KNN - K Nearest Neighbours Algorithm

In [63]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn import metrics
from sklearn.neighbors import KNeighborsClassifier

import warnings
warnings.filterwarnings('ignore')
```

Data Preparation

In [64]:
```
from sklearn import datasets


wine_data = datasets.load_wine()

X = pd.DataFrame(wine_data.data, columns = wine_data.feature_names)
y = pd.DataFrame(wine_data.target, columns = ['target'])
```

In [65]:
```
X.head(3)
```

Out[65]:

	alcohol	malic_acid	ash	alcalinity_of_ash	magnesium	total_phenols	flavanoids	nonflavanoid_
0	14.23	1.71	2.43	15.6	127.0	2.80	3.06	
1	13.20	1.78	2.14	11.2	100.0	2.65	2.76	
2	13.16	2.36	2.67	18.6	101.0	2.80	3.24	

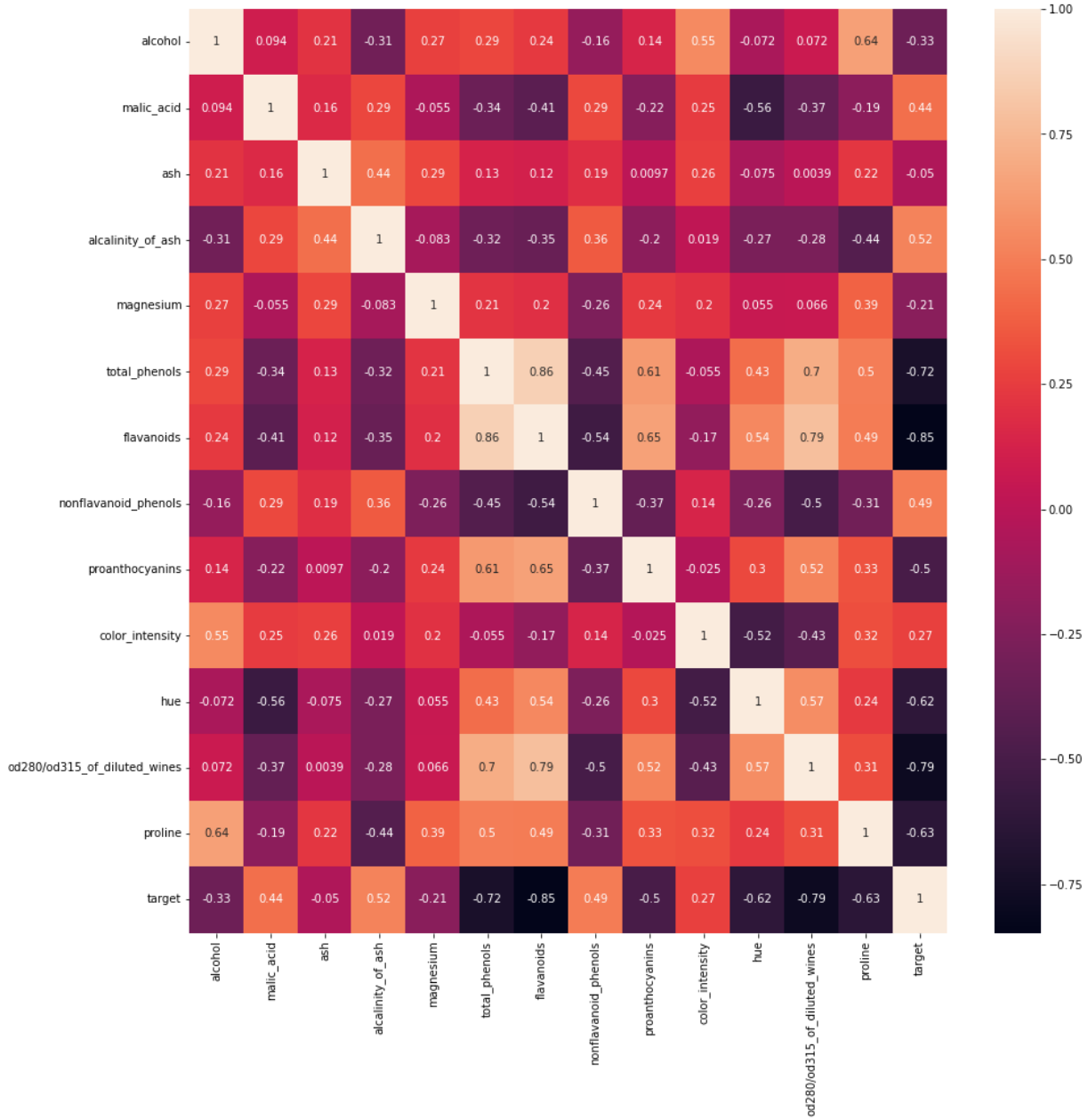
In [66]:
```
y.head(3)
```

Out[66]:

	target
0	0
1	0
2	0

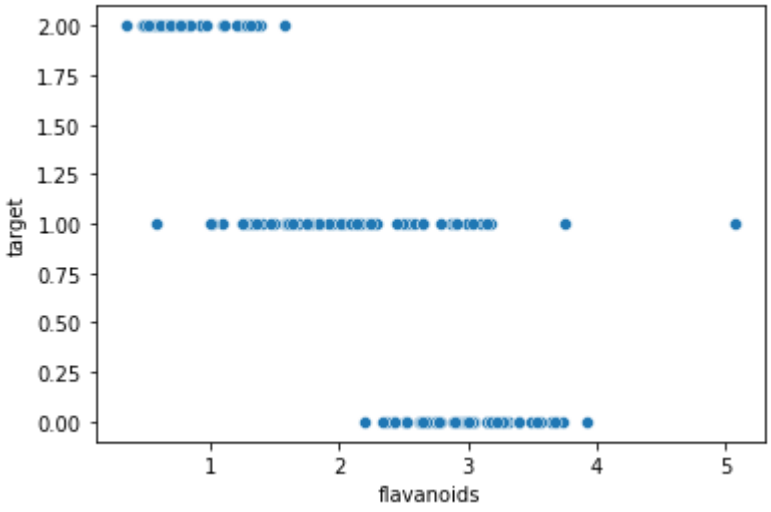
Visualization

In [72]:
```
plt.figure(figsize=(15,15))
sns.heatmap((pd.concat([X,y], axis = 1).corr()), annot = True)
plt.show()
```



In [73]:
```
# scatter

sns.scatterplot(x=X.flavanoids, y=y.target)
plt.show()
```



Standard Scaling

In [9]:
```
ss = StandardScaler()
X_new = ss.fit_transform(X)
```

Train-Test-Split

In [59]:
```
X_train, X_test, y_train, y_test = train_test_split(X_new, y, random_state =
```

Modelling

In [60]:
```
knn_model = KNeighborsClassifier(n_neighbors=8)
knn_model.fit(X_train, y_train)
```

Out[60]:
```
KNeighborsClassifier
KNeighborsClassifier(n_neighbors=8)
```

Prediction

In [61]:
```
y_pred = knn_model.predict(X_test)
y_pred
```

Out[61]:
```
array([0, 0, 2, 0, 1, 0, 1, 2, 1, 2, 0, 2, 0, 1, 0, 1, 1, 1, 0, 1, 0, 1,
       1, 2, 2, 2, 1, 0, 1, 0, 0, 1, 2, 0, 0, 0, 2, 2, 1, 2, 0, 1, 1, 1,
       2, 0, 1, 1, 2, 0, 1, 0, 0, 2])
```

Evaluation

In [62]:
```
# classification report

print(metrics.classification_report(y_test,y_pred))
```

```
              precision    recall  f1-score   support

           0       0.95      1.00      0.97        19
           1       1.00      0.95      0.98        21
           2       1.00      1.00      1.00        14

    accuracy                           0.98        54
   macro avg       0.98      0.98      0.98        54
weighted avg       0.98      0.98      0.98        54
```

Finding the optimal Value of K

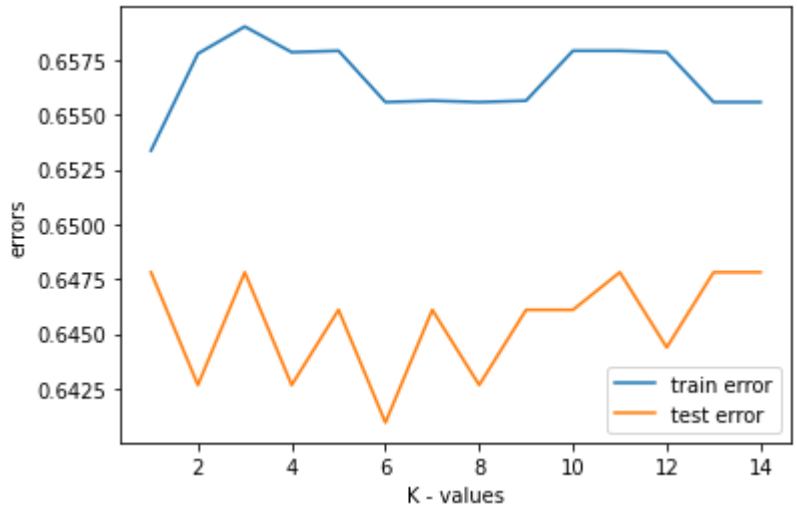
In [53]:
```
train_error = []
test_error = []
for i in range(1,15):

    knn_model = KNeighborsClassifier(n_neighbors=i)
    knn_model.fit(X_train, y_train)
    y_pred_train = knn_model.predict(X_train)
    y_pred_test = knn_model.predict(X_test)
    train_error.append(np.mean(np.array(y_pred_train) != np.array(y_train)))
    test_error.append(np.mean(np.array(y_pred_test) != np.array(y_test)))
```

In [54]:
```
# visualizing the train & test error

sns.lineplot(x = np.arange(1,15),y = train_error, label = 'train error')
sns.lineplot(x = np.arange(1,15),y = test_error, label = 'test error')
plt.legend()
plt.xlabel('K - values')
plt.ylabel('errors')

plt.show()
```



Optimal Value of K is 8 as the train and test error is less at this point.

In [ ]:
```
1
```

In [ ]:
```
1
```