Scalable Data Mining [CS60021]

Assignment 2 - Pytorch

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Wandb Project dashboard - https://wandb.ai/radhika_patwari/sdm-asgn-2?workspace=user-radhika_patwari

Wandb Report link - https://wandb.ai/radhika_patwari/sdm-asgn-2/reports/Scalable-Data-Mining-CS60021---VmlldzoxMDM2NDIy

Experiment Details

AIM

Train and test ResNet for image classification on CIFAR10 dataset using PyTorch Module

DATASET

- train_images: Consist of 50000 images of 32 x 32 RGB images
- train_labels: Consist of 50000 labels from 10 classes for the images in train_images
- test_images: Consist of 10000 images of 32 x 32 RGB images
- test_labels: Consist of 10000 labels from 10 classes for the images in test_images

EXPERIMENT

4 different approaches based on Cross entropy loss function with varying hyperparameters -

- Train all layers , SGD optimizer with lr = 0.001, m = 0.9
- Train all layers, Adam optimizer with lr = 0.01
- Fine tune last layer, Freeze other layers, SGD optimizer with lr = 0.001, m = 0.9
- Fine tune last layer, Freeze other layers, Adam optimizer with lr = 0.01

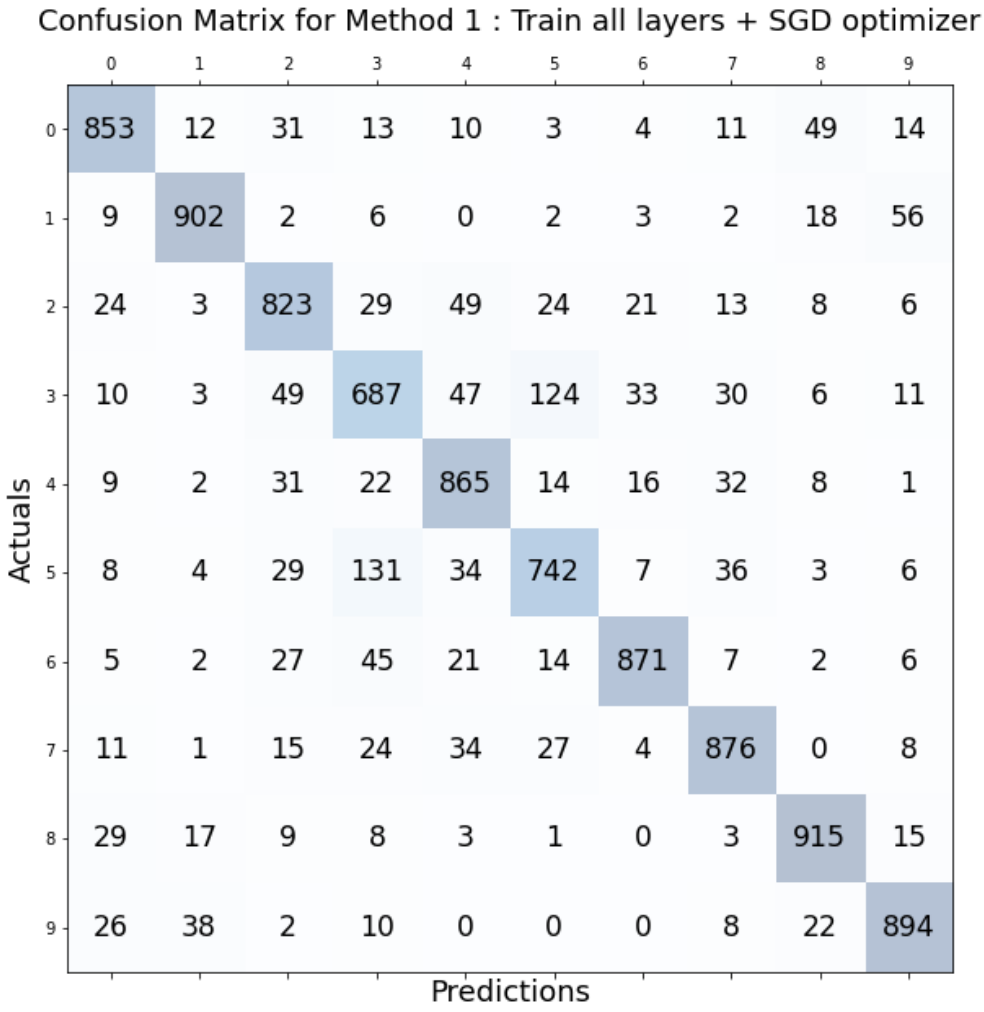
Results

CONFUSION MATRIX

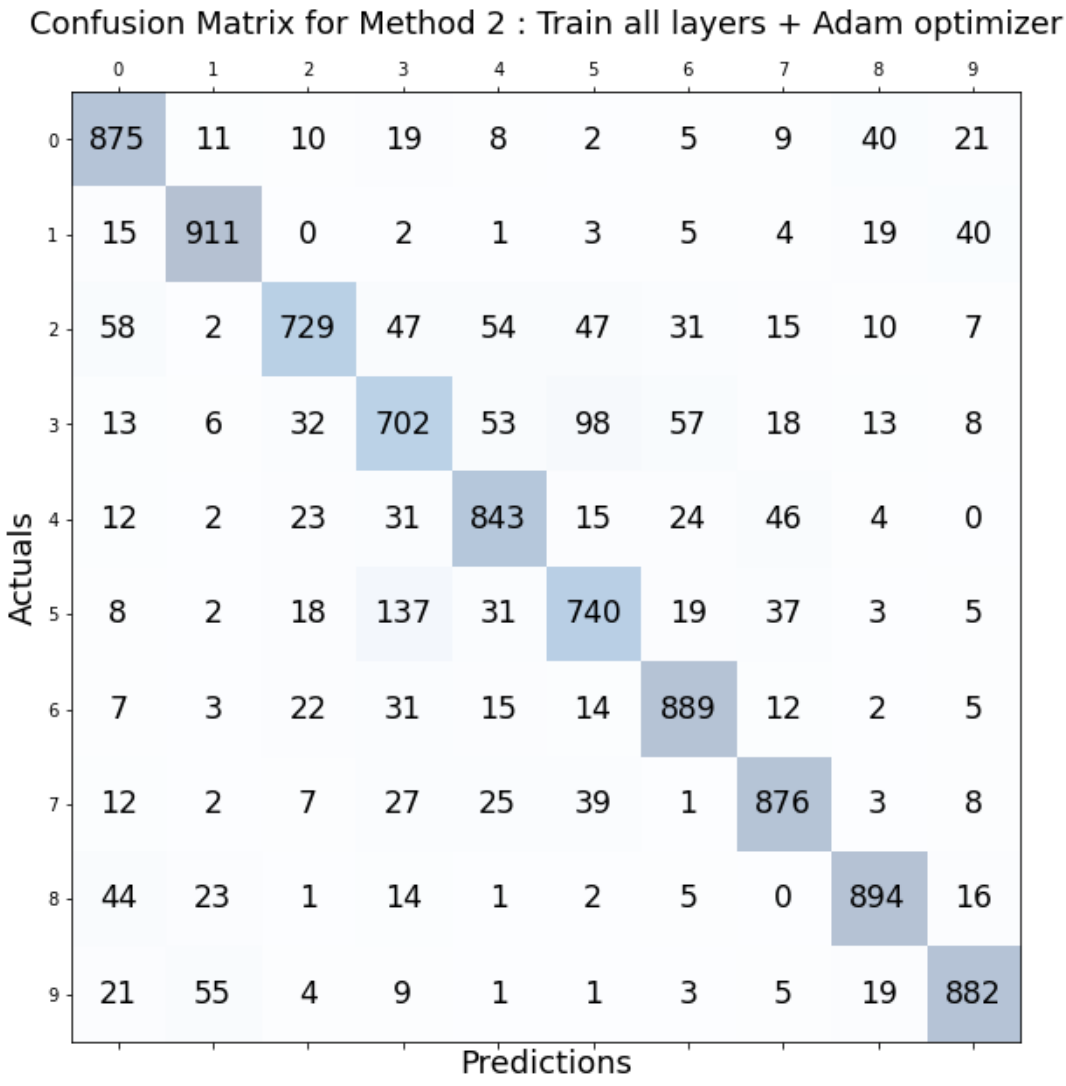
Confusion Matrix for all the 10 classes in the test set with the best and worst class predictions are :

Classes : ('plane', 'car', 'bird', 'cat', 'deer', 'dog', 'frog', 'horse', 'ship', 'truck')

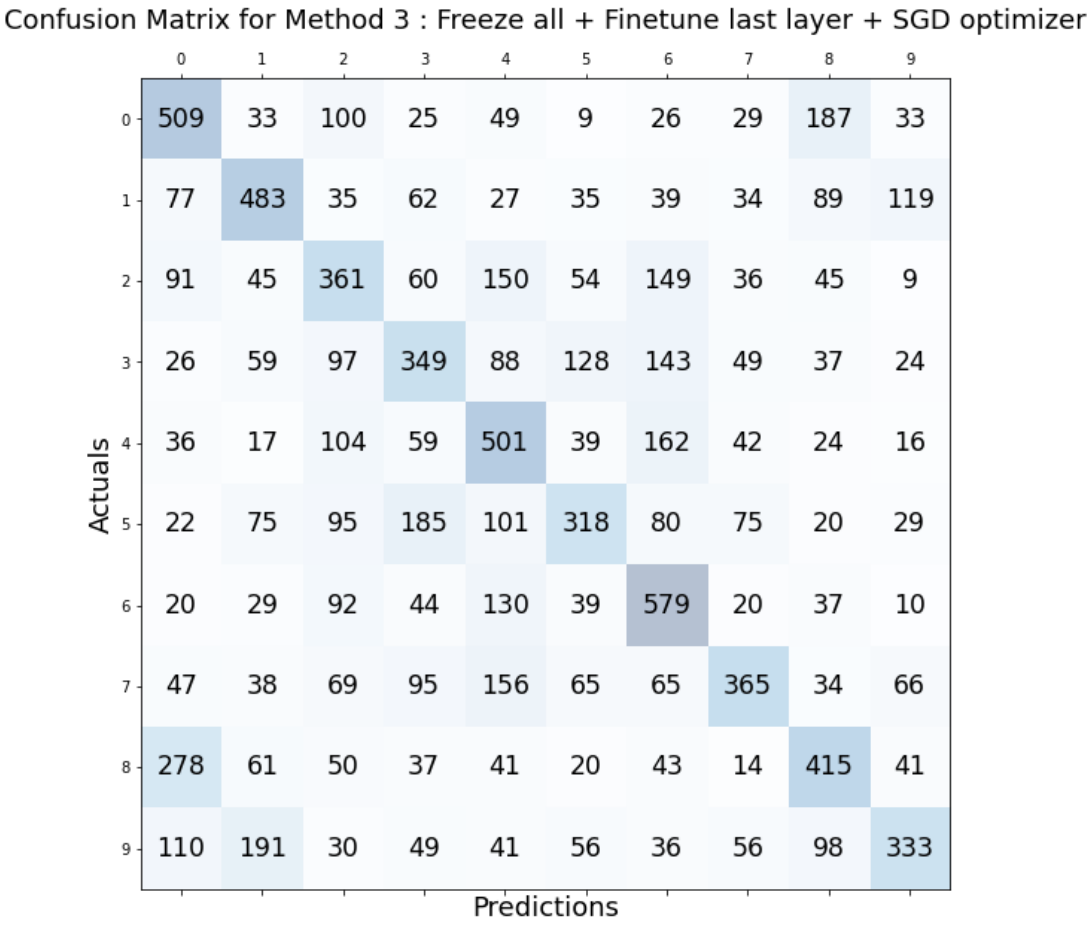
- Train all layers , SGD optimizer - best [ship - 915], worst [cat - 687]



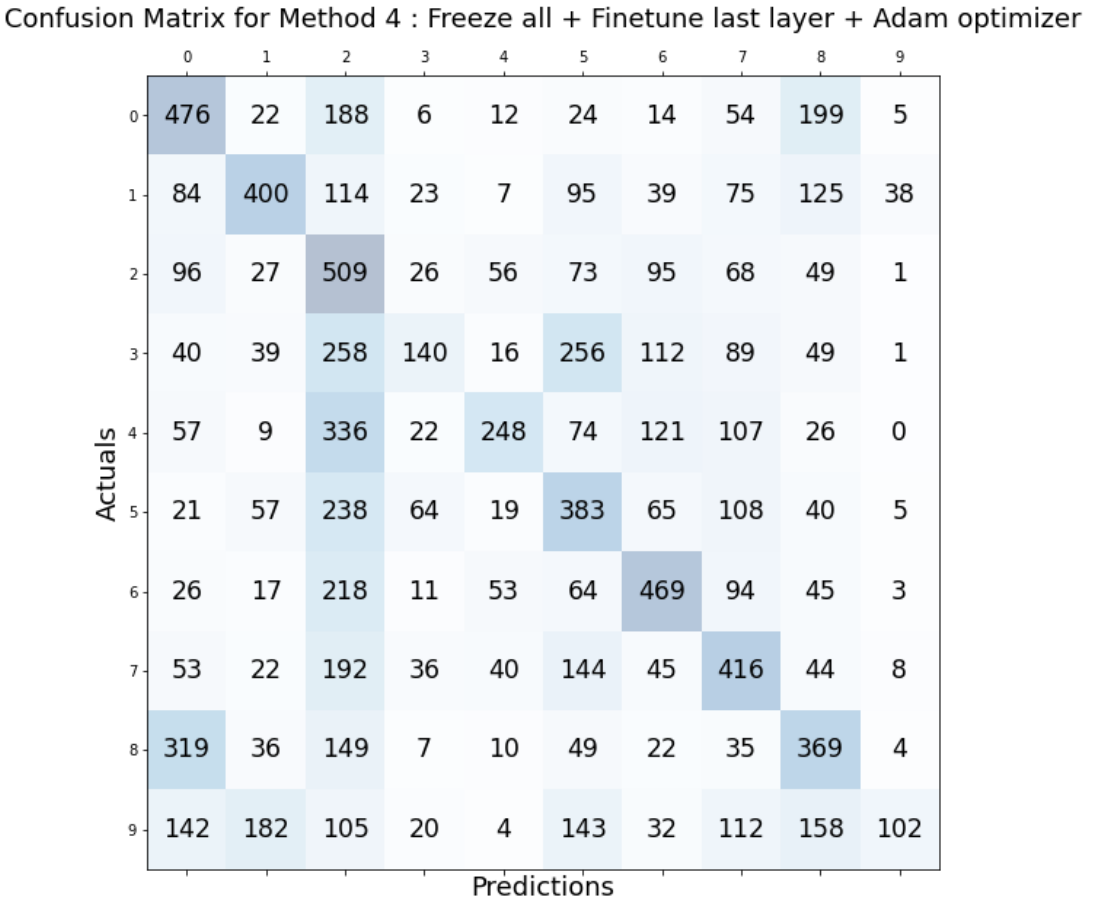
- Train all layers, Adam optimizer - best [car - 911], worst [cat - 702]

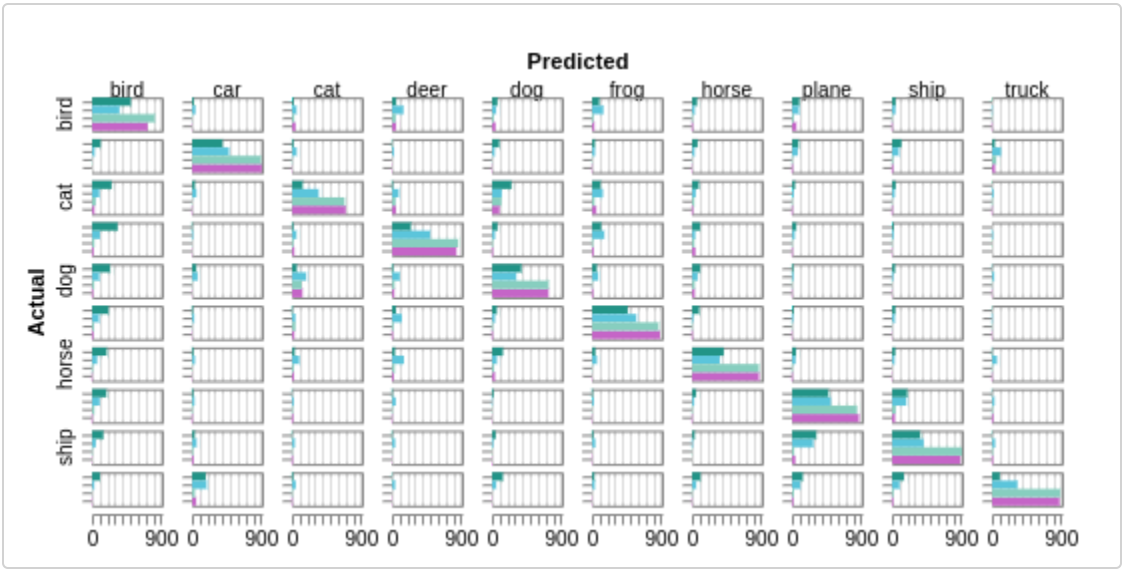


- Fine tune last layer, Freeze other layers, SGD optimizer - best [frog - 579], worst [dog - 318]



- Fine tune last layer, Freeze other layers, Adam optimizer - best [bird - 509], worst [truck - 102]





ACCURACY OF BEST PERFORMING MODELS

The accuracy of each of the variation of the models for 50 epochs can be found below :

- Train all layers , SGD optimizer with lr = 0.001, m = 0.9

Accuracy : 84%

- Train all layers, Adam optimizer with lr = 0.01

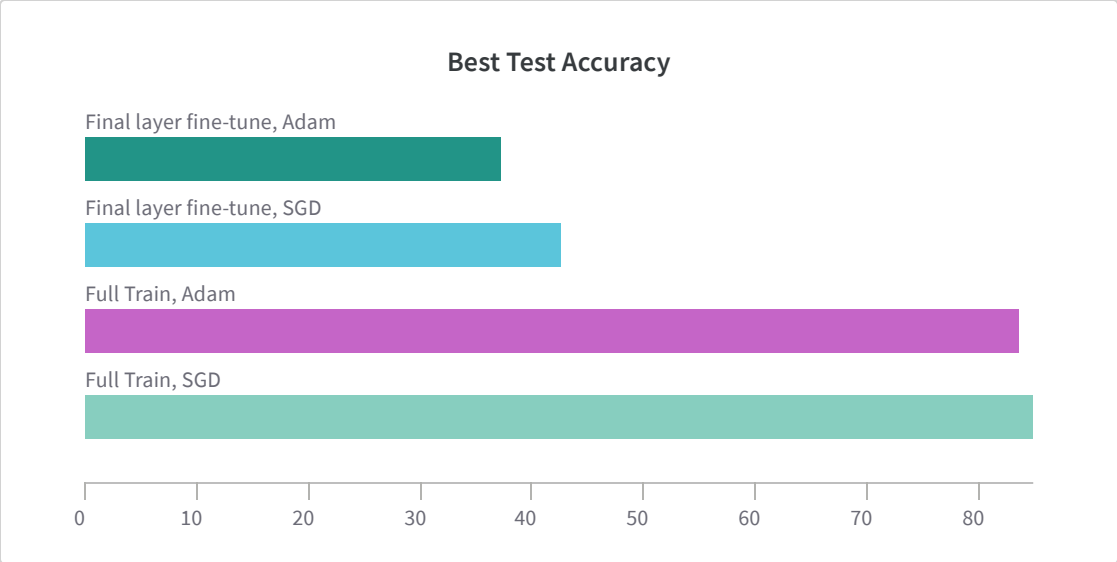
Accuracy : 83%

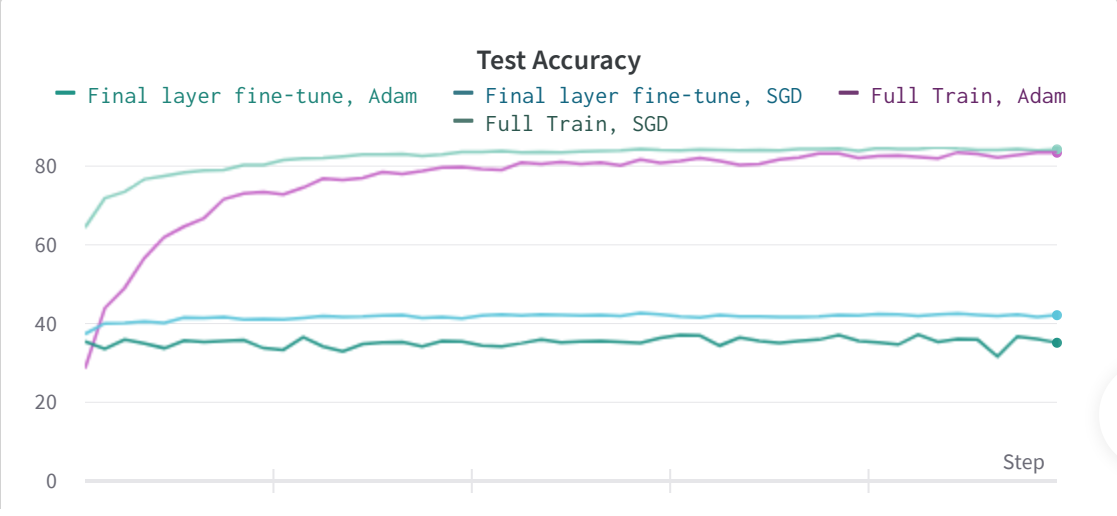
- Fine tune last layer, Freeze other layers, SGD optimizer with lr = 0.001, m = 0.9

Accuracy : 42%

- Fine tune last layer, Freeze other layers, Adam optimizer with lr = 0.01

Accuracy : 35%

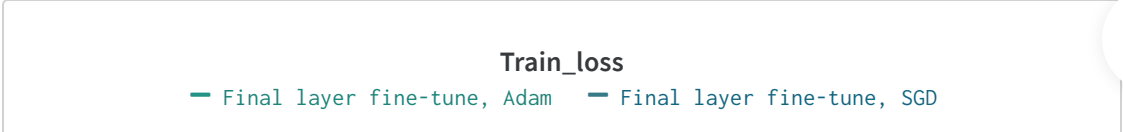


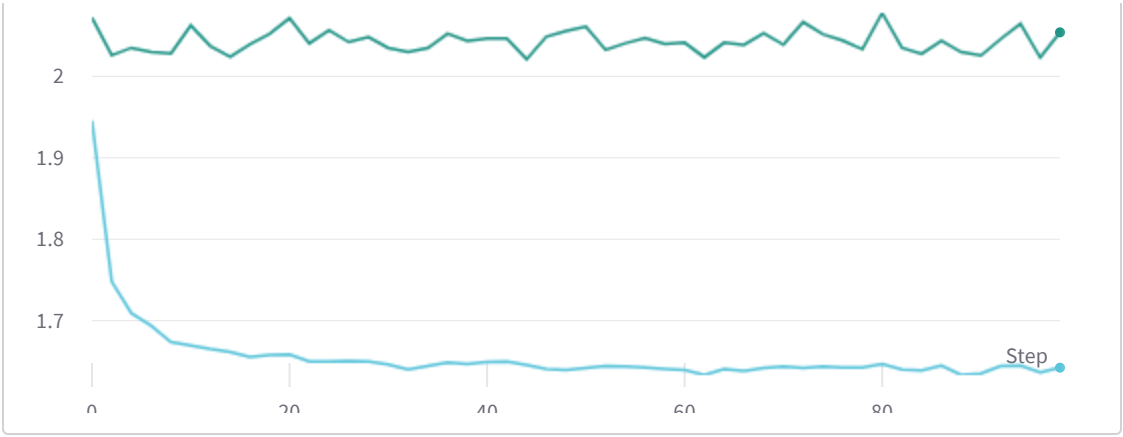



20
40
60
80


Train_loss
Full Train, Adam
Full Train, SGD
0.015
0.01
0.005
0
Step
0
20
40
60
80


Test Loss
Full Train, Adam
Full Train, SGD
0.02
0.015
0.01
0.005
0
Step
20
40
60
80


Train_loss
Final layer fine-tune, Adam
Final layer fine-tune, SGD



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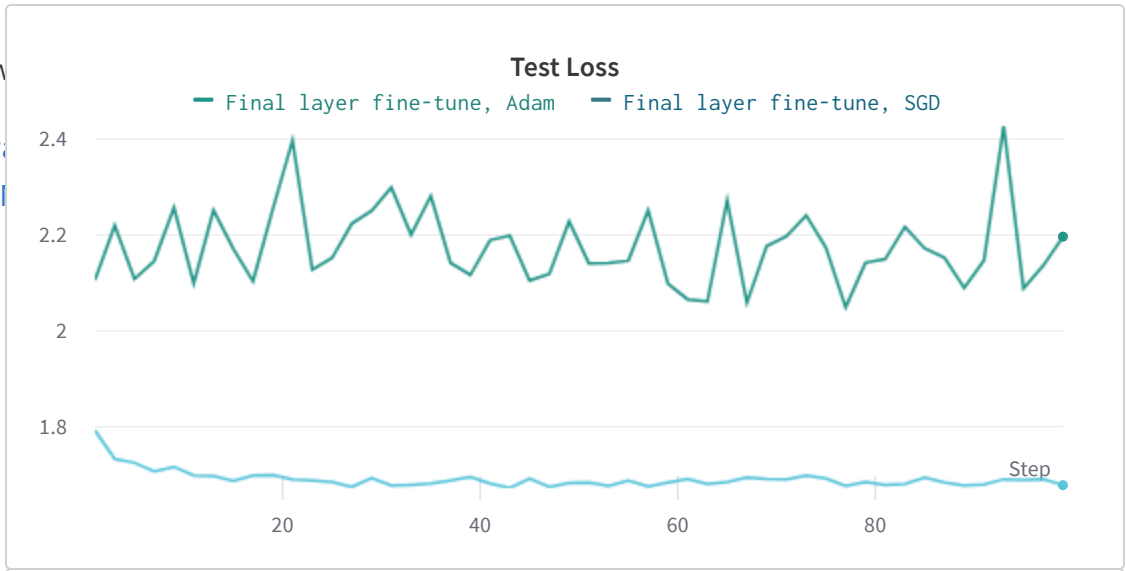

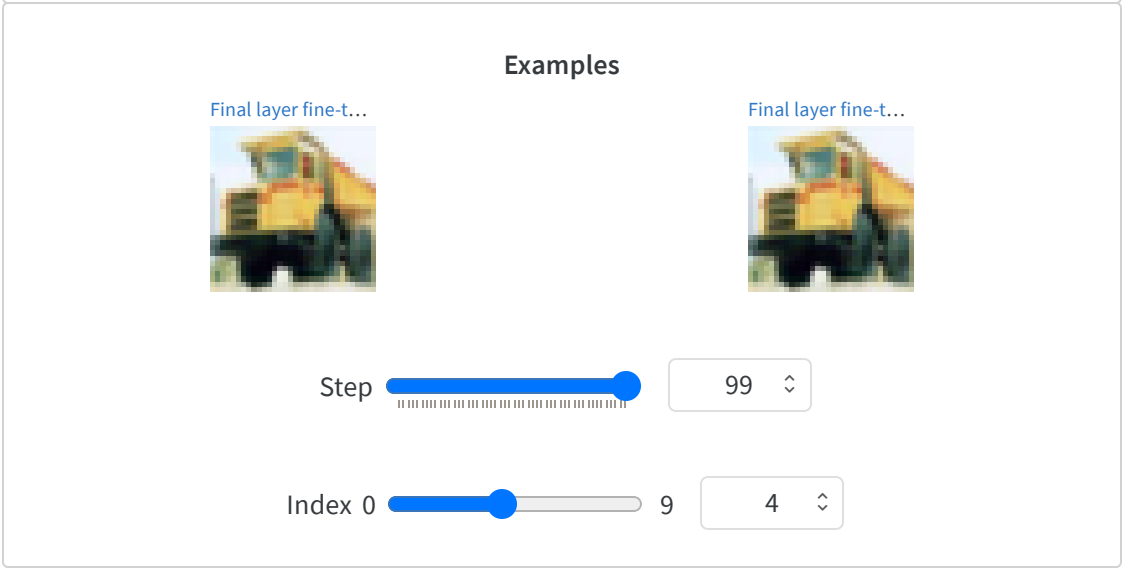

Resnet-18 model representations are not powerful enough to generalize to CIFAR-10 when trained on imagenet which has 1000

classes. This might be a reason for difference in accuracy across various variations of the model.