In [7]:

```python
import numpy as np
import pandas as pd
import csv
import cv2
import seaborn as sb
import matplotlib.pyplot as plt
from sklearn.preprocessing import LabelEncoder, StandardScaler
from sklearn.metrics import confusion_matrix, accuracy_score
from sklearn.linear_model import LogisticRegression
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestClassifier
from sklearn.tree import DecisionTreeClassifier
from sklearn.cluster import KMeans
import plotly.express as px
import scipy.stats as stats
```

In [7]:

```python
pip install opencv-python
```

```
Collecting opencv-python
  Downloading opencv_python-4.8.0.74-cp37-abi3-win_amd64.whl (38.1 MB)
Requirement already satisfied: numpy>=1.19.3 in c:\users\mannahil miftah\anaconda3\lib\si
te-packages (from opencv-python) (1.20.3)
Installing collected packages: opencv-python
Successfully installed opencv-python-4.8.0.74
Note: you may need to restart the kernel to use updated packages.
```

In [8]:

```python
image = cv2.imread(r'C:\Users\Mannahil Miftah\Downloads\face.jpg')
image.shape
```

Out[8]:

```
(220, 200, 3)
```

In [13]:

```python
image.shape[2]
```

Out[13]:

```
3
```

In [9]:

```python
convert_img = np.reshape(image, (-1, image.shape[2]))
convert_img
```

Out[9]:

```
array([[241, 240, 244],
       [241, 240, 244],
       [241, 240, 244],
       ...,
       [235, 231, 236],
       [235, 231, 236],
       [235, 231, 236]], dtype=uint8)
```
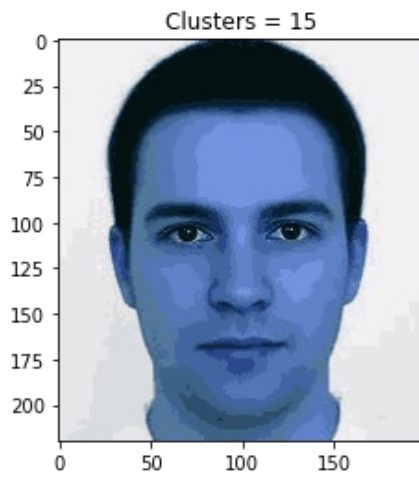
In [12]:

```python
clusters = [2, 3, 5, 10, 15]

for c in clusters:
    kmeans = KMeans(n_clusters = c, random_state = 42)
```

```
        label = kmeans.fit_predict(convert_img)
        cluster_centers = kmeans.cluster_centers_
        face = cluster_centers[label]
        face = face.reshape(image.shape).astype(np.uint8)
        plt.title('Clusters = ' + str(c))
        plt.imshow(face)
        plt.show()
```

Clusters = 2

Clusters = 3

Clusters = 5
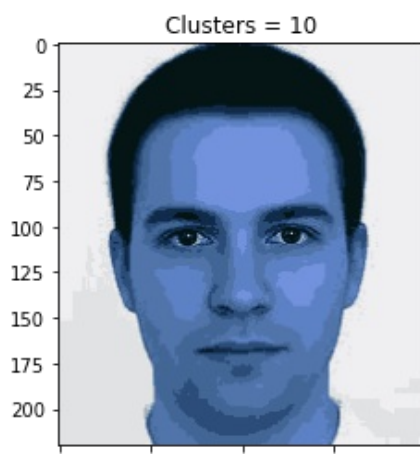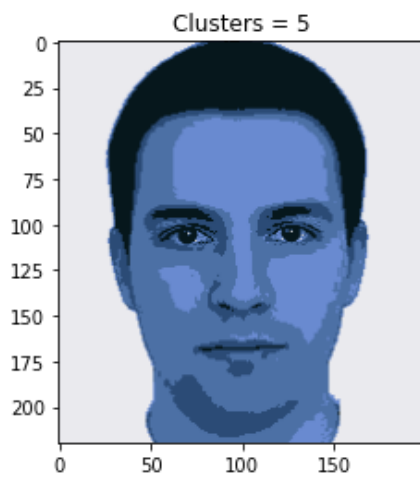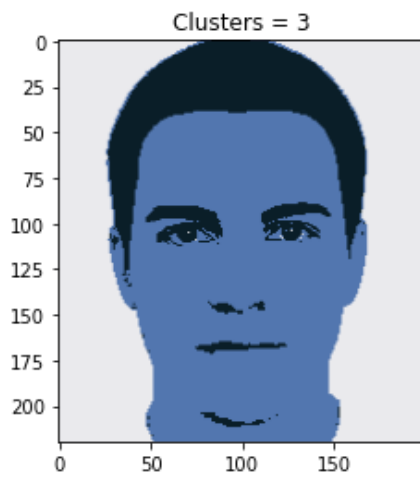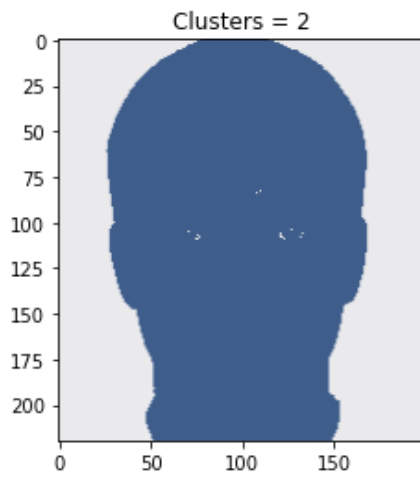
Clusters = 10

Clusters = 15

From the above results we can conclude that by increasing the number of clusters kmeans algorithm is adding more details/colors to the image.

When k=15 we can see the clear and complete image of the face whereas when k=2 the image is not clear as only very little detail is added

which points towards the facial feature eyes. When we increase k to 3 and 5 we can see more details added to the facial features and the basic

face structure is made, however finer details are still missing.