MNIST_Softmax

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1 MNIST Dataset with a Basic Approach using TensorFlow

- This code uses many built-in functions(for batches) and basic approach to solve
- Refer MNIST_CNN_tensorflow for more detailed approach

```
In [1]: import tensorflow as tf
```

```
C:\Users\jsidd\Anaconda3\lib\site-packages\h5py\__init__.py:34: FutureWarning: Conversion of th
  from ._conv import register_converters as _register_converters
```

```
In [2]: from tensorflow.examples.tutorials.mnist import input_data
```

One_hot is set True * it creates 10 columns for the one column given(0-9) * 7 will be represented in that 10 columns as [0., 0., 0., 0., 0., 0., 0., 1., 0., 0.]

```
In [3]: mnist = input_data.read_data_sets('MNIST_data/',one_hot=True)       # if nothing is fo
```

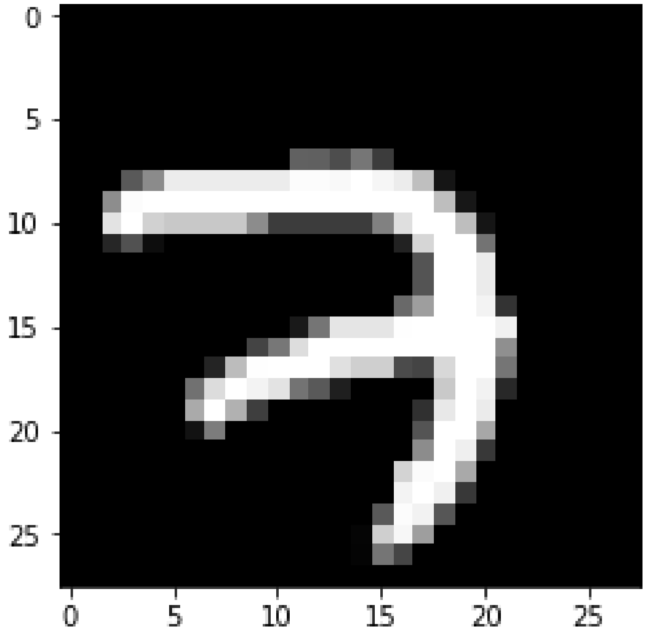
```
Extracting MNIST_data/train-images-idx3-ubyte.gz
Extracting MNIST_data/train-labels-idx1-ubyte.gz
Extracting MNIST_data/t10k-images-idx3-ubyte.gz
Extracting MNIST_data/t10k-labels-idx1-ubyte.gz
```

```
In [4]: import matplotlib.pyplot as plt
        %matplotlib inline

In [5]: sample_image = mnist.train.images[0].reshape(28,28)      # Since all are of shape (1,78

In [6]: plt.imshow(sample_image,cmap='gray')    # imshow-> used for plotting images
                                                # cmap-> gives gray color to the coloured part
```

```
Out[6]: <matplotlib.image.AxesImage at 0x2969d813b38>
```



2 Steps :

```
1.PlaceHolder
2.Variables
3.Create graph Operation
4.Loss Function
5.Optimizer
6.Create Session
```

```
In [7]: #Placeholder
        x = tf.placeholder(tf.float32,shape=[None,784])       # None-> because it wil depend on
        y_true = tf.placeholder(tf.float32,shape=[None,10])   # same as above
```

Regarding the Shapes: * y = tf.matmul(x,w) + b * since x and w are multiplied therefore 2nd parameter of x becomes 1st parameter of y * and we will be classifying for 10 numbers(or 10 columns) thus 2nd parameter of y becomes 10 * now tf.matmul(x,w) has shape(None, 10) None here is the batch_size * thus the shape of bias will be 10

```
In [8]: #Variables
        w = tf.Variable(tf.zeros([784,10]))
        b = tf.Variable(tf.zeros([10]))
```

```
In [9]: #Create graph Operation
        y = tf.matmul(x,w) + b
```

```
In [10]: #Loss Function
         cross_entropy = tf.reduce_mean(tf.nn.softmax_cross_entropy_with_logits_v2(labels = y_
```

```
In [11]: #Optimizer
         optimizer = tf.train.GradientDescentOptimizer(learning_rate=0.5)
         train = optimizer.minimize(cross_entropy)
```

```
In [12]: #Create Session
         init = tf.global_variables_initializer()     # to initialize all the vairables
```

```
In [13]: with tf.Session() as sess:

             sess.run(init)

             for step in range(1000):

                 batch_x , batch_y = mnist.train.next_batch(100)    # this implicitly creates

                 sess.run(train, feed_dict = {x:batch_x,y_true:batch_y})     # Running the Ses

             # evaluate the model
             # here we create a list correct prediction
             #comparing the index of max value of actual value and predicted value
             correct_prediction = tf.equal(tf.argmax(y,1),tf.argmax(y_true, 1))

             #convert the boolean values into 0's and 1's
             acc = tf.reduce_mean(tf.cast(correct_prediction,tf.float32))

             #predicted [3,4,..] but true values were [3,9,..]
             #[True,False,..]
             #we cast it to float32(numeric value)[1,0,..]
             #accuracy turns to be 0.5 for 1st two values

             print(sess.run(acc,feed_dict={x:mnist.test.images,y_true:mnist.test.labels}))
             pred_w , pred_b = sess.run([w,b])
```

```
0.9148
```

```
In [14]: import numpy as np
```

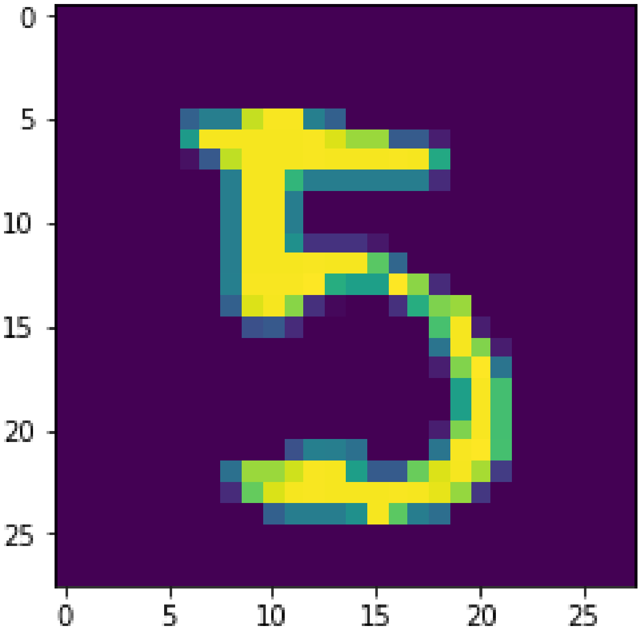
```
In [15]: # selecting a random index from the total test data
         pred_index = np.random.randint(0,mnist.test.num_examples)
```

```
In [16]: # calculating the predictded label using the trained weight  and bias from the Sessio
         pred_y = tf.matmul(mnist.test.images[pred_index].reshape((1,784)),pred_w) + pred_b
```

```
In [17]: with tf.Session() as sess:
             sess.run(tf.global_variables_initializer())
```

```
plt.imshow(mnist.test.images[pred_index].reshape(28,28))    # plot the image
print("Expected Value is "+ str(np.argmax(mnist.test.labels[pred_index])))  # pri
print("Predicted Value is "+ str(sess.run(tf.argmax(pred_y,1)))) # Finally printi
```

```
Expected Value is 5
Predicted Value is [5]
```


0
5
10
15
20
25
0
5
10
15
20
25