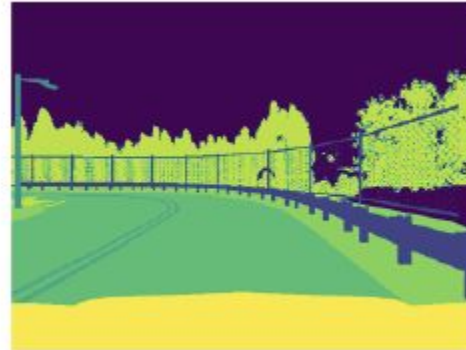


Semantic Segmentation for Self Driving Cars

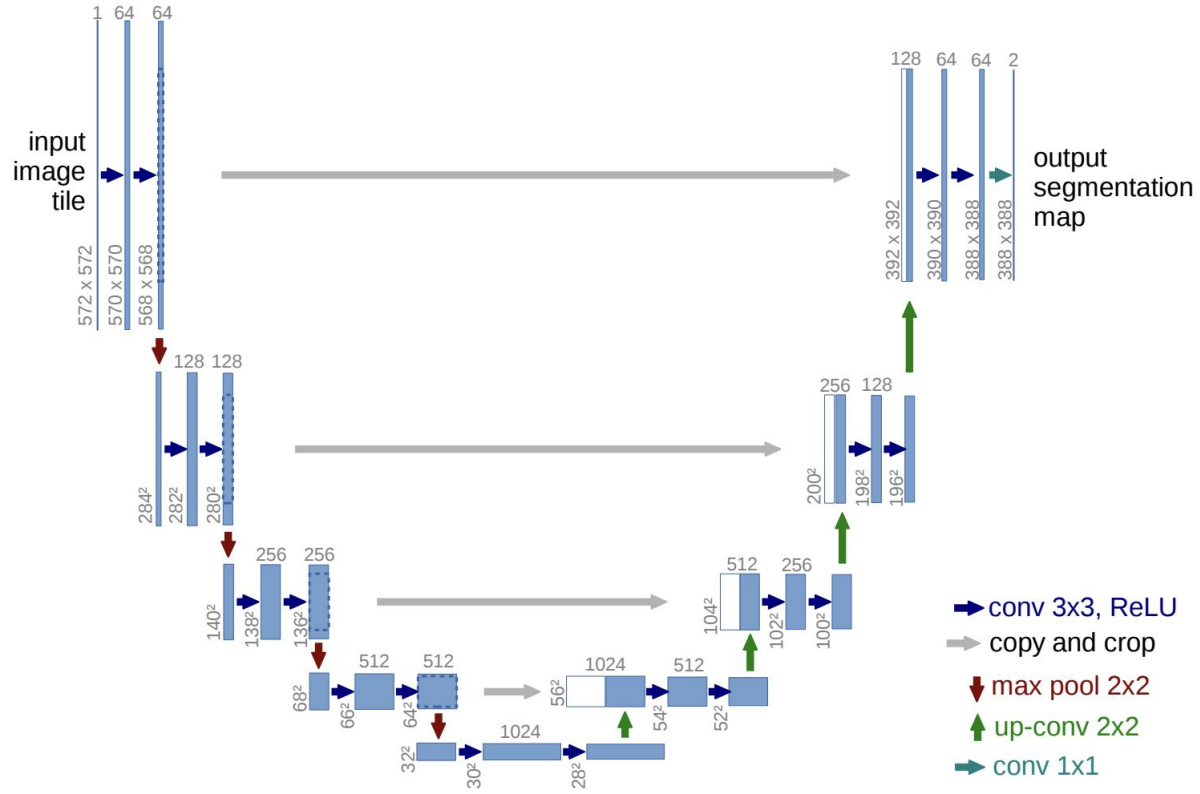
Prasad Naik

Semantic Segmentation

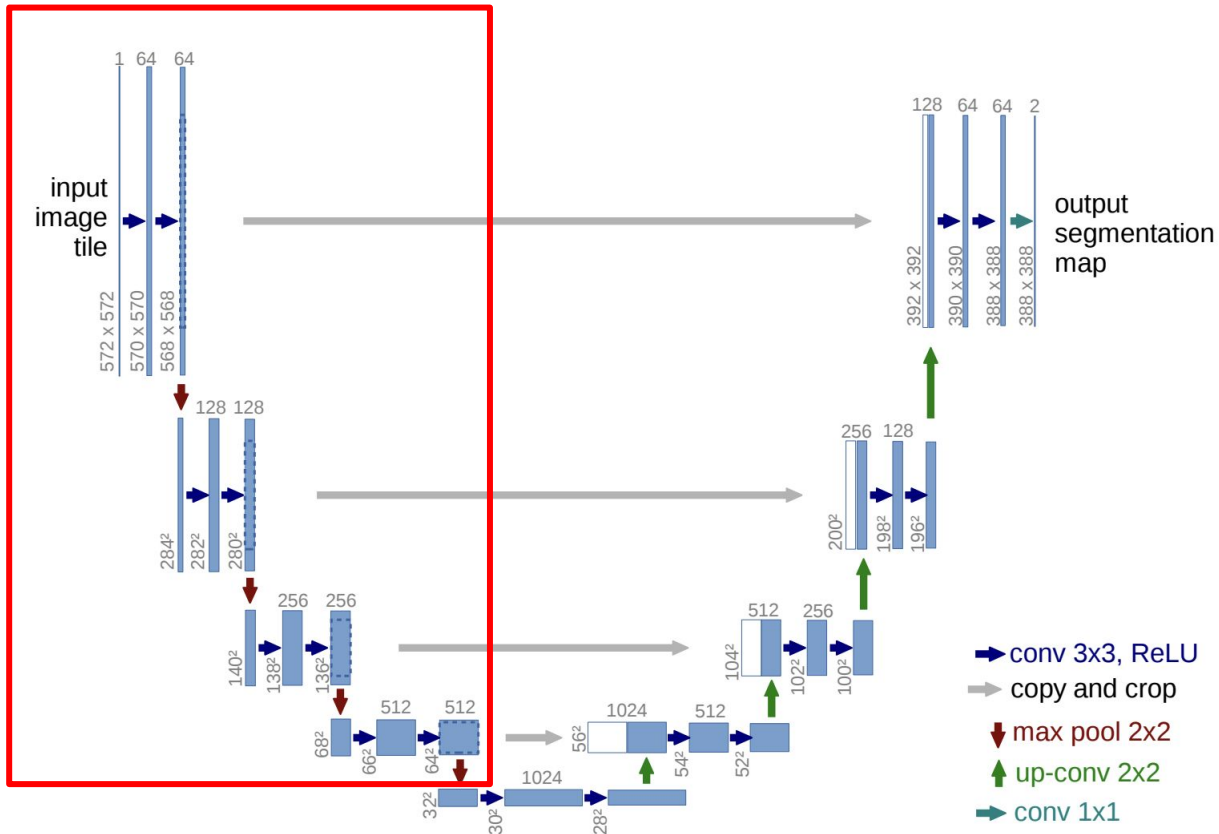
- Deep Learning Algorithm
- Process of partitioning a digital image into multiple image segments
- Associates a label or category with every pixel in an image
- Applications: Medical Image Analysis, Autonomous Vehicles, Satellite Image Analysis



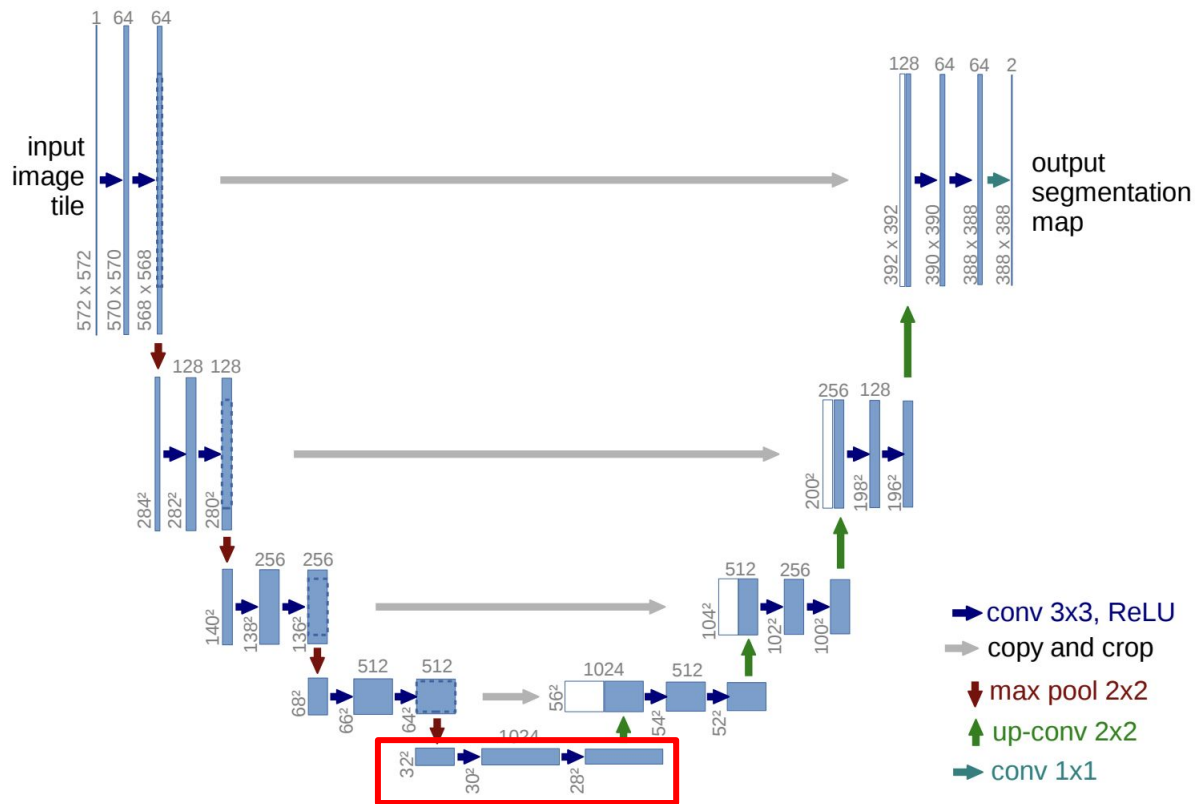
U-Net



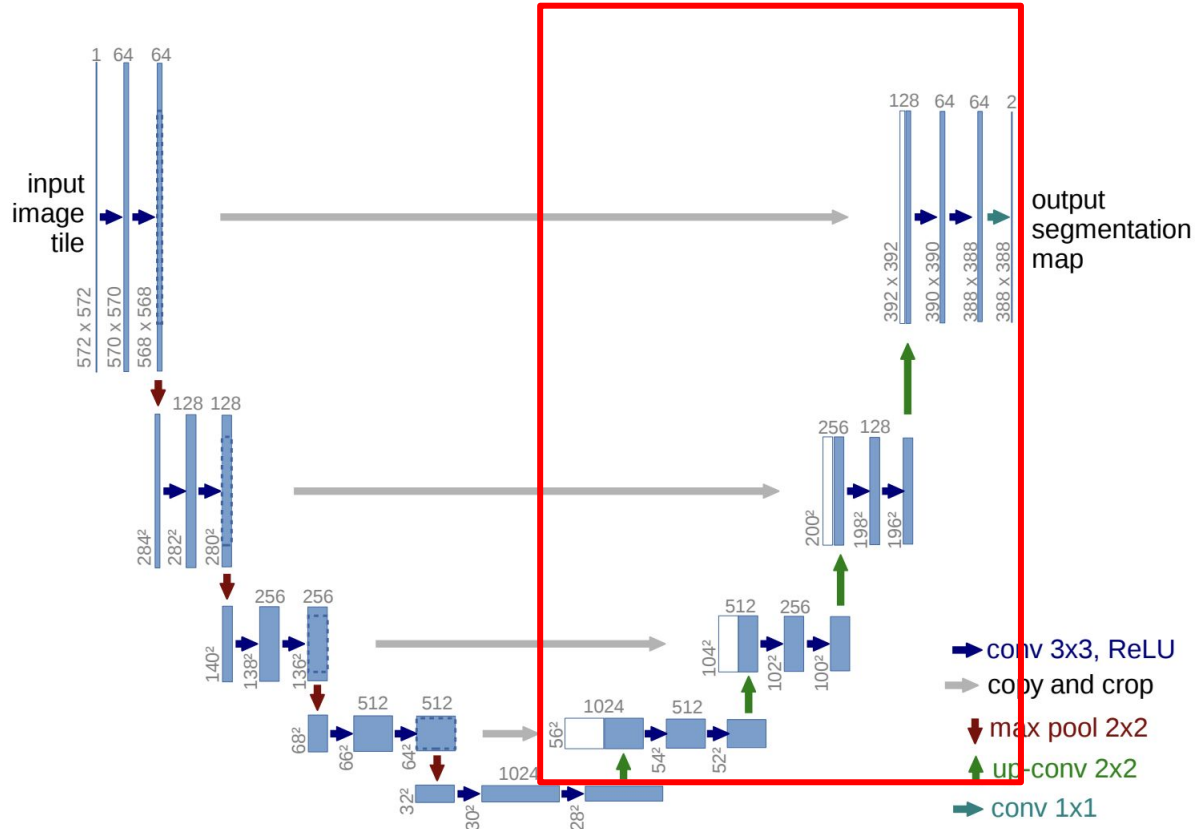
U-Net: Encoder



U-Net: Bottleneck

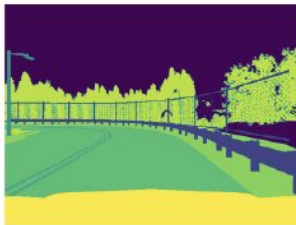


U-Net: Decoder



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



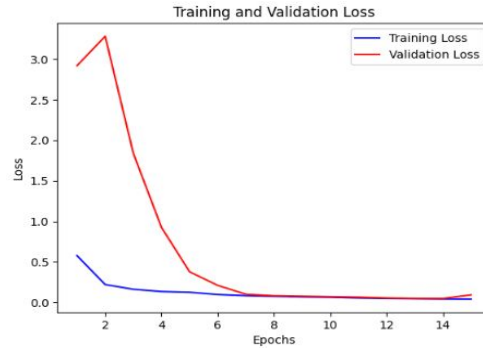
Tools & Technologies: Versions

Tools & Technologies	Version
Python	3.10.12
Tensorflow	2.14.0
Keras	2.14.0
Numpy	1.23.5
Matplotlib	3.7.1
HDF5	3.9.0
Scikit-learn	1.2.2
GPU	Nvidia Tesla V100

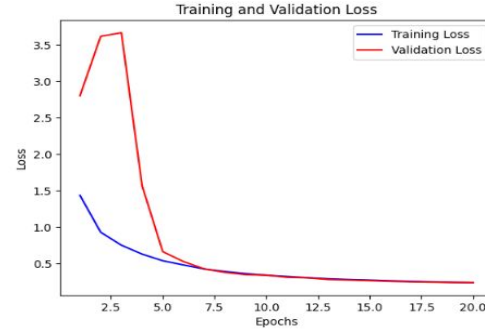
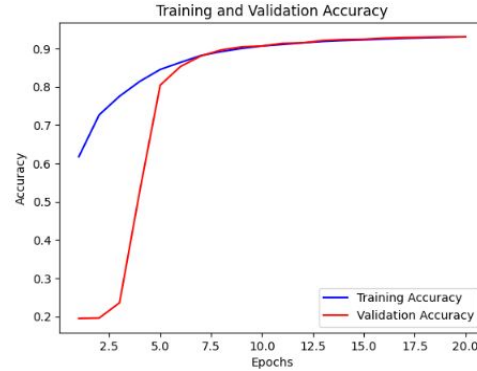
Experiments

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

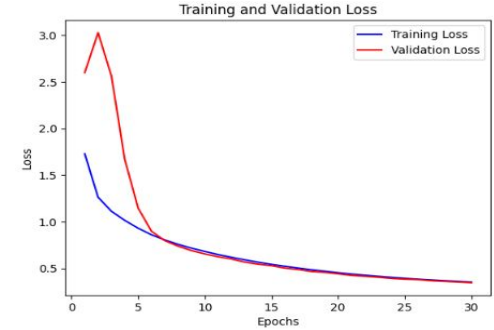
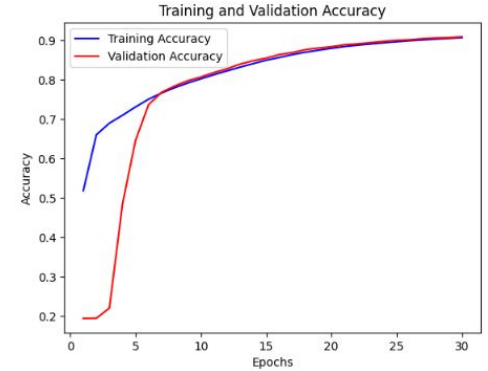
Experiments: Accuracy and Loss



Adam

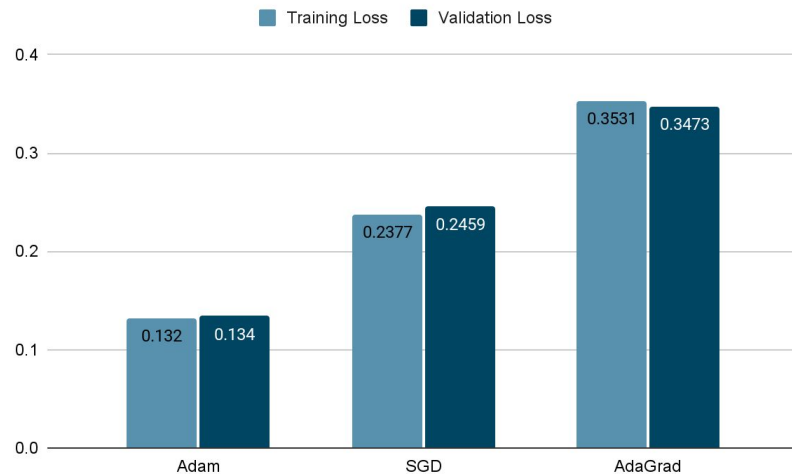
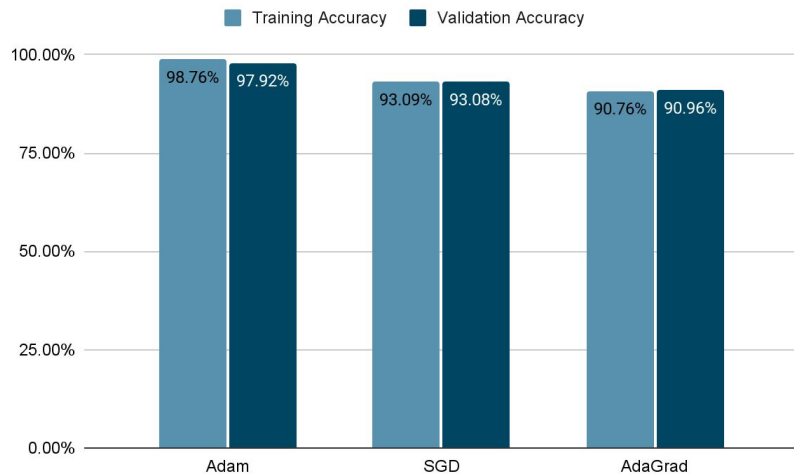


SGD



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