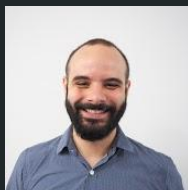
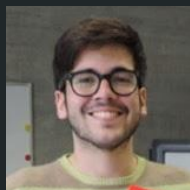


# Proposal-based Instance Segmentation with Point Supervision

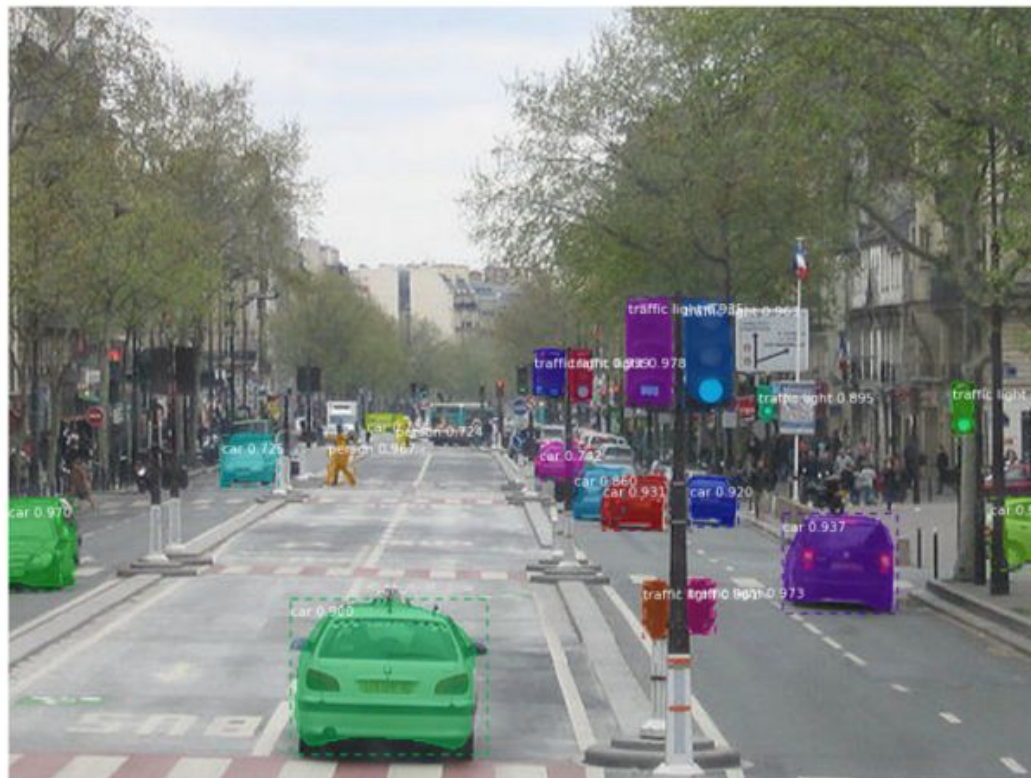
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Laradji et al. accepted at ICIP2020

# Instance Segmentation with Point Supervision

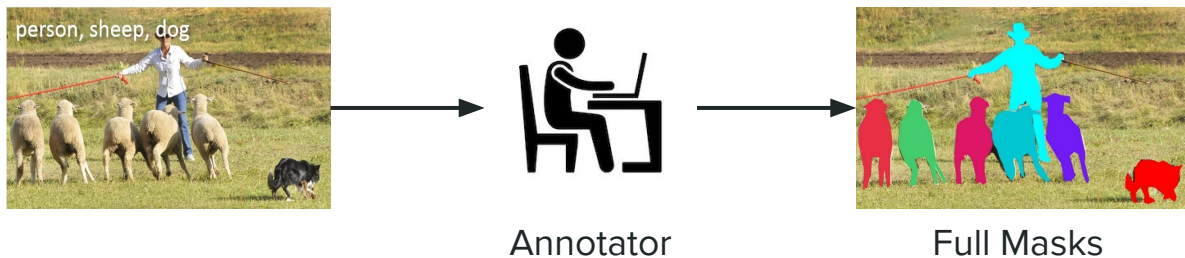
## Motivation



# Instance Segmentation with Point Supervision

## Motivation

Per-pixel labels require 1.5 hours/image



Point-level labels require few seconds/image

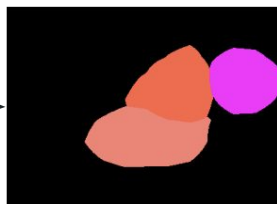


# Instance Segmentation with Point Supervision

## Related work



Point  
annotations



FCN8  
Predictions



CAM



Affinity



Pseudo labels

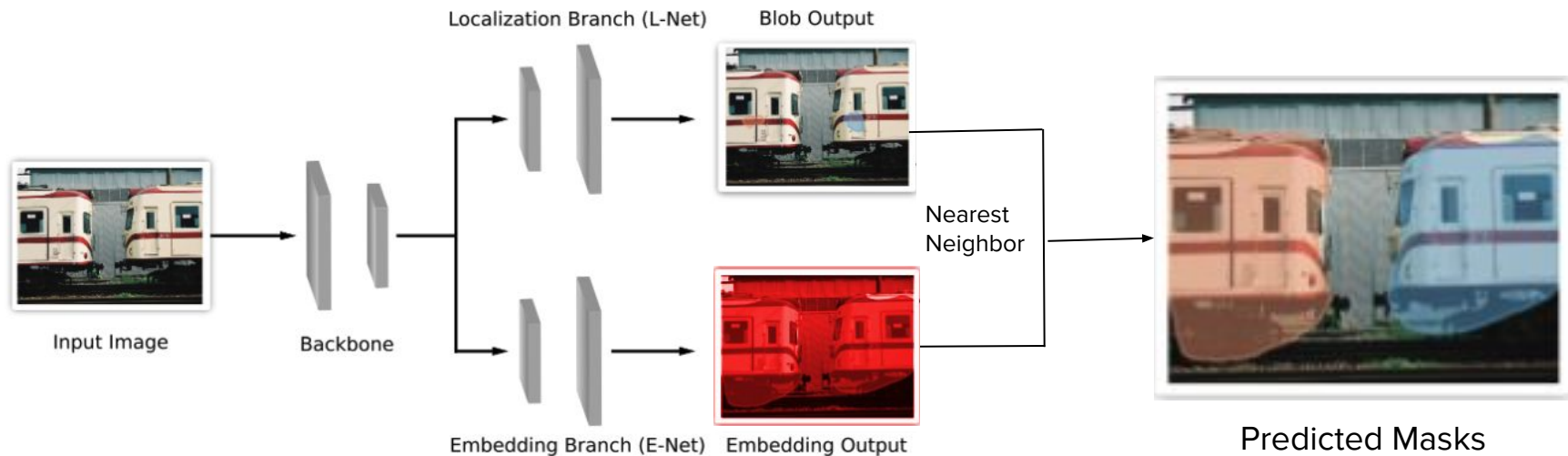
What's the point [ECCV 2016]

Learning semantic affinity [CVPR 2018]

However, these are weakly supervised  
semantic segmentation methods

# Instance Segmentation with Point Supervision

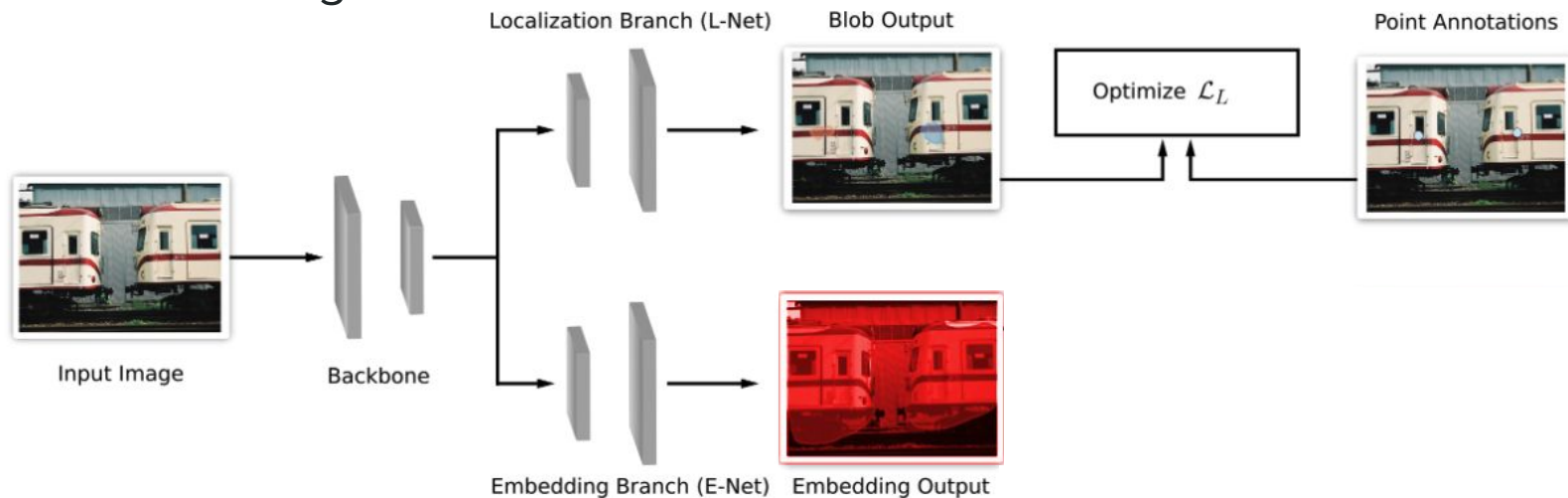
## WISE-Net Prediction



- Locate the objects with the localization branch
- Obtain the masks with the embedding branch

# Instance Segmentation with Point Supervision

## WISE-Net Training

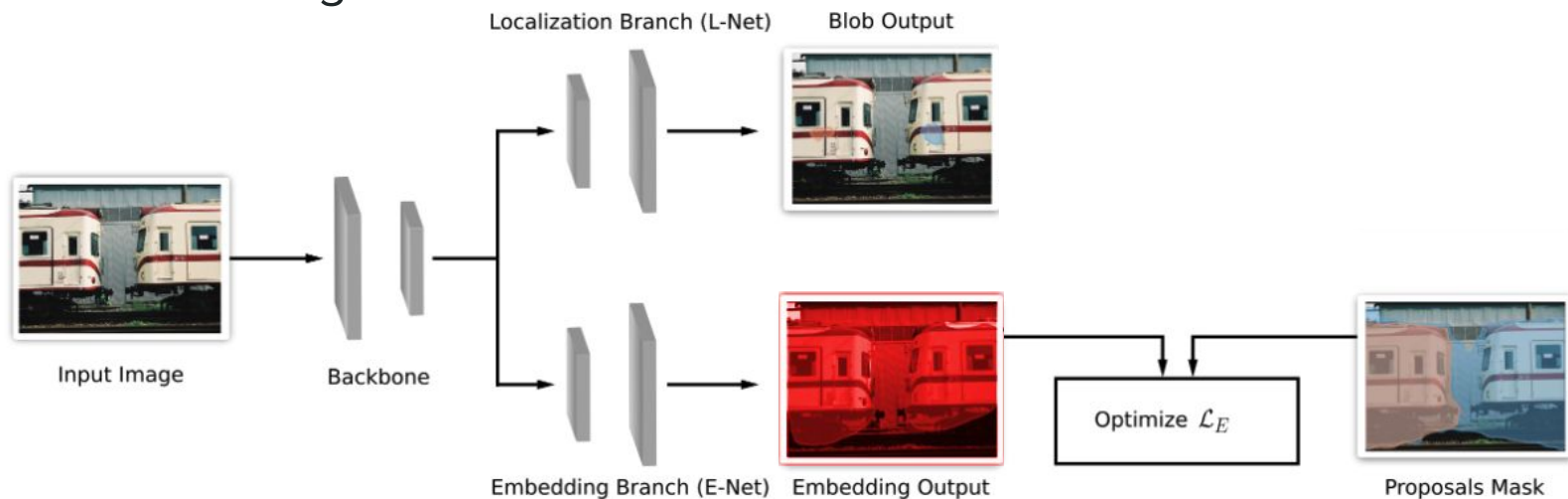


- **LCFCN loss** to predict the object locations:

$$\mathcal{L}_L = \underbrace{\mathcal{L}_I(S, T)}_{\text{Image-level loss}} + \underbrace{\mathcal{L}_P(S, T)}_{\text{Point-level loss}} + \underbrace{\mathcal{L}_S(S, T)}_{\text{Split-level loss}} + \underbrace{\mathcal{L}_F(S, T)}_{\text{False positive loss}}$$

# Instance Segmentation with Point Supervision

## WISE-Net Training



- **Similarity loss** makes pixels of the same object have similar embeddings:

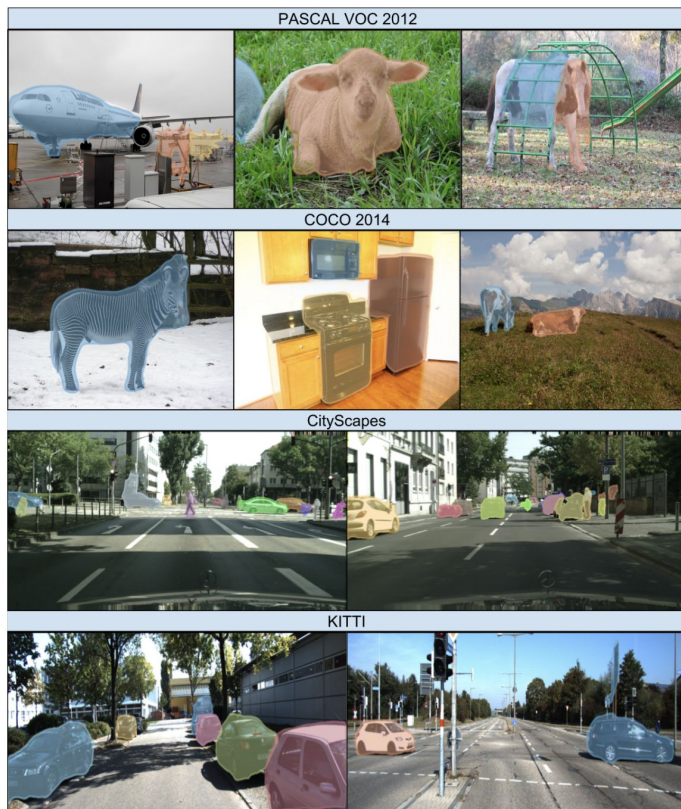
$$\mathcal{L}_E = - \sum_{(i,j) \in P} \left[ \mathbb{1}_{\{y_i=y_j\}} \log S(E_i, E_j) + \mathbb{1}_{\{y_i \neq y_j\}} \log (1 - S(E_i, E_j)) \right]$$

where few points are sampled from the proposals and from the background regions

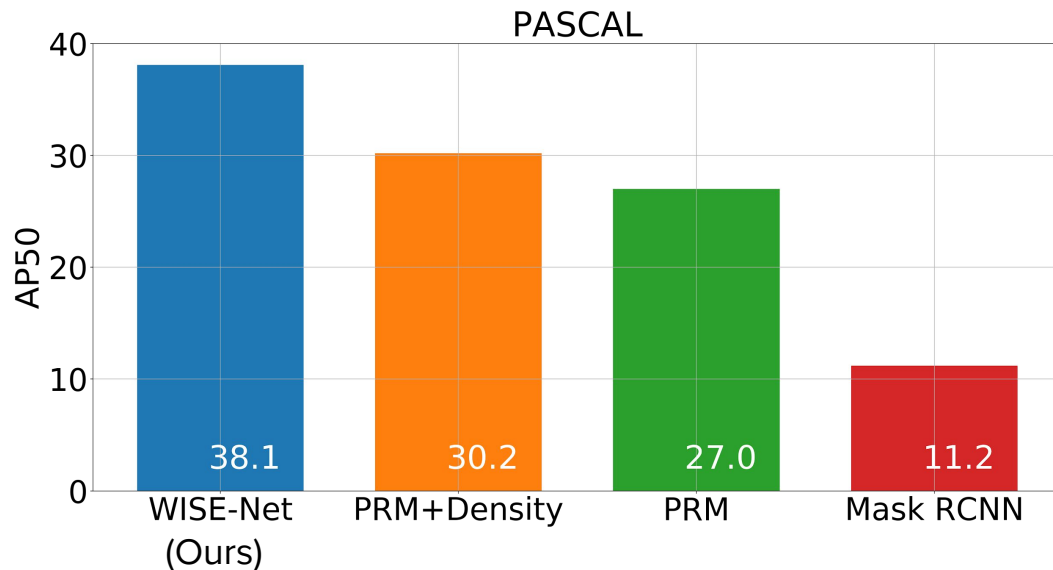


# Instance Segmentation with Point Supervision

## Results



Same labeling effort are given for each of these methods



Higher AP50 is better



# Instance Segmentation with Point Supervision

## Conclusions

- A **novel framework** instance segmentation with point supervision
- **Outperforms** fully- and weakly-supervised methods **for fixed annotation budget**
- Established a first **strong baseline** for the problem setup
- Check out our code in <https://github.com/IssamLaradji/wisenet>

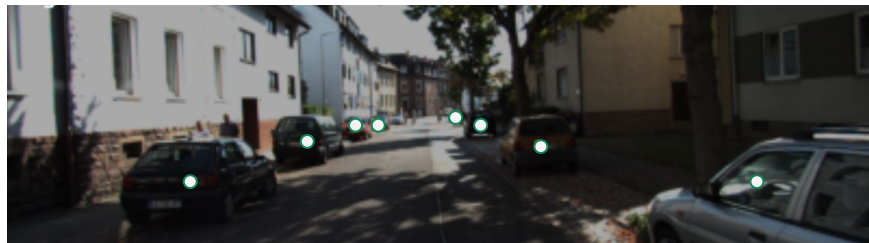
# Instance Segmentation with Point Supervision

Real life applications



# Instance Segmentation with Point Supervision

Real life applications



WISE (Ours)



Annotator then  
refines these  
masks