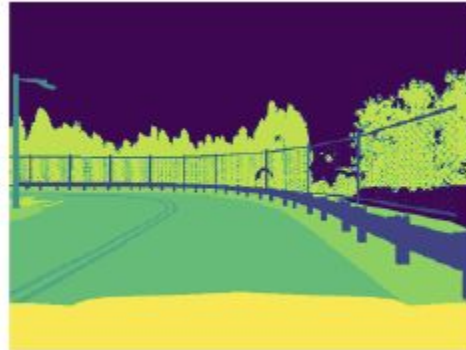# Semantic Segmentation for Self Driving Cars
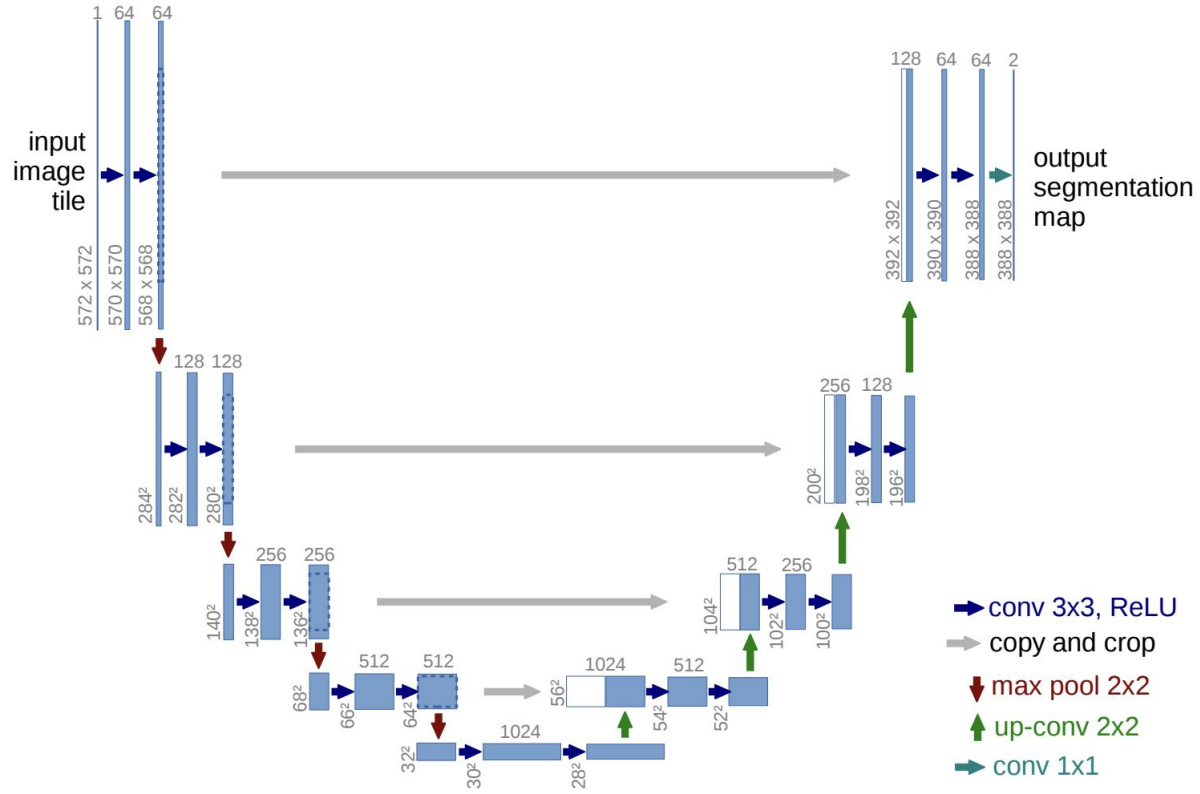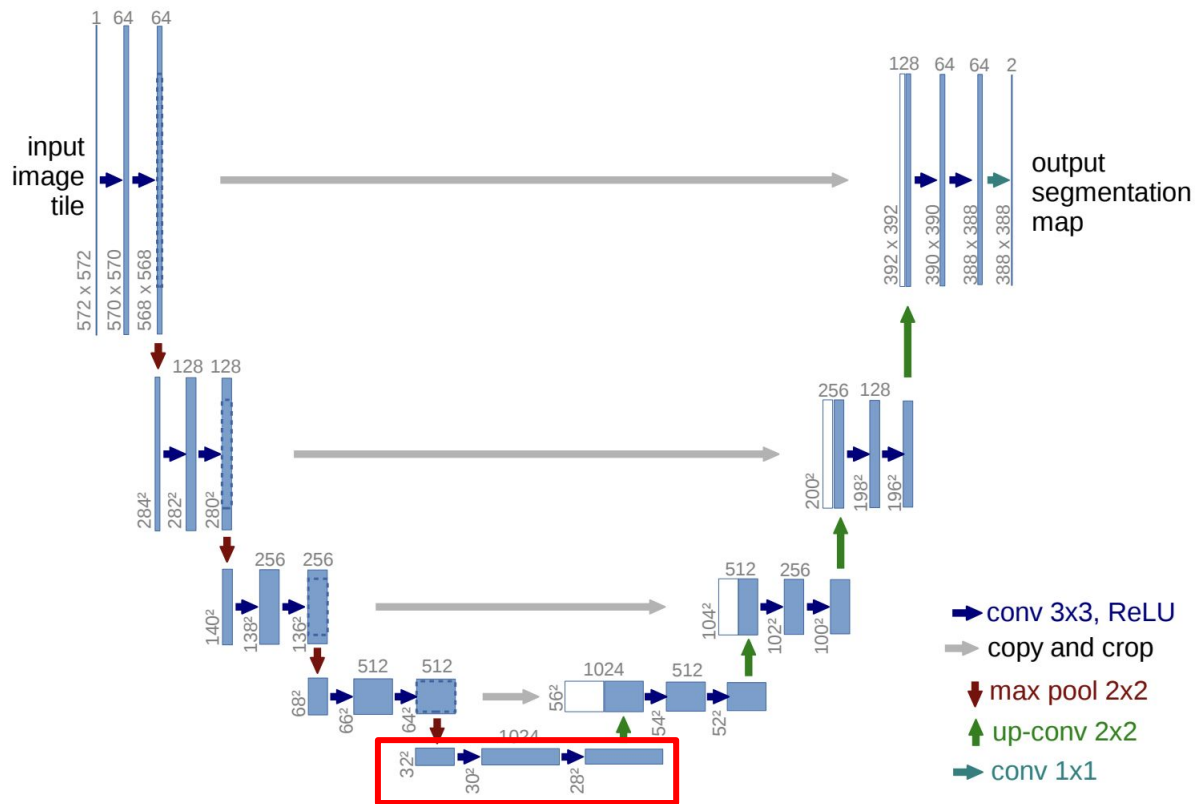
Prasad Naik

Semantic Segmentation

- Deep Learning Algorithm

- Process of partitioning a digital image into multiple image segments

- Associates a label or category with every pixel in an image

- Applications: Medical Image Analysis, Autonomous Vehicles, Satellite Image Analysis
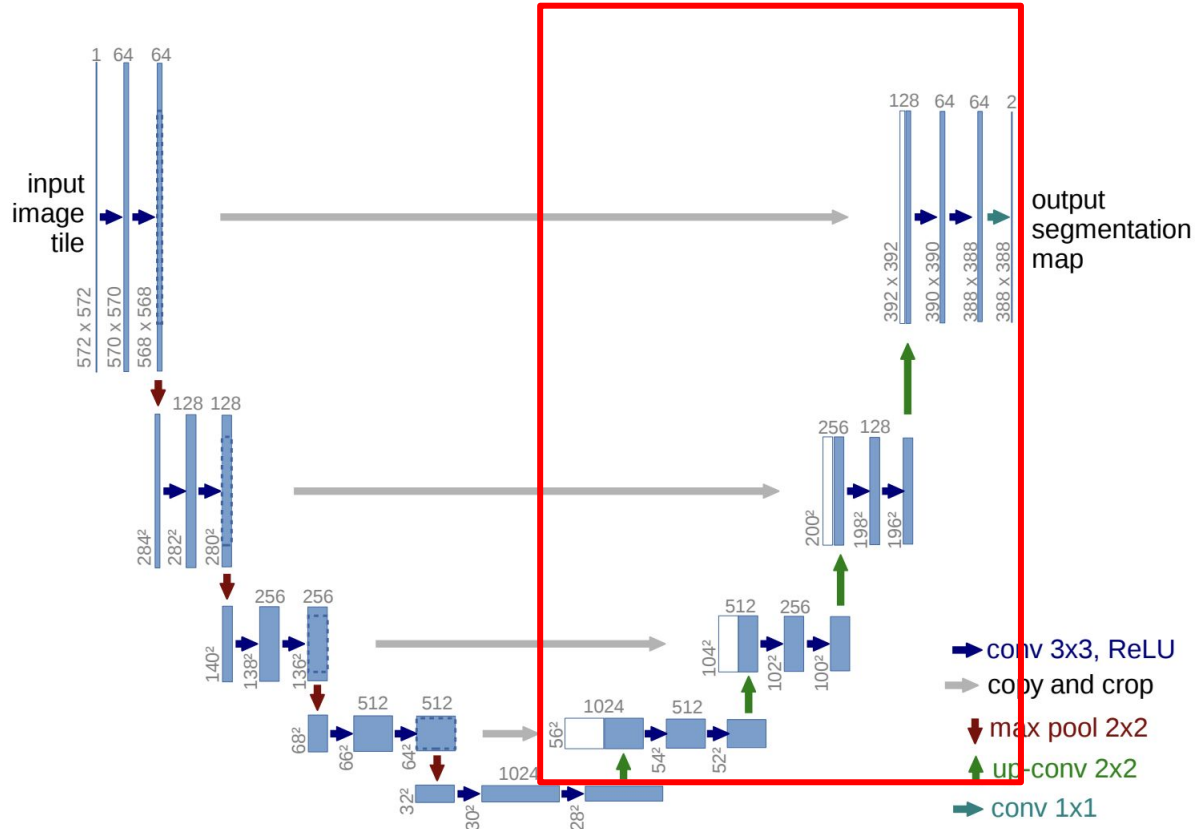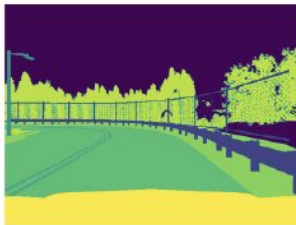
U-Net

U-Net: Encoder

U–Net: Bottleneck

U-Net: Decoder

input
image
tile

output
segmentation
map

→ conv 3x3, ReLU
→ copy and crop
↓ max pool 2x2
↑ up-conv 2x2
→ conv 1x1

Data

- CARLA (CAR Learning to Act) Self Driving Simulator

- Lyft - Udacity Challenge

- Images and Segmentation Maps

- Source: Kaggle

- 5 sets of 1000 Images and corresponding label

- 13 classes

Value	Tag
0	None
1	Buildings
2	Fences
3	Other
4	Pedestrians
5	Poles
6	RoadLines
7	Roads
8	Sidewalks
9	Vegetation
10	Vehicles
11	Walls
12	TrafficSigns

Dataset Distribution Overview

Dataset Type	Samples
Train	4000
Validation	800
Test	200

Tools & Technologies

Python	Tensorflow	Keras	Numpy	Matplotlib	HDF5	Scikit-learn	GPU
3.10.12	2.14.0	2.14.0	1.23.5	3.7.1	3.9.0	1.2.2	Tesla V100

Experiments

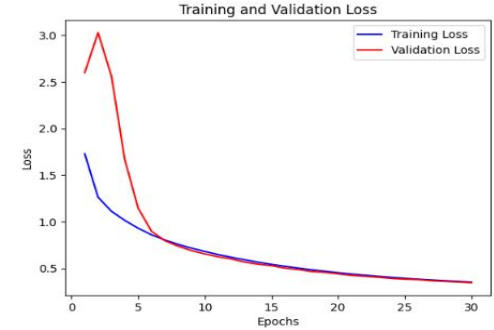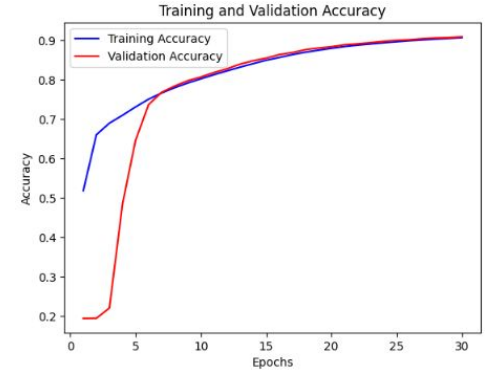| Optimizer	Learning Rate	Loss	Epochs	Metric
Adam	0.01	Sparse Categorical Cross Entropy	15	Accuracy
SGD	0.01	Sparse Categorical Cross Entropy	20	Accuracy
AdaGrad	0.01	Sparse Categorical Cross Entropy	30	Accuracy

Experiments: Accuracy and Loss
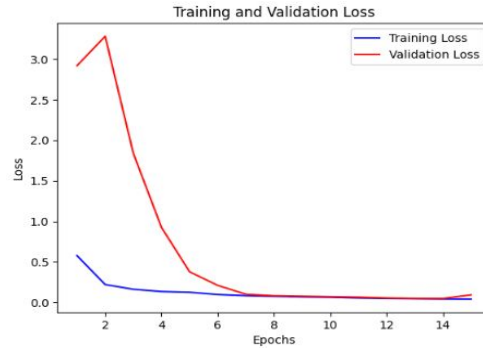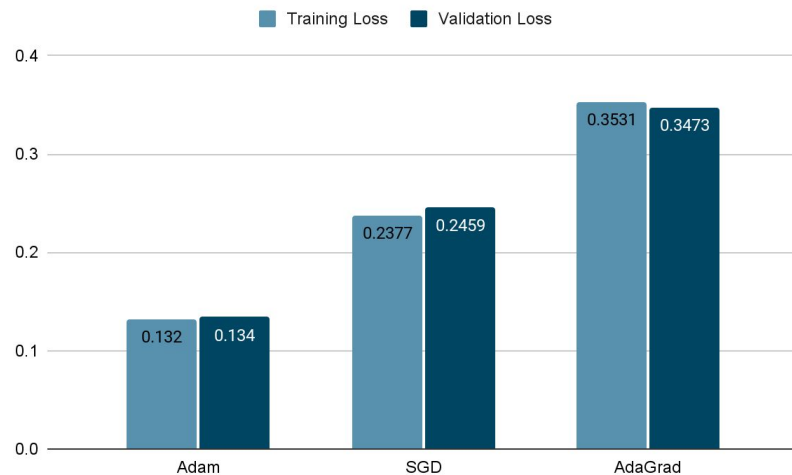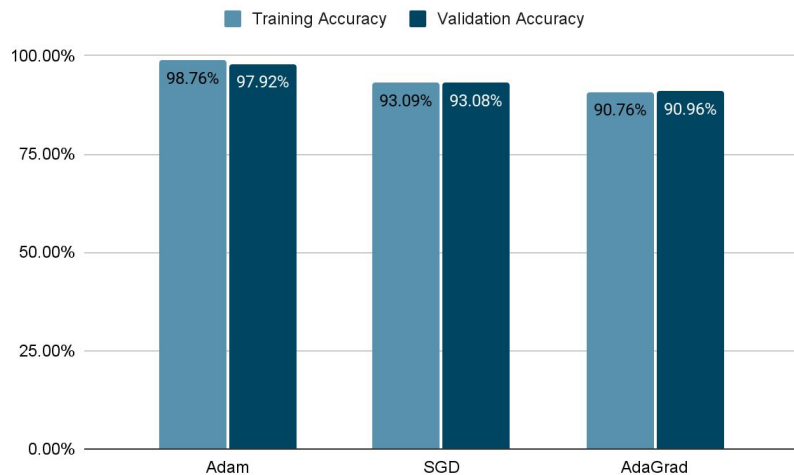

Adam
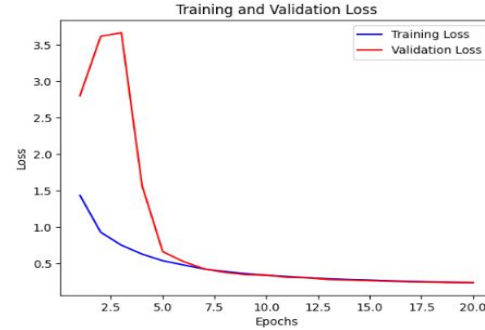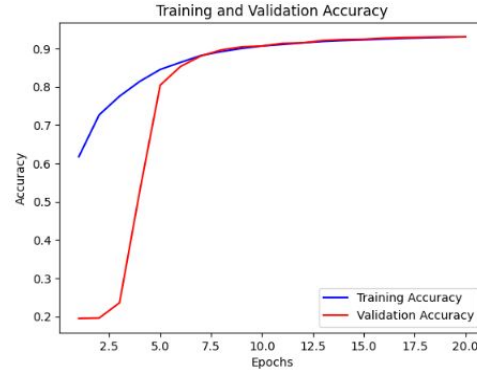
SGD

AdaGrad

Experiments: Accuracy and Loss

Results

Adam

Test Accuracy: 96.70%
Test Loss: 0.1074

SGD

Test Accuracy: 93.09%
Test Loss: 0.2392

AdaGrad

Test Accuracy: 90.30%
Test Loss: 0.3532