

EXP NO: TRANSFORMATION TECHNIQUES: CONSTRUCT HAARWAVELET TRANSFORMATION FOR NUMERICAL
DATE: DATA, CONSTRUCT PRINCIPAL COMPONENT ANALYSIS (PCA) FOR 5-DIMENSIONAL DATA.

AIM:

BACKGROUND THEORY:

a)Implementing the Haar wavelet transformation for numerical data involves the following steps:

- Divide the data into pairs.
- Calculate the averages and differences for each pair.
- Repeat the process on the averages until you are left with a single value (this process can be stopped earlier if needed).
- Step-by-Step Haar Wavelet Transformation
- **Divide Data into Pairs:** Suppose you have a list of data points $[x_1, x_2, x_3, x_4, \dots, x_n]$ where n is a power of 2. If n is not a power of 2, zero-padding can be applied to the data.
- **Calculate Averages and Differences:**
- **For each pair (x_{2i-1}, x_{2i}) , calculate:** Average: $a_i = \frac{x_{2i-1} + x_{2i}}{2}$ Difference: $d_i = \frac{x_{2i-1} - x_{2i}}{2}$
- The averages will form a new sequence of length $n/2$, and the differences will form another sequence of length $n/2$.
- **Repeat the Process:** Apply the same process to the new sequence of averages until only one value remains.

PROCEDURE:

Install Orange: Ensure you have Orange installed. If not, you can install it via pip:

Load Orange: Open the Orange application.

Import Data: Drag and drop the "File" widget to the canvas.

Double-click the "File" widget and load your dataset (ensure it has 5 dimensions).

Data Table: Connect the "File" widget to the "Data Table" widget to inspect your data and ensure it is loaded correctly.

PCA: Drag and drop the "PCA" widget to the canvas. And Connect the "File" widget to the "PCA" widget.

PCA Settings: Double-click the "PCA" widget to configure it. You can choose how many components you want to retain. For visualization purposes, retaining 2 or 3 components is often useful.

Click "Apply" to perform PCA.

Visualize: To visualize the results, you can connect the "PCA" widget to the "Scatter Plot" widget. Double-click the "Scatter Plot" widget to configure and visualize your data in the new principal component space.

b) Principal Component Analysis (PCA) in Orange

Open Orange: Launch the Orange application.

Load Your Data: Drag and drop the “File” widget to the canvas Load your dataset.

PCA Widget: Drag and drop the “PCA” widget to the canvas. Connect the “File” widget to the “PCA” widget. Double-click the “PCA” widget to configure it.

Configure PCA: In the PCA widget, you can specify the number of components you want to retain. For 5-dimensional data, you might want to reduce it to 2 or 3 components for visualization purposes Apply the transformation.

Visualize PCA Results : Connect the “PCA” widget to the “Scatter Plot” widget. Double-click the “ScattePlot” widget to configure and visualize the PCA results.

OUTPUT:

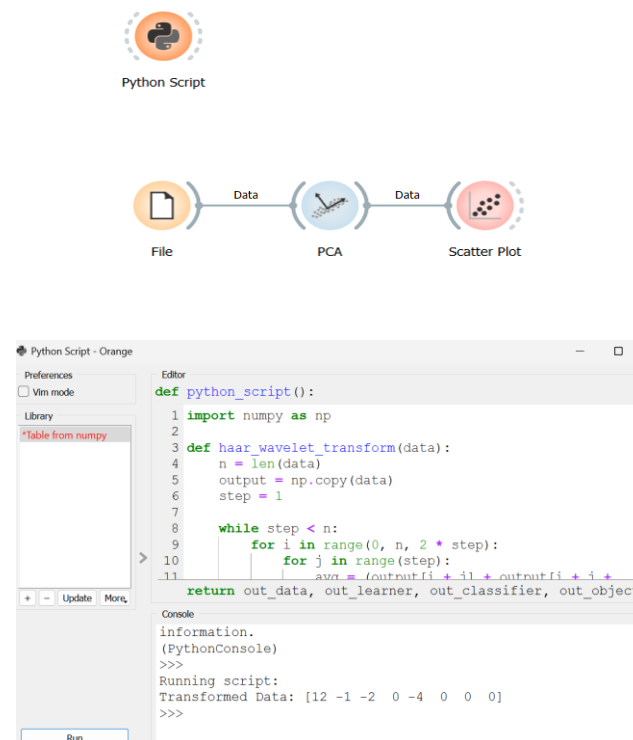


FIG 6.1: HAARWAVELET TRANSFORMATION FOR NUMERICAL DATA

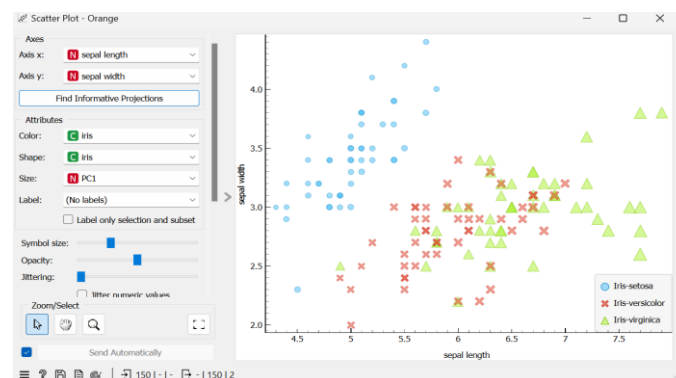


FIG 6.2: PRINCIPAL COMPONENT ANALYSIS

RESULT: