Started_with_Colab

January 23, 2023

[ ]:

```
```

[4]:

```
import numpy as np
import tensorflow.compat.v1 as tf
%matplotlib inline
import matplotlib.pyplot as plt
plt.style.use('ggplot')
import warnings
warnings.filterwarnings('ignore')
plt.rcParams['figure.figsize'] = (20.0, 10.0)
```

1 Create Synthetic data

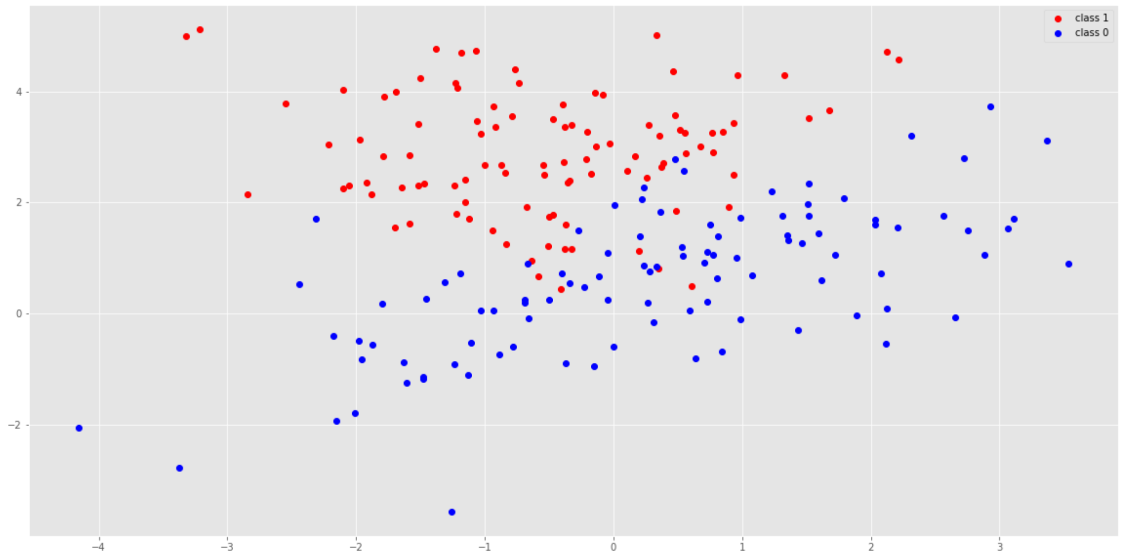
[5]:

```
num_points_each_cluster = 100
mu1 = [-0.4, 3]
covar1 = [[1.3,0],[0,1]]
mu2 = [0.5, 0.75]
covar2 = [[2.2,1.2],[1.8,2.1]]
X1 = np.random.multivariate_normal(mu1, covar1, num_points_each_cluster)
X2 = np.random.multivariate_normal(mu2, covar2, num_points_each_cluster)
y1 = np.ones(num_points_each_cluster)
y2 = np.zeros(num_points_each_cluster)
```

2 Let's visualize this data

[6]:

```
plt.plot( X1[:, 0], X1[:,1], 'ro', label='class 1')
plt.plot(X2[:, 0], X2[:,1], 'bo', label='class 0')
plt.legend(loc='best')
plt.show()
```



[19]:
```
X = np.vstack((X1, X2))
y = np.hstack((y1, y2))
print (X.shape, y.shape)
```

```
(200, 2) (200,)
```

[18]:
```
X_tf = tf.constant(X)
y_tf = tf.constant(y)
```

3 Main logic for KNN

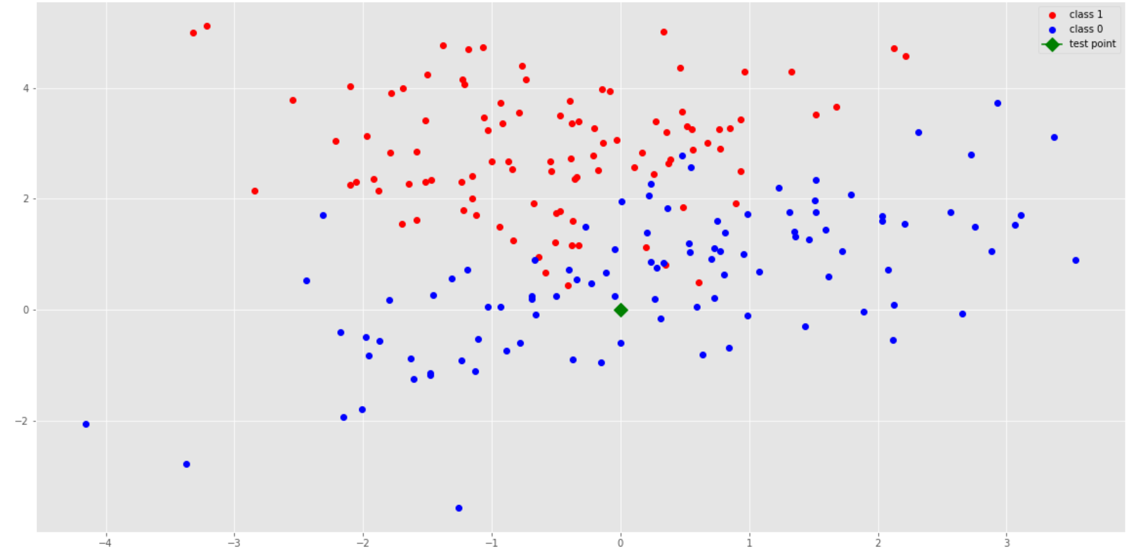
[17]:
```
def predict(X_t, y_t, x_t, k_t):
    neg_one = tf.constant(-1.0, dtype=tf.float64)
    # we compute the L-1 distance
    distances =  tf.reduce_sum(tf.abs(tf.subtract(X_t, x_t)), 1)
    # to find the nearest points, we find the farthest points based on negative␣
 ↪distances
    # we need this trick because tensorflow has top_k api and no closest_k or␣
↪reverse=True api
    neg_distances = tf.multiply(distances, neg_one)
    # get the indices
    vals, indx = tf.nn.top_k(neg_distances, k_t)
    # slice the labels of these points
    y_s = tf.gather(y_t, indx)
    return y_s
```

```
def get_label(preds):
    counts = np.bincount(preds.astype('int64'))
    return np.argmax(counts)
```

4 Generate a test point

[16]:
```
example = np.array([0, 0])
example_tf = tf.constant(example,dtype=tf.float64)

plt.plot( X1[:, 0], X1[:,1], 'ro', label='class 1')
plt.plot(X2[:, 0], X2[:,1], 'bo', label='class 0')
plt.plot(example[0], example[1], 'g', marker='D', markersize=10, label='test␣
 ↪point')
plt.legend(loc='best')
plt.show()
```

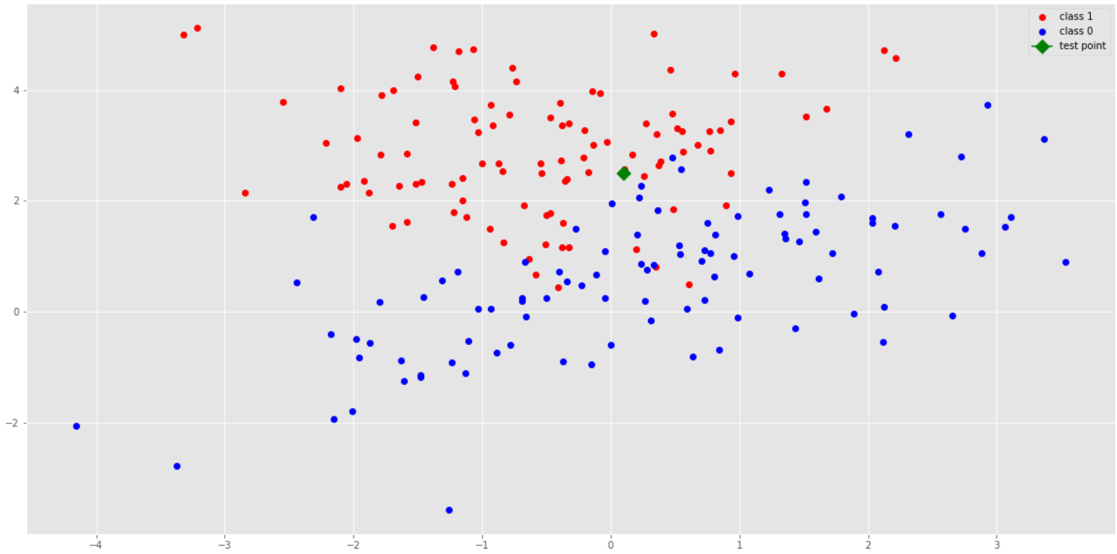


[20]:
```
k_tf = tf.constant(3)
tf.disable_v2_behavior()
with tf.compat.v1.Session() as sesss:
   pr = predict(X_tf, y_tf, example_tf, k_tf)
   sess = tf.compat.v1.Session()
   y_index = sess.run(pr)
   print (get_label(y_index))
   # print(sess.run(pr))
```

```
0
```

[12]:

```
example_2 = np.array([0.1, 2.5])
example_2_tf = tf.constant(example_2)
plt.plot( X1[:, 0], X1[:,1], 'ro', label='class 1')
plt.plot(X2[:, 0], X2[:,1], 'bo', label='class 0')
plt.plot(example_2[0], example_2[1], 'g', marker='D', markersize=10,␣
 ↪label='test point')
plt.legend(loc='best')
plt.show()
```



[21]:

```
pr = predict(X_tf, y_tf, example_2_tf, k_tf)
y_index = sess.run(pr)
print (get_label(y_index))
```

```
1
```