Student_Stress_Factors

November 23, 2023

[ ]:

```
import pandas as pd
import numpy as np
import plotly.express as px
import plotly.graph_objects as go
from sklearn.preprocessing import LabelEncoder
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.metrics import confusion_matrix, ConfusionMatrixDisplay
from sklearn.tree import DecisionTreeClassifier
from sklearn.neighbors import KNeighborsClassifier
from sklearn.cluster import KMeans
from sklearn.metrics import accuracy_score
```

1 Stress Level Factors

1.1 Preprocessing

[ ]:

```
stress_level_df = pd.read_csv('StressLevelDataset.csv')
stress_level_df.head()
```

[ ]:

```
   anxiety_level  self_esteem  mental_health_history  depression  headache  \
0             14           20                      0          11         2
1             15            8                      1          15         5
2             12           18                      1          14         2
3             16           12                      1          15         4
4             16           28                      0           7         2

   blood_pressure  sleep_quality  breathing_problem  noise_level  \
0               1              2                  4            2
1               3              1                  4            3
2               1              2                  2            2
3               3              1                  3            4
4               3              5                  1            3

   living_conditions  …  basic_needs  academic_performance  study_load  \
0                  3  …            2                     3           2
1                  1  …            2                     1           4
```

```
2                  2  …            2                     2           3
3                  2  …            2                     2           4
4                  2  …            3                     4           3

   teacher_student_relationship  future_career_concerns  social_support  \
0                             3                       3               2
1                             1                       5               1
2                             3                       2               2
3                             1                       4               1
4                             1                       2               1

   peer_pressure  extracurricular_activities  bullying  stress_level
0              3                           3         2             1
1              4                           5         5             2
2              3                           2         2             1
3              4                           4         5             2
4              5                           0         5             1

[5 rows x 21 columns]
```

1.1.1 Encoding Categorical Data

[ ]:

```
label_encoder = LabelEncoder()

df_columns = stress_level_df.columns.tolist()

for column in df_columns:
    stress_level_df[column]= label_encoder.
 ↪fit_transform(stress_level_df[column])
```

1.1.2 Normalizing Data

[ ]:

```
scaled_features = stress_level_df.copy()

scaler = StandardScaler()

df_columns = stress_level_df.columns.tolist()

for column in df_columns:
    stress_level_df[[column]]= scaler.fit_transform(stress_level_df[[column]])

scaled_features = pd.DataFrame(scaled_features)

scaled_features.head()
```

```
[ ]:   anxiety_level  self_esteem  mental_health_history  depression  headache  \
    0             14           20                      0          11         2
    1             15            8                      1          15         5
    2             12           18                      1          14         2
    3             16           12                      1          15         4
    4             16           28                      0           7         2

       blood_pressure  sleep_quality  breathing_problem  noise_level  \
    0               0              2                  4            2
    1               2              1                  4            3
    2               0              2                  2            2
    3               2              1                  3            4
    4               2              5                  1            3

       living_conditions  ...  basic_needs  academic_performance  study_load  \
    0                  3  ...            2                     3           2
    1                  1  ...            2                     1           4
    2                  2  ...            2                     2           3
    3                  2  ...            2                     2           4
    4                  2  ...            3                     4           3

       teacher_student_relationship  future_career_concerns  social_support  \
    0                             3                       3               2
    1                             1                       5               1
    2                             3                       2               2
    3                             1                       4               1
    4                             1                       2               1

       peer_pressure  extracurricular_activities  bullying  stress_level
    0              3                           3         2             1
    1              4                           5         5             2
    2              3                           2         2             1
    3              4                           4         5             2
    4              5                           0         5             1

    [5 rows x 21 columns]
```

```
[ ]: X = scaled_features.drop(['stress_level'], axis = 1).values
     y = scaled_features['stress_level'].values
     X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=1)
```

1.2 Decision Trees

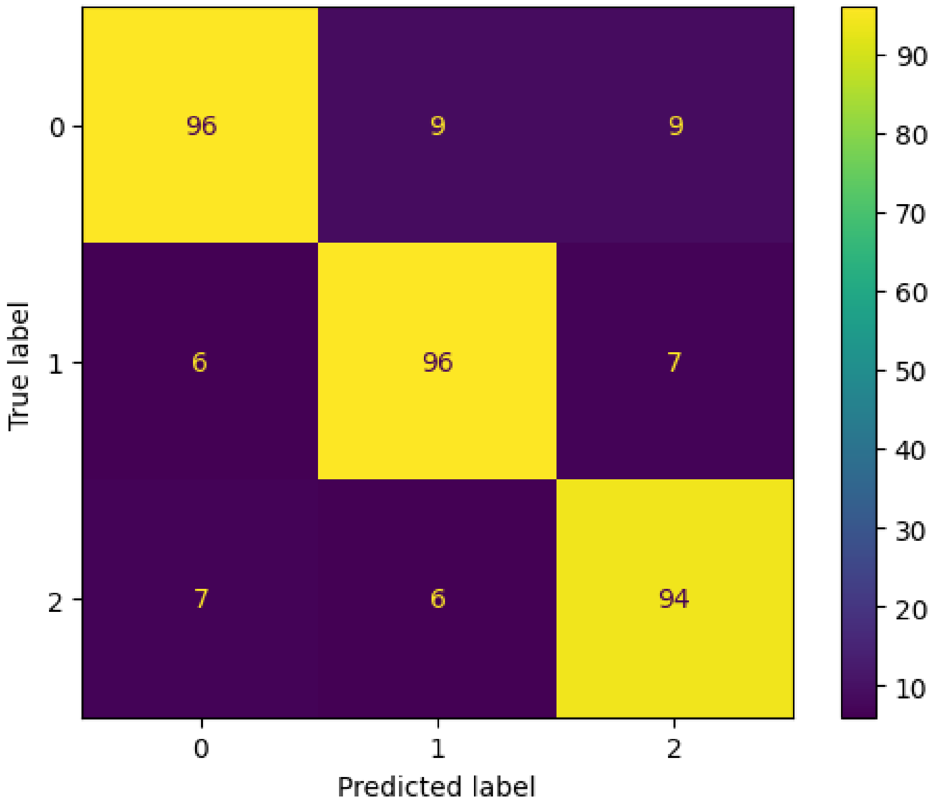
1.2.1 Making Predictions

```
[ ]: clf = DecisionTreeClassifier(criterion='entropy')
     clf.fit(X_train, y_train)
     y_pred = clf.predict(X_test)
     accuracy_score(y_test, y_pred)
```

```
[ ]: 0.8666666666666667
```

1.2.2 Visualizing Results

```
[ ]: cm = confusion_matrix(y_test, y_pred)
     ConfusionMatrixDisplay(cm).plot();
```



1.3 KNN

1.3.1 Making Predictions

[ ]:

```
knn = KNeighborsClassifier(metric = 'euclidean')
knn.fit(X_train, y_train)
y_pred = knn.predict(X_test)
accuracy_score(y_test, y_pred)
```

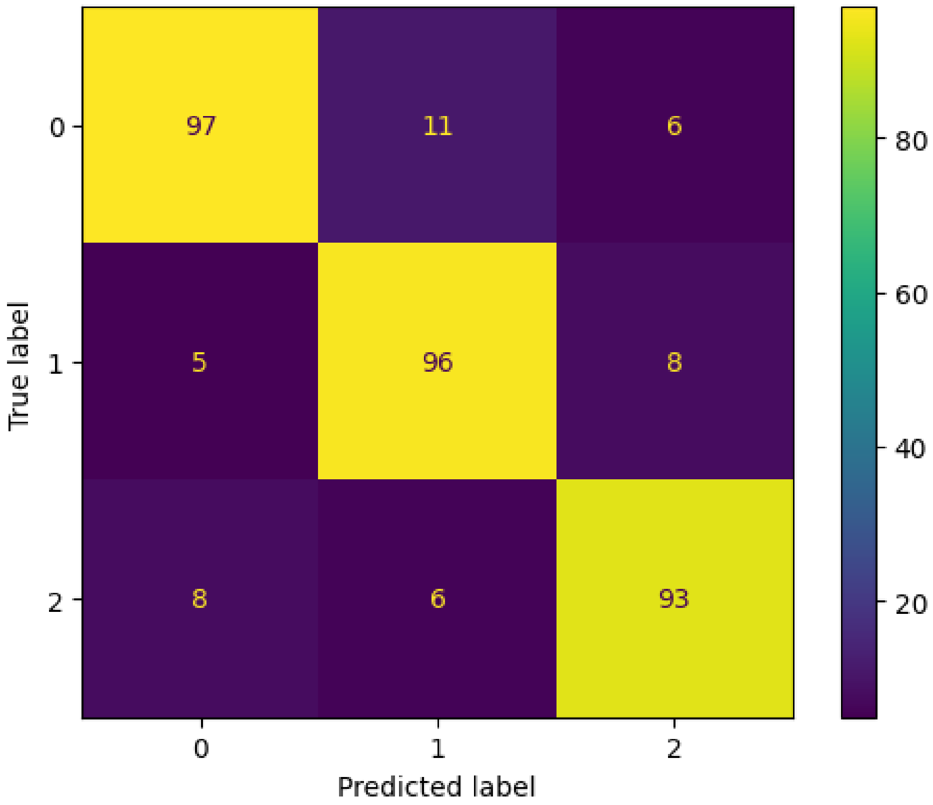
[ ]:

```
0.8666666666666667
```

1.3.2 Visualizing Results

[ ]:

```
cm = confusion_matrix(y_test, y_pred)
ConfusionMatrixDisplay(cm).plot();
```



1.4 K-Means

1.4.1 Testing Number of Clusters

[ ]:
```
distortions_ = []
for i in range(1, 11):
    kmeans = KMeans(n_clusters=i, init='k-means++', n_init=10, max_iter=300,␣
 ↪tol=0.0001, verbose=0, random_state=None, copy_x=True, algorithm='lloyd')
    kmeans.fit(scaled_features)
    distortions_.append(kmeans.inertia_)

min_distortion = min(distortions_)

best_num_clusters = distortions_.index(min_distortion)

print('The best number of clusters among the 10 quantities tested is',␣
 ↪best_num_clusters,end='.')
```

```
The best number of clusters among the 10 quantities tested is 9.
```

1.4.2 Visualizing Results

[ ]:
```
cluster = KMeans(n_clusters=best_num_clusters, init='k-means++', n_init=10,␣
 ↪max_iter=300, tol=0.0001, verbose=0, random_state=None, copy_x=True,␣
 ↪algorithm='lloyd')
kmeans.fit(scaled_features[['anxiety_level','sleep_quality']])

cluster_assignments = kmeans.labels_
cluster_centers = kmeans.cluster_centers_

graf1 = px.scatter(x = scaled_features.loc[:,'anxiety_level'], y =␣
 ↪scaled_features.loc[:,'sleep_quality'], color=cluster_assignments)
graf2 = px.scatter(x = cluster_centers[:,0], y = cluster_centers[:,1], size =␣
 ↪[10 for _ in range(10)])
graf3 = go.Figure(data = graf1.data + graf2.data)
graf3.update_layout(width=800,height=300,title_text='K-Means Clustering')
graf3.update_xaxes(title = 'anxiety_level')
graf3.update_yaxes(title = 'sleep_quality')
graf3.show()
```