Lecture 7, MTH 400, Fall 2024

Quarto/RMarkdown

R Markdown and Quarto are powerful tools for creating dynamic, reproducible statistical reports and presentations. They combine code, results, and narrative text into a single document, which can be rendered into various formats such as HTML, PDF, Word, and slides. Here's a guide on how to use R Markdown and Quarto for statistical reports and presentations.

Getting Started with R Markdown

Installation
- Install R and RStudio: If you haven't already, install R and RStudio.
- Install R Markdown: Install the rmarkdown package in R.

install.packages("rmarkdown")

Creating an R Markdown Document

- Open RStudio.
- Create a New R Markdown File: Go to File -> New File -> R Markdown....
- Select the Output Format: Choose from HTML, PDF, Word, or Presentation.

Structure of an R Markdown Document
- An R Markdown document has three main parts:
- YAML Header: Contains metadata about the document, such as title, author, date, and output format.

```
---
title: "My Statistical Report"
author: "Author Name"
date: "2024-06-08"
output: html_document
---
```

Narrative Text: Written in Markdown format to provide context, explanations, and interpretations.

Introduction

This is an example of a statistical report.

Code Chunks: Embedded R code to perform analysis and generate results.

```{r}
summary(cars)
```

Rendering the Document

- Click the "Knit" button in RStudio to render the document into the specified format.

Creating Statistical Reports

Introduction and Objectives: Explain the purpose and objectives of the report.

Introduction

This report analyzes the `cars` dataset to study the relationship between speed and stopping distance.

Data Preparation: Load and prepare the data.

```{r}
data(cars)
summary(cars)
```

Exploratory Data Analysis (EDA): Use code chunks to perform EDA and include plots.

```{r}
library(ggplot2)
ggplot(cars, aes(x = speed, y = dist)) +
  geom_point() +
  labs(title = "Speed vs Stopping Distance")
```

Statistical Analysis: Conduct statistical tests or build models.

```{r}
model <- lm(dist ~ speed, data = cars)
summary(model)
```

Results and Discussion: Interpret the results and provide insights.

Results

The linear model suggests a positive relationship between speed and stopping distance.

Conclusion: Summarize the findings and suggest future work.

Conclusion

Faster speeds are associated with longer stopping distances.

Creating Presentations
R Markdown supports creating presentations with various formats like ioslides, slidy, and beamer.

Creating an R Markdown Presentation
- Create a New R Markdown Presentation: Go to File -> New File -> R Markdown..., then select "Presentation" and choose a format (e.g., ioslides_presentation).

- YAML Header for Presentations

```
---
title: "My Presentation"
author: "Author Name"
date: "2024-06-08"
output: ioslides_presentation
---
```

Slide Content: Use Markdown to create slides and add R code chunks for analysis and plots.

Slide 1

Introduction to my presentation.

Slide 2

```{r}
ggplot(cars, aes(x = speed, y = dist)) +
  geom_point() +
  labs(title = "Speed vs Stopping Distance")
```

Rendering the Presentation: Click the "Knit" button to render the presentation.

Getting Started with Quarto
Quarto is a next-generation tool for authoring technical content. It supports R, Python, Julia, and Observable.

Installation
- Install Quarto: Follow the instructions at quarto.org.

Creating a Quarto Document
- Open RStudio or your preferred editor.
- Create a New Quarto Document: Go to File -> New File -> Quarto Document.
- Structure of a Quarto Document
- Similar to R Markdown, Quarto documents have a YAML header, narrative text, and code chunks.

```
---
title: "My Statistical Report"
author: "Author Name"
date: "2024-06-08"
format: html
---
```

Introduction

This is an example of a statistical report.

```{r}
data(cars)
summary(cars)

library(ggplot2)
ggplot(cars, aes(x = speed, y = dist)) +
  geom_point() +
  labs(title = "Speed vs Stopping Distance")
```

Rendering the Document
- Use the Quarto command line or the "Render" button in RStudio to generate the output.

Conclusion

R Markdown and Quarto provide flexible, powerful tools for creating dynamic, reproducible statistical reports and presentations. By combining narrative text with code and results, you can produce comprehensive documents that effectively communicate your analysis and findings.

Resources:
1. https://quarto.org/docs/computations/r.html
2. https://quarto.org/docs/get-started/hello/rstudio.html
3. https://r4ds.hadley.nz/quarto
4. https://www.appsilon.com/post/r-quarto-tutorial
5. https://www.datacamp.com/cheat-sheet/quarto-cheat-sheet-previously-known-as-r-markdown
6. https://quarto.org/docs/faq/rmarkdown.html
7. https://www.r4epi.com/quarto-files
8. https://rmarkdown.net/quarto/