

Quadratic Discriminant Analysis in R

Spoken Tutorial Project

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National Mission on Education through ICT

<https://sakshat.ac.in>

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Learning Objectives



Learning Objectives

We will learn about:



Learning Objectives

We will learn about:

- ▶ **Quadratic Discriminant Analysis or QDA**



Learning Objectives

We will learn about:

- ▶ Quadratic Discriminant Analysis or QDA
- ▶ Differences between linear discriminant analysis and quadratic discriminant analysis



Learning Objectives

- ▶ **When to use quadratic discriminant analysis**



Learning Objectives

- ▶ When to use quadratic discriminant analysis
- ▶ Implementation of quadratic discriminant analysis in R



System Specifications



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► **Ubuntu Linux OS version 20.04**



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- ▶ **Ubuntu Linux OS version 20.04**
- ▶ **R version 4.1.2**



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- ▶ **Ubuntu Linux OS version 20.04**
- ▶ **R version 4.1.2**
- ▶ **RStudio version 1.4.1717**



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- ▶ **Ubuntu Linux OS version 20.04**
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System Specifications

- ▶ **Ubuntu Linux OS version 20.04**
 - ▶ **R version 4.1.2**
 - ▶ **RStudio version 1.4.1717**
- R version 4.1.0 or higher**



Pre-requisites



Pre-requisites

► Basic programming in R



Pre-requisites

- ▶ **Basic programming in R**
- ▶ **Machine Learning in R**



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Pre-requisites

- ▶ Basic programming in R
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Quadratic Discriminant Analysis



Quadratic Discriminant Analysis

- It is the discriminant analysis that is performed on heteroscedastic gaussian data



Quadratic Discriminant Analysis

- ▶ It is the discriminant analysis that is performed on heteroscedastic gaussian data
- ▶ It is used when the covariance structures of the classes are different



Differences between LDA and QDA



Differences between LDA and QDA

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



Differences between LDA and QDA

- ▶ **LDA** assumes that each class has the same covariance matrix
- ▶ **On the other hand, QDA** assumes that each class has a different covariance matrix



Differences between LDA and QDA



Differences between LDA and QDA

- ▶ **LDA constructs a linear boundary, while QDA constructs an elliptical boundary**



Differences between LDA and QDA

- ▶ **LDA constructs a linear boundary, while QDA constructs an elliptical boundary**
- ▶ **When the covariance matrices of different classes are the same, QDA reduces to LDA**



When to use QDA



When to use QDA

- ▶ QDA is primarily used when data is multivariate gaussian



Download Files



Download Files

We will use:



Download Files

We will use:

► **A script file QDA.R**



Download Files

We will use:

- ▶ A script file **QDA.R**



Download Files

We will use:

▶ A script file **QDA.R**

Download this file from the **Code files** link of this tutorial

Make a copy and then use it for practising



Summary

We have learnt about:

- ▶ **Quadratic Discriminant Analysis or QDA**
- ▶ **Differences between linear discriminant analysis and quadratic discriminant analysis**



Summary

- ▶ **When to use quadratic discriminant analysis**
- ▶ **Implementation of quadratic discriminant analysis in R**



Assignment



Assignment

► **Apply QDA on the Wine dataset**



Assignment

- ▶ **Apply QDA on the `Wine` dataset**
- ▶ **This dataset can be found in the `HDclassif` package**



Assignment

- ▶ **Apply QDA on the `Wine` dataset**
- ▶ **This dataset can be found in the `HDclassif` package**
- ▶ **Install the package and import the dataset using the `data()` command**



Assignment

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



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- ▶ Watch the video available at https://spoken-tutorial.org/What_is_a_Spoken_Tutorial
- ▶ It summarises the Spoken Tutorial project
- ▶ If you do not have good bandwidth, you can download and watch it



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- ▶ The FOSSEE project will ensure an answer

You will have to register to ask questions



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<https://forums.fossee.in/>
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- ▶ We give certificates to those who do this

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<https://fossee.in/>



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About the Contributors

- ▶ **This tutorial is contributed by Tanmay Srinath and Madhuri Ganapathi, IIT Bombay**

