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# **R PROGRAMMING**

## **1: Introduction to R Programming**

### **1.1.What is R?**

- 1.1.1. Introduction to R Language
- 1.1.2. R's Role in Data Analysis

### **1.2.Installing and Setting Up R**

- 1.2.1. Installing R on Different Platforms
- 1.2.2. RStudio IDE Overview

## **2: Basics of R Programming**

### **2.1.Variables and Data Types**

- 2.1.1. Numeric, Character, Logical
- 2.1.2. Vectors and Data Structures

### **2.2.Basic Operations**

- 2.2.1. Arithmetic and Logical Operators
- 2.2.2. Data Indexing and Sub setting

### **2.3.Control Structures**

- 2.3.1. Conditional Statements (if, else)
- 2.3.2. Loops (for, while)

## **3: Data Manipulation with R**

### **3.1.Reading Data into R**

- 3.1.1. Reading CSV, Excel, and Text Files
- 3.1.2. Importing Data from Databases

### **3.2.Exporting Data from R**

- 3.2.1. Writing Data to Files
- 3.2.2. Exporting Data to Databases

### **3.3.Data Cleaning and Preprocessing**



- 3.3.1. Handling Missing Values
- 3.3.2. Data Transformation

## **4: Data Analysis with R\*\***

### **4.1. Summary Statistics**

- 4.1.1. Descriptive Statistics
- 4.1.2. Frequency Tables

### **4.2. Data Visualization**

- 4.2.1. Creating Plots with ggplot2
- 4.2.2. Customizing Visualizations

### **4.3. Statistical Testing**

- 4.3.1. Hypothesis Testing
- 4.3.2. ANOVA and Chi-Square Tests

## **5: R for Data Science**

### **5.1. Introduction to dplyr**

- 5.1.1. Filter, Select, Mutate
- 5.1.2. Group By and Summarize

### **5.2. Data Visualization with ggplot2**

- 5.2.1. Advanced ggplot2 Concepts
- 5.2.2. Creating Interactive Plots

### **5.3. Working with Tidy Data**

- 5.3.1. Reshaping Data
- 5.3.2. Joining and Combining Data Frames

## **6: R for Machine Learning**

### **6.1. Types of Machine Learning**

- 6.1.1. Supervised Learning
- 6.1.2. Unsupervised Learning



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## 6.2. Model Building with Caret

- 6.2.1. Data Splitting and Cross-Validation
- 6.2.2. Building Regression and Classification Models

## 6.3. Evaluating Machine Learning Models

- 6.3.1. Performance Metrics
- 6.3.2. Model Tuning and Optimization

## 7: Advanced R Programming

### 7.1. Functional Programming in R

- 7.1.1. Functions as First-Class Objects
- 7.1.2. Applying Functions with lapply and sapply

### 7.2. Object-Oriented Programming (OOP)

- 7.2.1. S3 and S4 Classes
- 7.2.2. Creating Custom Classes

### 7.3. Error Handling and Debugging

- 7.3.1. Debugging Techniques
- 7.3.2. Handling Errors and Exceptions

## 8: R in Real-World Applications

### 8.1. Text Mining with R

- 8.1.1. Text Preprocessing
- 8.1.2. Text Classification and Sentiment Analysis

### 8.2. Time Series Analysis

- 8.2.1. Time Series Data Handling
- 8.2.2. Forecasting with ARIMA

### 8.3. Shiny Web Applications

- 8.3.1. Building Interactive Web Apps
- 8.3.2. Deploying Shiny Apps



## **9: Final Project and Course Review**

### **9.1. Project Proposal and Planning**

- 9.1.1. Selecting a Real-World Problem
- 9.1.2. Designing an R Solution

### **9.2. Implementation and Presentation**

- 9.2.1. Building and Deploying the Solution
- 9.2.2. Final Project Presentation

