```
import numpy as np, pandas as pd, matplotlib.pyplot as plt
from sklearn.cluster import KMeans
from sklearn import metrics
from mpl_toolkits import mplot3d
X1 = hthr.iloc[:,0].to_numpy()
x1 = X1.reshape(len(X1))
X2 = hthr.iloc[:, 5].to_numpy()
x2 = X2.reshape(len(X2))
X3 = hthr.iloc[:,6].to_numpy()
x3 = X3.reshape(len(X3))
X = list(zip(x1, x2, x3))
k = 0

print('Silhouette metric for clusters\n')
verify = [2, 3, 4, 5, 6, 7, 8, 10]
for v in verify:
kmeans_model = KMeans(n_clusters = v).fit(X)
global K
K = (v, metrics.silhouette_score(X, kmeans_model.labels_, metric='euclidean'))
print(K)
kmeans_model = KMeans(n_clusters = 7).fit(X)
labels = kmeans_model.labels_
centers = kmeans_model.cluster_centers_
print('\ncentres - 7 clusters')
print(centers)
col_par = labels.astype(np.float)
ax = plt.axes(projection = "3d")
ax.scatter(X1, X2, X3, c = col_par, cmap='viridis')
ax.set_xlabel('Hearing Thld')
ax.set_ylabel('Age')
ax.set_zlabel('Noise Exposure')
ax.scatter(centers[:,0], centers[:,1], centers[:,2], c = 'black', s=200,
alpha=0.5)
plt.show
freq_count = np.unique(labels, return_counts=True)
Segmentation = pd.DataFrame(freq_count, columns = ('Clus1', 'Clus2','Clus3',
'Clus4', 'Clus
print('\nSegmentation:')
Segmentation
```

Output:

```
Silhouette metric for clusters
(2, 0.31532435990785734)
(3, 0.33162314719428393)
(4, 0.33190823574192435)
(5, 0.33826604272154015)
(6, 0.33731955902237826)
(7, 0.3634294376167676)
(8, 0.35255447850380306)
(10, 0.33281022456489273)

centres - 7 clusters

[[62.7 24.2 5.8]
[38.54 44.5 20.34]
```

```
[50.76315789 36.36842105 14.15789474]
[70.75 52.91666667 26.41666667]
[51. 48.44827586 24.5862069]
[38.45454545 54.81818182 31.5]
[34.26666667 32.73333333 11.8]]
```

	Clus1	Clus2	Clus3	Clus4	Clus5	Clus6	Clus7
0	0	1	2	3	4	5	6
1	10	50	38	12	29	22	30