# Artificial Neural Network(ANN) Toolbox for Scilab

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# Introduction to ToolBox

- **Developed by Ryurick M.Hristev and Updated by Allan Cornett**
- **Can be downloaded from the website ANN ToolBox**
- **Works for all Scilab versions**
- **Works on Linux and Windows**

# Introduction to Neural Networks

- **Mathematical or Computational models**
- **Inspired by aspects of biological neural networks**
- **Applications are diversified**
  1. **Industrial process control**
  2. **Data validation**
  3. **Classification**
- **ANN as input layer, hidden layers and output layer**
- **Data has to be trained**
- **Different Algorithms to train the data**

# ....Continued

- **Algorithms Implemented**

# ....Continued

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  1. **Momentum with or without bias, batch or on-line**

# ....Continued

- **Algorithms Implemented**
  1. **Momentum with or without bias, batch or on-line**
  2. **SuperSAB with or without bias, batch or on-line**

# ....Continued

- **Algorithms Implemented**
  1. **Momentum with or without bias, batch or on-line**
  2. **SuperSAB with or without bias, batch or on-line**
  3. **Standard (vanilla) with or without bias, batch or online**

# ....Continued

- **Algorithms Implemented**
  1. **Momentum with or without bias, batch or on-line**
  2. **SuperSAB with or without bias, batch or on-line**
  3. **Standard (vanilla) with or without bias, batch or online**
  4. **Conjugate gradient**

# ....Continued

- **Unlimited number of layers**
- **Unlimited number of neurons per each layer separately**
- **Only layered feedforward networks are supported "directly", for others use the "hooks"**

# Getting started

**Steps to follow for loading the ToolBox in Scilab**

1. **Open Scilab**

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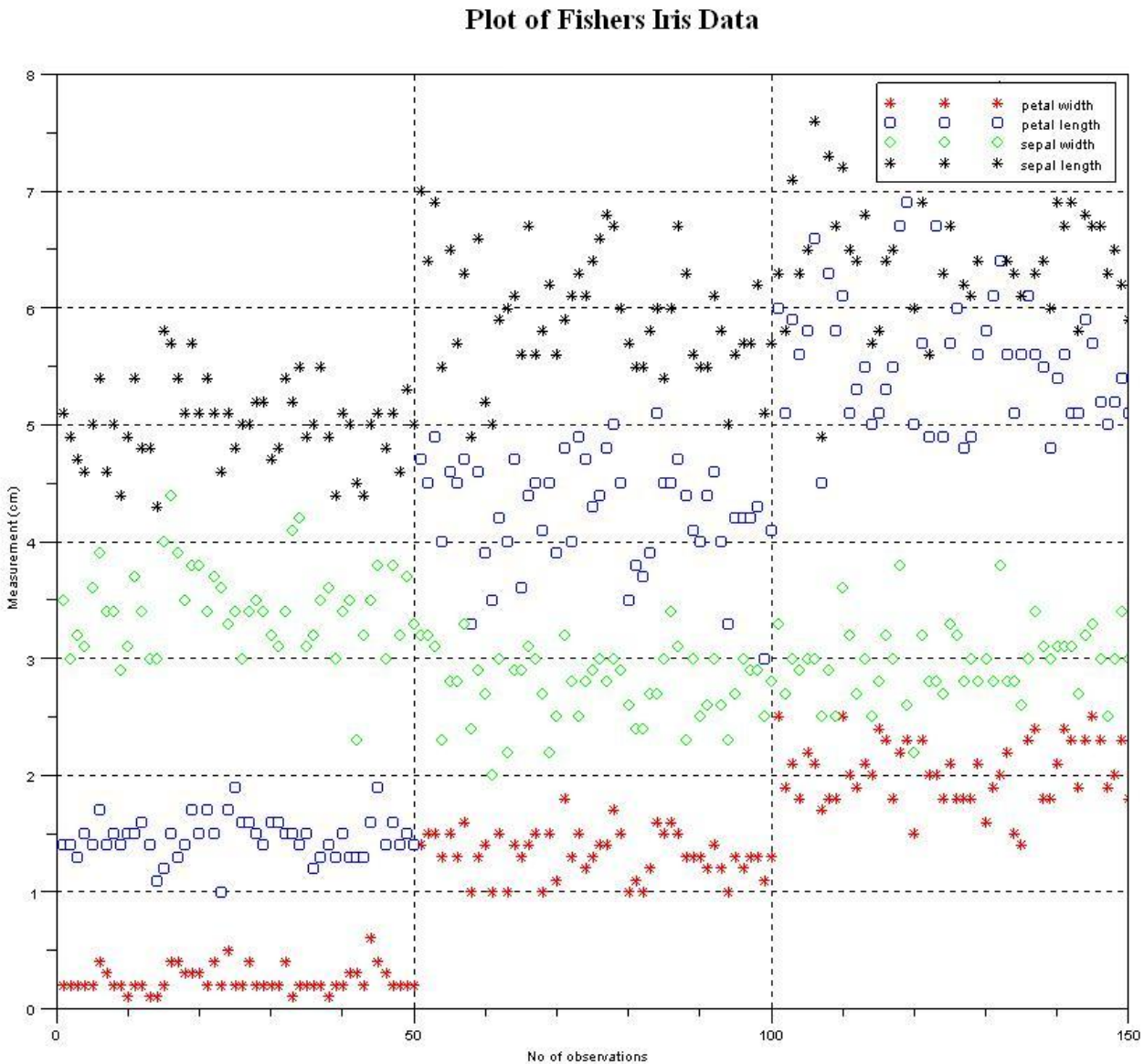
4. **exec loader.sce**

# Classification Example

**Objective: To calculate weights using training data and test the efficiency using test data**

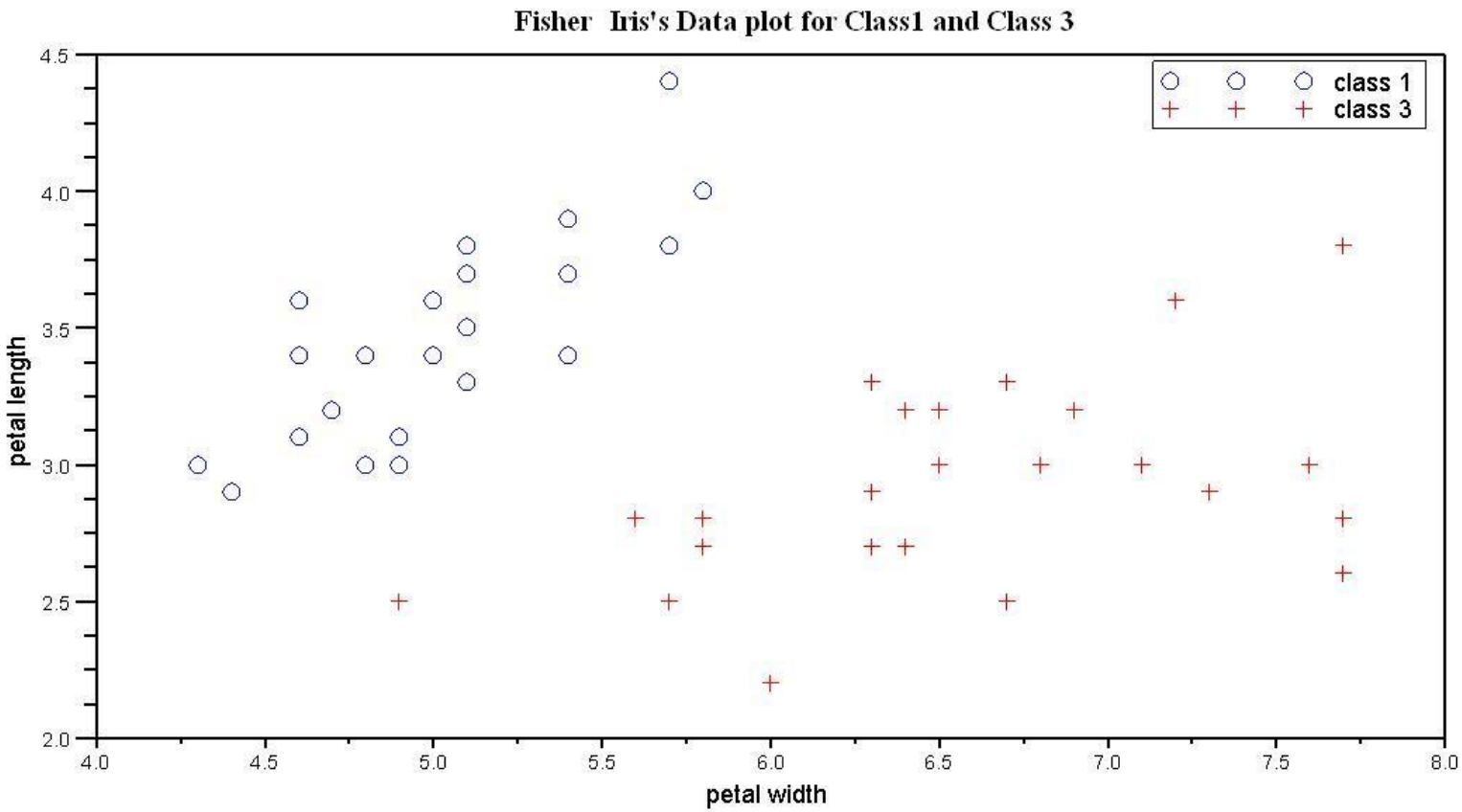
- **Fisher's iris data (Ref.:Fisher,R.,A.,The use of Multiple Measurements in Taxonomic Problems, Annals of Eugenics 7, 179-188,1936)**
- **Three classes of plants**
  1. *Setosa*
  2. *Virginica*
  3. *Versicolor*
- **Based on 4 attributes**
  1. **petal width**
  2. **petal length**
  3. **sepal width**
  4. **sepal length**

# ....Continued


Plot of Fishers Iris Data
petal width
petal length
sepal width
sepal length
Measurement (cm)
No of observations
0
1
2
3
4
5
6
7
8
0
50
100
150

# ....Continued

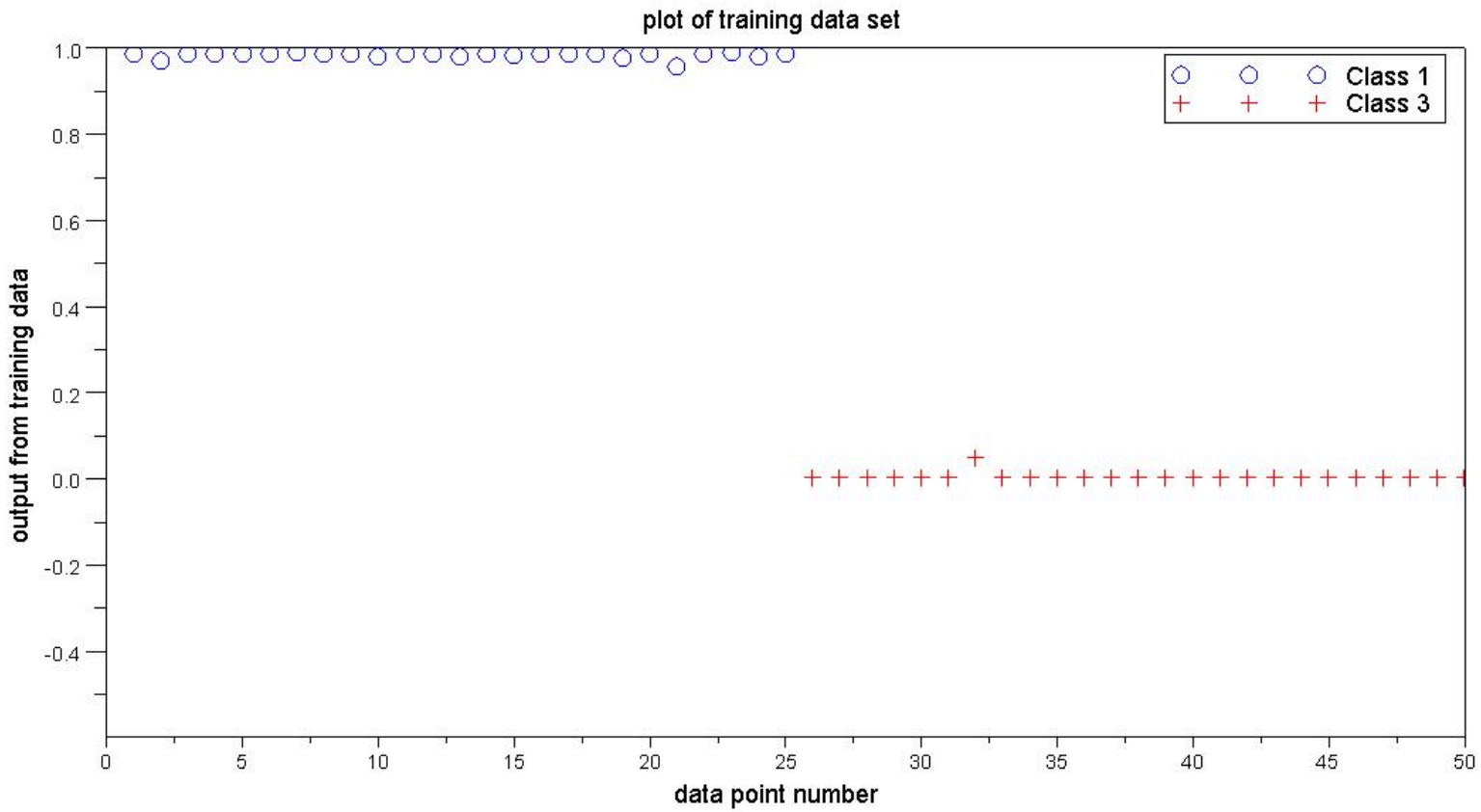
- 2 Classes will be considered i.e. class 1 and class 3
- 2 attributes will be used i.e. petal width and petal length



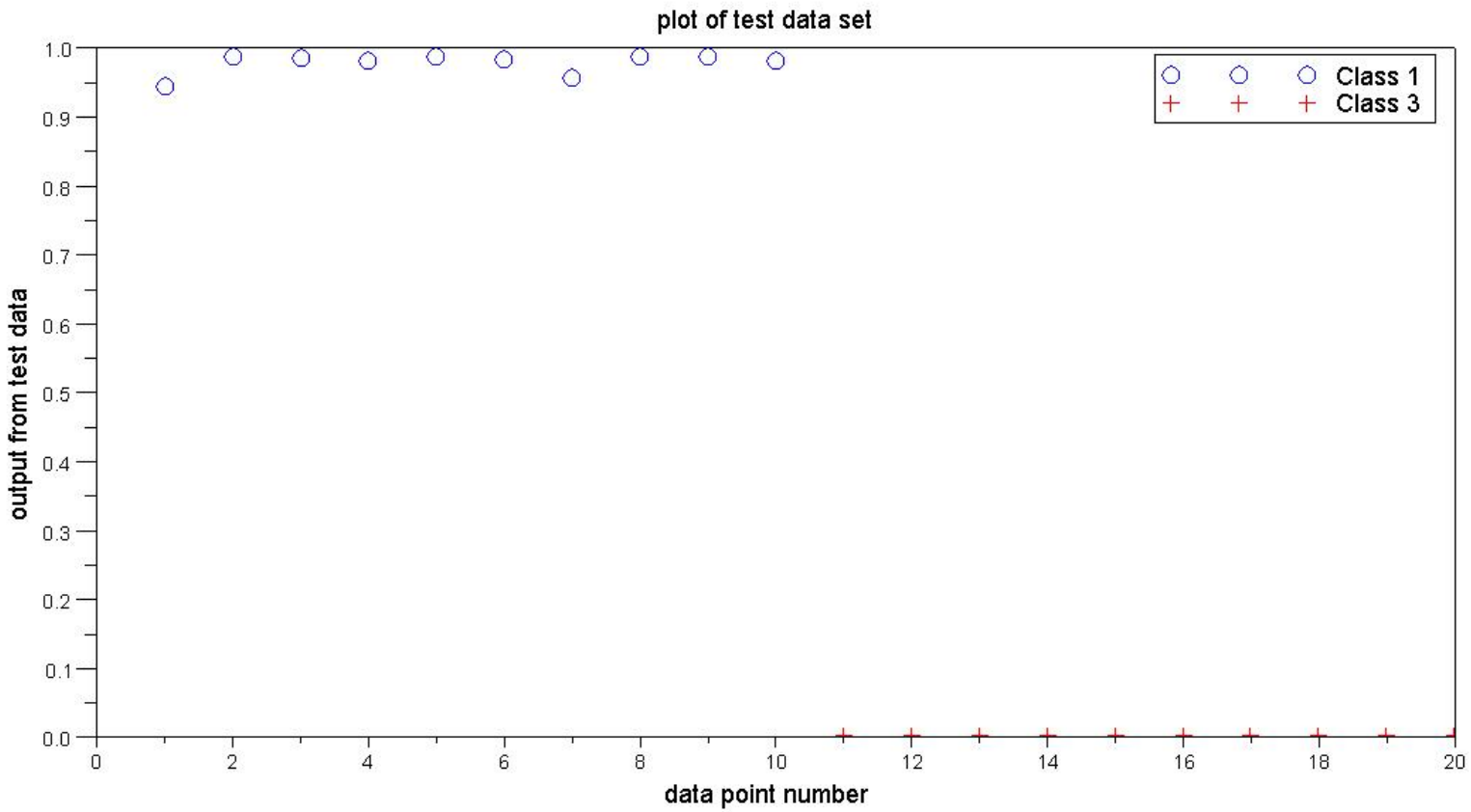
## ....Continued

- **Training Data: 25 data set form class 1 and class 3**
- **Test Data: 10 Data set from class 1 and class 3**
- **Scaling of the Data between 0 and 1**
- **Online backpropagation with Momentum with bias**

# ....Continued


plot of training data set
Class 1
Class 3
output from training data
data point number
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
0
5
10
15
20
25
30
35
40
45
50

# ....Continued


plot of test data set
output from test data
data point number
Class 1
Class 3
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
0
2
4
6
8
10
12
14
16
18
20

# Exercise

- **Repeat the same example with**
  1. **class 1 and class 2 data set with more than one hidden layers**
  2. **class 2 and class 3 data set (Is desired classification achieved ?)**

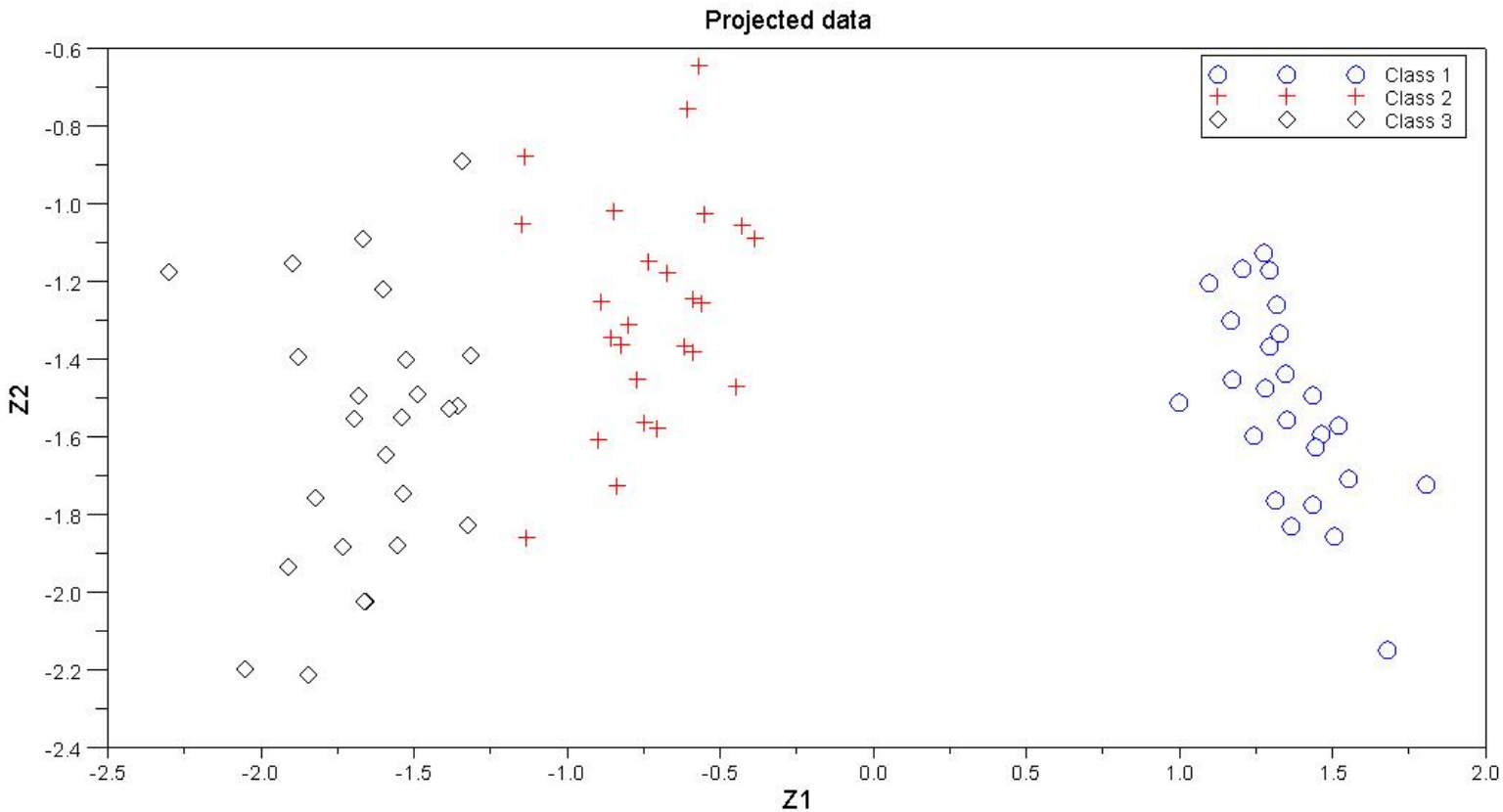
# Conclusion

- **Only one activation function**
- **Sometimes need to run twice as it gives error at the first place (WHY !!!)**
- **Still a Very effective toolbox**
- **Provides a range of Algorithms**

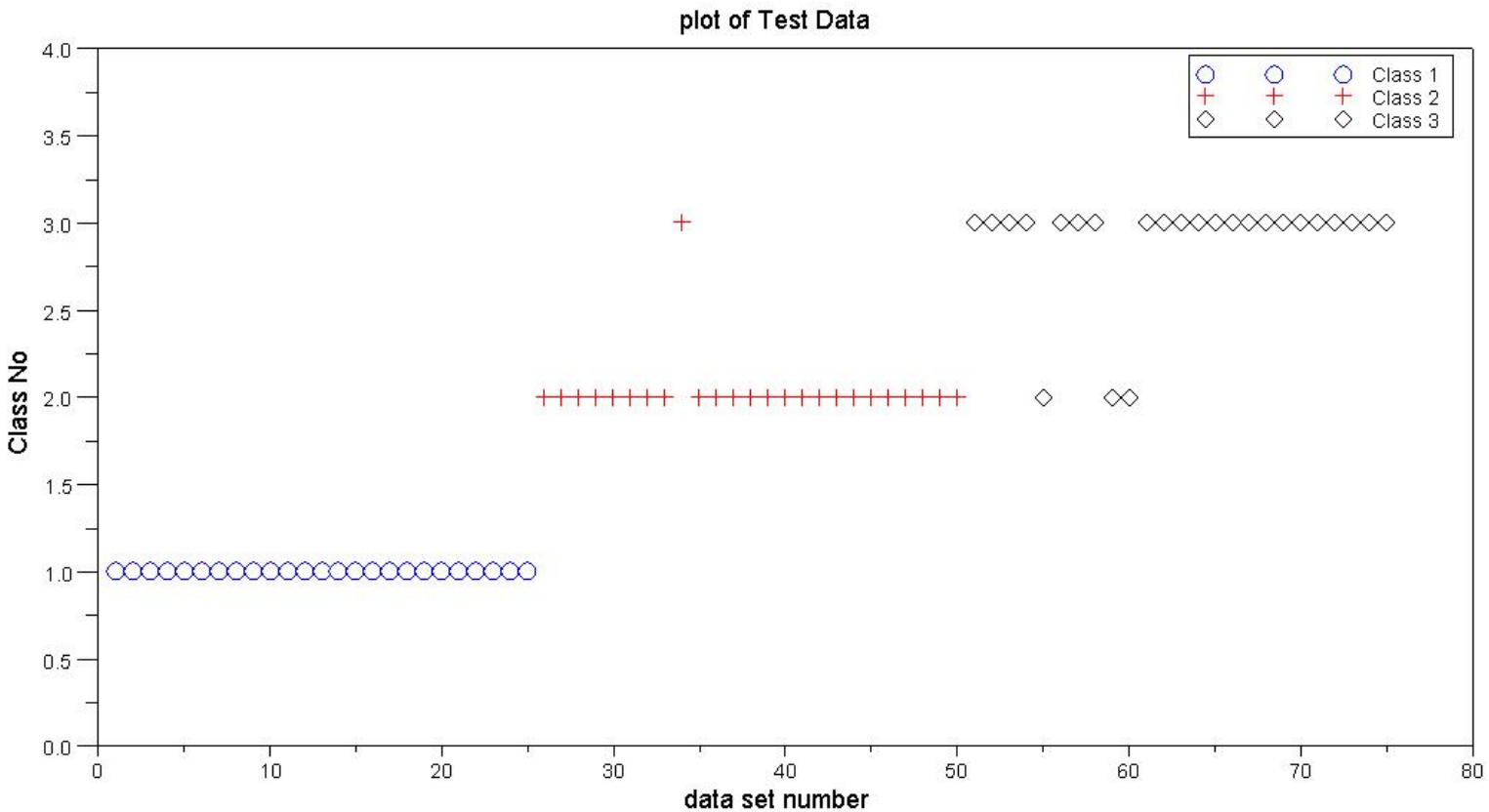
# Fisher Discriminant Analysis (FDA)

- **Generalized code is written in Scilab**
- **Training data and Test data are required**
- **Gives FDA vectors and their weights**
- **Gives Class number to which the test data belongs**

# Projected Data on FDA vectors



# Class No of Test Data



# Thank You.