Report

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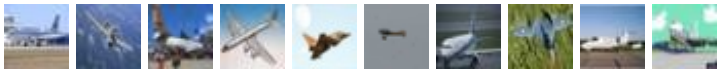
Introduction: CIFAR-10 is an established computer-vision dataset used for object recognition. It is a subset of the 80 million tiny images dataset and consists of 60,000 32x32 color images containing one of 10 object classes, with 6000 images per class.

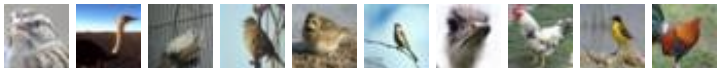
Here the classes in the dataset, as well as 10 random images from each:

airplane

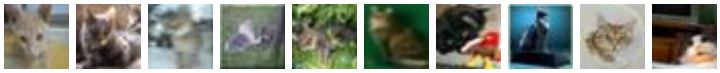


automobile

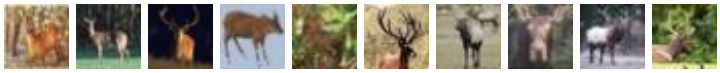
bird



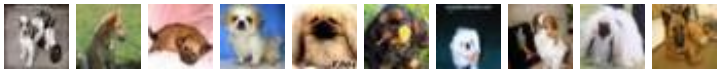
cat



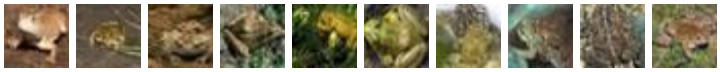
deer



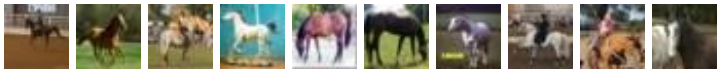
dog



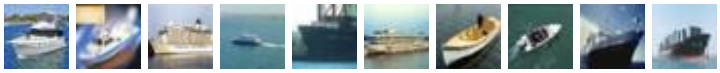
frog



horse



ship



truck

Here designed a network that combines supervised and unsupervised architectures in one model to achieve a classification on CIFAR-10 datasets. So, for this I build a encoder model and this model compressed the image data and after decoder model decompressed the data and again this model reconstruct the original image.

Another part of this notebook is to use the Pre-Training CNNs Using Convolutional Autoencoders to classify the image.

For completing this followed some module:

- ☐ Tensorflow
- ☐ Keras

- ☐ Scikit-learn
- ☐ Pandas
- ☐ Numpy

- ☐ cifar10
- ☐ to_categorical

Splitting Datasets into four parts

1. train_images
2. train_labels
3. test_images
4. test_labels

It is clear that the images of the datasets are indeed very small compared to modern photographs; it can be challenging to see what exactly is represented in some of the images given the extremely low Untitled 12/3/22 11:42 PM resolution. This low resolution is likely the cause of the limited performance that top-of-the-line algorithms are able to achieve on the dataset. The max pixel value is 255 for each channel. Normalize the images to a number from 0 to 1. Image has 3 channels (R,G,B) and each value in the channel can range from 0 to 255. Hence to normalize in 0-->1 range, we need to divide it by 255

Used 3 different optimizers into my task for compare the accuracy and loss values

1. Adam
2. Rmsprop
3. SGD

And 3 loss functions:

1. *sparse_categorical_crossentropy*
2. categorical_crossentropy
3. binary_crossentropy

Cifer10 Dataset Using ADAM optimizer with sparse_categorical_crossentropy loss Function

Summary of the model:

Model: "sequential"

Layer (type)	Output Shape	Param #

conv2d (Conv2D)	(None, 28, 28, 32)	2432
max_pooling2d (MaxPooling2D)	(None, 14, 14, 32)	0
conv2d_1 (Conv2D)	(None, 12, 12, 64)	18496
max_pooling2d_1 (MaxPooling2	(None, 6, 6, 64)	0
conv2d_2 (Conv2D)	(None, 4, 4, 128)	73856
max_pooling2d_2 (MaxPooling2	(None, 2, 2, 128)	0
flatten (Flatten)	(None, 512)	0
dense (Dense)	(None, 128)	65664
dense_1 (Dense)	(None, 64)	8256
dense_2 (Dense)	(None, 10)	650

Total params: 169,354

Trainable params: 169,354

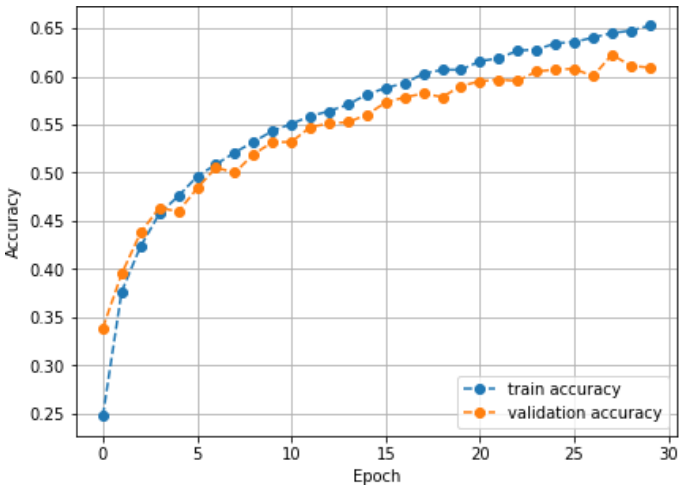
Non-trainable params: 0

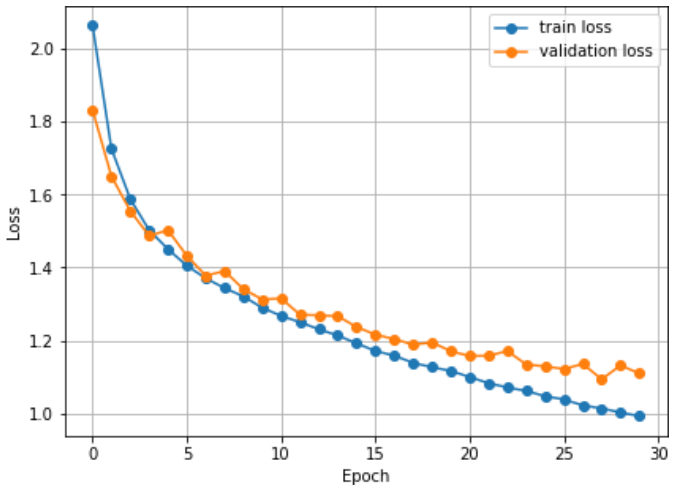
Training the model:

model.fit(x=train_images_norm,y=train_labels,epochs=30,batch_size=128,validation_split=0.3)

number of epochs was 30 and batch size=128

Data accuracy & loss chart:





After evaluating the model
Model Losses: 1.0952
Model accuracy: 0.6175

Cifer10 DataSet Using RMSPROP optimizer with categorical_crossentropy loss Function

Summary of the model:

Model: "sequential_2"

Layer (type)	Output Shape	Param #
conv2d_7 (Conv2D)	(None, 28, 28, 32)	2432
max_pooling2d_5 (MaxPooling 2D)	(None, 14, 14, 32)	0
conv2d_8 (Conv2D)	(None, 12, 12, 64)	18496
max_pooling2d_6 (MaxPooling 2D)	(None, 6, 6, 64)	0
conv2d_9 (Conv2D)	(None, 4, 4, 128)	73856
max_pooling2d_7 (MaxPooling 2D)	(None, 2, 2, 128)	0
flatten_2 (Flatten)	(None, 512)	0
dense_6 (Dense)	(None, 128)	65664
dense_7 (Dense)	(None, 256)	33024
dense_8 (Dense)	(None, 10)	2570

Total params: 196,042

Trainable params: 196,042

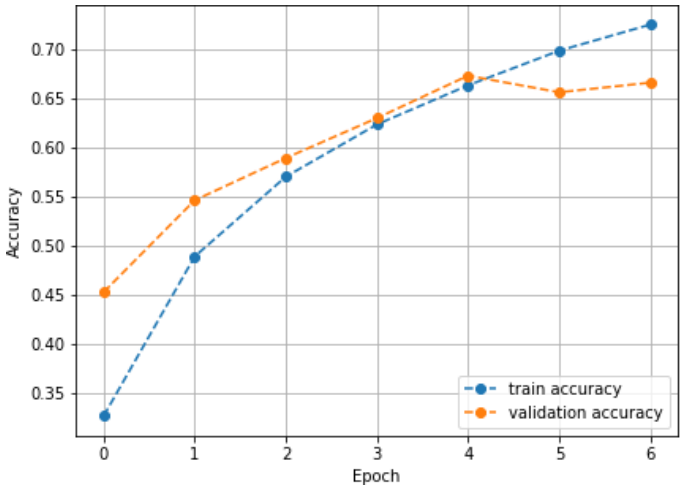
Non-trainable params: 0

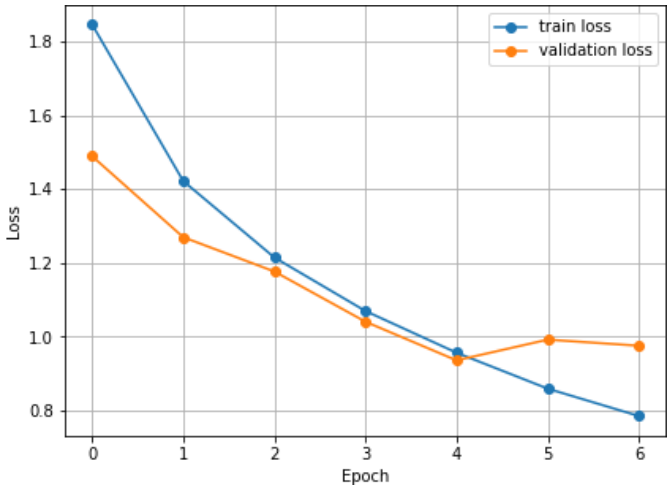
Training the model:

h=model.fit(train_images_norm, y_train_en, batch_size=128, epochs=20, validation_data=(test_images_norm, y_test_en),callbacks=callbacks)

number of epochs was 20 and batch size=128

Data accuracy & loss chart:





After evaluating the model

Model Losses: 0.9363400340080261
Model accuracy: 0.673399984836

Cifer10 DataSet Using SGD optimizer with binary_crossentropy loss Function

Summary of the model:

Model: "sequential_3"

Layer (type)	Output Shape	Param #
conv2d_9 (Conv2D)	(None, 28, 28, 32)	2432
max_pooling2d_9 (MaxPooling 2D)	(None, 14, 14, 32)	0
conv2d_10 (Conv2D)	(None, 12, 12, 64)	18496
max_pooling2d_10 (MaxPoolin g2D)	(None, 6, 6, 64)	0
conv2d_11 (Conv2D)	(None, 4, 4, 128)	73856
max_pooling2d_11 (MaxPoolin g2D)	(None, 2, 2, 128)	0
flatten_3 (Flatten)	(None, 512)	0
dense_9 (Dense)	(None, 128)	65664
dense_10 (Dense)	(None, 256)	33024
dense_11 (Dense)	(None, 10)	2570

Total params: 196,042

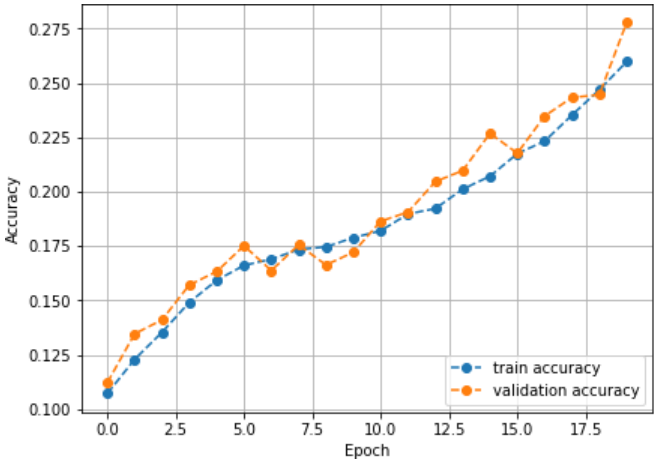
Trainable params: 196,042

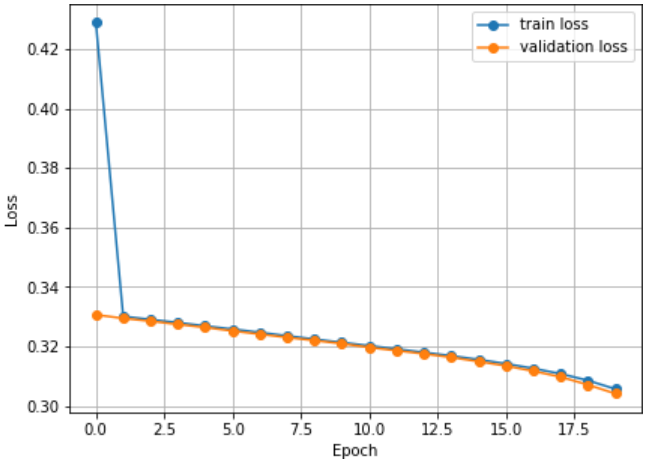
Non-trainable params: 0

Training the model:

h=model.fit(train_images_norm, y_train_en, batch_size=128, epochs=20, validation_data=(test_images_norm, y_test_en),callbacks=callbacks)

number of epochs was 20 and batch size=128





After evaluating the model

Model Losses: 0.3042064309120178

Model accuracy: 0.2777999937534332

Summary:

Optimizers Name	Loss	Accuracy
Adam	1.0952	0.6175
RmsProp	0.9363	0.6734
SGD	0.3042	0.2778

I have got different accuracy metrics for different optimizers using condition.