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Machine Learning CS 453X

Homework 3

Part I

	Training	Testing
Accuracy	0.9516	0.8762
Cross Entropy	0.19884309939692674	0.424113500864912

Epoch: 81

Training Accuracy in epoch: 0.9478

Training Cross Entropy: 0.2116159862752099

Epoch: 82

Training Accuracy in epoch: 0.9454

Training Cross Entropy: 0.21087304261283954

Epoch: 83

Training Accuracy in epoch: 0.9454

Training Cross Entropy: 0.21010037454669228

Epoch: 84

Training Accuracy in epoch: 0.9458

Training Cross Entropy: 0.21088527443267185

Epoch: 85

Training Accuracy in epoch: 0.9476

Training Cross Entropy: 0.20840437276273843

Epoch: 86

Training Accuracy in epoch: 0.9482

Training Cross Entropy: 0.2076959504595103

Epoch: 87

Training Accuracy in epoch: 0.9466

Training Cross Entropy: 0.20717395017057824

Epoch: 88

Training Accuracy in epoch: 0.9476

Training Cross Entropy: 0.2069279477103497

Epoch: 89

Training Accuracy in epoch: 0.9486

Training Cross Entropy: 0.20575114605783168

Epoch: 90

Training Accuracy in epoch: 0.9482

Training Cross Entropy: 0.20512511466167208

Epoch: 91

Training Accuracy in epoch: 0.9492

Training Cross Entropy: 0.20469459152939765

Epoch: 92

Training Accuracy in epoch: 0.9492

Training Cross Entropy: 0.2038422537651569

Epoch: 93

Training Accuracy in epoch: 0.9496

Training Cross Entropy: 0.2028316476366843

Epoch: 94

Training Accuracy in epoch: 0.9492

Training Cross Entropy: 0.20224678888269804

Epoch: 95

Training Accuracy in epoch: 0.9488

Training Cross Entropy: 0.2016114014776356

Epoch: 96
Training Accuracy in epoch: 0.9514
Training Cross Entropy: 0.20113181410134406

Epoch: 97
Training Accuracy in epoch: 0.9504
Training Cross Entropy: 0.20030958467428658

Epoch: 98
Training Accuracy in epoch: 0.9512
Training Cross Entropy: 0.20009089271942598

Epoch: 99
Training Accuracy in epoch: 0.9496
Training Cross Entropy: 0.19939178623242557

Epoch: 100
Training Accuracy in epoch: 0.9516
Training Cross Entropy: 0.19884309939692676

Part II

	Training	Testing
Accuracy	0.9006666666666666	0.865
Cross Entropy	0.3672603578243321	0.4609717552872451

Epoch: 81
Training Accuracy in epoch: 0.8961333333333333
Training Cross Entropy: 0.37594511971760675

Epoch: 82
Training Accuracy in epoch: 0.8987333333333334
Training Cross Entropy: 0.3742892211337215

Epoch: 83

Training Accuracy in epoch: 0.8972

Training Cross Entropy: 0.3745720064676675

Epoch: 84

Training Accuracy in epoch: 0.8984666666666666

Training Cross Entropy: 0.3729435625576648

Epoch: 85

Training Accuracy in epoch: 0.8978

Training Cross Entropy: 0.37353935517815917

Epoch: 86

Training Accuracy in epoch: 0.8978

Training Cross Entropy: 0.3743605978949844

Epoch: 87

Training Accuracy in epoch: 0.8984666666666666

Training Cross Entropy: 0.3725728156512132

Epoch: 88

Training Accuracy in epoch: 0.8986666666666666

Training Cross Entropy: 0.3725379861881836

Epoch: 89

Training Accuracy in epoch: 0.8992666666666667

Training Cross Entropy: 0.37091541981175813

Epoch: 90

Training Accuracy in epoch: 0.8975333333333333

Training Cross Entropy: 0.37233899553469524

Epoch: 91

Training Accuracy in epoch: 0.899

Training Cross Entropy: 0.3700646015355099

Epoch: 92

Training Accuracy in epoch: 0.8996
Training Cross Entropy: 0.3693344599307876

Epoch: 93
Training Accuracy in epoch: 0.8985333333333333
Training Cross Entropy: 0.3694649978074504

Epoch: 94
Training Accuracy in epoch: 0.8999333333333334
Training Cross Entropy: 0.3683987901851392

Epoch: 95
Training Accuracy in epoch: 0.8991333333333333
Training Cross Entropy: 0.3689901793837204

Epoch: 96
Training Accuracy in epoch: 0.9006
Training Cross Entropy: 0.3683554740451706

Epoch: 97
Training Accuracy in epoch: 0.9004
Training Cross Entropy: 0.36720906430769795

Epoch: 98
Training Accuracy in epoch: 0.9006
Training Cross Entropy: 0.3668931261783977

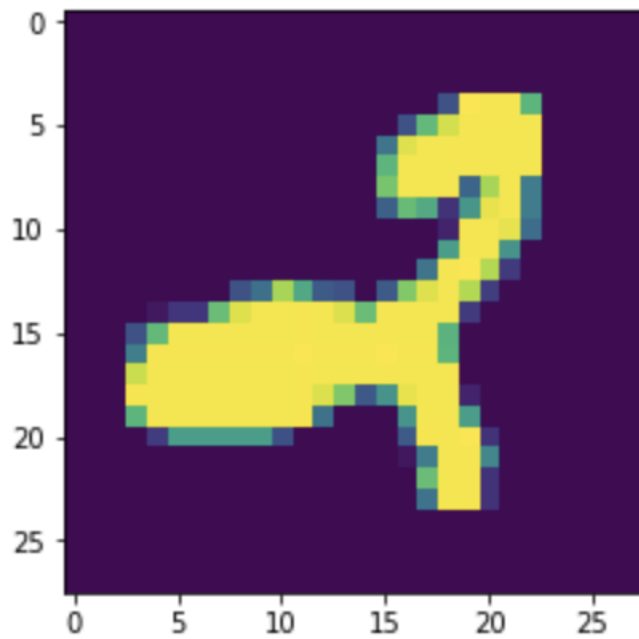
Epoch: 99
Training Accuracy in epoch: 0.8994
Training Cross Entropy: 0.3681080804718927

Epoch: 100
Training Accuracy in epoch: 0.9006666666666666
Training Cross Entropy: 0.36726035782433203

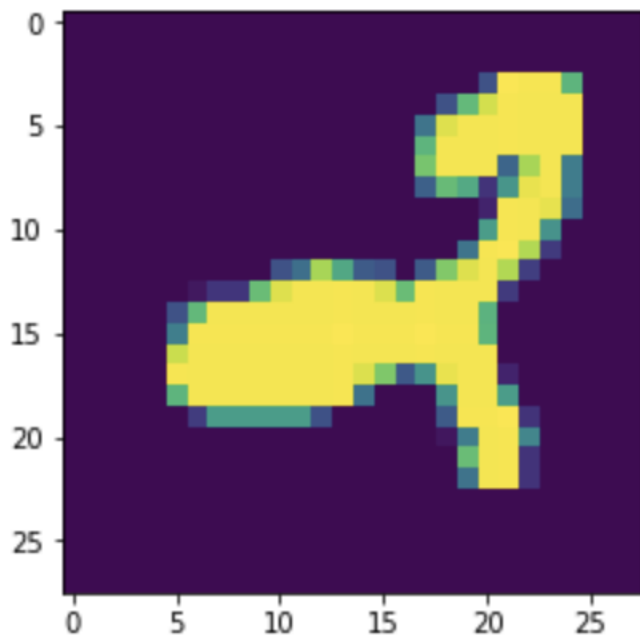
Data Augmentation

Translation (Shift up by 1 pixel and right by 2 pixels)

Original:

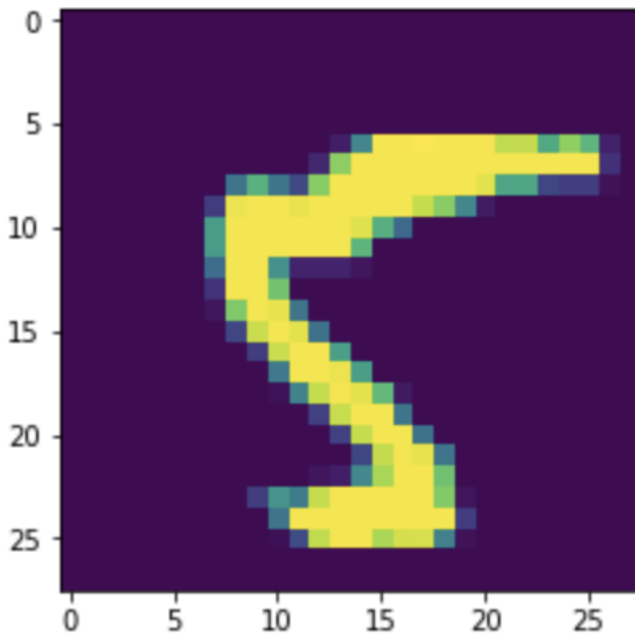


Transformed:

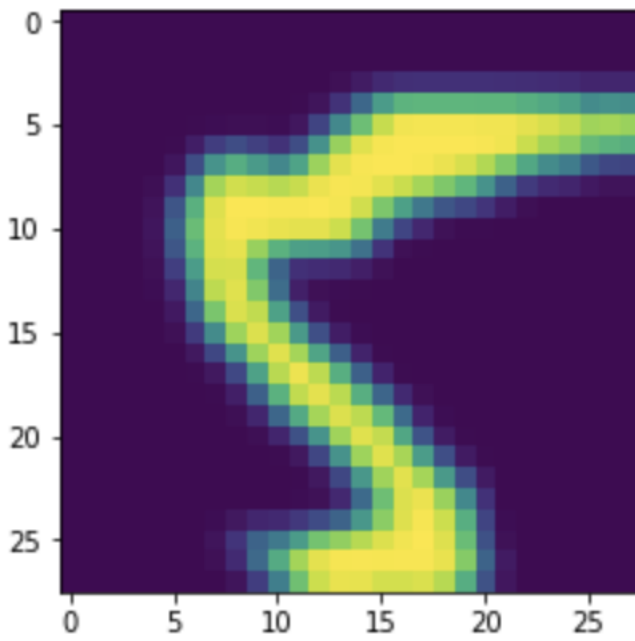


Zoom

Original:

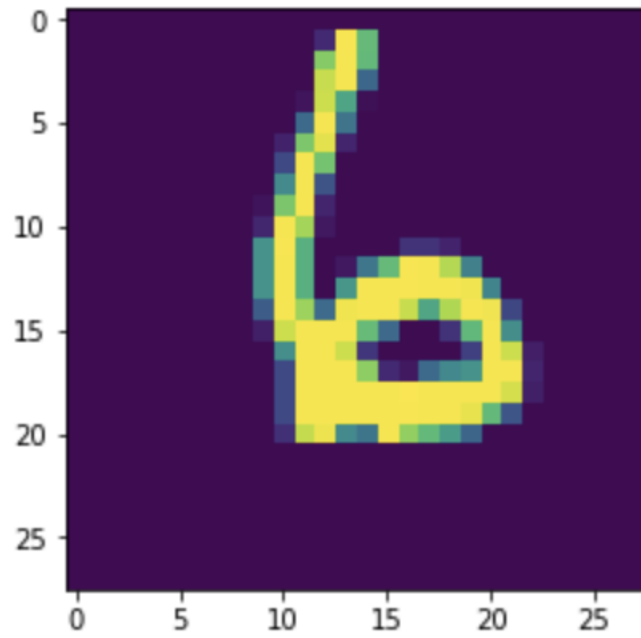


Transformed:

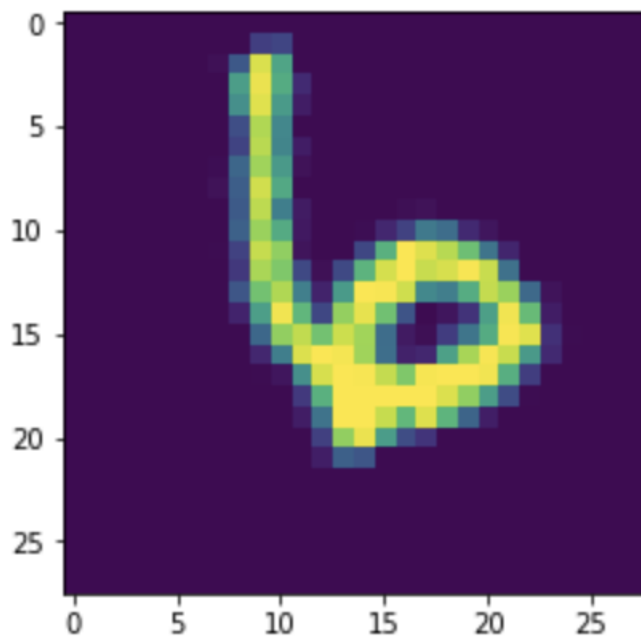


Rotate

Original:

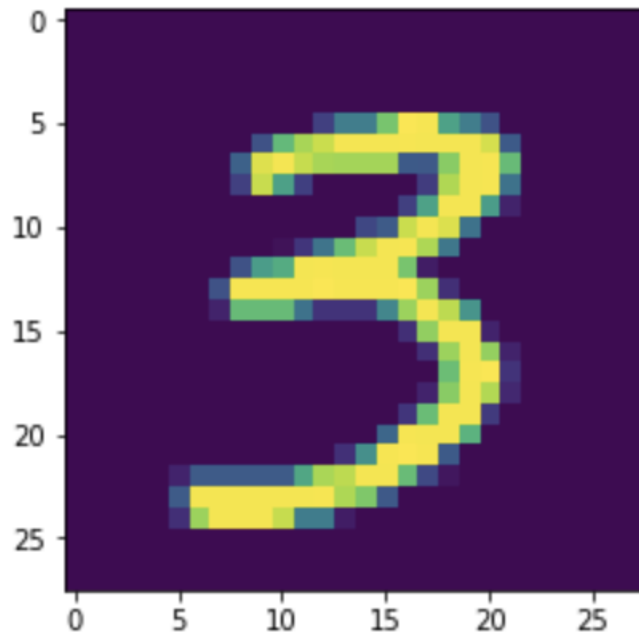


Transformed:



Noise

Original:



Transformed:

