driving_behavior_k_mean_v1

September 2, 2022

[ ]:
```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
```

[ ]:
```
df_training = pd.read_csv("../data_mod/train_motion_data.csv")
df_test = pd.read_csv("../data_mod/test_motion_data.csv")

df_training
```

[ ]:
```
          AccX      AccY     GyroZ   Class  DiffAccX  DiffAccY
0     0.000000  0.000000  0.101938  NORMAL  0.000000  0.000000
1    -1.624864 -1.082492  0.135536  NORMAL -1.624864 -1.082492
2    -0.594660 -0.122410  0.087888  NORMAL  1.030204  0.960082
3     0.738478 -0.228456  0.054902  NORMAL  1.333138 -0.106046
4     0.101741  0.777568  0.054902  NORMAL -0.636737  1.006023
…          …         …        …      …         …         …
3639  0.915688 -2.017489 -1.236468    SLOW  2.374675 -1.824629
3640 -1.934203  0.914925 -0.477162    SLOW -2.849891  2.932414
3641 -0.222845  0.747304  0.054291    SLOW  1.711359 -0.167621
3642 -0.349423  0.067261 -0.004963    SLOW -0.126579 -0.680043
3643 -0.402428  0.406218  0.001145    SLOW -0.053005  0.338957

[3644 rows x 6 columns]
```

[ ]:
```
df_training.isna().sum()
```

[ ]:
```
AccX        0
AccY        0
GyroZ       0
Class       0
DiffAccX    0
DiffAccY    0
dtype: int64
```

[ ]:
```
df_training = df_training.replace(
    {"Class": {"NORMAL": 0, "AGGRESSIVE": 1, "SLOW": 2}})
```

```
df_test = df_test.replace(
    {"Class": {"NORMAL": 0, "AGGRESSIVE": 1, "SLOW": 2}})
df_training
```

[ ]:

```
          AccX      AccY     GyroZ  Class  DiffAccX  DiffAccY
0     0.000000  0.000000  0.101938      0  0.000000  0.000000
1    -1.624864 -1.082492  0.135536      0 -1.624864 -1.082492
2    -0.594660 -0.122410  0.087888      0  1.030204  0.960082
3     0.738478 -0.228456  0.054902      0  1.333138 -0.106046
4     0.101741  0.777568  0.054902      0 -0.636737  1.006023
…          …         …         …      …         …         …
3639  0.915688 -2.017489 -1.236468      2  2.374675 -1.824629
3640 -1.934203  0.914925 -0.477162      2 -2.849891  2.932414
3641 -0.222845  0.747304  0.054291      2  1.711359 -0.167621
3642 -0.349423  0.067261 -0.004963      2 -0.126579 -0.680043
3643 -0.402428  0.406218  0.001145      2 -0.053005  0.338957

[3644 rows x 6 columns]
```

[ ]:

```
X_train = df_training.drop(columns=["Class"])
X_train = (X_train - X_train.mean()) / X_train.std() * 100

X_train["Class"] = df_training["Class"]
X_train
```

[ ]:

```
            AccX        AccY        GyroZ    DiffAccX    DiffAccY  Class
0      -4.105593    8.126800    81.244480    0.010300   -0.010421      0
1    -168.957027 -111.696347   110.286351 -151.542377 -101.201825      0
2     -64.437130   -5.422989    69.099704   96.098456   89.738101      0
3      70.817107  -17.161393    40.585870  124.353421   -9.923577      0
4       6.216602   94.197287    40.585870  -59.378806   94.032688      0
…            …           …            …           …           …      …
3639   88.795978 -215.193071 -1075.677828  221.498566 -170.576840      2
3640 -200.341232  109.401604  -419.331681 -265.801873  274.111831      2
3641  -26.714411   90.847295    40.057837  159.630443  -15.679652      2
3642  -39.556507   15.572024   -11.161455  -11.795809  -63.580862      2
3643  -44.934120   53.091875    -5.881115   -4.933494   31.675331      2

[3644 rows x 6 columns]
```

[ ]:

```
X_test = df_test.drop(columns="Class")
X_test = (X_test - X_test.mean()) / X_test.std() * 100

X_test["Class"] = df_test["Class"]
X_test
```

```
[ ]:             AccX        AccY        GyroZ    DiffAccX    DiffAccY  Class
     0      67.345100   -9.509000   -10.104756   -0.021340   -0.012385      1
     1      57.982946   10.303100   188.298737   -8.494392   16.758078      1
     2     270.452050 -824.010358   -43.597957  192.270076 -706.238535      1
     3     229.805029 -828.171460   -55.972952  -36.808209   -3.534656      1
     4     283.133326 -732.402479    20.967248   48.242495   81.053740      1
     …          …           …            …          …           …      …
     3079  -84.712435  -57.627689   445.483427  -73.609489   -1.097380      2
     3080  145.444037   51.068429  -604.239195  208.277716   91.996249      2
     3081  121.268079 -177.287100  -422.380477  -21.901364 -193.309813      2
     3082   83.265000   79.069807   347.559582  -34.415357  216.987532      2
     3083  140.063424   35.612446    57.016155   51.383072  -36.797989      2

     [3084 rows x 6 columns]
```

```
[ ]: X_training  = X_train.drop(columns="Class")
     y_training  = X_train.Class

     X_testing = X_test.drop(columns="Class")
     y_testing = X_test.Class
```

```
[ ]: from sklearn.cluster import KMeans
     from sklearn.model_selection import GridSearchCV
     from sklearn.metrics import confusion_matrix, ConfusionMatrixDisplay
```

```
[ ]: kmeans = KMeans(n_clusters=3, random_state=0, max_iter=400)
     kmeans.fit(X_training)
```

```
[ ]: KMeans(max_iter=400, n_clusters=3, random_state=0)
```

```
[ ]: kmeans.labels_
```

```
[ ]: array([0, 0, 1, …, 1, 0, 1], dtype=int32)
```

```
[ ]: kmeans.score(X_training, y_training)
```

```
[ ]: -122089879.2330603
```

```
[ ]: kmeans.score(X_testing, y_testing)
```

```
[ ]: -105974789.25071318
```

0.0.1 Understand the created model

```
[ ]: y_pred = kmeans.predict(X_testing)
```

[ ]:

```
from sklearn import metrics

metrics.rand_score(y_testing, y_pred)
```

[ ]:

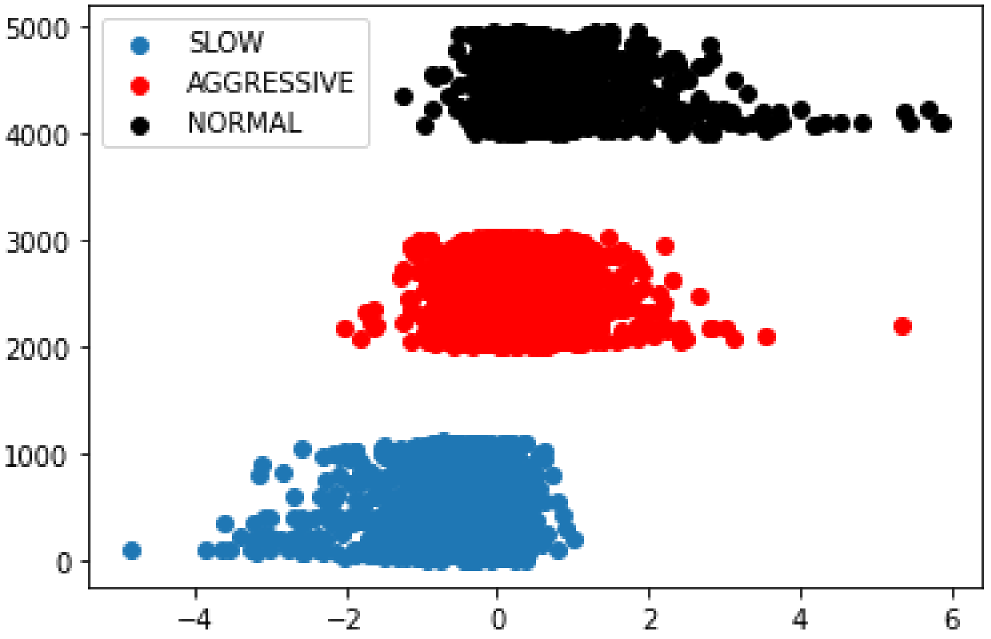
```
0.5525817703291511
```

[ ]:

```
df_results = df_test
df_results["Class"] = y_pred

labels = ["SLOW", "AGGRESSIVE", "NORMAL"]
```

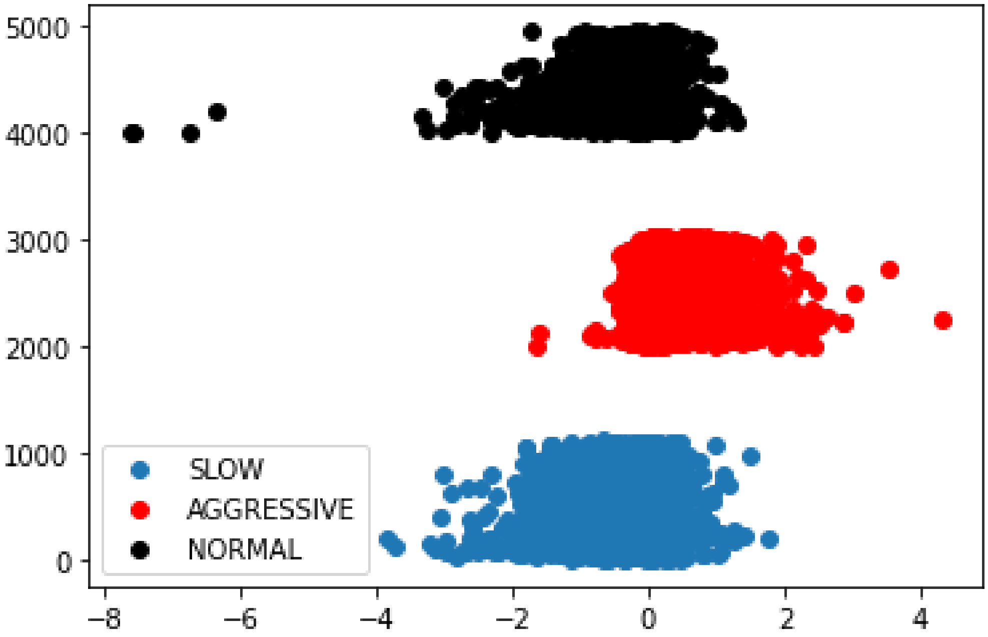
[ ]:

```
normal = df_results[df_results.Class == 0].AccX
plt.scatter(x = normal, y = np.arange(len(normal)), label=labels[0])

slow = df_results[df_results.Class == 1].AccX
plt.scatter(x = slow, y = np.arange(len(slow)) + 2000, color="red",␣
 ↪label=labels[1])

aggressive = df_results[df_results.Class == 2].AccX
plt.scatter(x = aggressive, y = np.arange(len(aggressive)) + 4000,␣
 ↪color="black", label=labels[2])

plt.legend()
plt.show()
```



[ ]:

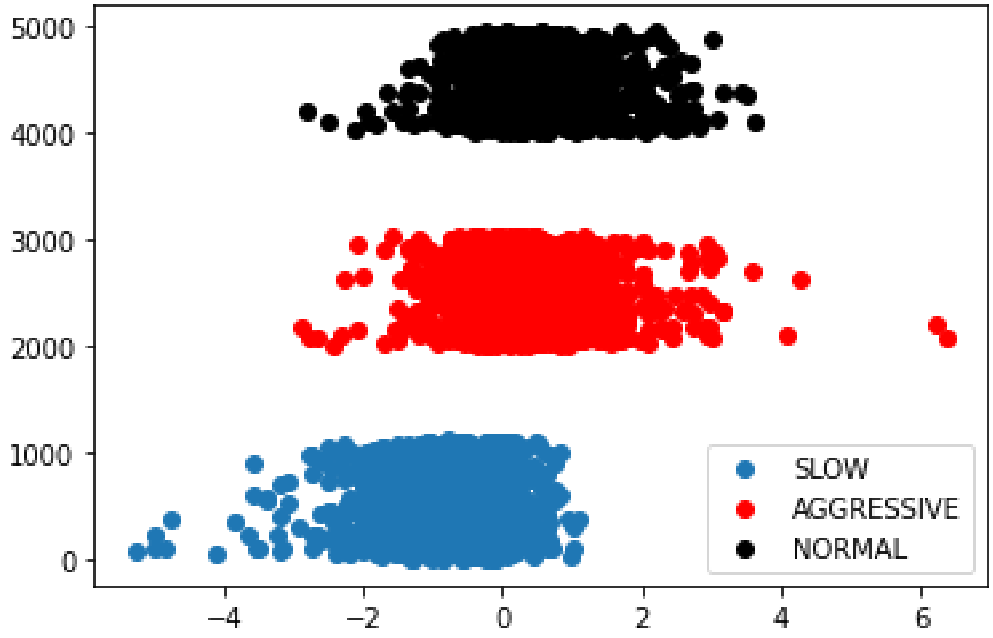
```
normal = df_results[df_results.Class == 0].AccY
plt.scatter(x = normal, y = np.arange(len(normal)), label=labels[0])

slow = df_results[df_results.Class == 1].AccY
plt.scatter(x = slow, y = np.arange(len(slow)) + 2000, color="red",␣
 ↪label=labels[1])

aggressive = df_results[df_results.Class == 2].AccY
plt.scatter(x = aggressive, y = np.arange(len(aggressive)) + 4000,␣
 ↪color="black", label=labels[2])

plt.legend()
plt.show()
```



[ ]:

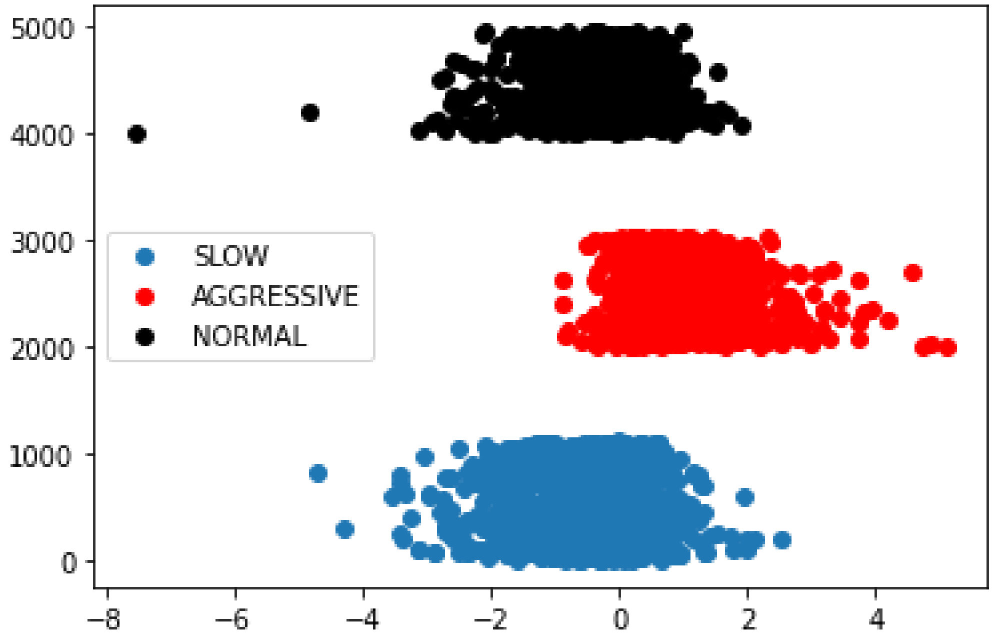
```
normal = df_results[df_results.Class == 0].DiffAccX
plt.scatter(x = normal, y = np.arange(len(normal)), label=labels[0])

slow = df_results[df_results.Class == 1].DiffAccX
plt.scatter(x = slow, y = np.arange(len(slow)) + 2000, color="red",␣
 ↪label=labels[1])

aggressive = df_results[df_results.Class == 2].DiffAccX
plt.scatter(x = aggressive, y = np.arange(len(aggressive)) + 4000,␣
 ↪color="black", label=labels[2])
```

```
plt.legend()
plt.show()
```



[ ]:

```
normal = df_results[df_results.Class == 0].DiffAccY
plt.scatter(x = normal, y = np.arange(len(normal)), label=labels[0])

slow = df_results[df_results.Class == 1].DiffAccY
plt.scatter(x = slow, y = np.arange(len(slow)) + 2000, color="red",␣
 ↪label=labels[1])

aggressive = df_results[df_results.Class == 2].DiffAccY
plt.scatter(x = aggressive, y = np.arange(len(aggressive)) + 4000,␣
 ↪color="black", label=labels[2])

plt.legend()
plt.show()
```



[ ]:
```
"""normal = df_results[df_results.Class == 0].VelX
plt.scatter(x = normal, y = np.arange(len(normal)), label=labels[0])

slow = df_results[df_results.Class == 1].VelX
plt.scatter(x = slow, y = np.arange(len(slow)) + 2000, color="red", label=labels[1])

aggressive = df_results[df_results.Class == 2].VelX
plt.scatter(x = aggressive, y = np.arange(len(aggressive)) + 4000, color="black", label=labels[2])

plt.legend()
plt.show()"""
```

[ ]:
```
'normal = df_results[df_results.Class == 0].VelX\nplt.scatter(x = normal, y =
np.arange(len(normal)), label=labels[0])\n\nslow = df_results[df_results.Class
== 1].VelX\nplt.scatter(x = slow, y = np.arange(len(slow)) + 2000, color="red",
label=labels[1])\n\naggressive = df_results[df_results.Class ==
2].VelX\nplt.scatter(x = aggressive, y = np.arange(len(aggressive)) + 4000,
color="black", label=labels[2])\n\nplt.legend()\nplt.show()'
```

[ ]:
```
"""normal = df_results[df_results.Class == 0].VelY
plt.scatter(x = normal, y = np.arange(len(normal)), label=labels[0])

slow = df_results[df_results.Class == 1].VelY
```

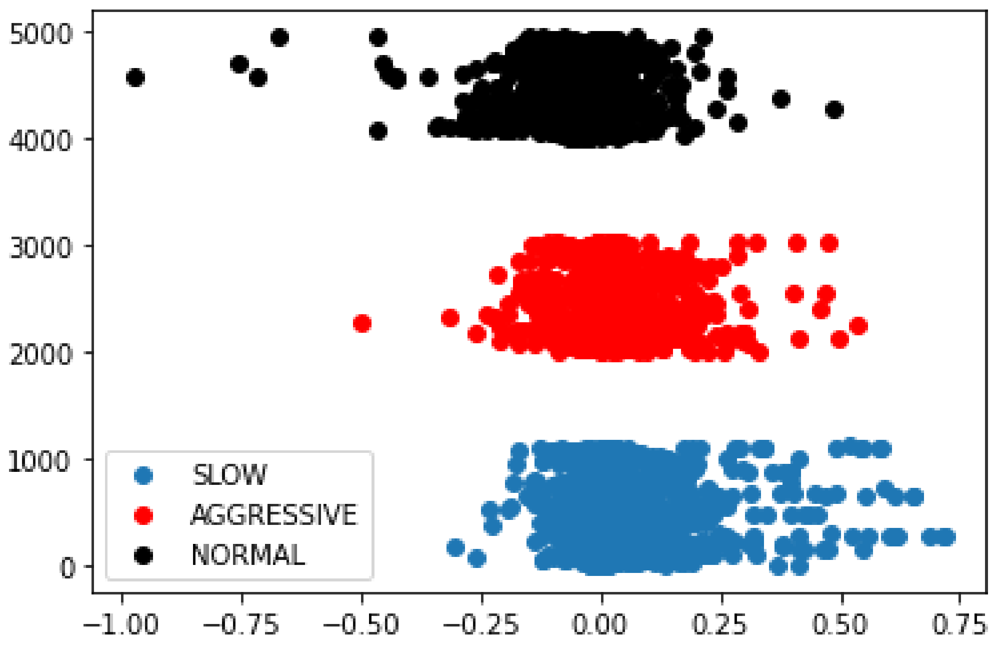
```
plt.scatter(x = slow, y = np.arange(len(slow)) + 2000, color="red",␣
 ↪label=labels[1])

aggressive = df_results[df_results.Class == 2].VelY
plt.scatter(x = aggressive, y = np.arange(len(aggressive)) + 4000,␣
 ↪color="black", label=labels[2])

plt.legend()
plt.show()"""
```

[ ]:

```
'normal = df_results[df_results.Class == 0].VelY\nplt.scatter(x = normal, y =
np.arange(len(normal)), label=labels[0])\n\nslow = df_results[df_results.Class
== 1].VelY\nplt.scatter(x = slow, y = np.arange(len(slow)) + 2000, color="red",
label=labels[1])\n\naggressive = df_results[df_results.Class ==
2].VelY\nplt.scatter(x = aggressive, y = np.arange(len(aggressive)) + 4000,
color="black", label=labels[2])\n\nplt.legend()\nplt.show()'
```

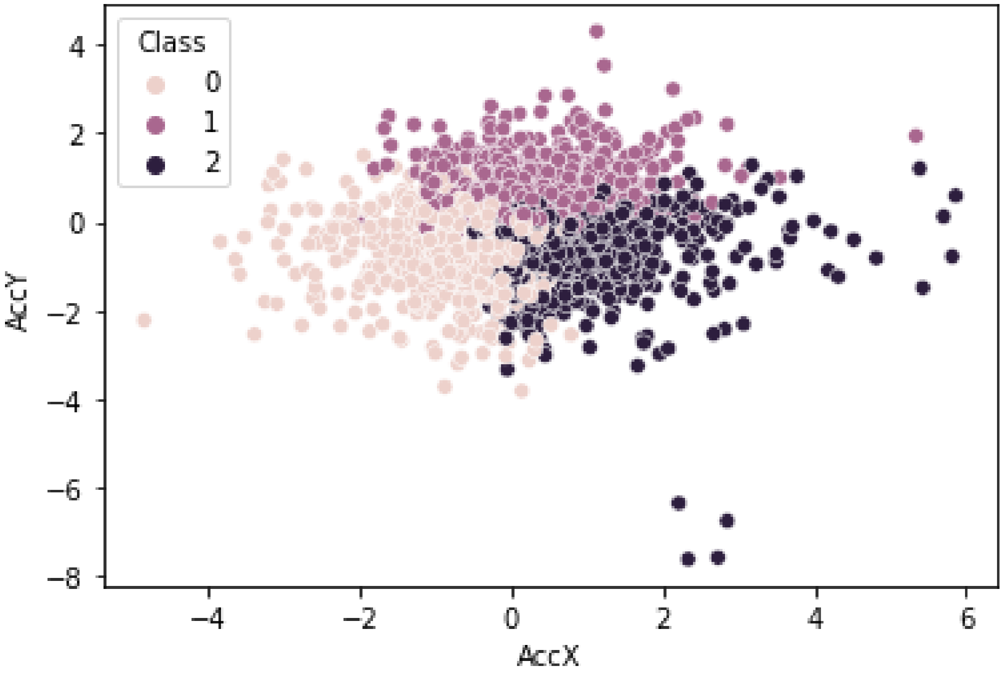
[ ]:

```
normal = df_results[df_results.Class == 0].GyroZ
plt.scatter(x = normal, y = np.arange(len(normal)), label=labels[0])

slow = df_results[df_results.Class == 1].GyroZ
plt.scatter(x = slow, y = np.arange(len(slow)) + 2000, color="red",␣
 ↪label=labels[1])

aggressive = df_results[df_results.Class == 2].GyroZ
plt.scatter(x = aggressive, y = np.arange(len(aggressive)) + 4000,␣
 ↪color="black", label=labels[2])

plt.legend()
plt.show()
```



```
[ ]: sns.scatterplot(data=df_results, x="AccX", y="AccY", hue="Class")
```

```
[ ]: <AxesSubplot:xlabel='AccX', ylabel='AccY'>
```

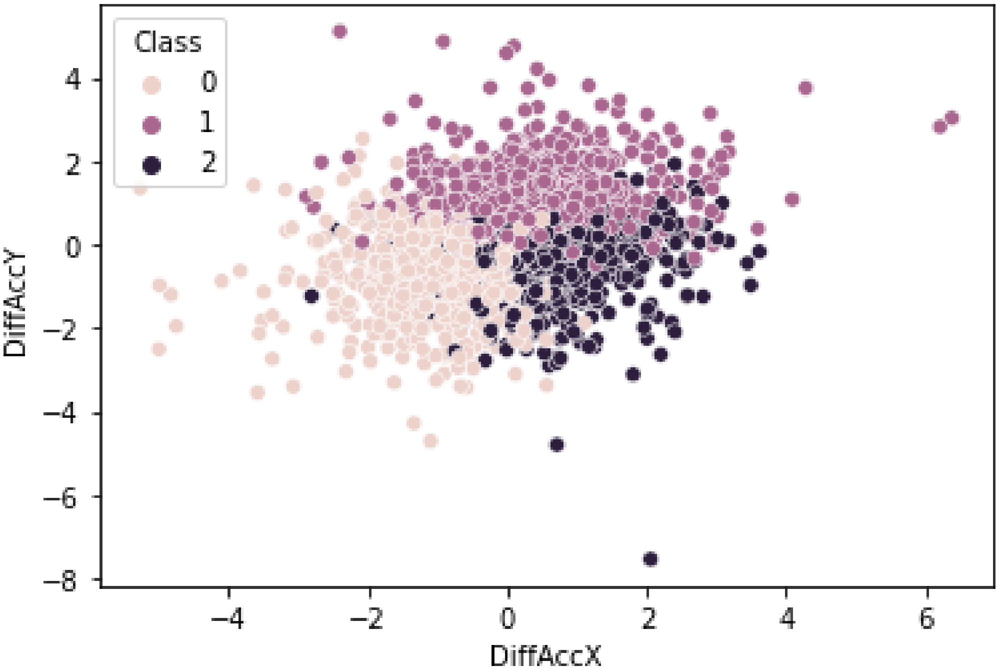


[ ]:

```
sns.scatterplot(data=df_results, x="DiffAccX", y="DiffAccY", hue="Class")
```

[ ]:

```
<AxesSubplot:xlabel='DiffAccX', ylabel='DiffAccY'>
```



[ ]:

```

```