AIM

To implement the K-Means clustering algorithm to group unlabeled data points into clusters based on feature similarity.

PROCEDURE

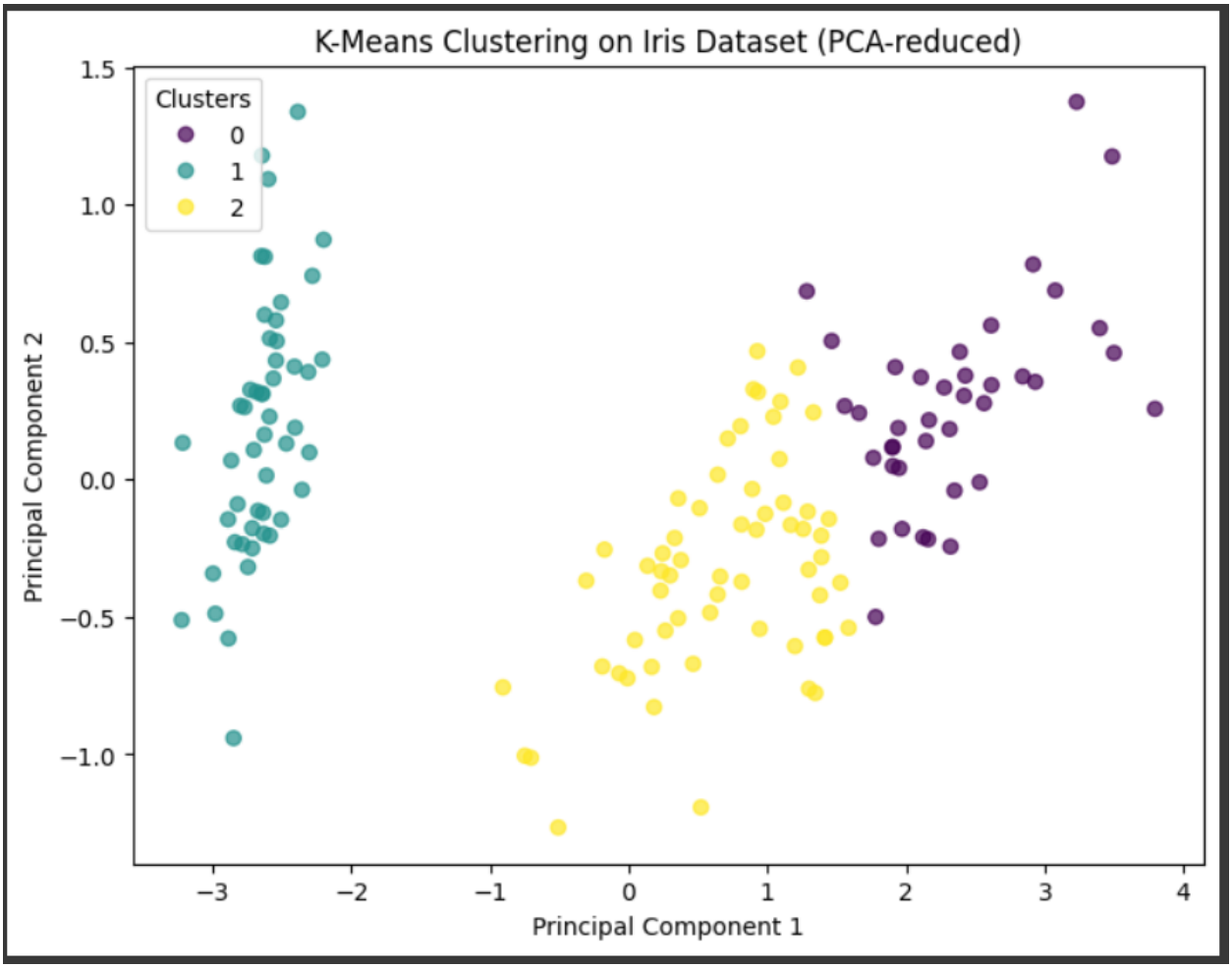
1. **Import dataset**: Use a dataset with unlabeled or labeled data (e.g., Iris dataset without labels).
2. **Preprocess data**: Extract features for clustering.
3. **Apply K-Means algorithm**:
    - Choose the number of clusters (k).
    - Initialize cluster centroids randomly.
    - Assign each data point to the nearest centroid.
    - Recalculate centroids as mean of assigned points.
    - Repeat assignment and centroid update until convergence.
4. **Visualize clusters** using 2D plot.
5. **Evaluate results** by comparing clusters to actual labels (optional).

CODE

```
import matplotlib.pyplot as plt
from sklearn.datasets import load_iris
from sklearn.cluster import KMeans
from sklearn.decomposition import PCA

# Load dataset
iris = load_iris()
```

```
X = iris.data

# Apply PCA to reduce to 2 dimensions for visualization
pca = PCA(n_components=2)
X_reduced = pca.fit_transform(X)

# Initialize and fit K-Means with 3 clusters
kmeans = KMeans(n_clusters=3, random_state=42)
kmeans.fit(X)

# Get cluster labels
labels = kmeans.labels_

# Plot the clusters
plt.figure(figsize=(8,6))
scatter = plt.scatter(X_reduced[:, 0], X_reduced[:, 1], c=labels, cmap='viridis', alpha=0.7)
plt.title('K-Means Clustering on Iris Dataset (PCA-reduced)')
plt.xlabel('Principal Component 1')
plt.ylabel('Principal Component 2')
plt.legend(*scatter.legend_elements(), title="Clusters")
plt.show()
```

OUTPUT :



EXPLANATION

- PCA reduces 4D Iris data to 2D for visualization.
- K-Means partitions data into 3 clusters based on feature similarity.
- Each cluster corresponds roughly to one Iris species.
- Algorithm iteratively minimizes within-cluster variance.

CONCLUSION

- K-Means is an unsupervised algorithm that groups similar data points.
- It requires choosing the number of clusters in advance.
- Visualizing clusters in reduced dimensions aids understanding.
- K-Means works well on well-separated data but may struggle on complex shapes.