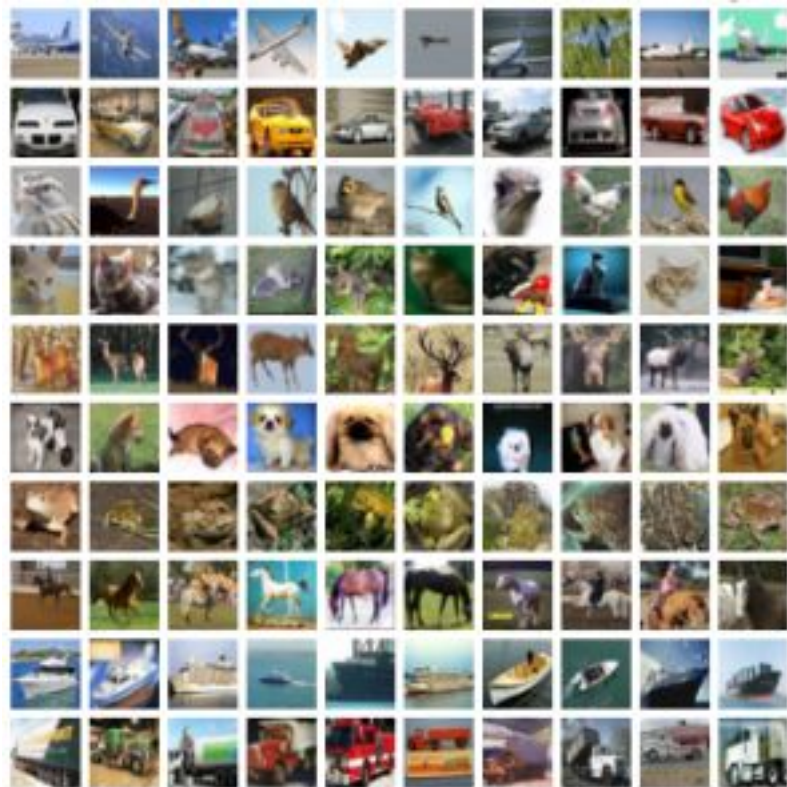


Image Classification

CS551 Mini Project

Overview of the problem

- Classification of various distinct objects.
 - Animal :- cat, dog
 - Person :- boy, girl
 - Vehicle :- car, truck
 -
- Dataset
 - CIFAR 100
 - CIFAR 10
 - ImageNet



Literature Survey

- [1] describes the use of convolutional networks for image classification.
 - Model was trained for 5 epochs with around 20% error rate
 -
- [2] explains how a large convolutional network was used to classify 1.3 million high resolution images from LSVRC 2010,
 - It had 1000 classes
 - 500,000 neurons in 5 convolutional layer
 - 2 fully connected layer with 1000 way softmax
 - On test data, top-1 and top-5 error rates of 39.7% and 18.9%



CIFAR 100

- 60000 images, 600 per class
 - ◆ Each image is preprocessed to $32*32*3$ matrix (row,column,colorchannels)
 - 100 classes (used as top-1)
 - ◆ Can be grouped into 20 superclasses (used as top-5)
 - 50000 are taken as training images
 - 10000 are taken as test images
-

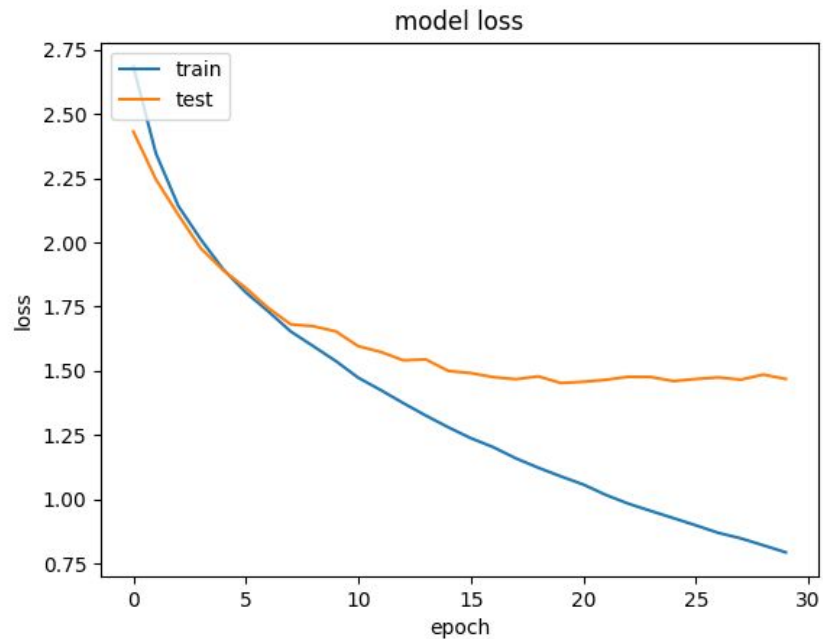
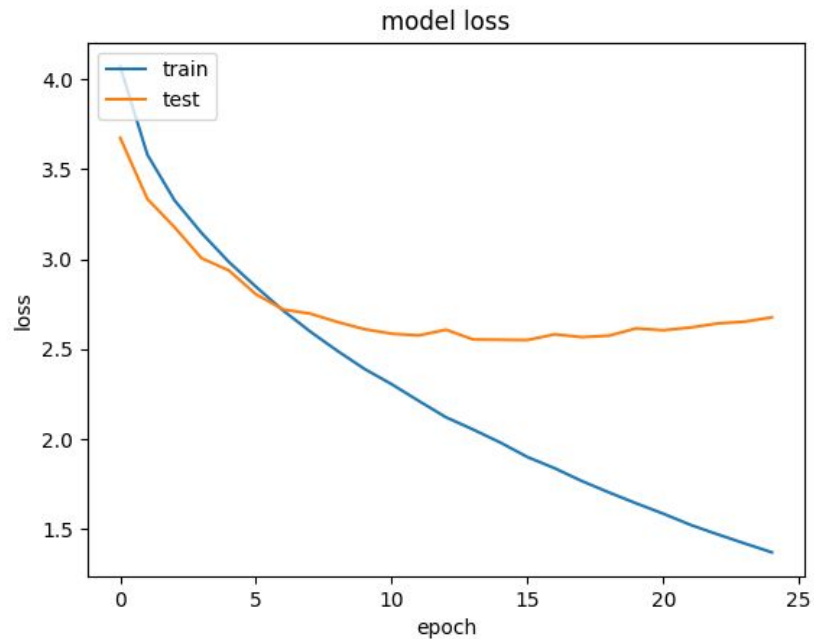
Convolutional Network 1

- ★ 2 Convolutional layer of size 3*3 with 32 feature maps, ReLu activation function
- ★ Output is then flattened
- ★ Fully connected Dense layer of size 100, softmax activation
- ★ Resultant accuracy : - 38%

Convolutional Network 2

- ★ Feature Layers
 - 5 Convolutional Layer of size 3*3
 - ReLu activation
 - Final Max Pooling 2*2
 - Final Flattening of output from last layer
 - ★ Classification Layers
 - Dense layer size 512, ReLu activation
 - Output Dense layer size 100, softmax activation
 - ★ Resultant accuracy :- 51%
-

Results

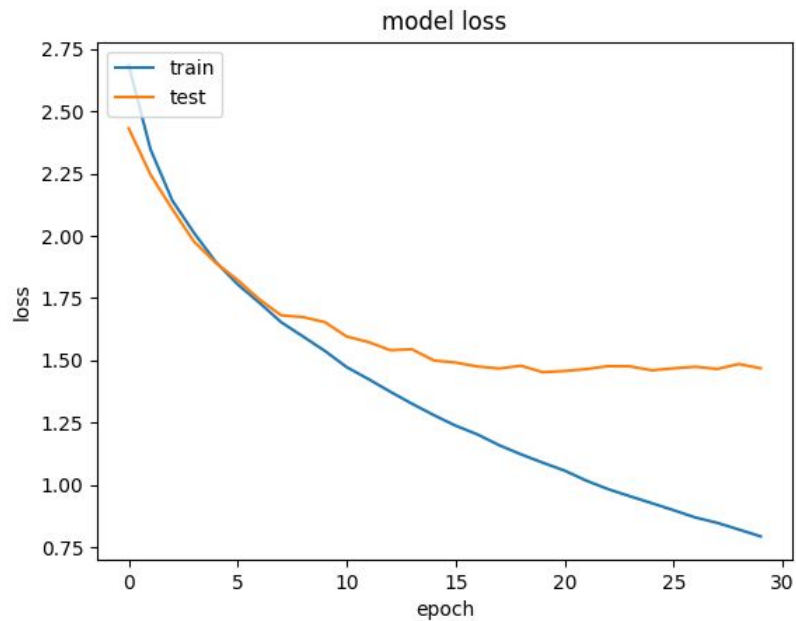
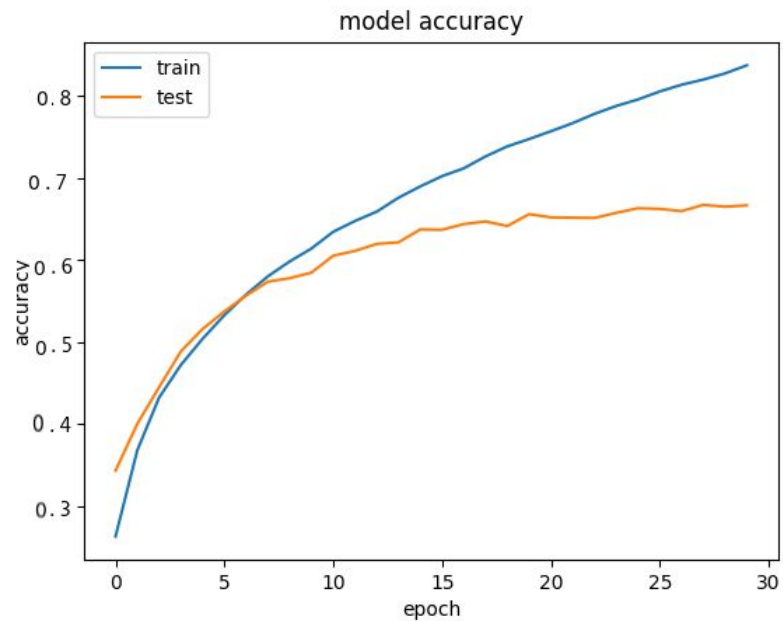


Final Network

Added 0.2 dropout
(Reduced Overfitting)

- Same as Network 2
 - Total 5 feature layers with final flattening
 - 2 classification layer
 - Each feature layer has an extra parameter of 0.2 dropout
 - 25 - 30 epochs required for saturation
 - Resultant test accuracy increased from 51% to 62% in 20 - 25 epochs
-

Results : Final Network



What information is our network extracting?

- Color Information :- this is basis info which all networks extract from image.
 - HOG like features
 - Gradient in both x and y direction
-



75.72%

Fast and Accurate Deep Network Learning by Exponential Linear Units

Our Accuracy : 62.54%

References

1. Ciresan, Dan C., et al. "Flexible, high performance convolutional neural networks for image classification." IJCAI Proceedings-International Joint Conference on Artificial Intelligence. Vol. 22. No. 1. 2011.
2. Krizhevsky, Alex, Ilya Sutskever, and Geoffrey E. Hinton. "Imagenet classification with deep convolutional neural networks." Advances in neural information processing systems. 2012



Thank You

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