EDS Assignment 6

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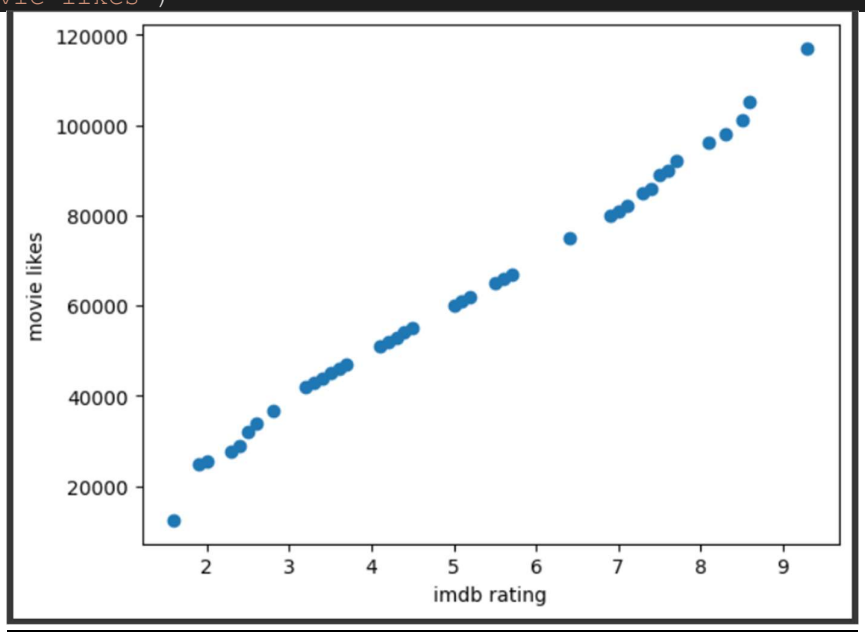
1. Linear Regression:

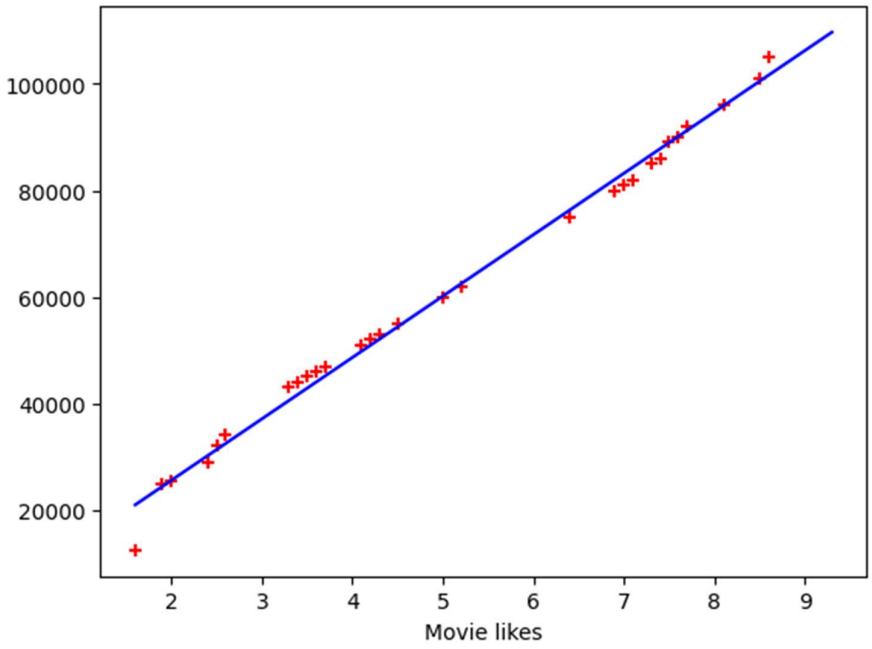
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn import linear_model
from sklearn.model_selection import train_test_split
df = pd.read_csv("/content/movie_data.csv")

#data cleaning
df.dropna(inplace=True)
df.reset_index(drop=True, inplace=True)
df1 = df.head(40)
# print(df1)
plt.scatter(df1['imdb_score'], df1['movie_likes'])
plt.xlabel('imdb rating')
plt.ylabel('movie likes')
```



```
X = np.array(df1[['imdb_score']]).reshape(-1,1)
Y = np.array(df1[['movie_likes']]).reshape(-1,1)
X_train,X_test,Y_train,Y_test = train_test_split(X,Y,test_size = 0.25)

# create linear regression object
reg = linear_model.LinearRegression()
reg.fit(X_train, Y_train)  #training the model
# predicting movie likes using the testing dataset on the trained model
reg.predict(X_test)
# ploting linear regression line
plt.scatter(X_train, Y_train, color='red', marker='+')
plt.xlabel('IMDB')
plt.xlabel('Movie likes')
plt.plot(df1['imdb_score'], reg.predict(df1[['imdb_score']]), color='blue')
```



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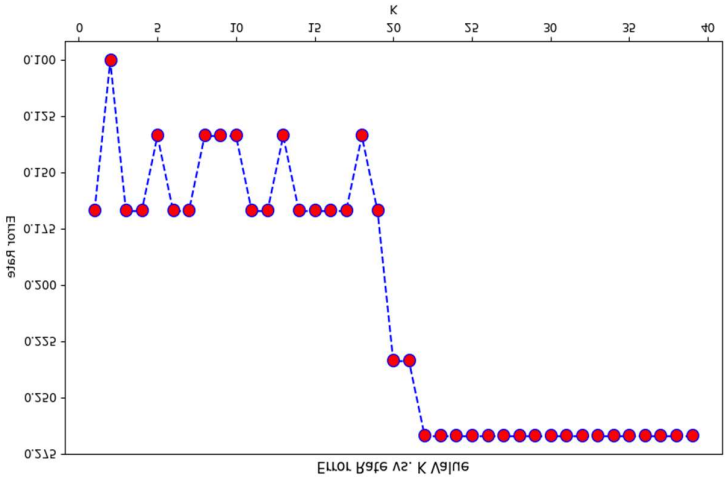
2. KNN

```
3. import pandas as pd
4. import seaborn as sns
5. import matplotlib.pyplot as plt
6. import numpy as np
7. df = pd.read_csv("prostate.csv")
8. df.head()
9. from sklearn.preprocessing import StandardScaler
10.
11.      scaler = StandardScaler()
12.
13.      scaler.fit(df.drop('Target', axis=1))
14.      scaled_features = scaler.transform(df.drop('Target',
15.                          axis=1))
16.
```

```
    df_feat = pd.DataFrame(scaled_features,
              columns=df.columns[:-1])
    df_feat.head()
    from sklearn.metrics import classification_report,\
      confusion_matrix
    from sklearn.neighbors import KNeighborsClassifier
    from sklearn.model_selection import train_test_split

    X_train, X_test,\
      y_train, y_test = train_test_split(scaled_features,
                      df['Taregt'],
                      test_size=0.30)

    # Remember that we are trying to come up
    # with a model to predict whether
    # someone will Target or not.
    # We'll start with k = 1.

    knn = KNeighborsClassifier(n_neighbors=1)
    knn.fit(X_train, y_train)
    pred = knn.predict(X_test)

    # Predictions and Evaluations
    # Let's evaluate our KNN model !
    print(confusion_matrix(y_test, pred))
    print(classification_report(y_test, pred))
    error_rate = []

    # Will take some time
    for i in range(1, 40):

      knn = KNeighborsClassifier(n_neighbors=i)
      knn.fit(X_train, y_train)
      pred_i = knn.predict(X_test)
      error_rate.append(np.mean(pred_i != y_test))

    plt.figure(figsize=(10, 6))
    plt.plot(range(1, 40), error_rate, color='blue',
        linestyle='dashed', marker='o',
        markerfacecolor='red', markersize=10)

    plt.title('Error Rate vs. K Value')
    plt.xlabel('K')
    plt.ylabel('Error Rate')
    plt.show()
```




```
# FIRST A QUICK COMPARISON TO OUR ORIGINAL K = 1
knn = KNeighborsClassifier(n_neighbors = 1)

knn.fit(X_train, y_train)
pred = knn.predict(X_test)

print('WITH K = 1')
print('Confusion Matrix')
print(confusion_matrix(y_test, pred))
print('Classification Report')
print(classification_report(y_test, pred))
```

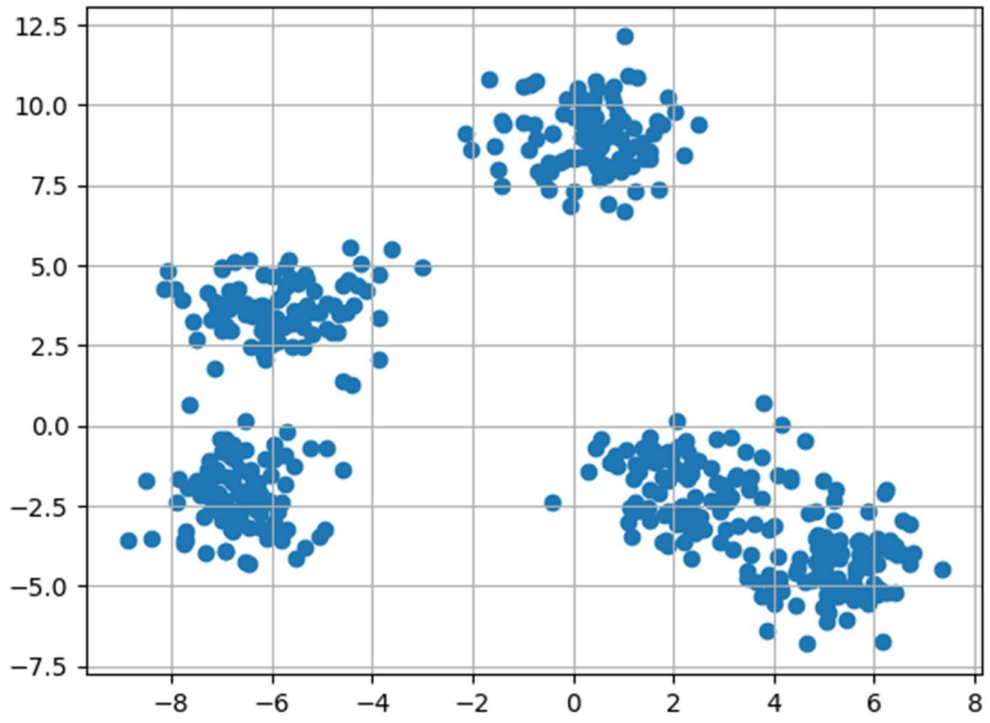
```
WITH K = 1

Confusion Matrix

[[19  3]

[ 2  6]]

Classification Report

precision    recall  f1-score   support


0       0.90      0.86      0.88        22

1       0.67      0.75      0.71         8


accuracy                           0.83        30

macro avg       0.79      0.81      0.79        30

weighted avg       0.84      0.83      0.84        30
```

```
# NOW WITH K = 10
knn = KNeighborsClassifier(n_neighbors = 10)

knn.fit(X_train, y_train)
pred = knn.predict(X_test)

print('WITH K = 10')
print('Confusion Matrix')
print(confusion_matrix(y_test, pred))
print('Classification Report')
print(classification_report(y_test, pred))
```

```
WITH K = 10

Confusion Matrix

[[21  1]

 [ 3  5]]

Classification Report

              precision    recall  f1-score   support


           0       0.88      0.95      0.91        22

           1       0.83      0.62      0.71         8


    accuracy                           0.87        30

   macro avg       0.85      0.79      0.81        30

weighted avg       0.86      0.87      0.86        30
```

3. K means

```
#k-Means
import numpy as np
import matplotlib.pyplot as plt
from sklearn.datasets import make_blobs

X,y = make_blobs(n_samples = 500,n_features = 2,centers = 5,random_state = 23)

fig = plt.figure(0)
plt.grid(True)
plt.scatter(X[:,0],X[:,1])
plt.show()
```

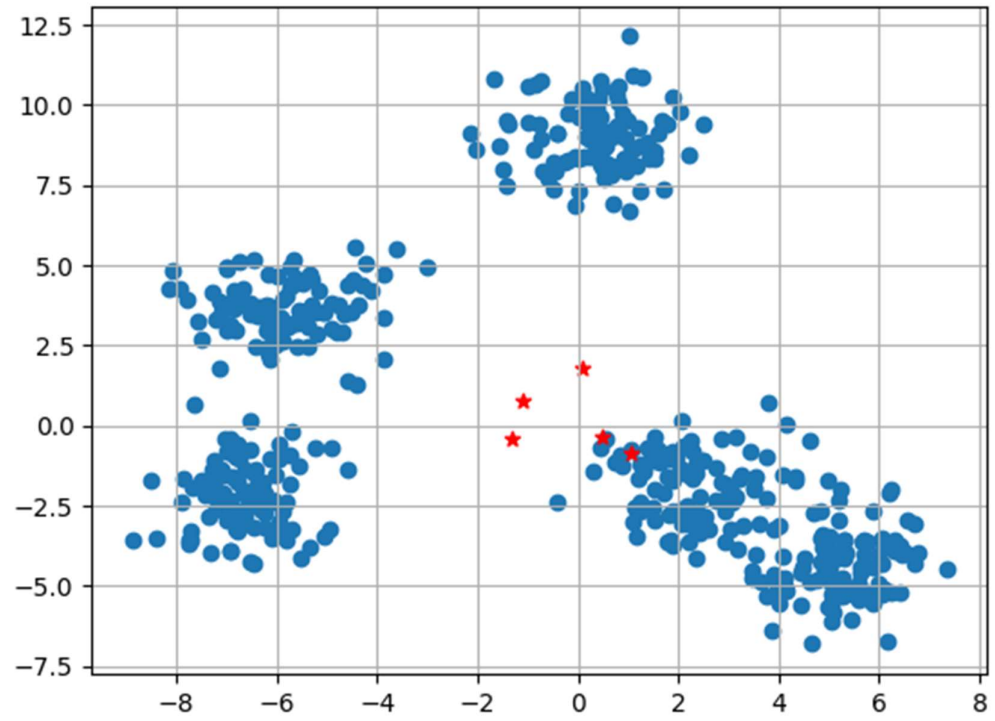



```
k = 5
```

```
clusters = {}
np.random.seed(23)

for idx in range(k):
  center = 2*(2*np.random.random((X.shape[1],))-1)
  points = []
  cluster = {
    'center' : center,
    'points' : []
  }

  clusters[idx] = cluster

clusters
```

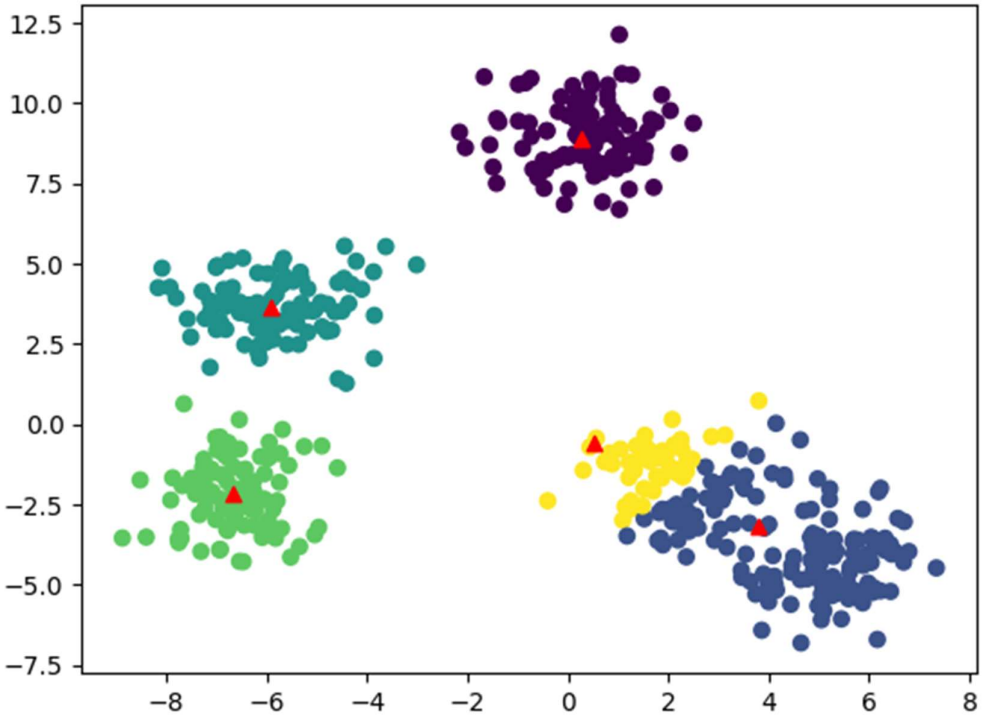
```
{0: {'center': array([0.06919154, 1.78785042]), 'points': []},
 1: {'center': array([ 1.06183904, -0.87041662]), 'points': []},
 2: {'center': array([-1.11581855,  0.74488834]), 'points': []},
 3: {'center': array([-1.33144319, -0.43023013]), 'points': []},
 4: {'center': array([ 0.47220939, -0.35227962]), 'points': []}}
```

```
plt.scatter(X[:,0],X[:,1])
plt.grid(True)
for i in clusters:
  center = clusters[i]['center']
  plt.scatter(center[0],center[1],marker = '*',c = 'red')
plt.show()
```




```
def distance(p1,p2):
  return np.sqrt(np.sum((p1-p2)**2))
```

```
#Implementing E step
def assign_clusters(X, clusters):
  for idx in range(X.shape[0]):
    dist = []

    curr_x = X[idx]

    for i in range(k):
      dis = distance(curr_x,clusters[i]['center'])
      dist.append(dis)
    curr_cluster = np.argmin(dist)
    clusters[curr_cluster]['points'].append(curr_x)
  return clusters

#Implementing the M-Step
def update_clusters(X, clusters):
  for i in range(k):
    points = np.array(clusters[i]['points'])
    if points.shape[0] > 0:
      new_center = points.mean(axis =0)
      clusters[i]['center'] = new_center

      clusters[i]['points'] = []
  return clusters

def pred_cluster(X, clusters):
  pred = []
  for i in range(X.shape[0]):
    dist = []
    for j in range(k):
      dist.append(distance(X[i],clusters[j]['center']))
    pred.append(np.argmin(dist))
  return pred

clusters = assign_clusters(X,clusters)
clusters = update_clusters(X,clusters)
pred = pred_cluster(X,clusters)

plt.scatter(X[:,0],X[:,1],c = pred)
for i in clusters:
    center = clusters[i]['center']
    plt.scatter(center[0],center[1],marker = '^',c = 'red')
plt.show()
```


12.5
10.0
7.5
5.0
2.5
0.0
−2.5
−5.0
−7.5
−8
−6
−4
−2
0
2
4
6
8