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Report – 9

Question 1 : **Logistics Regression On Iris Data Set**

**1 ) Load the Iris dataset, randomly split it into training set 90% and test set 10%.**

- Split the data using 135 , 15 as train and test

2 )

- Matrix multiplication of placeholder, with weights and bias
- multiplication with y to get the output loss over the training dataset

$$\sigma(\mathbf{z})_j = \frac{e^{z_j}}{\sum_{k=1}^{K} e^{z_k}}$$

which allows us to interpret the outputs as probabilities, while cross-entropy loss is what we use to measure the error at a softmax layer, and is given by[1]

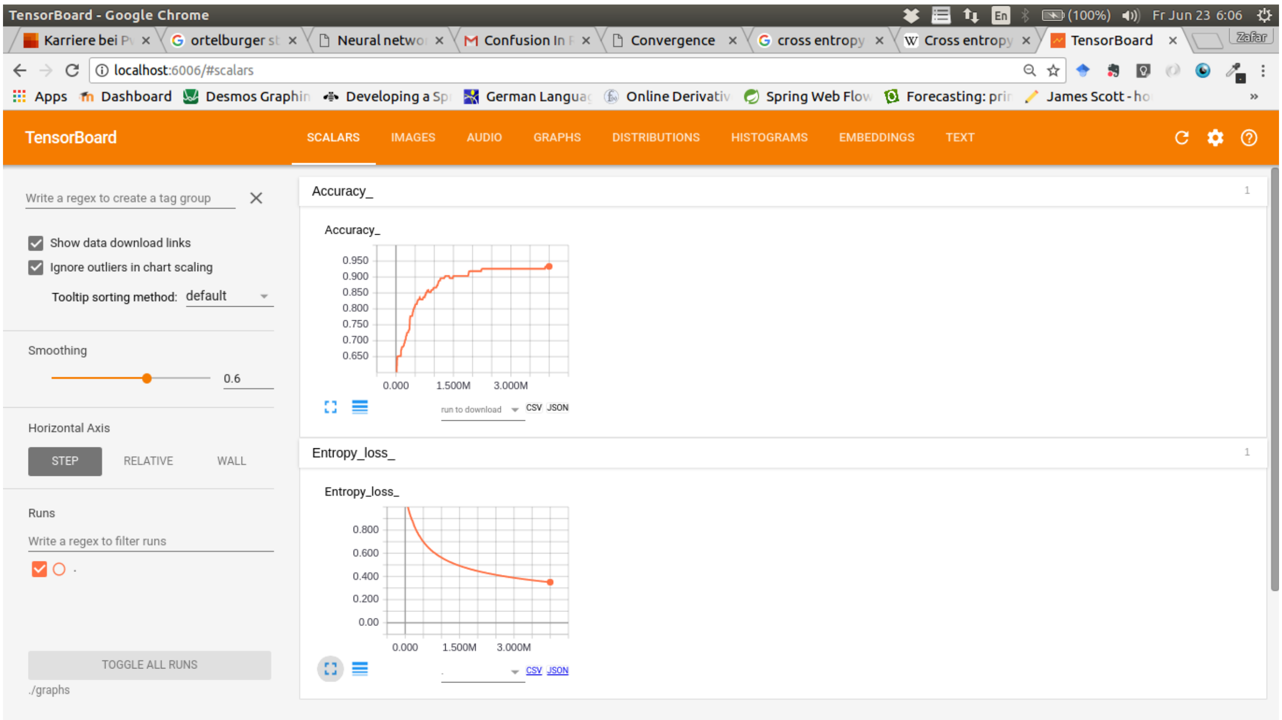
$$L(\mathbf{w}) = \frac{1}{N}\sum_{n=1}^{N} H(p_n, q_n) = -\frac{1}{N}\sum_{n=1}^{N} \left[ y_n \log \hat{y}_n + (1 - y_n)\log(1 - \hat{y}_n) \right],$$

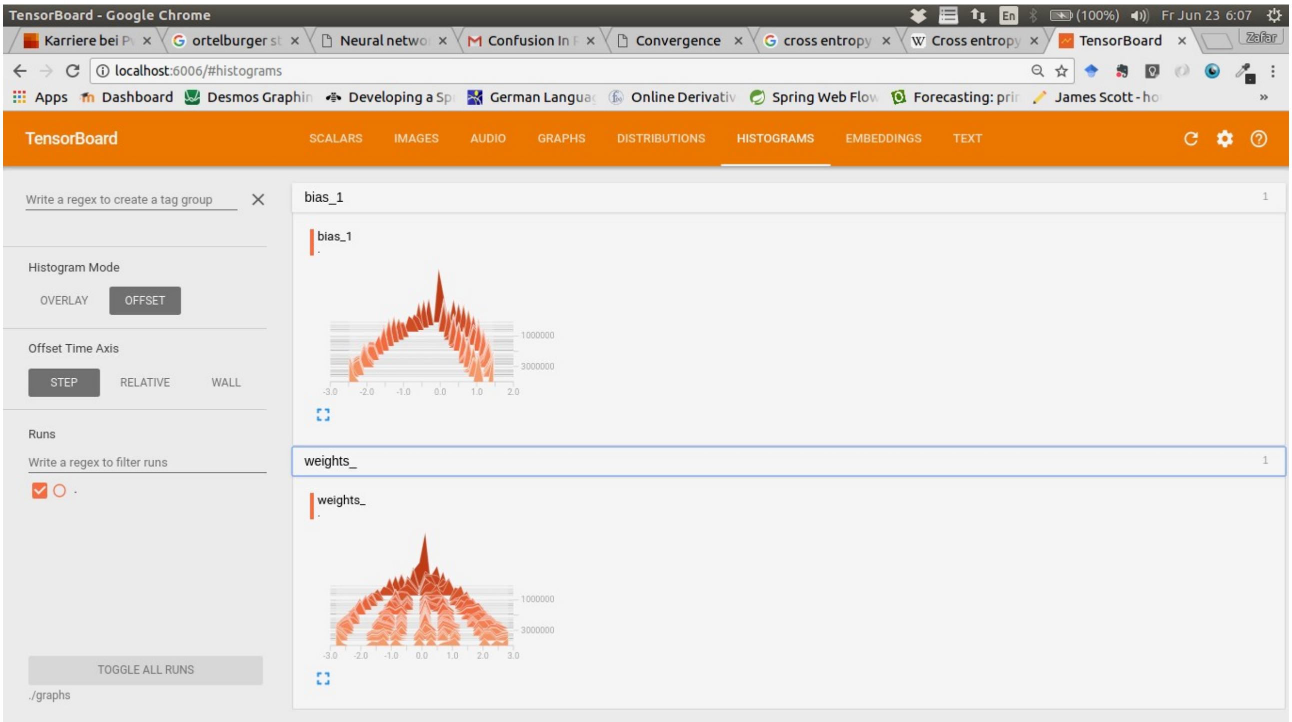
```
y = tf.nn.softmax(tf.matmul(x, W) + b)

cross_entropy = tf.reduce_mean(-tf.reduce_sum(y_ * tf.log(y), reduction_indices=[1]))
```

**3) Train the model on the training set and make prediction on the test set**

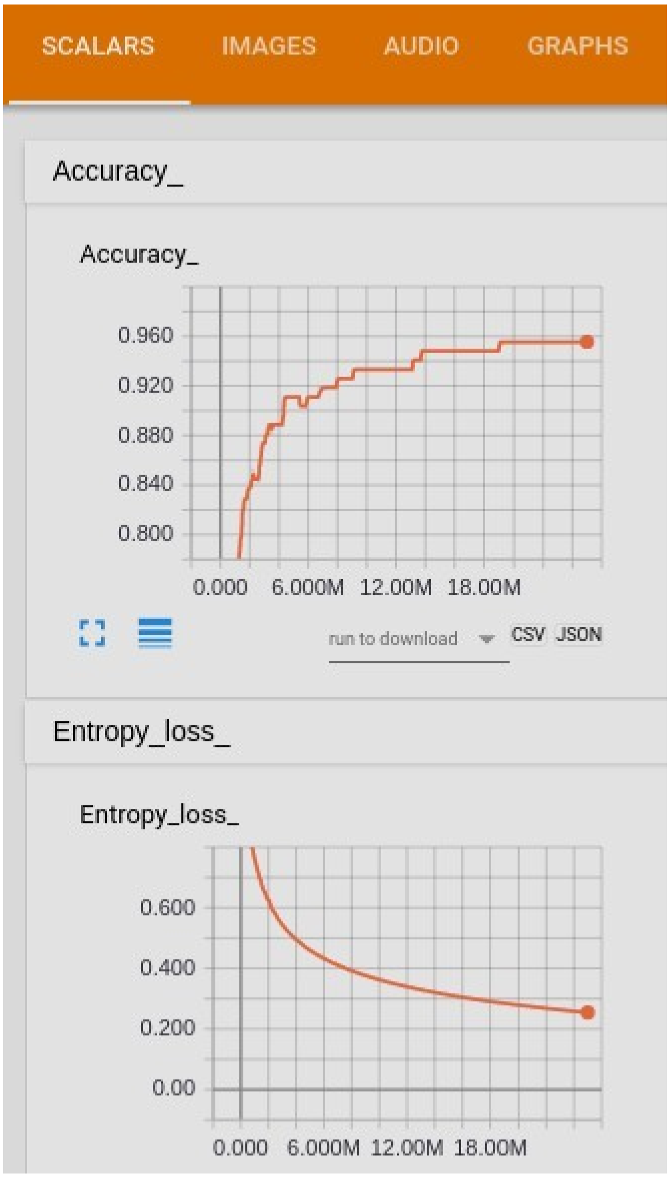
- training the model using two optimizer function
  - AdamOptimizer
  - GradientDecentOptimizer
- Leanining rate 0.05
- The accuracy that I received
  - using the gradient decent It didn’t converged although I randomly shuffled, normalized the dataset, but still the training error was not satisfactory so is the case with test set, received 93 % accuracy , if I try to increase the learning rate the it gave little better accuracy But if i run this Gradient Decent using 5000 epochs then it gives 100 % accuracy
  - using the AdamOptimizser it converged and received 100% accuracy ( lower training error and 100% accuracy )

## Gradient Decent Optimizer





Epochs : 5000


SCALARS
IMAGES
AUDIO
GRAPHS
Accuracy_
Accuracy_
0.960
0.920
0.880
0.840
0.800
0.000
6.000M
12.00M
18.00M
run to download
CSV
JSON
Entropy_loss_
Entropy_loss_
0.600
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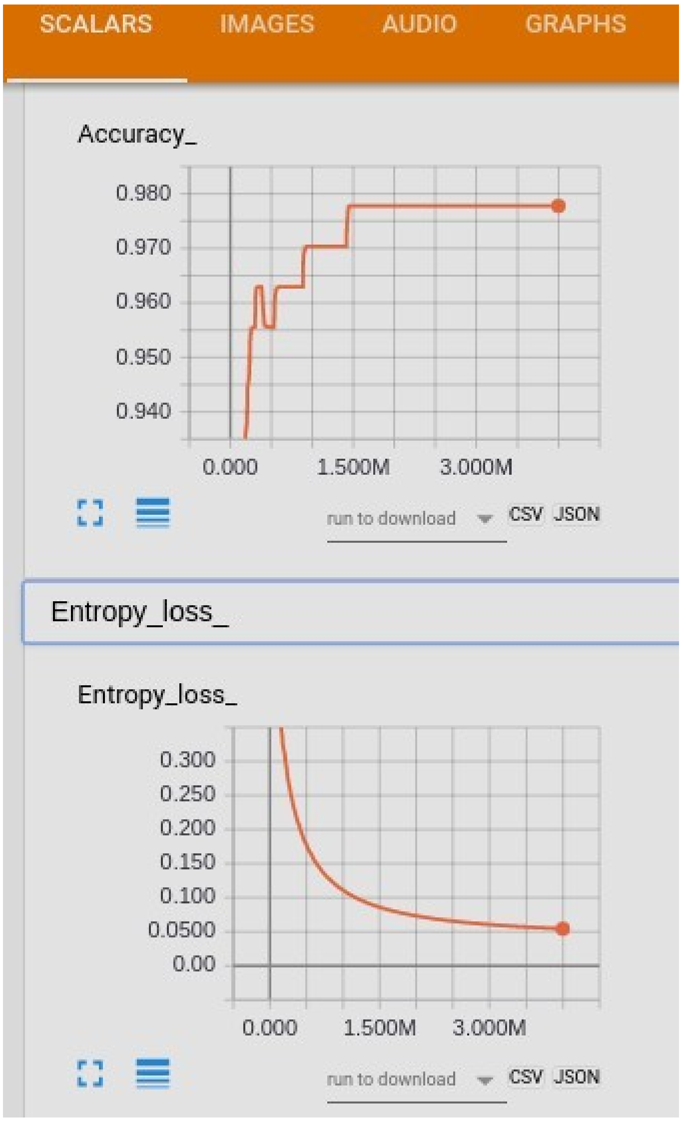
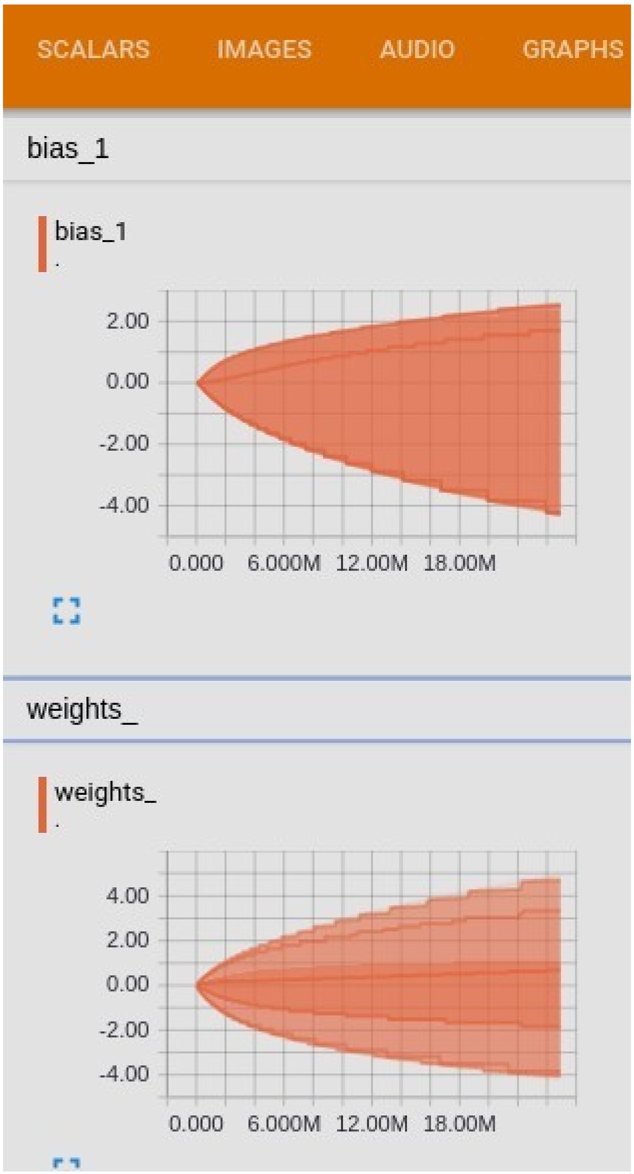
0.200
0.00
0.000
6.000M
12.00M
18.00M

Adam Optimizer






TensorBoard visulization

For this visualization

created scalar variables for entropy loss  and accuracy
while for histogram and distribution using bias and weights

```
tf.summary.scalar("Accuracy:", accuracy)
tf.summary.scalar("Entropy loss:",cross_entropy)
tf.summary.histogram("weights ", W)
tf.summary.histogram("bias",b)
```

**Question 1 : <u>Logistics Regression On the Olivetti faces dataset</u>**

Same execution process

pre-processed the dataset ( same old but without normalizing , as that data is approximately already normalized )

```
def prepData() :
        enc = OneHotEncoder()

        olivetti = datasets.fetch_olivetti_faces()
        X , y = olivetti.data, olivetti.target

        nb_classes = 40
        targets = np.array(y).reshape(-1)
        y_ = one_hot_targets = np.eye(nb_classes)[targets]

        X_train, X_test , Y_train, Y_test = train_test_split(X, y_, test_size=0.10, random_state=42)
```

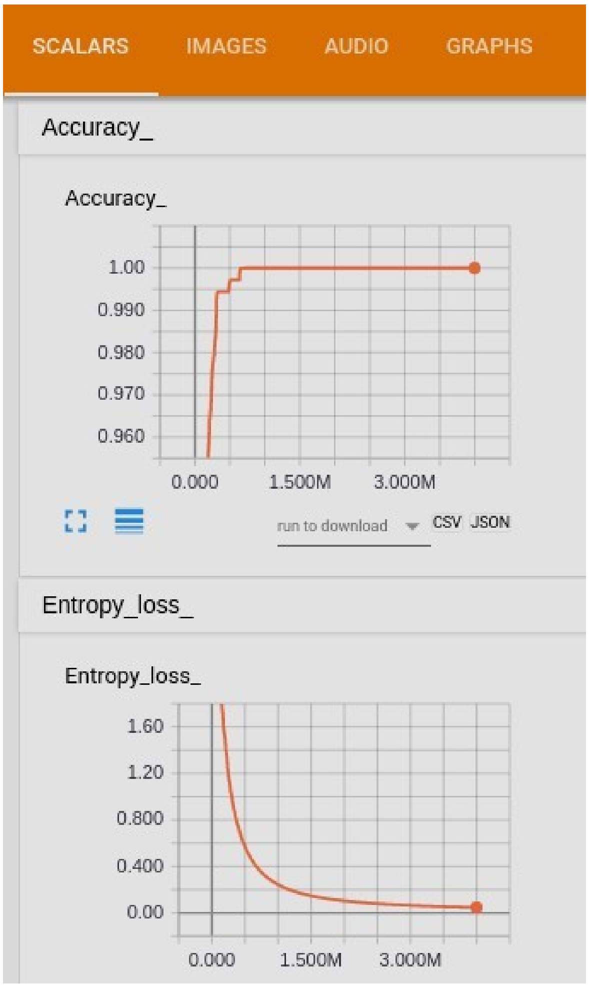
$$\sigma(\mathbf{z})_j = \frac{e^{z_j}}{\sum_{k=1}^{K} e^{z_k}}$$

which allows us to interpret the outputs as probabilities, while cross-entropy loss is what we use to measure the error at a softmax layer, and is given by[1]

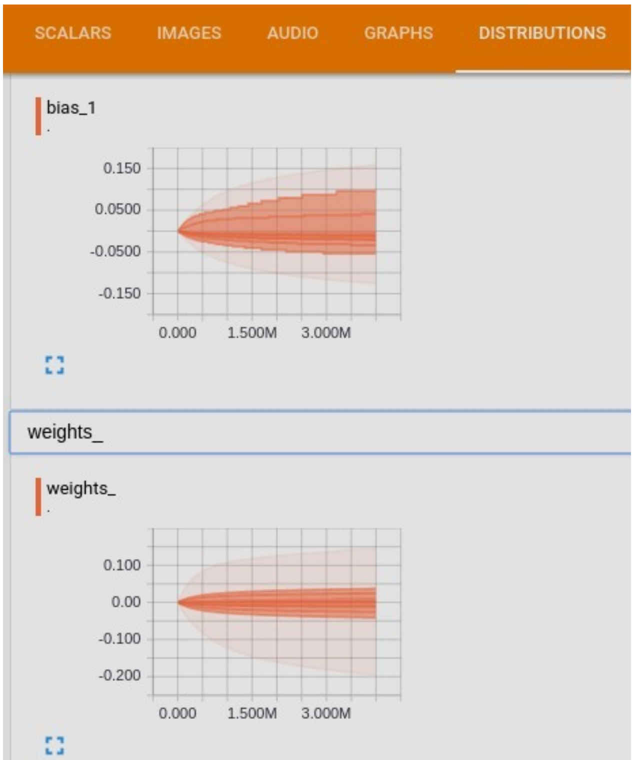
$$L(\mathbf{w}) = \frac{1}{N}\sum_{n=1}^{N} H(p_n, q_n) = -\frac{1}{N}\sum_{n=1}^{N} \left[ y_n \log \hat{y}_n + (1 - y_n) \log(1 - \hat{y}_n) \right],$$

Same entropy function

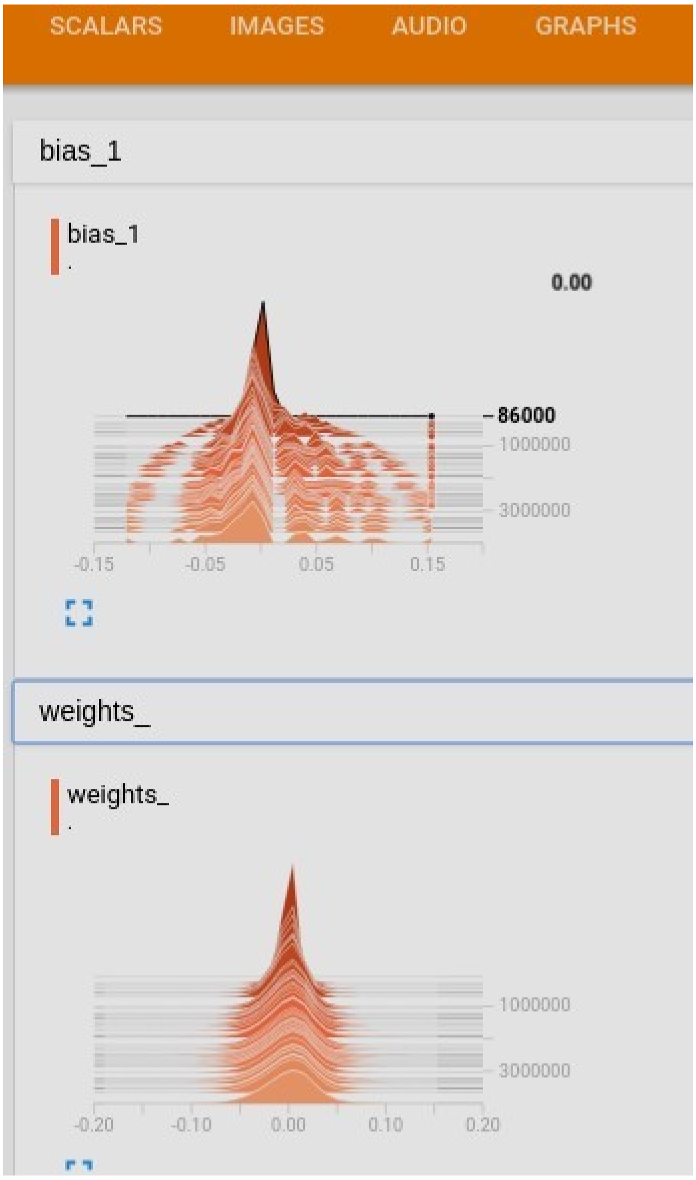
But the only difference is it converges on gradientDecent even with smaller learning rate




Distributions :



Histograms :


SCALARS
IMAGES
AUDIO
GRAPHS
bias_1
bias_1
0.00
86000
1000000
3000000
-0.15
-0.05
0.05
0.15
weights_
weights_
1000000
3000000
-0.20
-0.10
0.00
0.10
0.20