# Quadratic Discriminant Analysis

**Spoken Tutorial Project**
**https://spoken-tutorial.org**
**National Mission on Education through ICT**

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**We will learn about:**

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- **Quadratic Discriminant Analysis(QDA)**

# Learning Objectives

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- **Implementation of QDA using Raisin Dataset**

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- **Limitations of QDA**

# System Specifications

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**It is recommended to install R version 4.2.0 or higher**

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- **Quadratic discriminant analysis is a statistical method used for classification**

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- **QDA constructs a data-driven non-linear separator between two classes**

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- **A quadratic function describes the decision boundary between each pair of classes**

- LDA assumes that each class has the same covariance matrix

# Differences between QDA and LDA

- **LDA assumes that each class has the same covariance matrix**

- **QDA relaxes the assumption of an equal covariance matrix for all the classes**

- **LDA constructs a linear boundary, while QDA constructs a non-linear boundary**

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- **When the covariance matrices of different classes are the same, QDA reduces to LDA**

# Assumptions for QDA

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- QDA assumes that each class has its own covariance matrix

# Applications of QDA

QDA technique is used in several applications:

- Medical Diagnosis
- Bio-Imaging classification
- Fraud Detection

# Implementation of QDA

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- **Let us implement QDA on the raisin dataset with two chosen variables**

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- **For more information on Raisin data please see the Additional Reading material on this tutorial page**

**We will use:**

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- **A script file QDA.R**

# Download Files

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- **Raisin Dataset 'raisin.xlsx'**

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**Please download these files from the Code files link of this tutorial**

**Make a copy and then use them while practising**

# Limitations of QDA

- **Multicollinearity among predictors may lead to poor performance**
- **The presence of outliers in data may lead to poor performance**

# Summary

**In this tutorial we have learnt about:**

- **Quadratic Discriminant Analysis (QDA)**
- **Comparison between QDA and LDA**
- **Assumptions for QDA**
- **Applications of QDA**

# Summary

- **Implementation of QDA using Raisin Dataset**
- **Visualization of the QDA separator**
- **Limitations of QDA**

- **Apply QDA on the wine dataset**
- **Measure the accuracy of the model**
- **This dataset can be found in the HDclassif package**
- **Install the package and import the dataset using the data() command**

# About the Spoken Tutorial Project

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- **Gives certificates to those who pass an online test**
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- **Explain your question briefly**

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- **You will have to register to ask questions**

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# Thank You

- **This tutorial is contributed by Yate A Ronald O and Debatosh Chakraborty from IIT Bombay**
- **Thank you for joining**