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USE CASE 2 - Abalone Dataset

In [1]:
```
import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)
from sklearn import datasets
from sklearn.model_selection import train_test_split
from sklearn.neighbors import KNeighborsClassifier
import seaborn as sns
sns.set()
import matplotlib.pyplot as plt
import os
```

In [3]:
```
data = pd.read_csv("/content/abalone_PCA.csv")
```

In [4]:
```
data.head()
```

Out[4]:

	Length	Diameter	Height	Whole weight	Shucked weight	Viscera weight	Shell weight	Rings
0	0.455	0.365	0.095	0.5140	0.2245	0.1010	0.150	15
1	0.350	0.265	0.090	0.2255	0.0995	0.0485	0.070	7
2	0.530	0.420	0.135	0.6770	0.2565	0.1415	0.210	9
3	0.440	0.365	0.125	0.5160	0.2155	0.1140	0.155	10
4	0.330	0.255	0.080	0.2050	0.0895	0.0395	0.055	7

WITHOUT PCA

In [5]:
```
X = data.drop(["Rings"],axis=1)
Y = data.Rings
```

In [6]:
```
from sklearn.preprocessing import MinMaxScaler
scaler = MinMaxScaler()
X=scaler.fit_transform(X)
```

In [7]:
```
X_train, X_test, y_train, y_test = train_test_split(X, Y, test_size = 0.3, random_stat
```

In [8]:
```
X_train.shape
```

Out[8]:
```
(2923, 7)
```

In [9]:
```
knn = KNeighborsClassifier(7)
knn.fit(X_train,y_train)
print("Train score before PCA",knn.score(X_train,y_train),"%")
print("Test score before PCA",knn.score(X_test,y_test),"%")
```

```
Train score before PCA 0.4149846048580226 %
Test score before PCA 0.20972886762360446 %
```

WITH PCA

In [12]:
```
from sklearn.decomposition import PCA
pca = PCA()
X_new = pca.fit_transform(X)
```

In [13]:
```
pca.get_covariance()
```

Out[13]:
```
array([[0.0263373 , 0.02671094, 0.00497119, 0.02607972, 0.02175153,
        0.02115053, 0.02020923],
       [0.02671094, 0.0278188 , 0.00514694, 0.02680872, 0.02223664,
        0.02165798, 0.02094625],
       [0.00497119, 0.00514694, 0.00137012, 0.00526663, 0.00428188,
        0.00426476, 0.00419673],
       [0.02607972, 0.02680872, 0.00526663, 0.03016518, 0.02513205,
        0.02422356, 0.02301697],
       [0.02175153, 0.02223664, 0.00428188, 0.02513205, 0.02228122,
        0.02007736, 0.01827562],
       [0.02115053, 0.02165798, 0.00426476, 0.02422356, 0.02007736,
        0.02082948, 0.0181715 ],
       [0.02020923, 0.02094625, 0.00419673, 0.02301697, 0.01827562,
        0.0181715 , 0.01924245]])
```

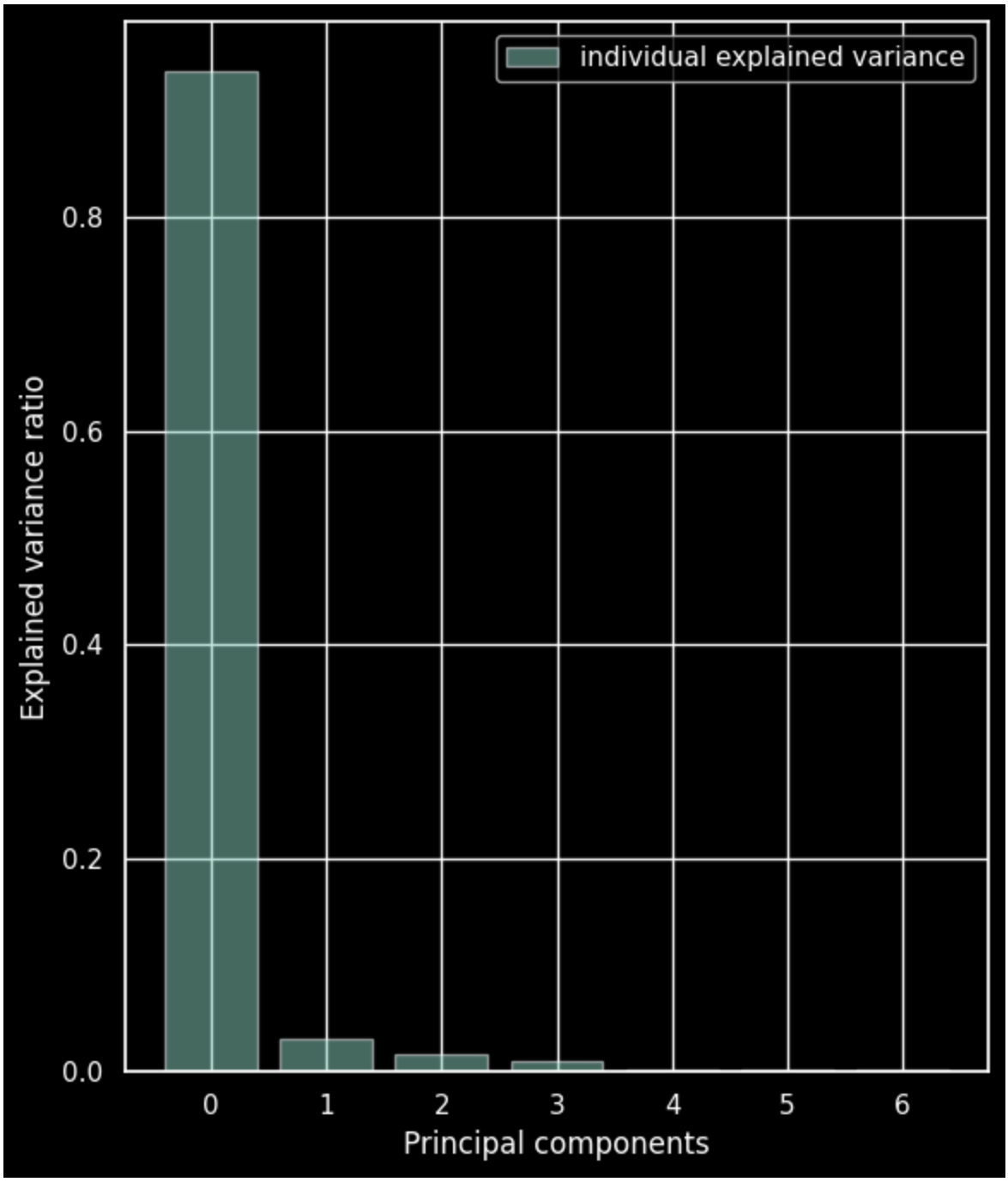
In [14]:
```
explained_variance=pca.explained_variance_ratio_
explained_variance
```

Out[14]:
```
array([0.93679718, 0.03153659, 0.01626195, 0.0093007 , 0.00260248,
       0.00229245, 0.00120865])
```

Model will be able to predict 90 to 95% data using 2 Principal Components

In [31]:
```
with plt.style.context('dark_background'):
    plt.figure(figsize=(6, 7))

    plt.bar(range(7), explained_variance, alpha=0.5, align='center',
            label='individual explained variance')
    plt.ylabel('Explained variance ratio')
    plt.xlabel('Principal components')
    plt.legend(loc='best')
    plt.tight_layout()
```



In [34]:
```
cumulative_variance = np.cumsum(explained_variance)

n_components_90 = np.argmax(cumulative_variance >= 0.9) + 1
n_components_95 = np.argmax(cumulative_variance >= 0.95) + 1

print(f'Number of components to explain 90% of variance: {n_components_90}')
print(f'Number of components to explain 95% of variance: {n_components_95}')
```

```
Number of components to explain 90% of variance: 1
Number of components to explain 95% of variance: 2
```

Model with 3 PCAs

In [17]:
```
pca=PCA(n_components=3)
X_new=pca.fit_transform(X)
```

In [18]:
```
print(X_new)
```

```
[[-0.23081559 -0.02656329 -0.00678646]
 [-0.49767081  0.04379106  0.00304922]
 [-0.06885678 -0.08145397  0.01171976]
 ...
 [ 0.27393757  0.01903742 -0.02508556]
 [ 0.26228233 -0.02765864 -0.045737  ]
 [ 0.73902813  0.13032208 -0.04692217]]
```

In [20]:
```
df=pd.DataFrame(X_new)
df.head(10)
```

Out[20]:

	0	1	2
0	-0.230816	-0.026563	-0.006786
1	-0.497671	0.043791	0.003049
2	-0.068857	-0.081454	0.011720
3	-0.230997	-0.012962	0.004214
4	-0.532797	0.057362	-0.000513
5	-0.365677	0.001097	0.009902
6	-0.017584	-0.055328	0.120170
7	-0.011209	-0.066032	0.035870
8	-0.205363	-0.042998	0.004117
9	0.052356	-0.055884	0.079397

In [24]:
```
X_train_new, X_test_new, y_train, y_test = train_test_split(X_new, Y, test_size = 0.3,
```

In [25]:
```
knn_pca = KNeighborsClassifier(7)
knn_pca.fit(X_train_new,y_train)
print("Train score after PCA",knn_pca.score(X_train_new,y_train),"%")
print("Test score after PCA",knn_pca.score(X_test_new,y_test),"%")
```

```
Train score after PCA 0.39616832021895315 %
Test score after PCA 0.24720893141945774 %
```

Model with 2 PCAs

In [26]:
```
# model with two PCAs
pca=PCA(n_components=2)
X_new=pca.fit_transform(X)
```

In [28]:
```
X_train_new, X_test_new, y_train, y_test = train_test_split(X_new, Y, test_size = 0.3,
```

In [29]:
```
knn_pca = KNeighborsClassifier(7)
knn_pca.fit(X_train_new,y_train)
print("Train score after PCA",knn_pca.score(X_train_new,y_train),"%")
print("Test score after PCA",knn_pca.score(X_test_new,y_test),"%")
```

```
Train score after PCA 0.4036948340745809 %
Test score after PCA 0.215311004784689 %
```

Converting ipynb file into HTML

In [30]:
```
%%shell
jupyter nbconvert --to html "/content/0328_USECASE2.ipynb"
```

```
[NbConvertApp] Converting notebook /content/0328_USECASE2.ipynb to html
[NbConvertApp] Writing 615832 bytes to /content/0328_USECASE2.html
```

Out[30]: