hierarchical

March 31, 2022

1 Hierarical Clustring (Agglomerative-single Linkage)

1.0.1 Importing packages

[ ]:
```
import numpy as np
import pandas as pd
from matplotlib import pyplot as plt
from scipy.cluster.hierarchy import dendrogram
from sklearn.cluster import AgglomerativeClustering
```

1.1 Reading the dateset & Renaming columns lables

[ ]:
```
col_names = ['timeStamp', 'Gender', 'Grade', 'Age', 'Length', 'Weight',␣
 ↪'ShoesSize']
dataframe = pd.read_csv("../human_features.csv", names = col_names,␣
 ↪skiprows=(0, ))
```

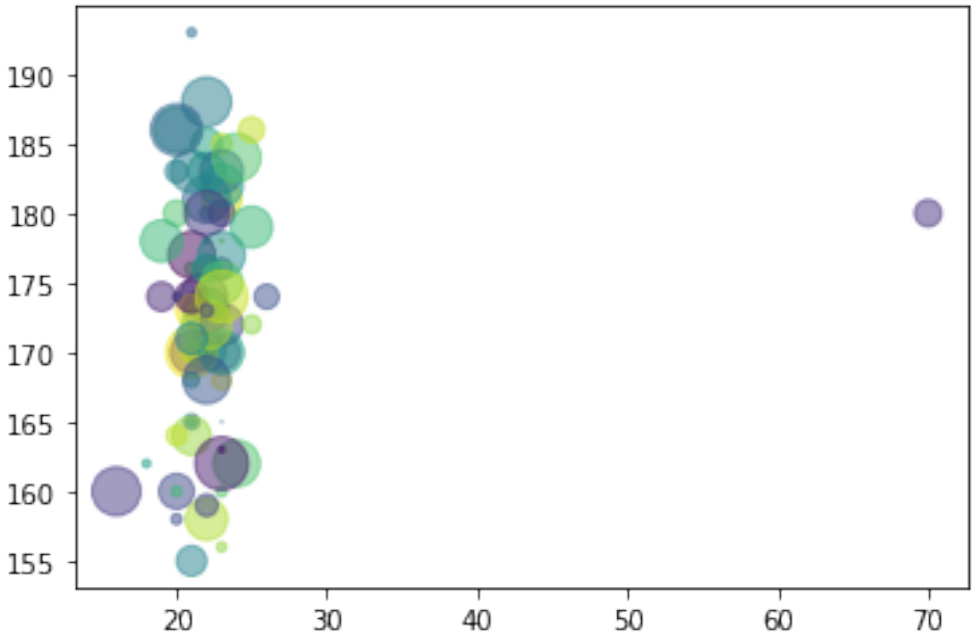
[ ]:
```
dataFrameWithConcernedFeatures = dataframe.loc[:, ['Age', 'Length']]
```

1.2 Visualizing the data

[ ]:
```
x = dataFrameWithConcernedFeatures.iloc[:, 0]
y = dataFrameWithConcernedFeatures.iloc[:, 1]
```

[ ]:
```
n = dataFrameWithConcernedFeatures.shape[0]
colors = np.random.rand(n)
size = pow(20 * np.random.rand(n), 2)
plt.scatter(x, y, s=size, c=colors, alpha=0.5)
```

[ ]:
```
<matplotlib.collections.PathCollection at 0x7f335b448310>
```



1.3 Filtering out odd date

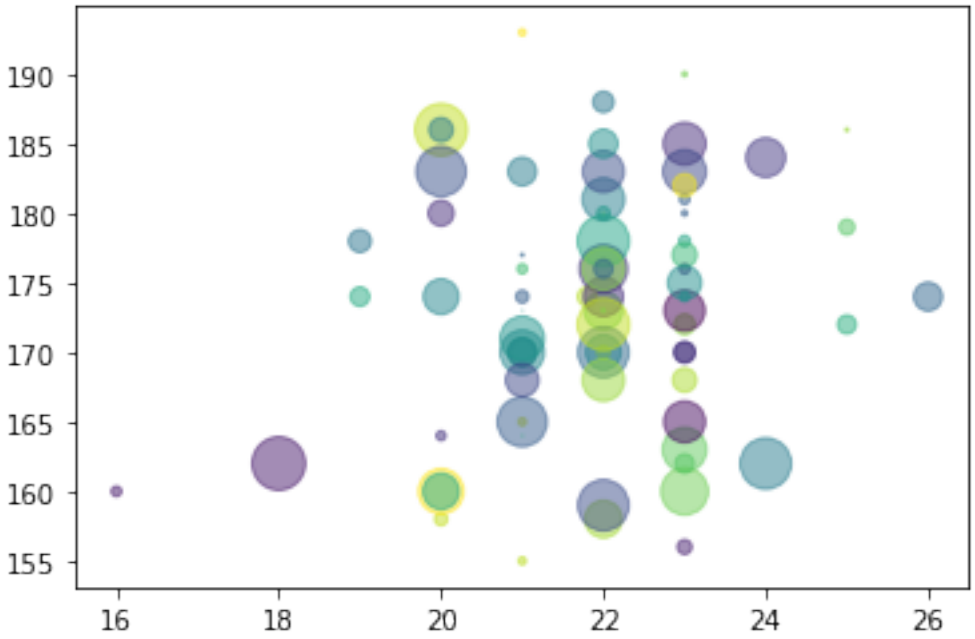
[ ]:
```
dataFrameFiltered = dataFrameWithConcernedFeatures.loc[dataframe["Age"] <= 40,␣
↪["Age", "Length"]]
```

1.4 Data after removing odd samples

[ ]:
```
x = dataFrameFiltered.loc[:, 'Age']
y = dataFrameFiltered.loc[:, 'Length']
```

[ ]:
```
n = dataFrameFiltered.shape[0]
colors = np.random.rand(n)
size = pow(20 * np.random.rand(n), 2)
plt.scatter(x, y, s=size, c=colors, alpha=0.5)
```

[ ]:
```
<matplotlib.collections.PathCollection at 0x7f335b0dcd30>
```



1.5 Creating Agglomerative Clusting model

[ ]:
```
cluster_model = AgglomerativeClustering(distance_threshold=0, n_clusters=None)
```

1.5.1 Training the model on the data

[ ]:
```
clustring = cluster_model.fit(dataFrameFiltered)
```

2 Needs Explaination

[ ]:
```
clustring.labels_
```

[ ]:
```
array([62, 67, 75, 74, 73, 61, 72, 65, 71, 49, 59, 69, 68, 63, 58, 48, 45,
       35, 47, 56, 39, 53, 43, 40, 55, 66, 27, 50, 51, 57, 24, 46, 70, 33,
       52, 25, 60, 44, 28, 32, 36, 21, 19, 54, 29, 64, 30, 14, 23, 37, 13,
       22, 31, 34, 42, 17, 41, 26, 20,  6, 15, 16, 38, 18, 11,  9,  8, 10,
        7,  4,  3, 12,  5,  1,  2,  0])
```

[ ]:
```
clustring.children_
```

[ ]:
```
array([[  2,  39],
       [  3,  73],
       [  4,  41],
       [  6,  20],
```

```
[  8,  59],
[ 32,  74],
[ 11,  31],
[ 12,  15],
[ 33,  83],
[ 70,  75],
[ 25,  79],
[ 52,  82],
[ 13,  22],
[  0,  26],
[  5,   9],
[ 36,  37],
[ 10,  42],
[ 14,  44],
[ 29,  34],
[ 19,  23],
[ 24,  61],
[ 57,  63],
[ 21,  62],
[ 35,  68],
[ 28,  46],
[ 27,  58],
[ 30,  54],
[ 48,  50],
[ 18,  81],
[ 69,  86],
[ 51,  96],
[ 77,  88],
[ 78,  84],
[ 98, 107],
[ 90, 104],
[ 76,  97],
[ 87, 101],
[ 66, 112],
[ 49,  92],
[ 40, 102],
[ 55,  94],
[ 53,  95],
[  1,  17],
[  7,  16],
[ 45,  56],
[ 99, 100],
[ 47,  64],
[ 38,  85],
[ 93, 113],
[ 43,  65],
[ 71, 111],
```

```
       [ 72, 116],
       [109, 121],
       [105, 108],
       [ 67,  89],
       [ 91, 114],
       [117, 123],
       [110, 130],
       [115, 129],
       [103, 128],
       [ 60, 119],
       [127, 131],
       [122, 133],
       [106, 126],
       [ 80, 137],
       [118, 132],
       [120, 135],
       [124, 142],
       [125, 141],
       [136, 140],
       [139, 144],
       [134, 143],
       [138, 145],
       [147, 148],
       [146, 149]])
```

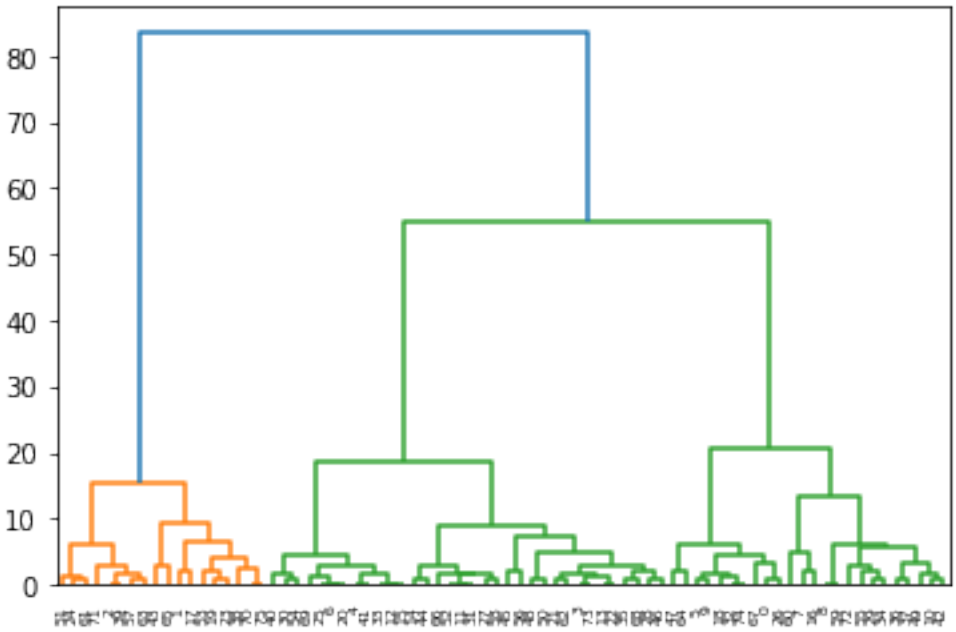
[ ]:
```python
def plot_dendrogram(model, **kwargs):
    # Create linkage matrix and then plot the dendrogram

    # create the counts of samples under each node
    counts = np.zeros(model.children_.shape[0])
    n_samples = len(model.labels_)
    for i, merge in enumerate(model.children_):
        current_count = 0
        for child_idx in merge:
            if child_idx < n_samples:
                current_count += 1  # leaf node
            else:
                current_count += counts[child_idx - n_samples]
        counts[i] = current_count

    linkage_matrix = np.column_stack(
        [model.children_, model.distances_, counts]
    ).astype(float)

    # Plot the corresponding dendrogram
    dendrogram(linkage_matrix, **kwargs)
```

[ ]:
```
plot_dendrogram(clustring)
```



[ ]:
```
plot_dendrogram(clustring, truncate_mode="level", p=3 )
```