

Assignment 3

Task 4

	Number of Trainable Parameters	Accuracy on test set	Epochs
Custom Model – (Small ResNet)	47,450	0.736	18
VGG16	41,802	0.705	18
MNIST-pretrained model	34,826	0.526	60

1. The custom ResNet model achieved the best performance due to due to its higher number of trainable parameters. Training from scratch, despite being more time-consuming, allowed for optimal weight optimization specific to this task. Conversely, the model originally trained on MNIST performed the worst due to its shallow architecture, limited pretrained layers, and smaller parameter count, which hindered its ability to effectively transfer knowledge from digit classification to the more complex categories of animals and vehicles in CIFAR. Additionally, the difference in color channel usage between the datasets (three channels for CIFAR, one for MNIST) likely contributed to the performance gap.
2. The performance gap between the pretrained models demonstrates the critical importance of aligning pretraining data with the target task. VGG16, trained on the broader ImageNet dataset, significantly outperformed the MNIST-pretrained model on CIFAR-10 due to ImageNet's greater similarity in content and complexity. This highlights two key requirements for successful transfer learning: dataset similarity, ensuring the pretrained data closely resembles the target dataset, and task relevance, where the pretrained model's knowledge aligns with the target task's demands.