

Minor 1

Q1

DoB - DD/MM/YY - 03/06/99

RollNo - M22CS061 - ABC - 061

Dataset:

MTech: CIFAR10

Weight Initialization:

MM - 06 Even Xavier

Data Augmentation Details:

DD - 03 Odd 10 degree rotation and gaussian noise

Pooling:

MM - 06 Even AvgPool

Classification details:

$3+6+99 = 108$ Even 0,2,4,6,8

Model Details:

Feature Extraction: Layer 6 Conv and 1 pool with 12 filter

FC Layer: 1FC with 512 nodes

Q2

ABC - 061 odd

Auto encoder with same above details

Number of AE = 3

Classification 1FC with 512 nodes

Question 1

- Augmentation the train dataset
- Remove unwanted classes
- Build Model and apply xavier initialization

```
CNNCIFAR10(  
    (conv_block_1): Sequential(  
        (0): Conv2d(3, 12, kernel_size=(5, 5), stride=(1, 1), padding=(2, 2))  
        (1): Tanh()  
    )  
    (conv_block_2): Sequential(  
        (0): Conv2d(12, 12, kernel_size=(5, 5), stride=(1, 1), padding=(2, 2))  
        (1): Tanh()  
    )  
    (conv_block_3): Sequential(  
        (0): Conv2d(12, 12, kernel_size=(5, 5), stride=(1, 1), padding=(2, 2))  
        (1): Tanh()  
    )  
    (conv_block_4): Sequential(  
        (0): Conv2d(12, 12, kernel_size=(5, 5), stride=(1, 1), padding=(2, 2))  
        (1): Tanh()  
    )  
)
```

```

(conv_block_5): Sequential(
  (0): Conv2d(12, 12, kernel_size=(5, 5), stride=(1, 1), padding=(2, 2))
  (1): Tanh()
)
(conv_block_6): Sequential(
  (0): Conv2d(12, 12, kernel_size=(5, 5), stride=(1, 1), padding=(2, 2))
  (1): Tanh()
  (2): AvgPool2d(kernel_size=3, stride=1, padding=0)
)
(fc1_layer): Sequential(
  (0): Flatten(start_dim=1, end_dim=-1)
  (1): Linear(in_features=10800, out_features=8, bias=True)
  (2): Tanh()
  (3): Linear(in_features=8, out_features=5, bias=True)
)
)

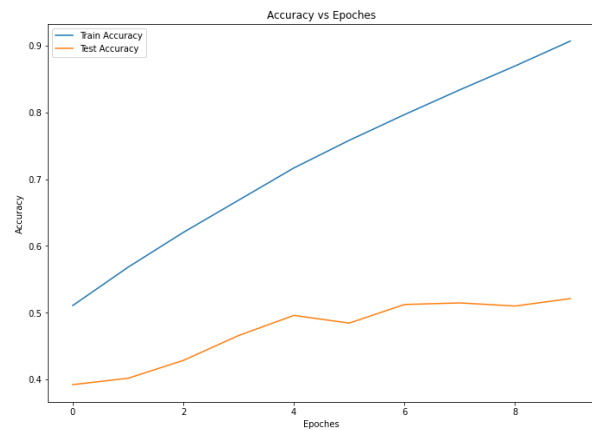
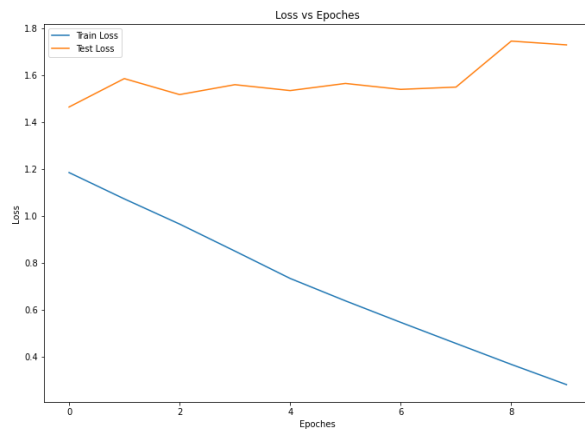
```

- Train and test step loop for model
- Train model and plot the loss and accuracy

```

Epoch: 1  Train Loss: 1.1857 / Test Loss: 1.4652 -/- Train Accuracy: 0.5108 / Test Accuracy: 0.3923
Epoch: 2  Train Loss: 1.0733 / Test Loss: 1.5864 -/- Train Accuracy: 0.5681 / Test Accuracy: 0.4018
Epoch: 3  Train Loss: 0.9660 / Test Loss: 1.5182 -/- Train Accuracy: 0.6203 / Test Accuracy: 0.4286
Epoch: 4  Train Loss: 0.8507 / Test Loss: 1.5604 -/- Train Accuracy: 0.6686 / Test Accuracy: 0.4659
Epoch: 5  Train Loss: 0.7340 / Test Loss: 1.5353 -/- Train Accuracy: 0.7169 / Test Accuracy: 0.4960
Epoch: 6  Train Loss: 0.6384 / Test Loss: 1.5657 -/- Train Accuracy: 0.7582 / Test Accuracy: 0.4845
Epoch: 7  Train Loss: 0.5467 / Test Loss: 1.5404 -/- Train Accuracy: 0.7967 / Test Accuracy: 0.5123
Epoch: 8  Train Loss: 0.4568 / Test Loss: 1.5501 -/- Train Accuracy: 0.8338 / Test Accuracy: 0.5147
Epoch: 9  Train Loss: 0.3673 / Test Loss: 1.7464 -/- Train Accuracy: 0.8696 / Test Accuracy: 0.5100
Epoch: 10 Train Loss: 0.2810 / Test Loss: 1.7303 -/- Train Accuracy: 0.9069 / Test Accuracy: 0.5212

```



- Here, the train loss is decreased but test loss is unstable. Hence, model perform overfitting.
- Hyperparameter:
 - Learning rate: 0.01
 - Batch Size: 32
 - Number of epoch: 10
 - (other are mention early)

Question 2

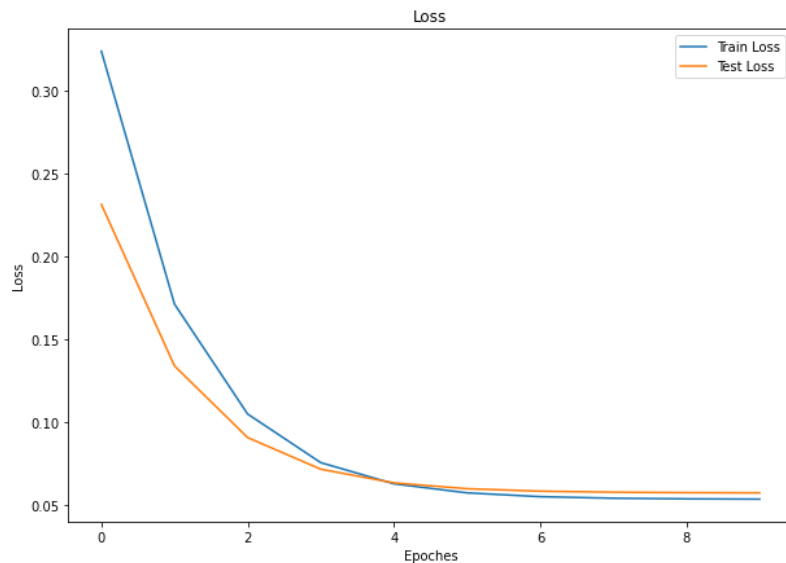
- Augmentation the train dataset
- Remove unwanted classes

- Build Auto encoder Model and apply xavier initialization

```
AutoEncoder(
  (encoder): Sequential(
    (0): Linear(in_features=1024, out_features=512, bias=True)
    (1): Sigmoid()
    (2): Linear(in_features=512, out_features=512, bias=True)
    (3): Sigmoid()
    (4): Linear(in_features=512, out_features=512, bias=True)
  )
  (decoder): Sequential(
    (0): Linear(in_features=512, out_features=512, bias=True)
    (1): Sigmoid()
    (2): Linear(in_features=512, out_features=512, bias=True)
    (3): Sigmoid()
    (4): Linear(in_features=512, out_features=1024, bias=True)
  )
)
```

- Train and test step loop for Auto encoder model
- Train model and plot the loss

```
Epoch: 1 Train Loss: 0.3240 | Test Loss: 0.2315
Epoch: 2 Train Loss: 0.1713 | Test Loss: 0.1340
Epoch: 3 Train Loss: 0.1049 | Test Loss: 0.0907
Epoch: 4 Train Loss: 0.0756 | Test Loss: 0.0716
Epoch: 5 Train Loss: 0.0628 | Test Loss: 0.0634
Epoch: 6 Train Loss: 0.0573 | Test Loss: 0.0598
Epoch: 7 Train Loss: 0.0550 | Test Loss: 0.0583
Epoch: 8 Train Loss: 0.0541 | Test Loss: 0.0577
Epoch: 9 Train Loss: 0.0537 | Test Loss: 0.0574
Epoch: 10 Train Loss: 0.0535 | Test Loss: 0.0573
```



Hyperparameters:

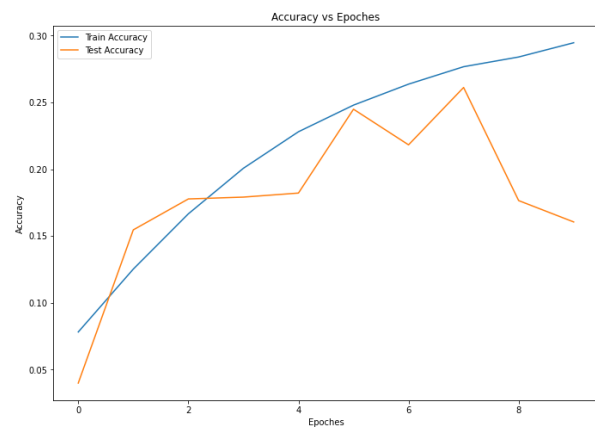
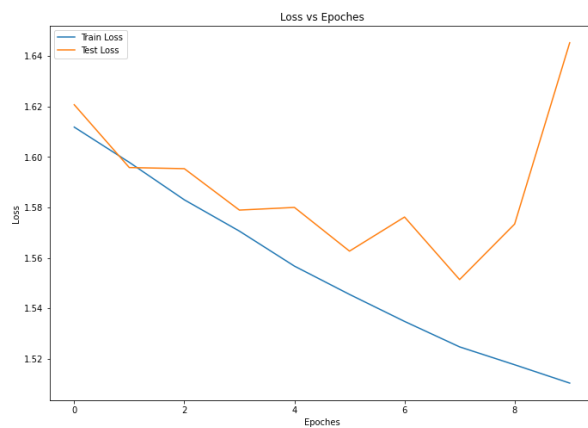
- Learning rate: 0.001
- Batch Size: 32
- Number of epoch: 10
- (other are mention early)

- Build Auto FC Model and apply xavier initialization

```
AutoCIFAR10(
  (layer_stack): Sequential(
    (0): Linear(in_features=512, out_features=512, bias=True)
    (1): Tanh()
    (2): Linear(in_features=512, out_features=5, bias=True)
  )
)
```

- Train and test step loop for FCmodel
- Train model and plot the loss and accuracy

```
Epoch: 1 Train Loss: 1.6183 | Train Acc: 0.08% | Test Loss: 1.6279 | Test Acc: 0.04%
Epoch: 2 Train Loss: 1.5917 | Train Acc: 0.14% | Test Loss: 1.5923 | Test Acc: 0.15%
Epoch: 3 Train Loss: 1.5660 | Train Acc: 0.18% | Test Loss: 1.5874 | Test Acc: 0.18%
Epoch: 4 Train Loss: 1.5498 | Train Acc: 0.22% | Test Loss: 1.5607 | Test Acc: 0.27%
Epoch: 5 Train Loss: 1.5344 | Train Acc: 0.25% | Test Loss: 1.6068 | Test Acc: 0.24%
Epoch: 6 Train Loss: 1.5280 | Train Acc: 0.27% | Test Loss: 1.5527 | Test Acc: 0.20%
Epoch: 7 Train Loss: 1.5196 | Train Acc: 0.29% | Test Loss: 1.6496 | Test Acc: 0.16%
Epoch: 8 Train Loss: 1.5116 | Train Acc: 0.29% | Test Loss: 1.5375 | Test Acc: 0.29%
Epoch: 9 Train Loss: 1.5082 | Train Acc: 0.30% | Test Loss: 1.6473 | Test Acc: 0.12%
Epoch: 10 Train Loss: 1.5022 | Train Acc: 0.31% | Test Loss: 1.6656 | Test Acc: 0.20%
```



- Here, the train loss is decreased but test loss is unstable. Hence, model perform overfitting.

Hyperparameters:

- Learning rate: 0.01
- Batch Size: 32
- Number of epoch: 10
- (other are mention early)

Reference:

[Pytorch Vision](#)

[Auto Encoder](#)

[CNN](#)

[Xavier](#)