

EXPERIMENT 6

CO3: To perform data collection and initial data handling by managing data structures and measurement levels.

Aim: To perform Discriminant Analysis using 10 sample values and analyze the classification of data using Origin Pro 2024 software.

Objective:

- To classify a set of observations into predefined groups.
- To examine how well the discriminant function distinguishes between the groups.
- To assess the accuracy of classification based on a set of predictor variables.

Theory:

Discriminant Analysis is a statistical technique used to classify a set of observations into predefined groups based on several continuous or binary predictor variables. It creates a discriminant function, which is a linear combination of the predictor variables that best separates the groups.

Key points include:

- **Linear Discriminant Analysis (LDA):** Assumes that the groups have identical variance-covariance matrices and the predictors follow a normal distribution.
- **Quadratic Discriminant Analysis (QDA):** Assumes different variance-covariance matrices for each group.

In Discriminant Analysis, the aim is to determine which variables differentiate between categories or groups, and it can be used for classification of new data.

Procedure:

1. Prepare the Data:

- Collect 10 sample values with corresponding group labels (e.g., Group A and Group B).
- The sample data should consist of predictor variables and a categorical response variable (group).

Example Data (Tabular Form):

Sample No.	Predictor 1	Predictor 2	Group
1	2.5	3.1	A
2	4.2	2.9	A
3	3.1	4.3	B
4	2.7	3.0	B
5	5.1	1.9	A
6	3.6	3.4	B
7	4.9	2.7	A
8	3.3	4.1	B
9	4.5	2.5	A
10	2.9	3.7	B

2. Open Origin Pro 2024:

Launch Origin Pro 2024 software on your computer.

3. Data Entry:

- a. Enter the sample data (predictors and groups) into the Origin Pro worksheet.
- b. Ensure that each predictor is entered in a separate column, and the group labels are in a separate column.

4. Select Analysis Tool:

- a. Go to the *Statistics* menu.
- b. Select **Multivariate Analysis** and then choose **Discriminant Analysis** from the drop-down menu.

5. Set Parameters:

- a. In the dialog box, select the predictor variables (e.g., Predictor 1 and Predictor 2) and the group variable (e.g., Group A, Group B).
- b. Choose whether to use Linear or Quadratic Discriminant Analysis (LDA or QDA) based on the data characteristics.
- c. Set any other relevant options like cross-validation or prior probabilities, if necessary.

6. Run the Analysis:

- a. Click on **OK** to run the analysis.
- b. Origin Pro will compute the discriminant function(s) and classify the sample values into their respective groups.

7. View Results:

The results will be displayed, including:

- The discriminant function.
- Classification table (how well the function classified the sample values).
- Group centroids.
- Eigenvalues and Wilks' Lambda for significance testing.

8. Plot the Discriminant Function:

- a. Plot the discriminant function by selecting the appropriate graph from the *Graph* menu.
- b. Visualize how well the samples are classified into groups.

Results:

Based on the above data and analysis, the results will typically include:

- **Discriminant Functions:** Linear combination of the predictor variables that best separate Group A and Group B.
- **Classification Table:** Shows how accurately the function classified the samples into the correct groups.
- **Group Centroids:** The mean of the discriminant function values for each group.

- **Significance Testing:** Wilks' Lambda and other statistical tests to assess the discriminative power of the function.

Example Output (Classification Table):

Group	Actual Count	Predicted Group A	Predicted Group B	Misclassification Rate
Group A	5	4	1	0.20
Group B	5	1	4	0.20
Total	10			0.20

Learning Outcomes:

- Understanding the basic principles of Discriminant Analysis.
- Ability to classify observations based on multiple predictor variables.
- Familiarity with using Origin Pro software to perform multivariate statistical analysis.
- Interpretation of discriminant function results, including classification accuracy and group separation.
- Knowledge of how to visualize discriminant analysis outcomes for further insights.