SELF DRIVING CAR
USING DEEP LEARNING

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Background

WHY SELF DRIVING CAR

Self driving car is one of essential safety riding:

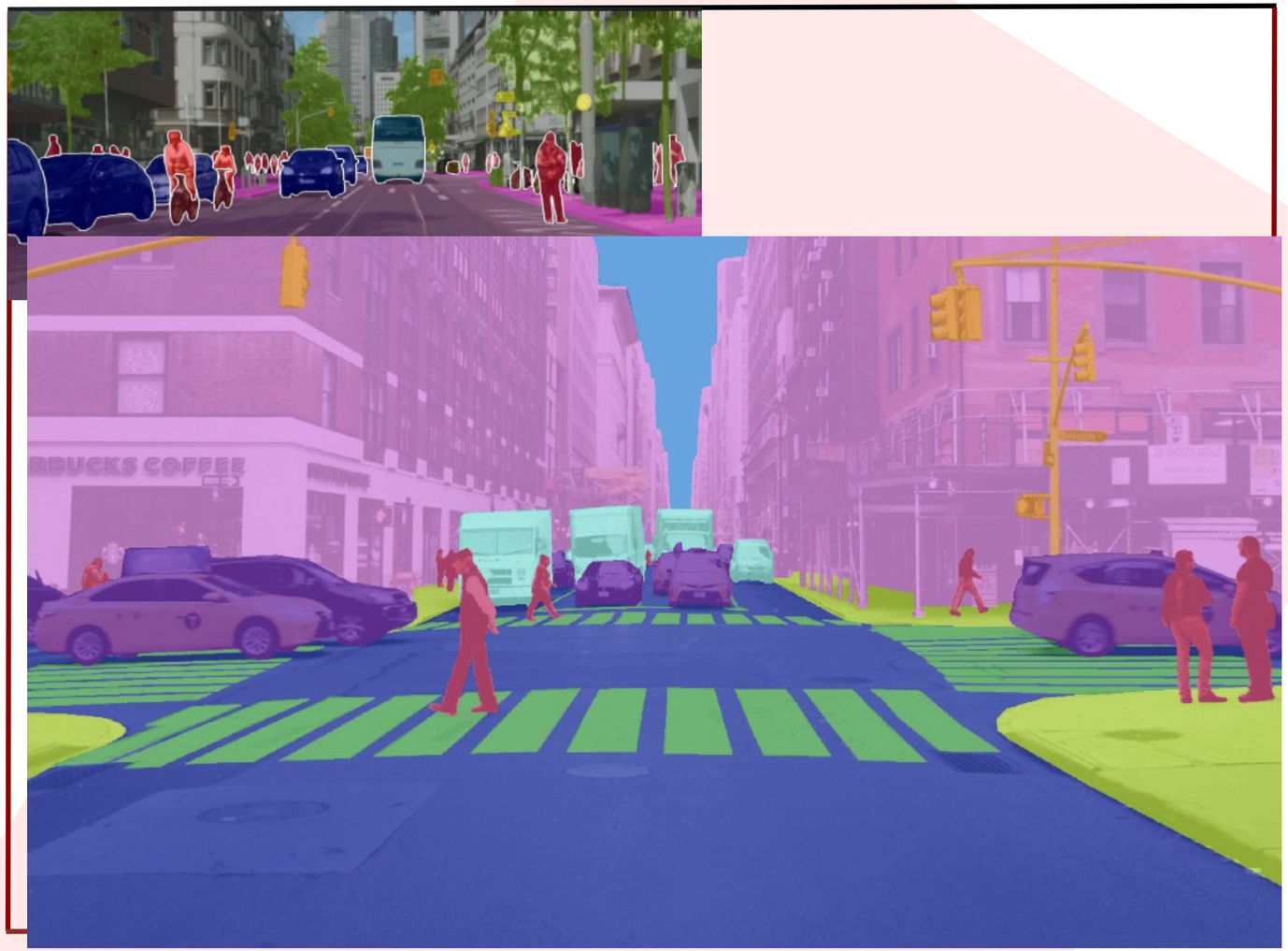
1. **Reducing Human Error**
2. **Predictive Safety**
3. **Support the driver about the environment**

etc...

Deep learning models like UNet and FCN for semantic segmentation and Mask RCNN for instance segmentation

OBJECTIVE

- To detect and segmented the object from image
- To evaluate model FCN and UNet performance.



DATA PREPARATION

Dataset	Source	Augmentation	Number of Train Images	Number of validation Images
Dataset 1	https://universe.roboflow.com/leo-ueno/people-detection-o4rdr/dataset/8	Flip: Horizontal Random Brightness Rotate	367	101

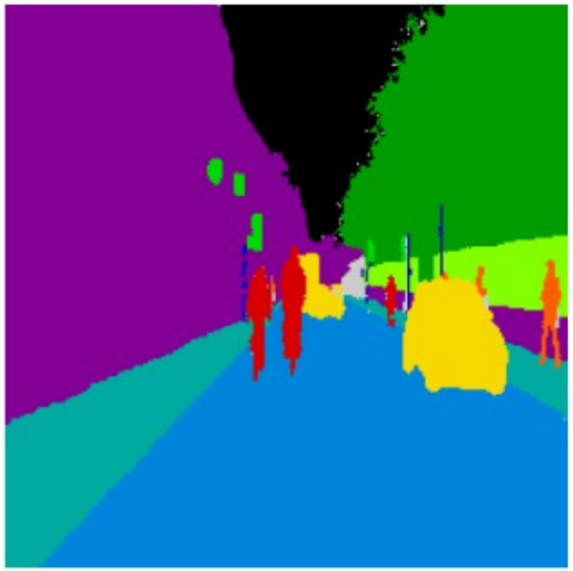
DATA PRE-PROCESSING

Masks verification:

1. ensure there are no duplicates and remove masks that didn’t have an image
2. Make sure total class from the masks

Sample 1 - Image

Ground Truth Mask



```
✔ Mask Loaded!
Mask shape: (360, 480)

✔ Mask sudah single channel (Class ID format).

🎯 Unique class IDs: [ 0  1  2  3  4  5  6  7  8  9 10 11]
```

MODEL TRAINING

Parameter	Nilai
Epochs	50/100
Batch size	4/6/10
Resize dimension	256, 512
Optimizer	AdamW
Dataset	Dataset - Google Drive
Framework	Unet with Resnet as Backbone Unet

Model Training using Unet from scratch, Unet with resnet 34 and 50 as backbone

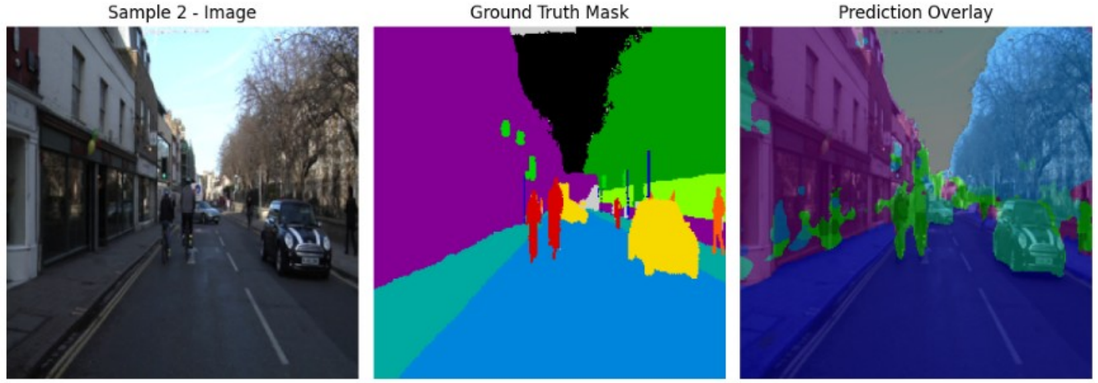
COMPARISON

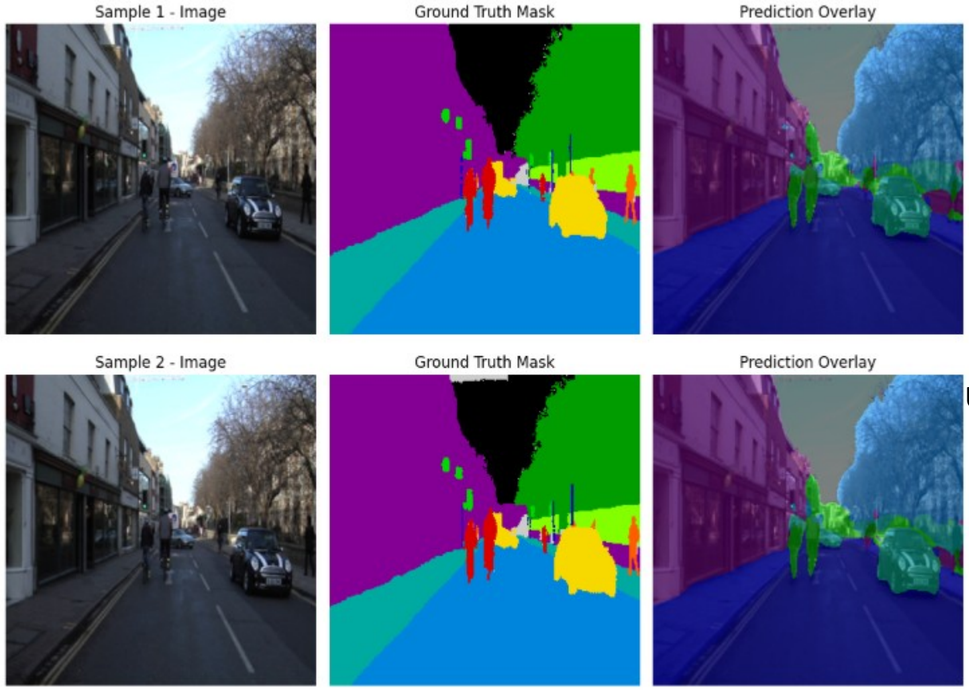
Model	mIoU	mPrecision	mRecall	mF1	Accuracy
Unet + Resnet 34	0.58	0.708	0.7	0.68	0.899
Unet	0.4635	0.57	0.59	0.568	0.831
Unet + Resnet 50	0.70	0.803	0.797	0.790	0.933

- **Unet + Resnet 50:** Performa yang paling bagus Ditunjang dengan Precision and Recall yang cukup baik.
- **Unet + Resnet 34:** Performa middle dilihat dari F1nya namun IoU tergolong biasa diangka 0.5
- **Unet:** Performa paling bawah secara F1 dan IoU walaupun nilai accuracy jika dilihat cukup baik jika 0.8.

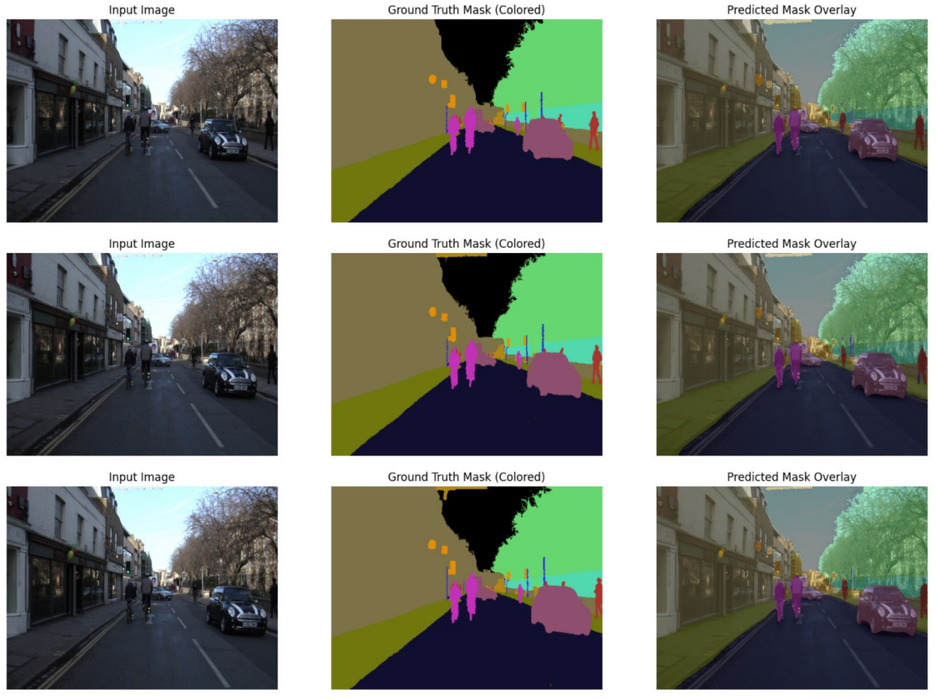
COMPARISON RESULT

Unet no pretrained





Unet with backbone Resnet 30

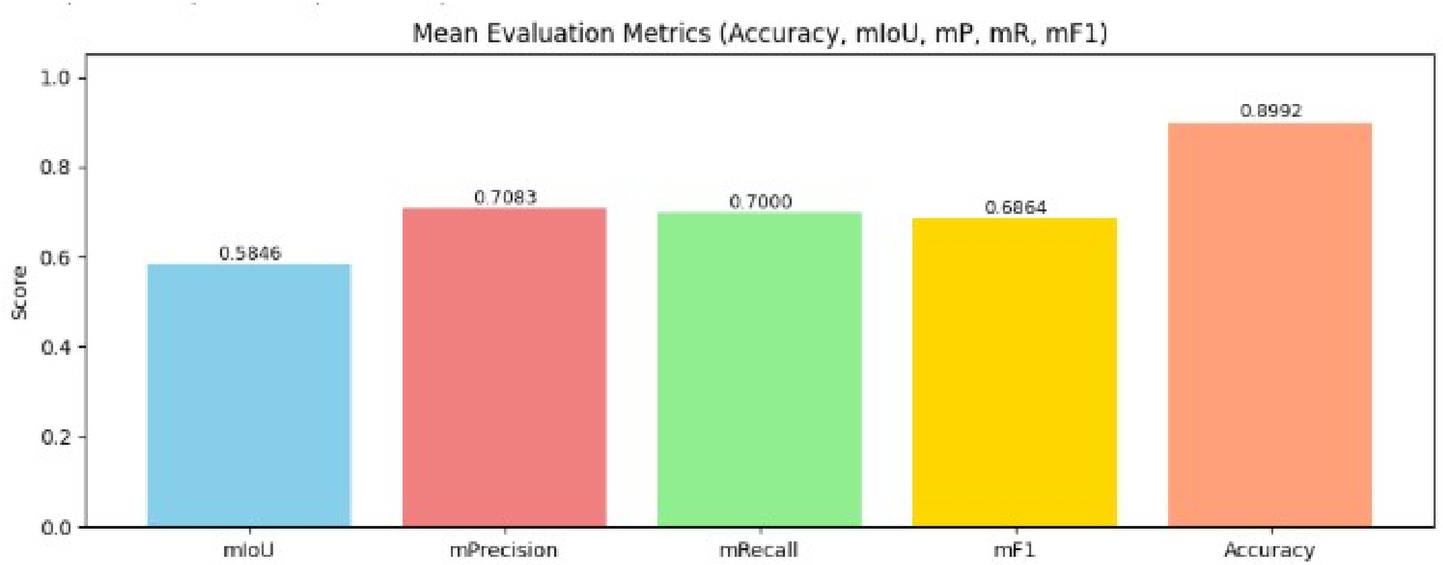


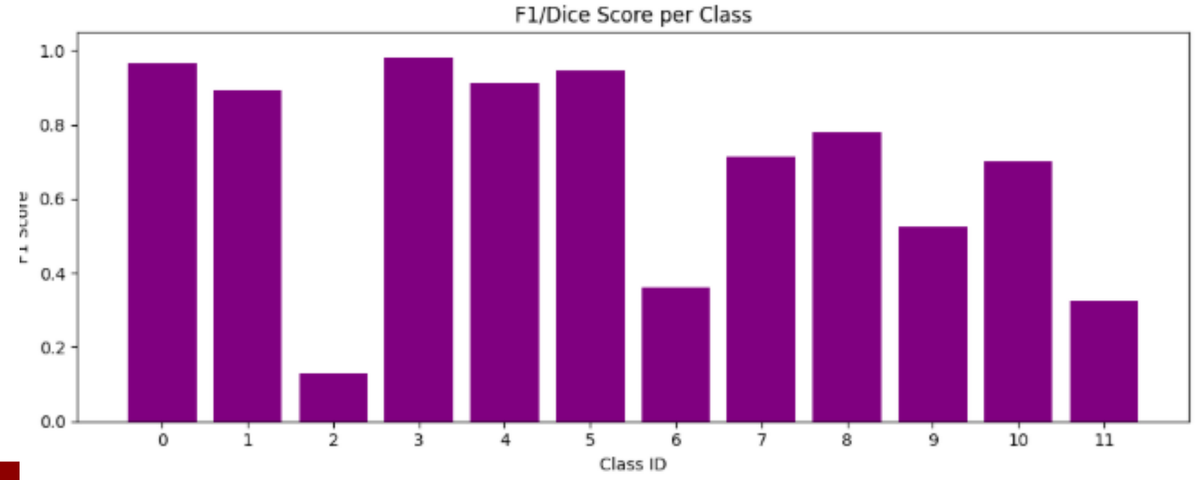
Unet with backbone Resnet 50

UNET

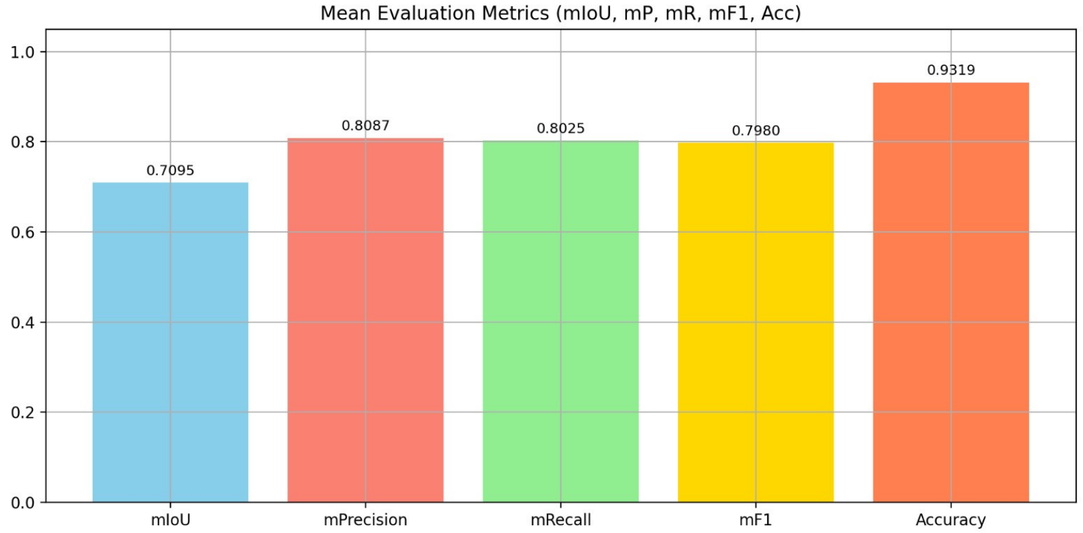

Mean Evaluation Metrics (Accuracy, mIoU, mP, mR, mF1)
Score
1.0
0.8
0.6
0.4
0.2
0.0
0.4635
0.5797
0.5952
0.5686
0.8310
mIoU
mPrecision
mRecall
mF1
Accuracy
F1/Dice Score per Class
F1 Score
1.0
0.8
0.6
0.4
0.2
0.0
0
1
2
3
4
5
6
7
8
9
10
11

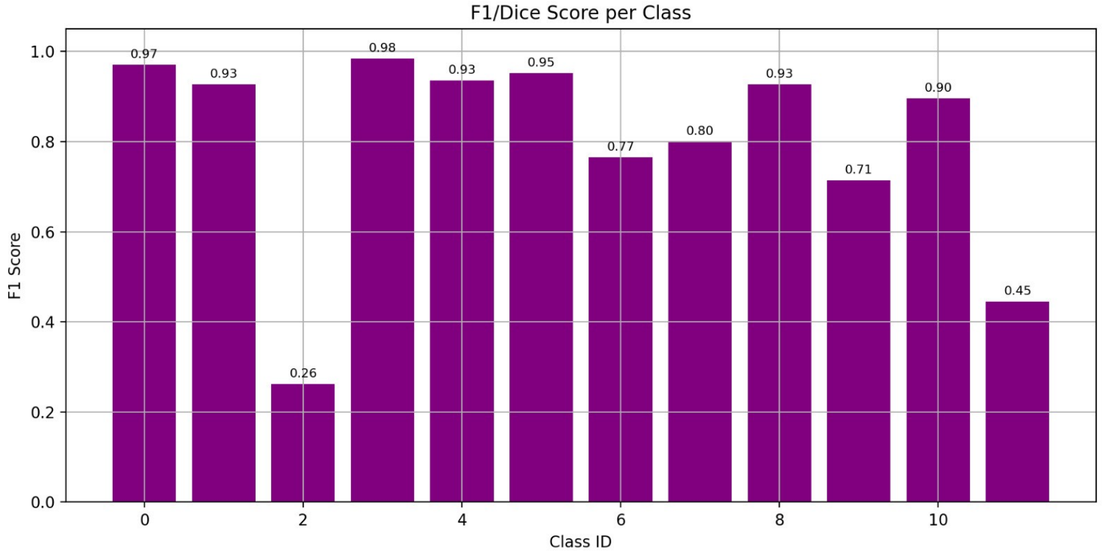
UNet+ Resnet 34





UNet + Resnet 50





Conclusion and Future Work

- Unet with Resnet 50 backbone provide powerfull IoU and balance with F1

Future Work:

Using more dataset images for powerful performance

THANK YOU