Vision and Uncertainty Writeup

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Problem Statement:
Train a simple image segmentation network and study how well calibrated is its confidence.

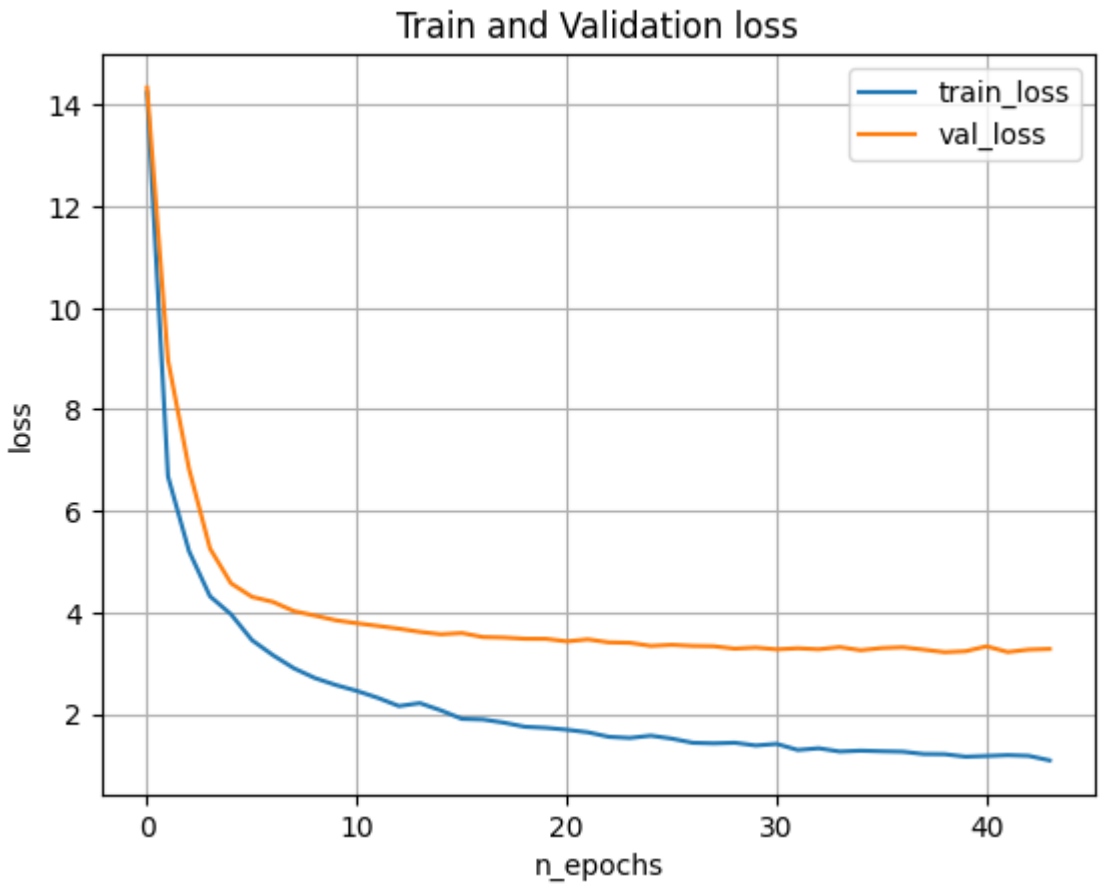
Tasks:

1) Download segmentation dataset and network
2) Train the network
3) Analyze and visualize the results
4) Plot train and validation loss
5) Plot validation accuracy
6) Plot confidence calibration curve

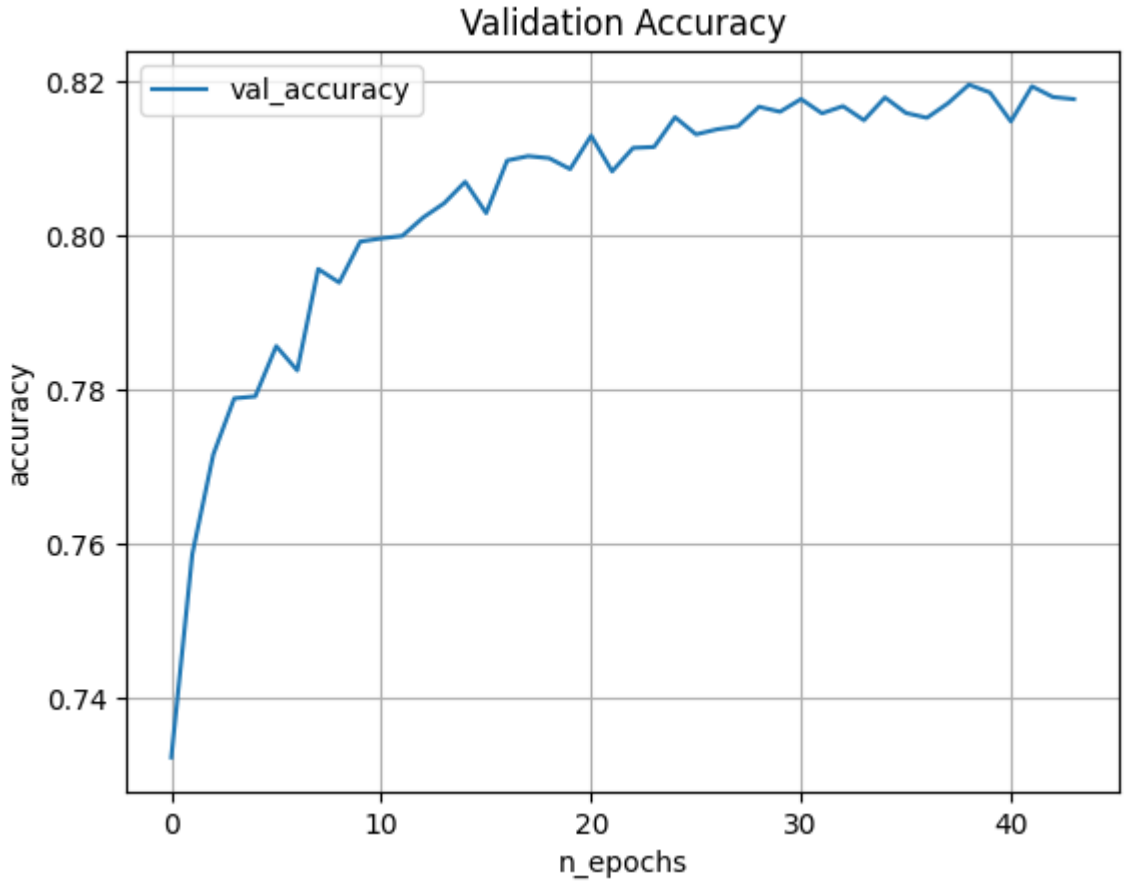
Hyperparameter Choices:
After applying grid search on the parameters, the following hyperparameters were chosen.

Number of epochs = 60
learning_rate = 0.01
batch_size = 32
resize_shape = (256,256)
weight_decay = 0.1
momentum = 0.01
early_stopping = True
patience = 5 # how many epochs to wait in case degradation is seen

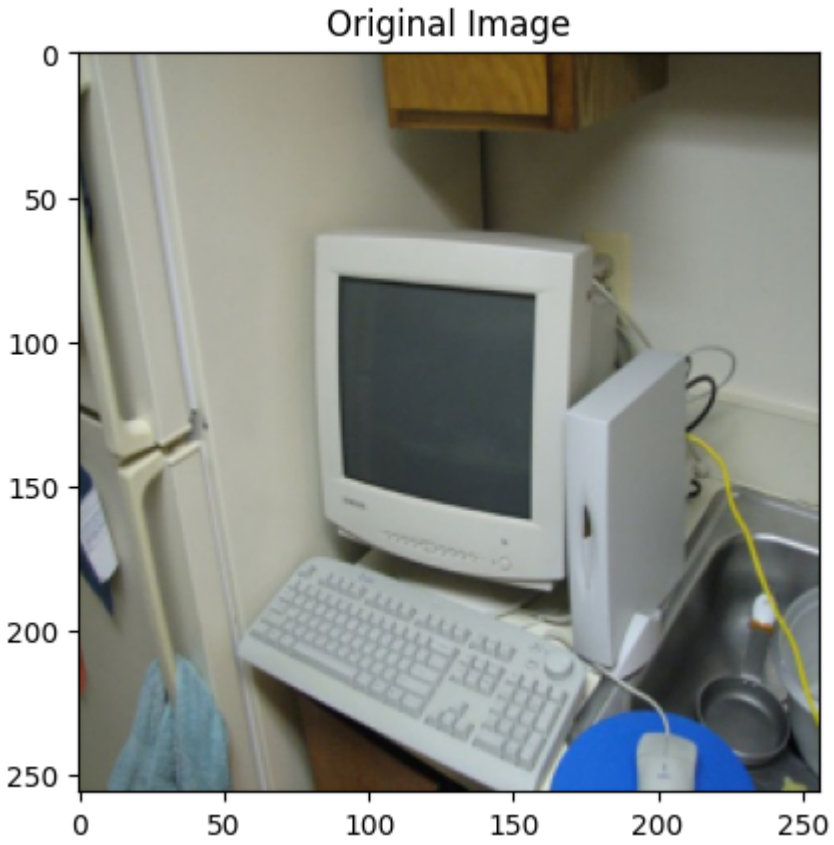
Train and Validation Loss curves:

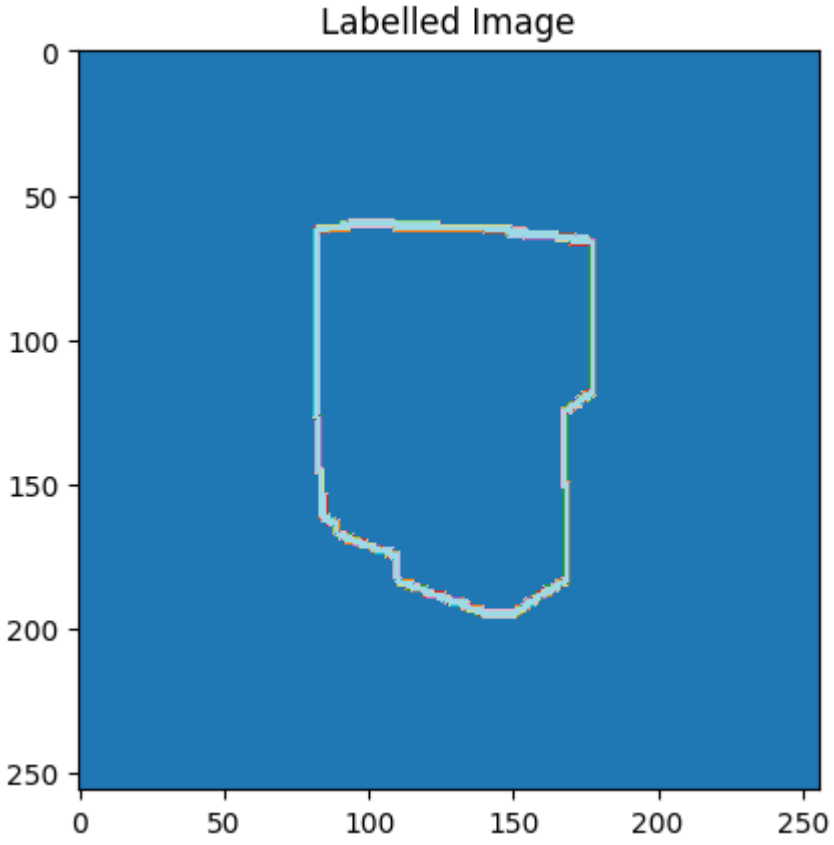


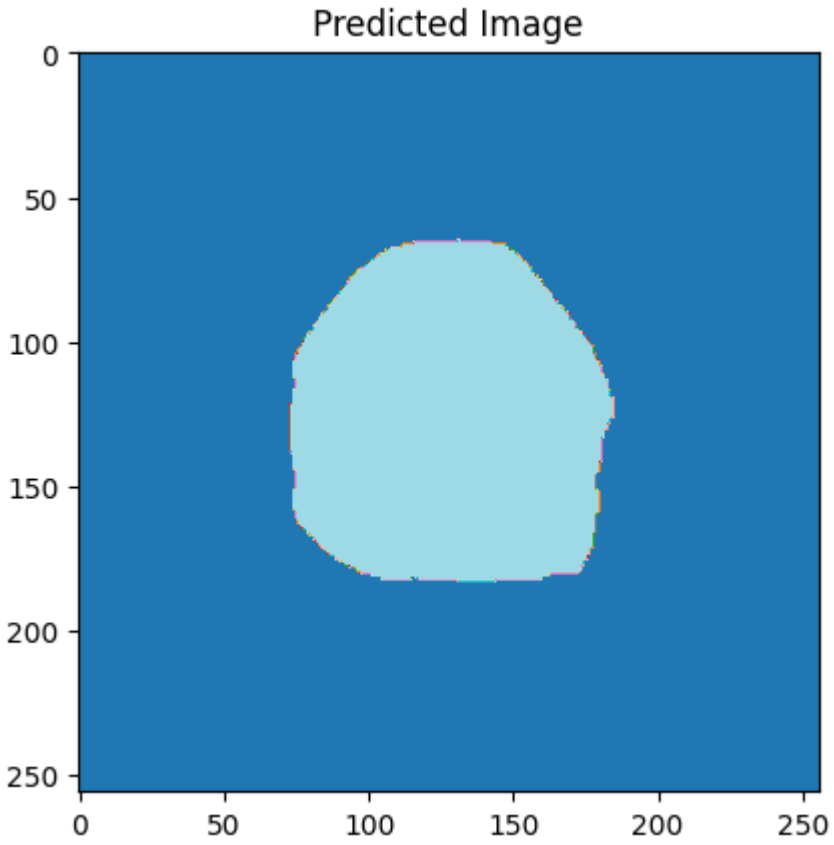
Validation Accuracy:



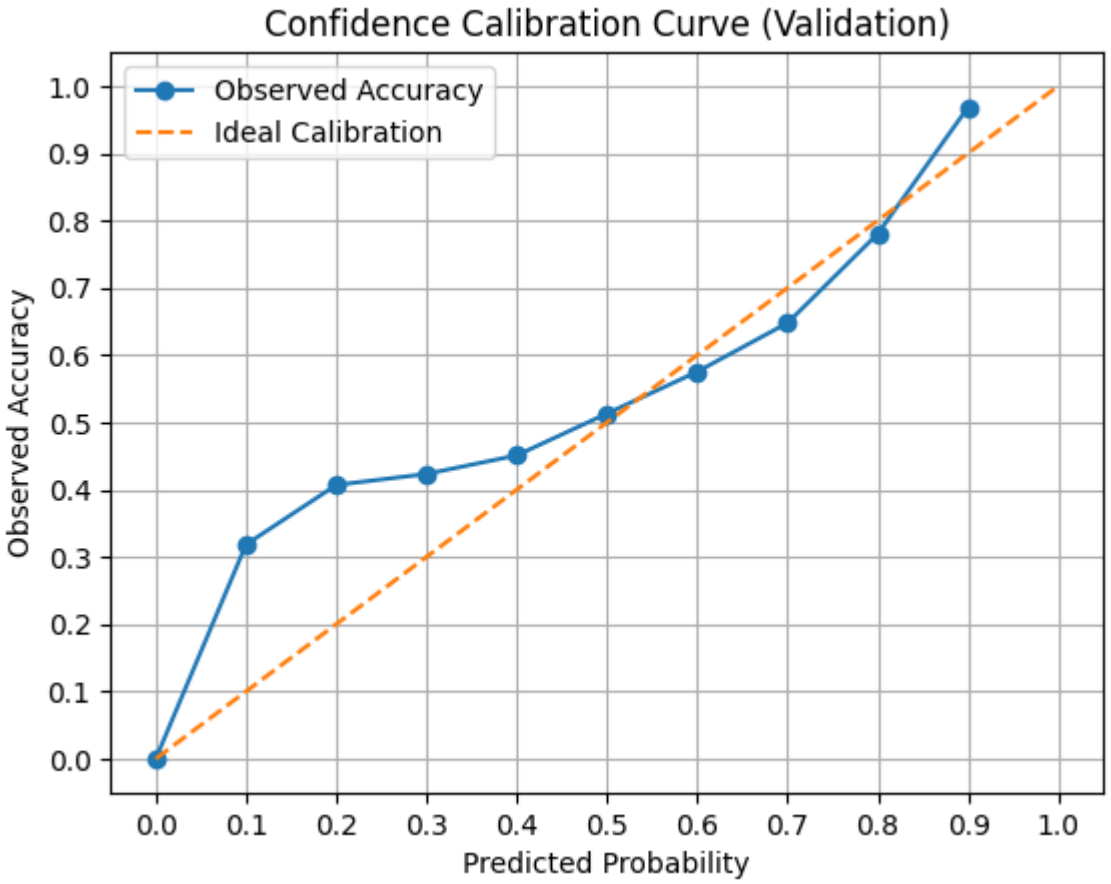
Visualize and image from validation set:

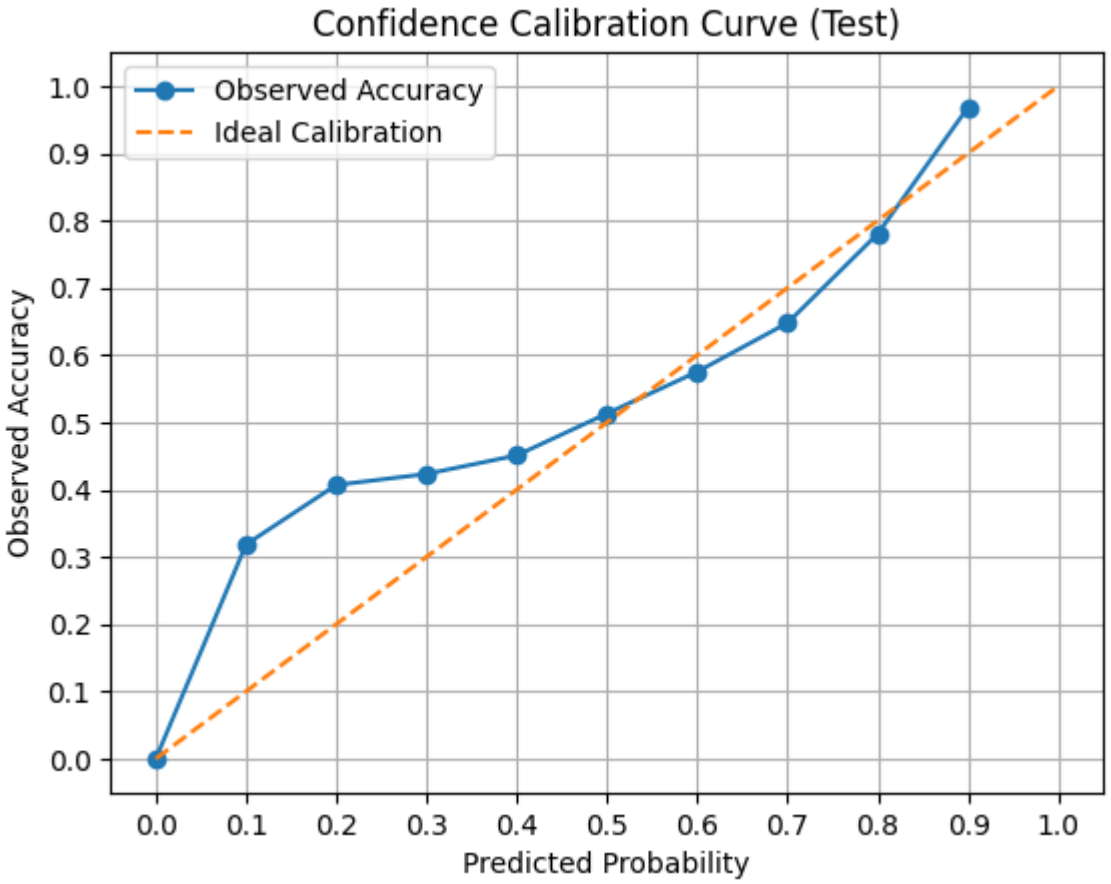

Original Image
0
50
100
150
200
250
0
50
100
150
200
250


Labelled Image
0
50
100
150
200
250
0
50
100
150
200
250



Plot confidence calibration curve


Confidence Calibration Curve (Validation)
Observed Accuracy
Ideal Calibration
Observed Accuracy
Predicted Probability
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0


Confidence Calibration Curve (Test)
Observed Accuracy
Ideal Calibration
Observed Accuracy
Predicted Probability
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0

Expected calibration Error

Test Set
ECE: 0.06005434410458268
Validation Set
ECE: 0.06005434410458268

AI Collaboration
No AI help was needed.

Extra Credit

Looked into early stopping for when val_acc drops degrades for at least the patience variable(default = 5) number of times.

Looked into different momentum, weight decay and learning rate values while doing o a grid search on finding optimal hyperparameters.