

## **Algorithm: Principal Component Analysis (PCA)**

- 1. Start**
  - 2. Import necessary libraries:**
    - o numpy, pandas, matplotlib.pyplot
    - o StandardScaler and PCA from sklearn
    - o load\_iris dataset
  - 3. Load dataset:**
    - o Load the *Iris dataset* using `load_iris()`.
    - o Extract features `x` and target labels `y`.
  - 4. Standardize the dataset:**
    - o Apply `StandardScaler` to normalize features so each has mean = 0 and standard deviation = 1.
  - 5. Apply PCA for dimensionality reduction:**
    - o Create a PCA model with `n_components = 2` for 2D visualization.
    - o Transform the scaled data to obtain `x_pca_2d`.
    - o Similarly, create a PCA model with `n_components = 3` for 3D visualization and get `x_pca_3d`.
  - 6. Plot the 2D PCA results:**
    - o Scatter plot the transformed data using the first two principal components.
    - o Use different colors for each class of Iris species.
  - 7. Plot the 3D PCA results:**
    - o Create a 3D scatter plot using the three principal components.
    - o Label each axis as PC1, PC2, and PC3.
  - 8. Display results:**
    - o Show both the 2D and 3D PCA visualizations with legends and grids.
  - 9. End**
-