Self-supervised and transfer learning

Task 1: Train a ResNet18 on the Rotation task

I this part we train a ResNet18 on the Rotation task. Based on the CIFAR10 data loader, we first generate the rotated images and labels for the rotation task. We train ResNet18 on the rotation task, report the test performance and store the model for the fine-tuning tasks.

Number of epochs:	45
lowest test loss	0.611
Test Accuracy:	75.52
Maximum accuracy:	75.77

According to the above table and the test performance, the lowest test loss obtained 0.611 and the corresponding accuracy is 75.52. But the best accuracy is 75.77.

Task 2: Fine-tuning on the pre-trained model

I this section, we initialized from the Rotation model and from random weights, fine-tune only the weights of the final block of convolutional layers and linear layer on the supervised CIFAR10 classification task.

	Rotation model (pre-trained ResNet18 model)	Randomly initialize ResNet18 model
Number of epochs:	20	20
lowest test loss	0.962	0.847
Test Accuracy:	66.30	70.83
Maximum accuracy:	66.30	70.92

According to the above table and the test performance, the lowest test loss for Rotation model obtained 0.962 and the corresponding accuracy is 66.30. But the lowest test loss for Randomly initialize a ResNet18 model obtained 0. 847 and the corresponding accuracy is 70.83. But the best accuracy for this is 70.92. So Randomly initialize

ResNet18 model gave the better result than rotation model for pretrained task.

Task 3: Supervised training on the pre-trained model

I this section, we Initialized from the Rotation model or from random weights, but this time train the full network on the supervised CIFAR10 classification task.

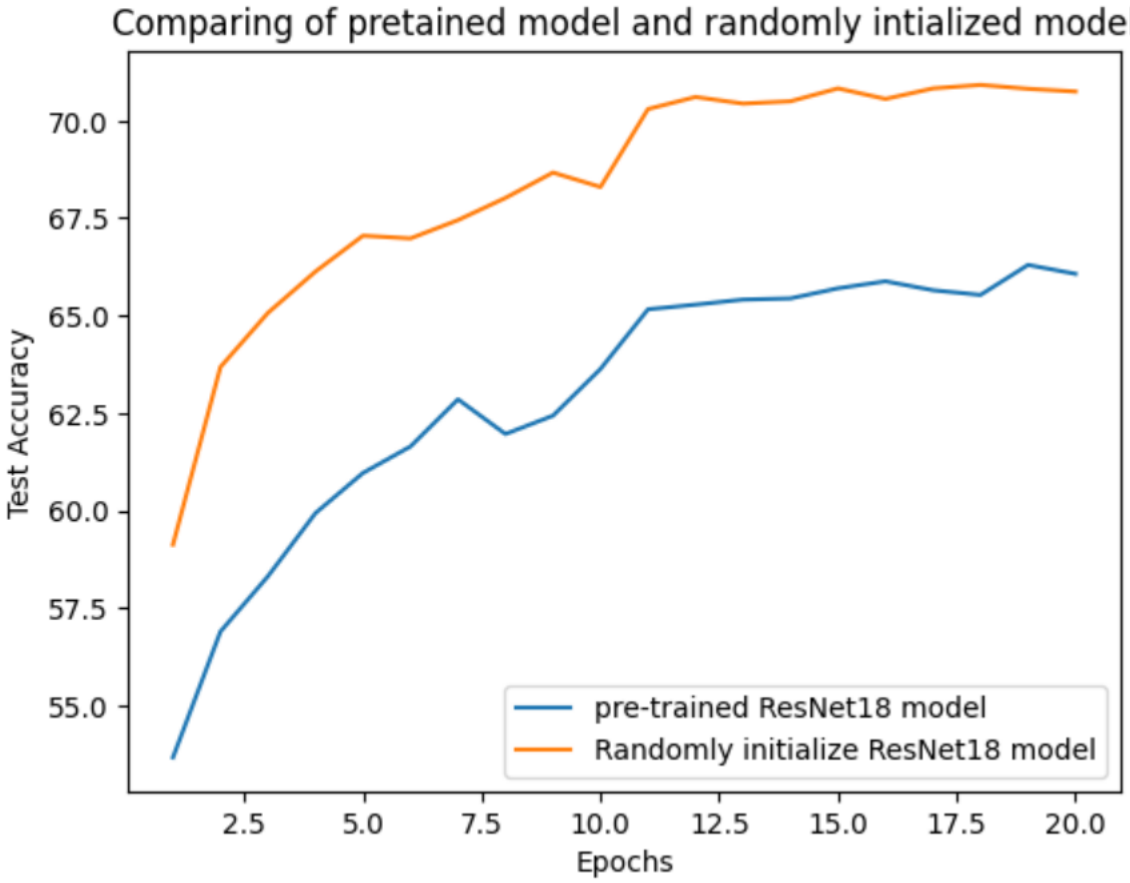
	Rotation model (pre-trained ResNet18 mode)	Randomly initialize ResNet18 model
Number of epochs:	20	20
lowest test loss	0.565	0.642
Test Accuracy:	80.38	77.83
Maximum accuracy:	80.79	77.92

According to the above table and the test performance, the lowest test loss for Rotation model obtained 0.565 and the corresponding accuracy is 80.38, but the best accuracy for this is 80.79.
However, the lowest test loss for Randomly initialize a ResNet18 model obtained 0.642 and the corresponding accuracy is 77.83. But the best accuracy for this is 77.92.
Therefore, when we train the full network on the supervised CIFAR10 classification task, Rotation model (pre-trained ResNet18 mode) gave the better result than Randomly initialize ResNet18 model, however when we fine-tune only the weights of the final block of convolutional layers and linear layer this result was converse.

Task 4: plot by performing supervised fine tuning/training

I) **plotting on one subset:**

- **Comparing of pretained ResNet18 model and randomly intialized ResNet18 model**


Comparing of pretained model and randomly intialized model
Test Accuracy
70.0
67.5
65.0
62.5
60.0
57.5
55.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
Epochs
pre-trained ResNet18 model
Randomly initialize ResNet18 model

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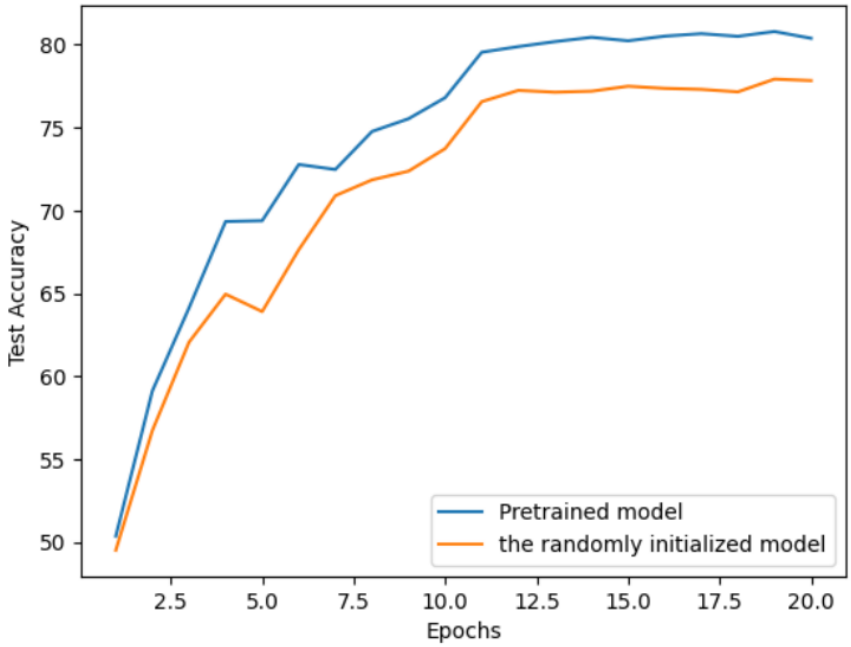
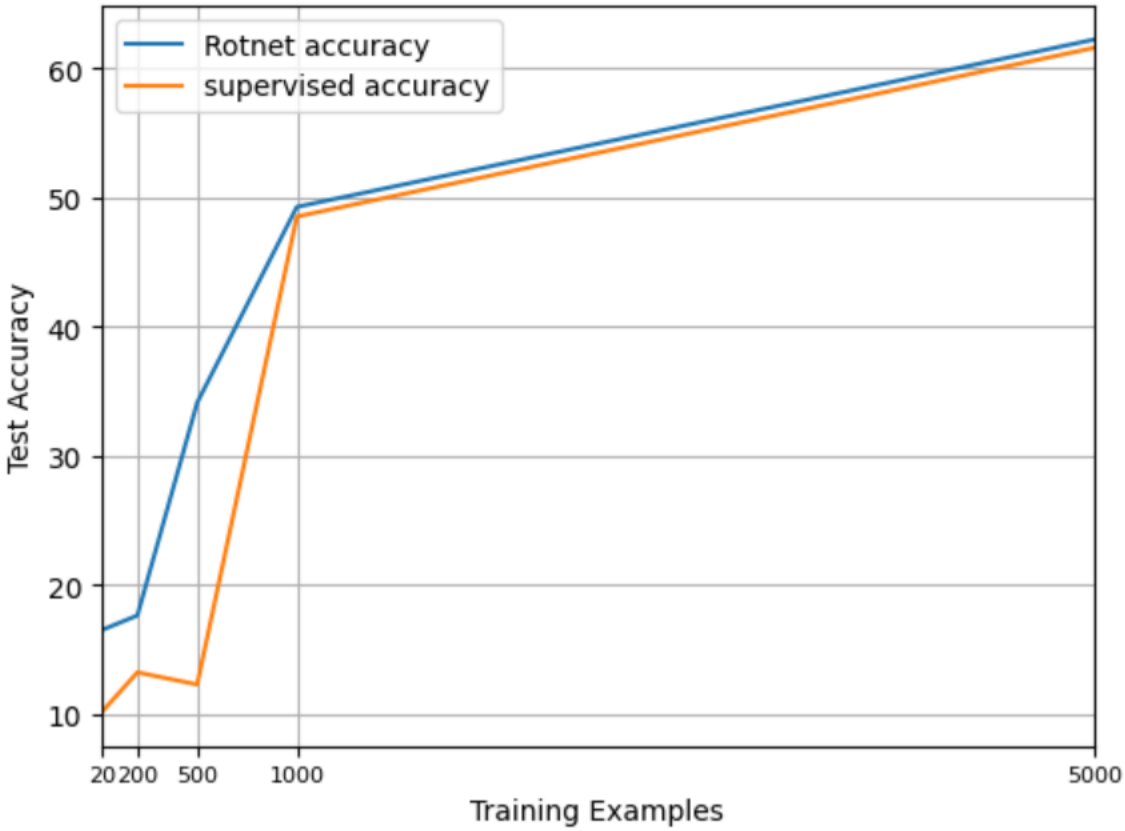
Comparing of Supervised training on the pretained ResNet18 model and randomly intialized ResNet18 model



II- **plotting on the numbers of subset:**



5- Explanation of the obtained results.

It is clear from comparing the results that Supervised training on the pre-trained model (train the full network) is the best option because it produces the best accuracy which is train the 80.79.

According to the results table in train the full network, the lowest test loss for Rotation model obtained 0.565 and the corresponding accuracy is 80.38, but the best accuracy for this is 80.79.

However, the lowest test loss for Randomly initialize a ResNet18 model obtained 0.642 and the corresponding accuracy is 77.83. But the best accuracy for this is 77.92.

Therefore, when we train the full network on the supervised CIFAR10 classification task, Rotation model (pre-trained ResNet18 mode) gave the better result than Randomly initialize ResNet18 model, however when we fine-tune only the weights of the final block of convolutional layers and linear layer this result was converse. Since the result in fine tuning model shows the lowest test loss for Rotation model obtained 0.962 and the corresponding accuracy is 66.30. But the lowest test loss for Randomly initialize a ResNet18 model obtained 0. 847 and the corresponding accuracy is 70.83. But the best accuracy for this is 70.92. So Randomly initialize ResNet18 model gave the better result than rotation model for pretrained task.