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# 🌸 Dimensionality Reduction using PCA on Iris Dataset

# Step 1: Import required libraries
from sklearn import datasets
import pandas as pd
from sklearn.preprocessing import StandardScaler
from sklearn.decomposition import PCA
import seaborn as sns
import matplotlib.pyplot as plt

# Step 2: Load the Iris dataset
iris = datasets.load_iris()
df = pd.DataFrame(iris['data'], columns = iris['feature_names'])
print("Original Iris Dataset (first 5 rows):")
print(df.head())

# Step 3: Standardize the data
scalar = StandardScaler()
scaled_data = pd.DataFrame(scalar.fit_transform(df), columns=df.columns)
print("\nScaled Data (first 5 rows):")
print(scaled_data.head())

# Step 4: Correlation heatmap before PCA
plt.figure(figsize=(6,4))
sns.heatmap(scaled_data.corr(), annot=True, cmap='coolwarm')
plt.title("Correlation Heatmap (Before PCA)")
plt.show()

# Step 5: Apply PCA to reduce dimensions to 3 components
pca = PCA(n_components=3)
pca.fit(scaled_data)
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data_pca = pca.transform(scaled_data)
data_pca = pd.DataFrame(data_pca, columns=['PC1','PC2','PC3'])
print("\nData after PCA (first 5 rows):")
print(data_pca.head())

# Step 6: Correlation heatmap after PCA
plt.figure(figsize=(6,4))
sns.heatmap(data_pca.corr(), annot=True, cmap='coolwarm')
plt.title("Correlation Heatmap (After PCA)")
plt.show()
```

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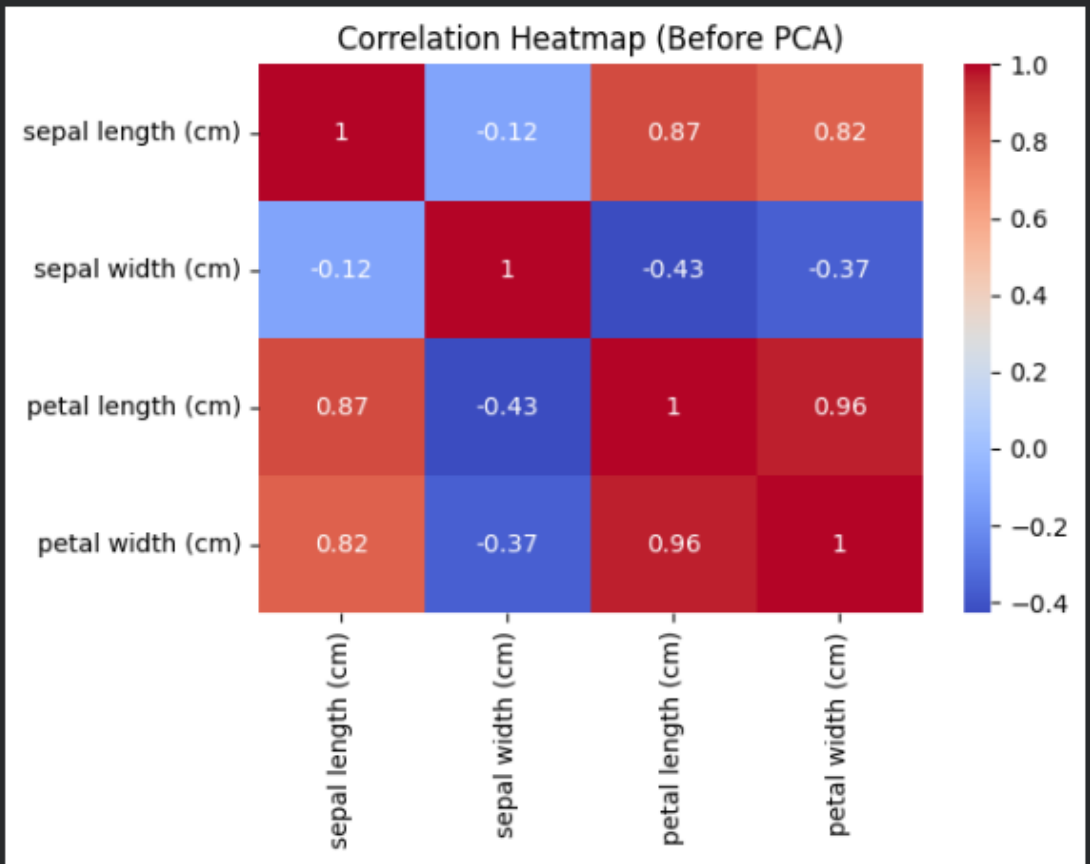
Original Iris Dataset (first 5 rows):
   sepal length (cm)  sepal width (cm)  petal length (cm)  petal width (cm)
0                5.1               3.5                1.4               0.2
1                4.9               3.0                1.4               0.2
2                4.7               3.2                1.3               0.2
3                4.6               3.1                1.5               0.2
4                5.0               3.6                1.4               0.2

Scaled Data (first 5 rows):
   sepal length (cm)  sepal width (cm)  petal length (cm)  petal width (cm)
0          -0.900681          1.019004          -1.340227         -1.315444
1          -1.143017         -0.131979          -1.340227         -1.315444
2          -1.385353          0.328414          -1.397064         -1.315444
3          -1.506521          0.098217          -1.283389         -1.315444
4          -1.021849          1.249201          -1.340227         -1.315444
```



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Data after PCA (first 5 rows):
        PC1       PC2       PC3
0 -2.264703  0.480027  0.127706
1 -2.080961 -0.674134  0.234609
2 -2.364229 -0.341908 -0.044201
3 -2.299384 -0.597395 -0.091290
4 -2.389842  0.646835 -0.015738
```