

## Algorithm: Principal Component Analysis (PCA)

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