balancing for segmentation
4. Augmentation parameter search

# 1. Efficient semantic segmentation

- Find the best in terms of IoU and the best trade-off between IoU and runtime
  - Inverted residuals
  - Residual blocks
  - ShuffleNet v2
  - Dense Block
- Decoder: explore multiple version of decoders find the best and best trade-off between IoU and runtime with the results from the previous experiments
  - ASPP (DeepLab v2)
  - PSP module (PSPNet)
  - U-Net
  - Deep Decoders
- Basic results on CamVid dataset, extra grade for experiments on Cityscapes

## 2. Modalities for segmentation



- Use a fixed segmentation network architecture (one of the following):
  - DeepLab v2
  - PSP Net
- Experiment with multiple input modalities
  - RGB
  - RGB + optical flow
  - RGB + motion boundaries
  - RGB + optical flow + motion boundaries
- Analyze how different modalities affect performance - qualitatively & quantitatively.
- Use FlowNet3 to precompute modalities
  - [https://github.com/lmb-freiburg/netdef\\_models](https://github.com/lmb-freiburg/netdef_models)
- Results on Cityscapes

### 3. IoU loss function and class balancing

- Implement a loss function based on the Intersection over Union (IoU) metric and its impact versus the standard accuracy loss
- Class balancing problem: test and provide insights of which approach to weight balancing is more suitable for segmentation
  - Median frequency
  - Focal loss
  - Other suitable approach
- Cityscapes dataset as benchmark dataset

## 4. Augmentation parameter search

- Use a fixed segmentation network architecture (one of the following):
  - DeepLab v2
  - PSP Net
- Some ideas for augmentation:
  - Spatial:
    - Random crop (crop size)
    - Horizontal flip (flip probability)
    - Image rescaling (rescale factors)
    - Cutout (cutout length)
    - ...
  - Intensity:
    - Noise (salt pepper, gaussian...)
    - Color augmentation
    - ...
- Present a nice ablation study
- Bonus points:
  - Come up with your own ideas of augmentation
  - Use Hyperband to tune the augmentation parameters
- Basic results on CamVid dataset, extra grade for experiments on Cityscapes