National Technical University of Ukraine
“Igor Sikorsky Kyiv Polytechnic Institute”
Faculty of Informatics and Computer Science
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Lab work No6

Clusterisation and regression in scikit-learn

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Tasks

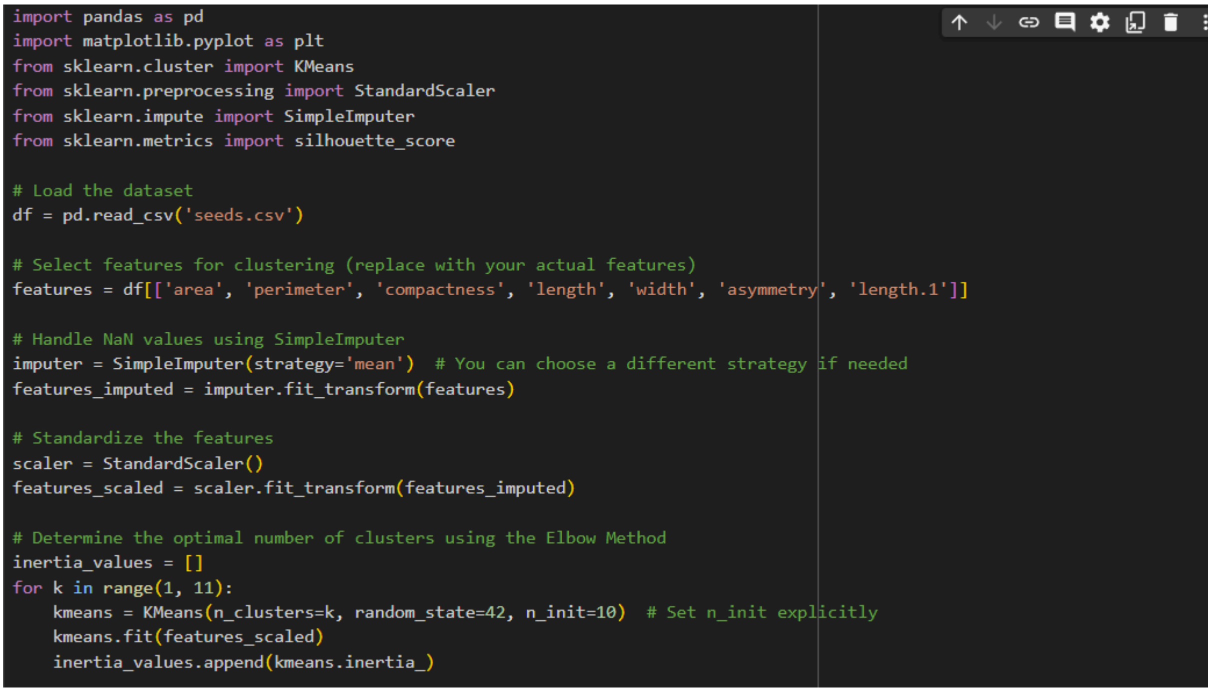
Create a Python program that trains and tests the model which does task according to your number in the group; evaluate the model with according metrics.

Make a report in doc-file. Report must contain:
— Title;
— Program code;
— Results (screenshots) of code execution.

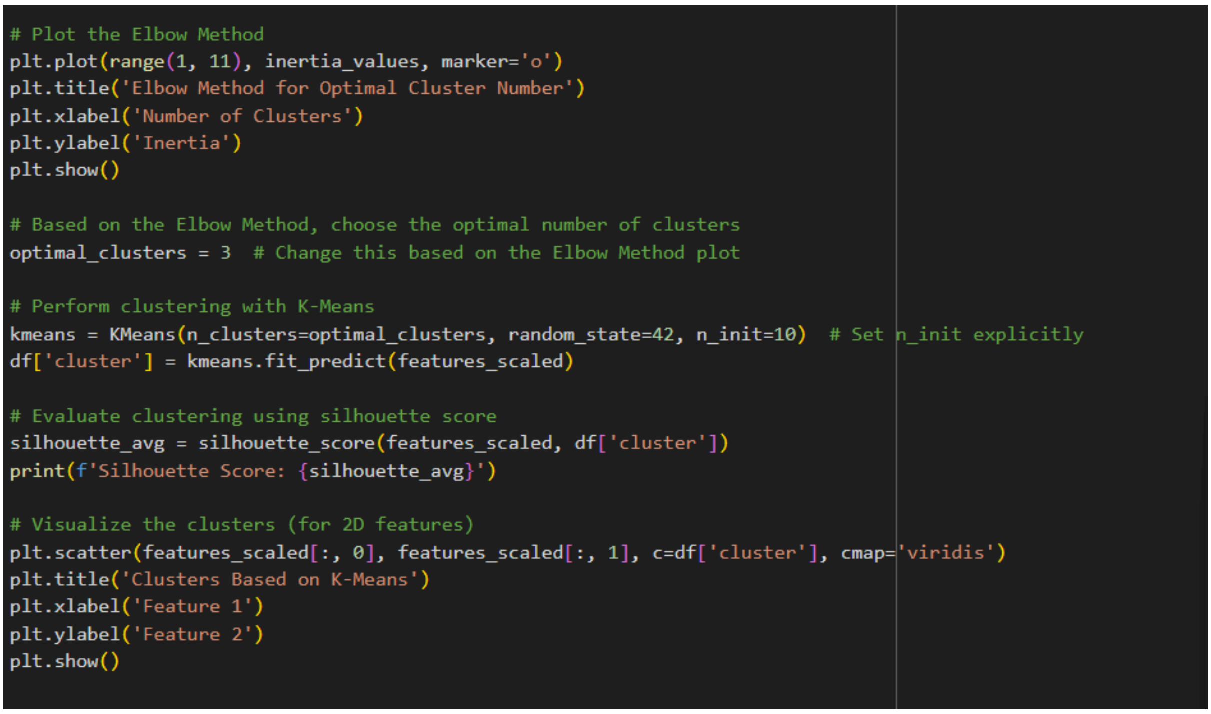
Demonstrate the working program and answer questions about theoretical information and program working.

3: seeds.csv. Do the clusterization, describe the results.

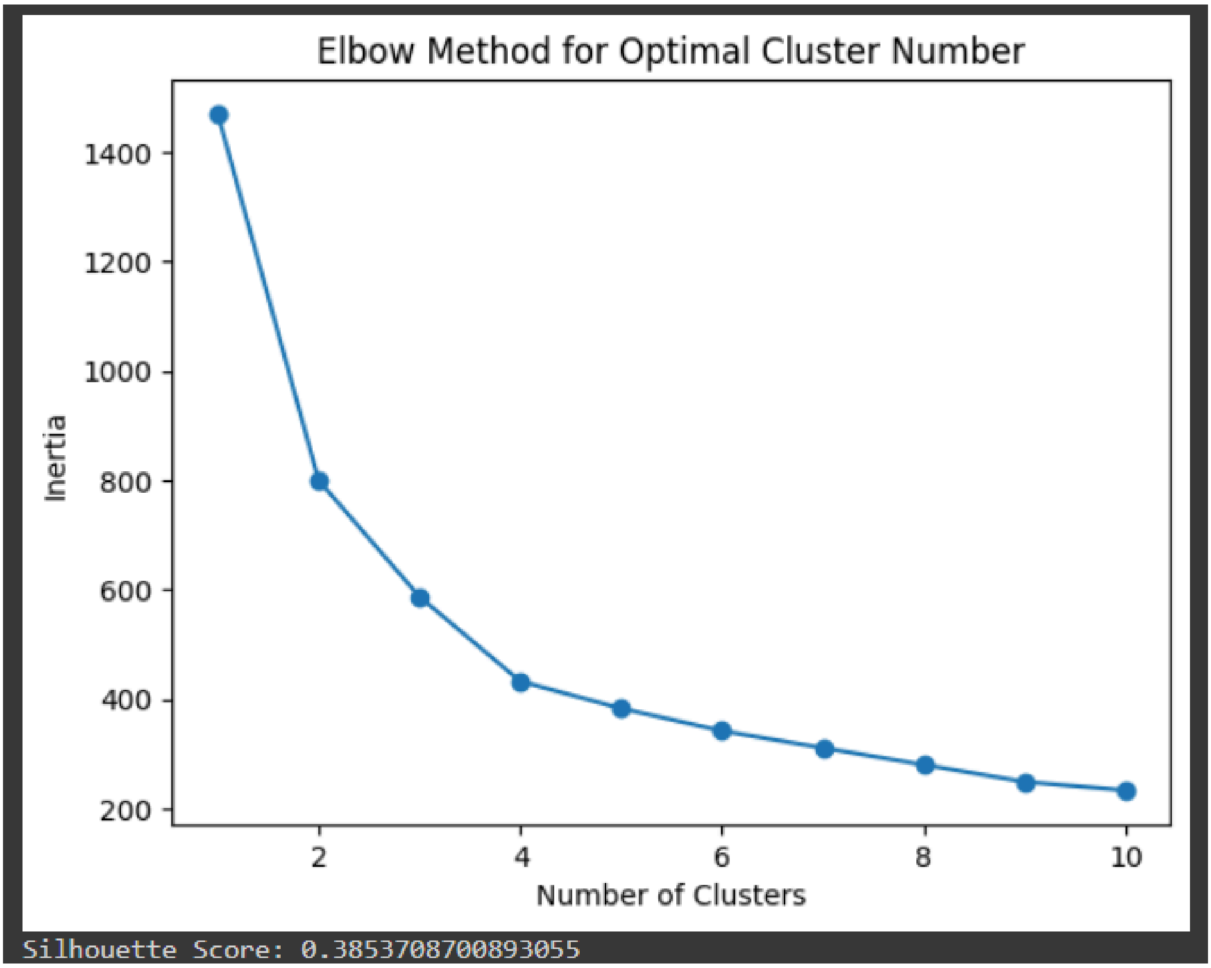
My Code Screen:



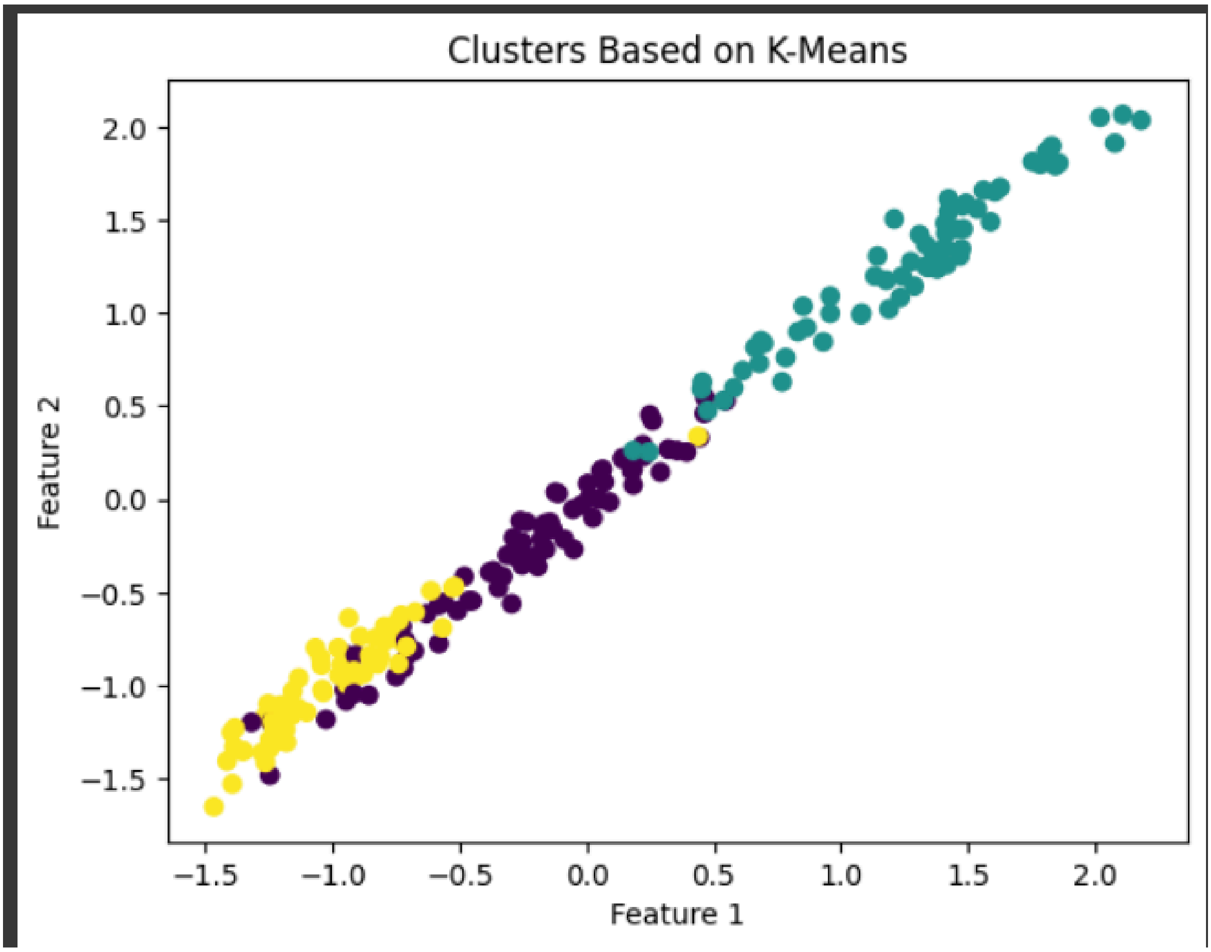
```
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.cluster import KMeans
from sklearn.preprocessing import StandardScaler
from sklearn.impute import SimpleImputer
from sklearn.metrics import silhouette_score

# Load the dataset
df = pd.read_csv('seeds.csv')

# Select features for clustering (replace with your actual features)
features = df[['area', 'perimeter', 'compactness', 'length', 'width', 'asymmetry', 'length.1']]

# Handle NaN values using SimpleImputer
imputer = SimpleImputer(strategy='mean')  # You can choose a different strategy if needed
features_imputed = imputer.fit_transform(features)

# Standardize the features
scaler = StandardScaler()
features_scaled = scaler.fit_transform(features_imputed)

# Determine the optimal number of clusters using the Elbow Method
inertia_values = []
for k in range(1, 11):
    kmeans = KMeans(n_clusters=k, random_state=42, n_init=10)  # Set n_init explicitly
    kmeans.fit(features_scaled)
    inertia_values.append(kmeans.inertia_)
```



```
# Plot the Elbow Method
plt.plot(range(1, 11), inertia_values, marker='o')
plt.title('Elbow Method for Optimal Cluster Number')
plt.xlabel('Number of Clusters')
plt.ylabel('Inertia')
plt.show()

# Based on the Elbow Method, choose the optimal number of clusters
optimal_clusters = 3  # Change this based on the Elbow Method plot

# Perform clustering with K-Means
kmeans = KMeans(n_clusters=optimal_clusters, random_state=42, n_init=10)  # Set n_init explicitly
df['cluster'] = kmeans.fit_predict(features_scaled)

# Evaluate clustering using silhouette score
silhouette_avg = silhouette_score(features_scaled, df['cluster'])
print(f'Silhouette Score: {silhouette_avg}')

# Visualize the clusters (for 2D features)
plt.scatter(features_scaled[:, 0], features_scaled[:, 1], c=df['cluster'], cmap='viridis')
plt.title('Clusters Based on K-Means')
plt.xlabel('Feature 1')
plt.ylabel('Feature 2')
plt.show()
```



```
Silhouette Score: 0.3853708700893055
```


Clusters Based on K-Means
Feature 2
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0
Feature 1