# CS/SE, SST, UMT

## Assignment #7 – Computer Vision (CS456/SE456)

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## Discussion Partner

None.

## Question 1

Task: Using the driver distraction dataset, apply five deep learning algorithms (from the provided list), run them on Google Colab, and report their accuracy and training time. Also, provide a description of each algorithm used.

### ResNet-50

ResNet-50 is a 50-layer deep CNN introduced by Microsoft. It uses residual connections to allow gradient flow across layers, helping combat vanishing gradients. It’s efficient for image classification with relatively low computational cost.

Final Accuracy: 77.78%

Training Time: 47 minutes 4 seconds

### ResNet-101

An extended version of ResNet-50 with 101 layers. It captures more complex image features and provides higher accuracy, though it requires more training time.

Final Accuracy: 84%

Training Time: 79 minutes 23 seconds

### DenseNet-121

DenseNet connects each layer to every other layer, ensuring better gradient flow and reduced overfitting. It is parameter-efficient and improves accuracy while using fewer computations than traditional CNNs.

Final Accuracy: 70%

Training Time: 36 minutes 12 seconds

### MobileNet

Designed for mobile and embedded devices, MobileNet uses depthwise separable convolutions to drastically reduce the number of parameters. It’s fast and lightweight, ideal for resource-constrained environments.

Final Accuracy: 79.86%

Training Time: 9 minutes 30 seconds

### Xception

Xception stands for 'Extreme Inception' and is based entirely on depthwise separable convolutions. It outperforms InceptionV3 and is effective in high-accuracy image classification with efficient computation.

Final Accuracy: 70.14%

Training Time: 1 hour 30 minutes

## Results Summary

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| --- | --- | --- |
| Model | Accuracy | Training Time |
| ResNet-50 | 77.78% | 47 minutes 4 seconds |
| ResNet-101 | 84% | 79 minutes 23 seconds |
| DenseNet-121 | 70% | 36 minutes 12 seconds |
| MobileNet | 79.86% | 9 minutes 30 seconds |
| Xception | 70.14% | 1 hour 30 minutes |