
| index | A_series | B_series | C_series | D_series |
|---|---|---|---|---|
| Current Value | 12220 | 5855 | 12920 | 14200 |
| Year-on-year | 22% | 14% | 26% | 32% |

Final Review and

# Introduction to Web Visualization

# Why Web Visualizations?


Source:
DashThis :7 Data Visualization Dashboard Example to WOW Clients

**Interactivity**: Unlike static charts, web visualizations can be dynamic and interactive, allowing users to explore the data on their own.

**Accessibility**: Web visualizations can be shared easily with a wider audience through a browser.

**Real-time updates**: With web visualizations, data can be updated in real-time from APIs or databases, which is crucial for live dashboards.

World Health Organization
Data

WHO Global | Language | Hide navigation

Indicators | Countries | Dashboards | About

# WHO COVID-19 dashboard

WHO Health Emergencies Programme

World

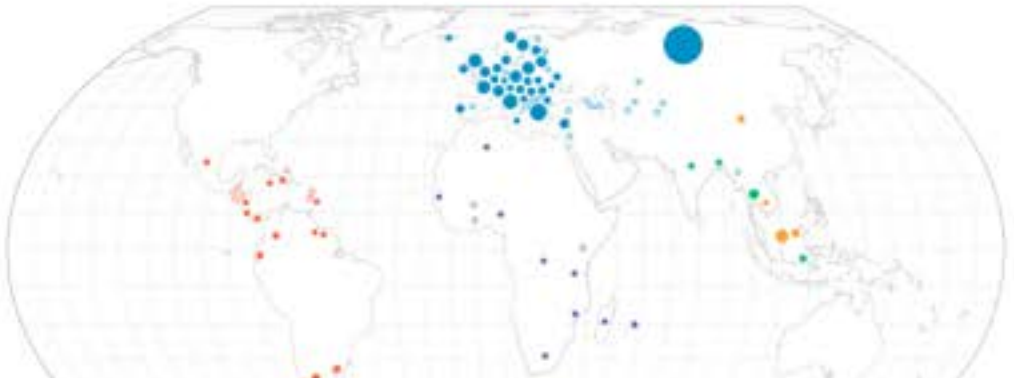
Circulation | Cases | Deaths | Vaccines | Variants | Wastewater | Data | More

Last 7 days | Last 28 days | Total cumulative

Count | Rate per 100,000

## Number of COVID-19 cases reported to WHO

World, 28 days to 5 January 2025



WHO Regions: Africa | Americas | Eastern Mediterranean | Europe | South-East Asia | Western Pacific

**161,264** ~41,556 decrease on previous 28 days

**Reported COVID-19 cases**

World, 28 days to 5 January 2025

## Number of COVID-19 cases reported to WHO

World, 28 days to 5 January 2025

| Country | Cases |
|---|---|
| World | 161k |
| Russian Federation | 93.5k |
| Greece | 10k |
| Turks And Caicos Islands | 0 |
| Uzbekistan | 0 |

Source: World Health Organization

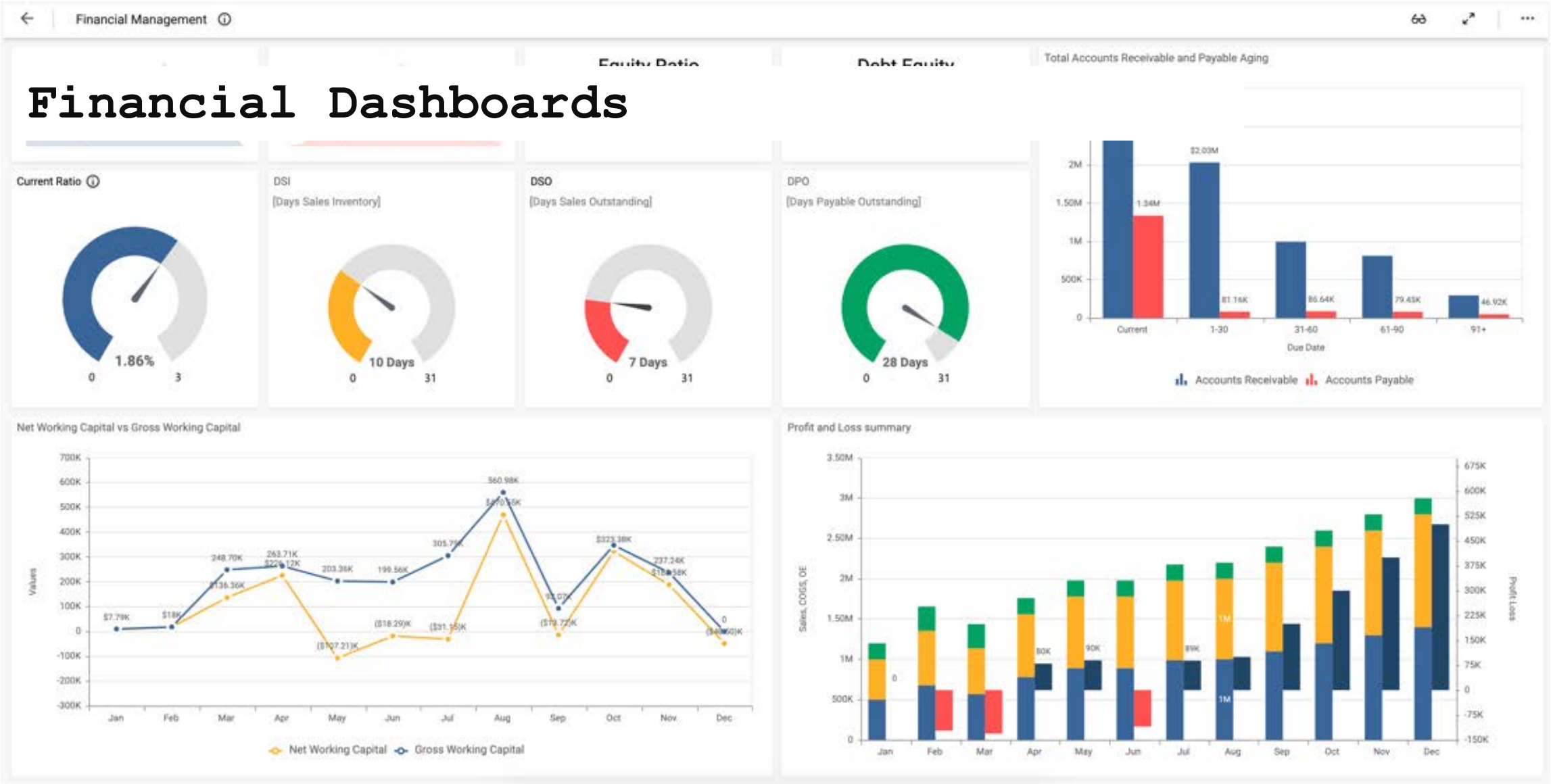
Most recent data submission date: 5th January 2025

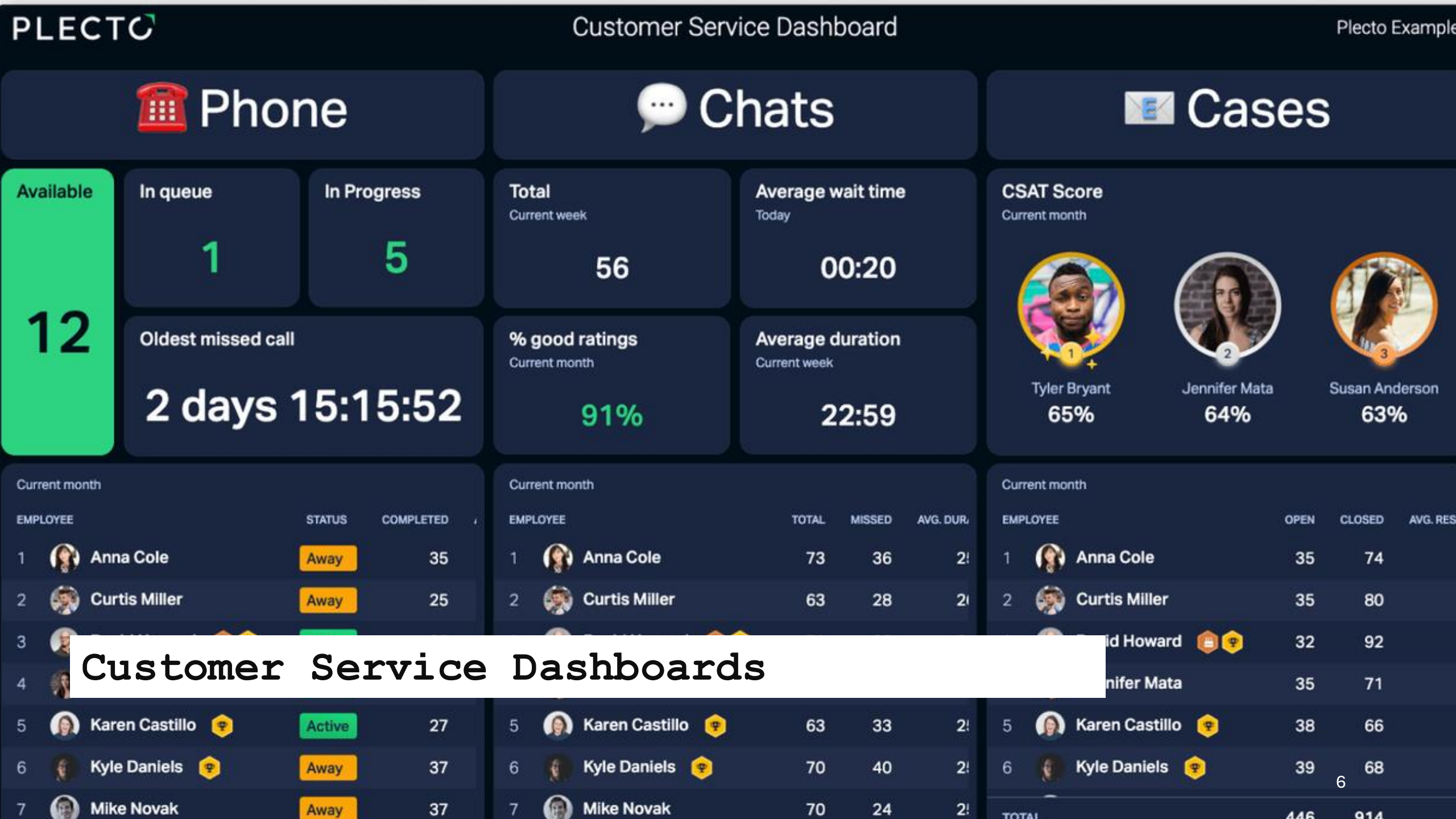
Number of countries reported: 93

https://data.who.int/dashboards/covid19/cases

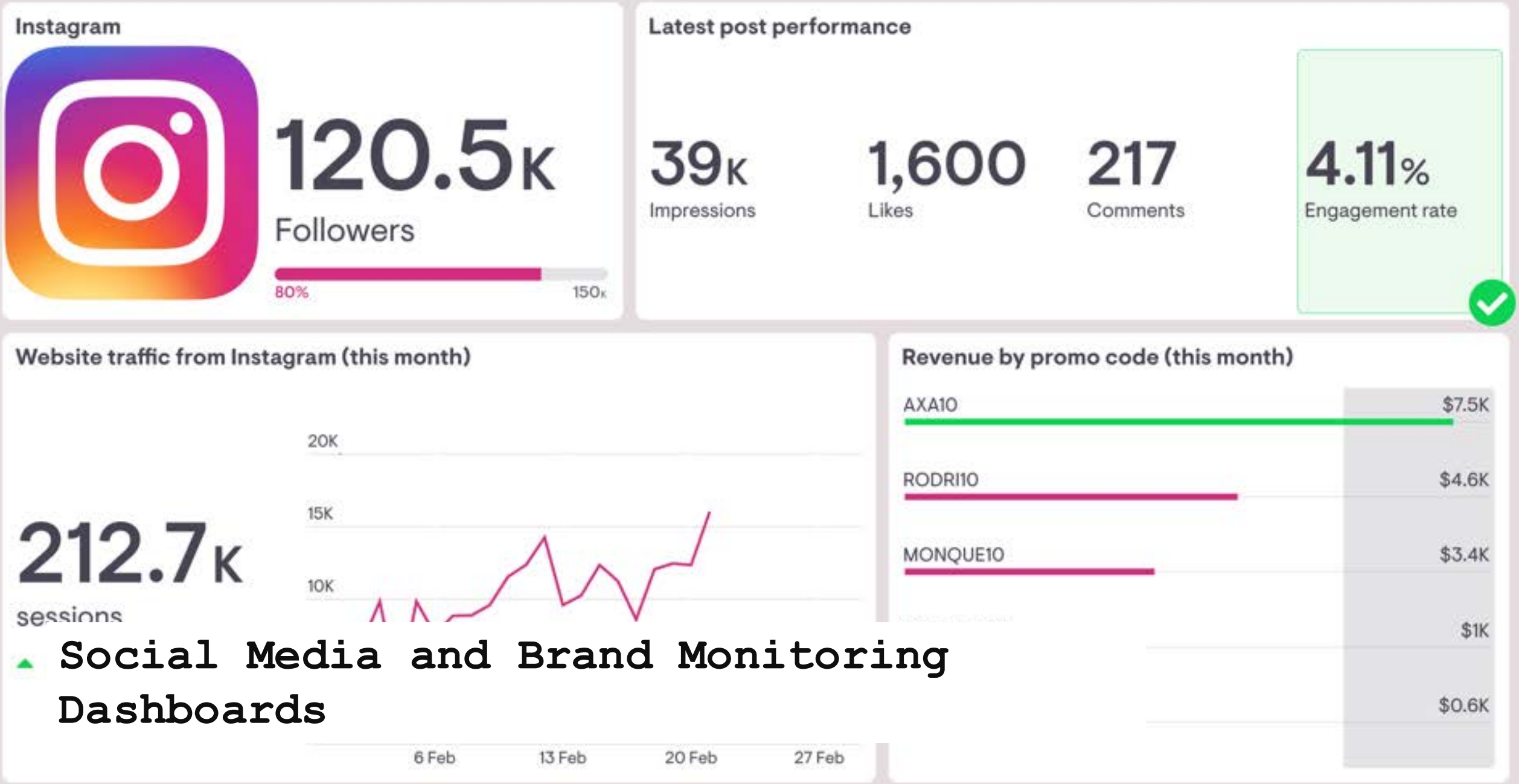

# Sales and Marketing Dashboards

# Financial Dashboards






# Customer Service Dashboards

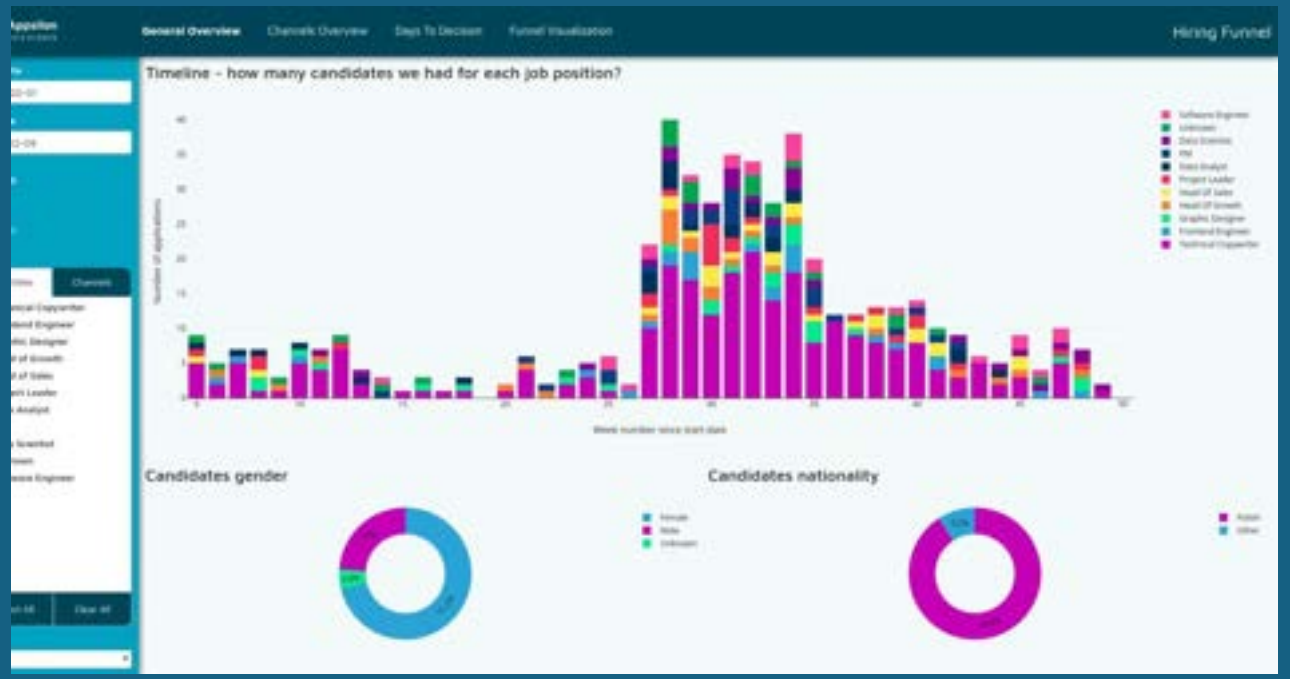

Instagram
120.5K
Followers
80%
150K
Latest post performance
39K
Impressions
1,600
Likes
217
Comments
4.11%
Engagement rate
Website traffic from Instagram (this month)
212.7K
sessions
20K
15K
10K
6 Feb
13 Feb
20 Feb
27 Feb
Revenue by promo code (this month)
AXA10
$7.5K
RODRI10
$4.6K
MONQUE10
$3.4K
$1K
$0.6K
Social Media and Brand Monitoring Dashboards
french
Instagram
18:08

# Tools / Libraries for Web Visualization


# Agenda

1. Introduction to Web Visualizations (Shiny)
2. Pratice: Create a Dashboard in Shiny
3. Review: Final Exam
4. Outlook Capstone Project


Shiny
www.rstudio.com


General Overview
Channels Overview
Days To Decision
Funnel Visualization
Hiring Funnel
Timeline - how many candidates we had for each job position?
Candidates gender
Candidates nationality

# Simplest possible Shiny dashboard

```
library(shiny)

# Define the UI
ui <- fluidPage(
  titlePanel("Hello, Shiny!"),
  sidebarLayout(
    sidebarPanel(
      sliderInput("num", "Choose a number:", min = 1, max = 100, value = 50)
    ),
    mainPanel(
      textOutput("outputText")
    )))

# Define the server logic
server <- function(input, output) {
  output$outputText <- renderText({
    paste("You chose the number:", input$num)
  })
}

# Combine the UI and server into the app
shinyApp(ui = ui, server = server)
```

**UI (User Interface)**: Defines what the app looks like (e.g., sliders, buttons, charts).

**Server:** Handles the logic (e.g., calculations, rendering outputs).

# User Interface (UI)

Defines how the dashboard looks and which interactive elements the user can see.

**layout** `fluidPage:` Defines the layout of the page

**title** `titlePanel:` The title of the dashboard

**sidebar** `sidebarPanel:` Input elements such as dropdowns, sliders, etc.

**main panel** `mainPanel`: Main area for diagrams, tables or other output

```
ui <- fluidPage(
  titlePanel("A Dashboard"),
  sidebarLayout(
    sidebarPanel(
      selectInput("variable", "chose variable:", choices = c("Option 1", "Option 2")),
      sliderInput("range", "value range:", min = 0, max = 100, value = c(10, 50))),
    mainPanel(
      plotOutput("plot"),
      tableOutput("table"))))
```

# Server

**How the Server Works:**

1. The **UI** sends input values (e.g., slider values, text input) to the **server**.

2. The **server** processes these inputs (e.g., calculations, plotting) based on the user's actions.

3. The **server** then generates output values (e.g., a plot, a text message) and sends them back to the **UI** for display.

The server is a **function** that takes two main arguments:

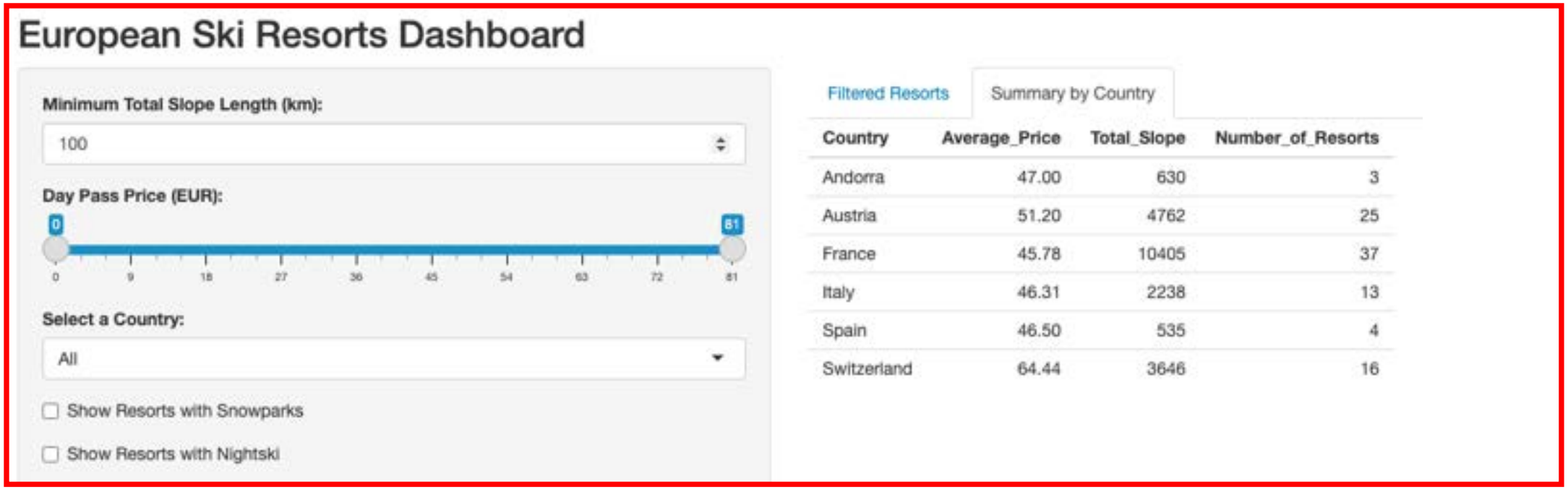
- `input`: This contains all the inputs from the UI (e.g., values from sliders, text boxes, etc.).
- `output`: This contains the outputs that the server will send back to the UI (e.g., plots, tables, or text).

# Server

```
library(shiny)


# UI: Define the interface with a slider and a plot output
ui <- fluidPage(
  titlePanel("Dynamic Histogram"),

  sidebarLayout(
    sidebarPanel(
      sliderInput("num", "Choose a number", min = 1, max = 100, value = 50)),

    mainPanel(
      plotOutput("distPlot"))))

# Server: Define the logic that updates the plot based on slider input
server <- function(input, output) {

  # Render the plot dynamically based on slider input
  output$distPlot <- renderPlot({
    # Generate a histogram of random numbers based on the slider input
    hist(rnorm(input$num), main = "Histogram of Random Numbers", xlab = "Value", col = "skyblue")})}

# Run the app
shinyApp(ui = ui, server = server)
```

# User Interface (UI): layout or `fluidPage`

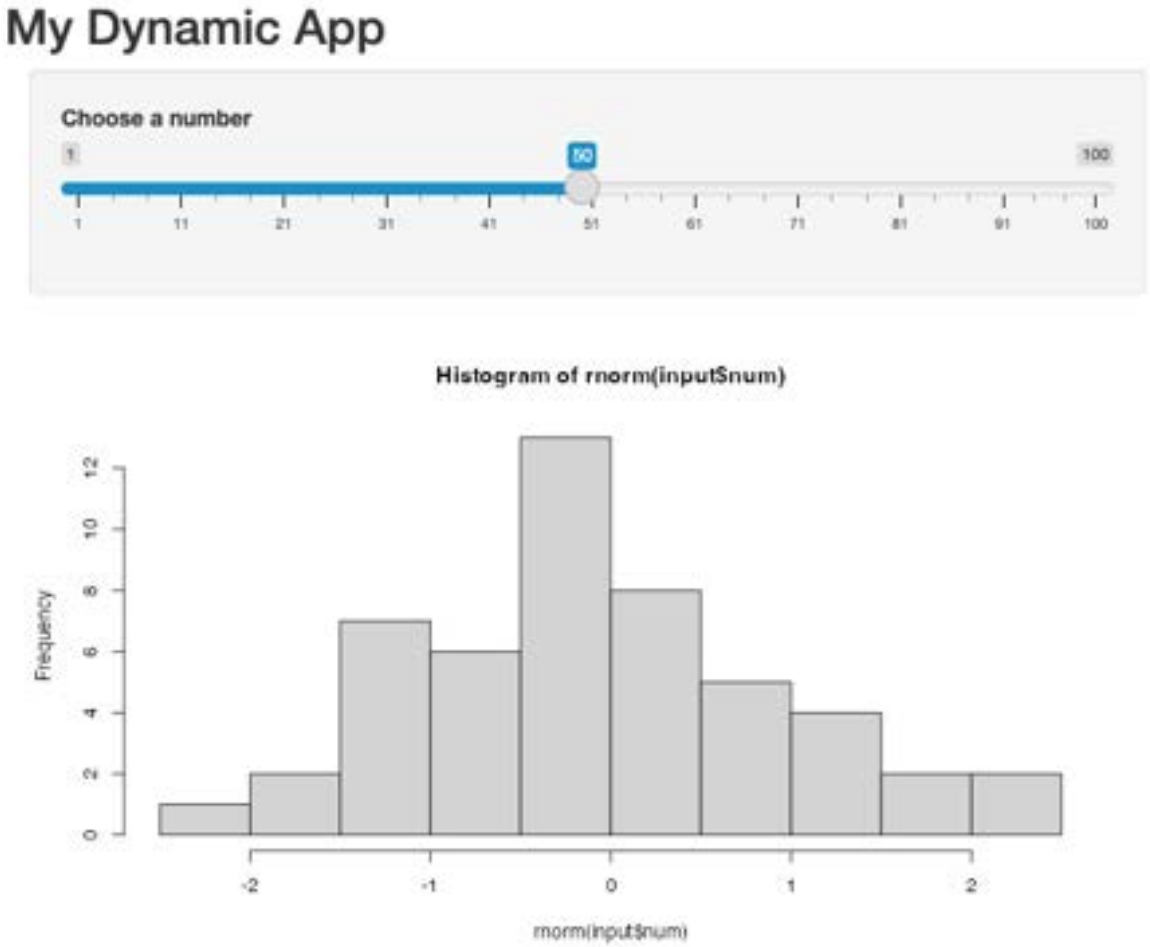
The layout is the overall structure of your UI. In Shiny, `fluidPage()` is commonly used to create a flexible and responsive layout, where elements automatically adjust to the screen size.




```
…
fluidPage(
  titlePanel("European Ski Resorts Dashboard"),
  sidebarLayout(
    sidebarPanel(
      sliderInput("num", "Select number", min = 1, max = 100, value = 50)),
    mainPanel(
      textOutput("result"))))
  …
```

# User Interface (UI): layout or `fluidPage`

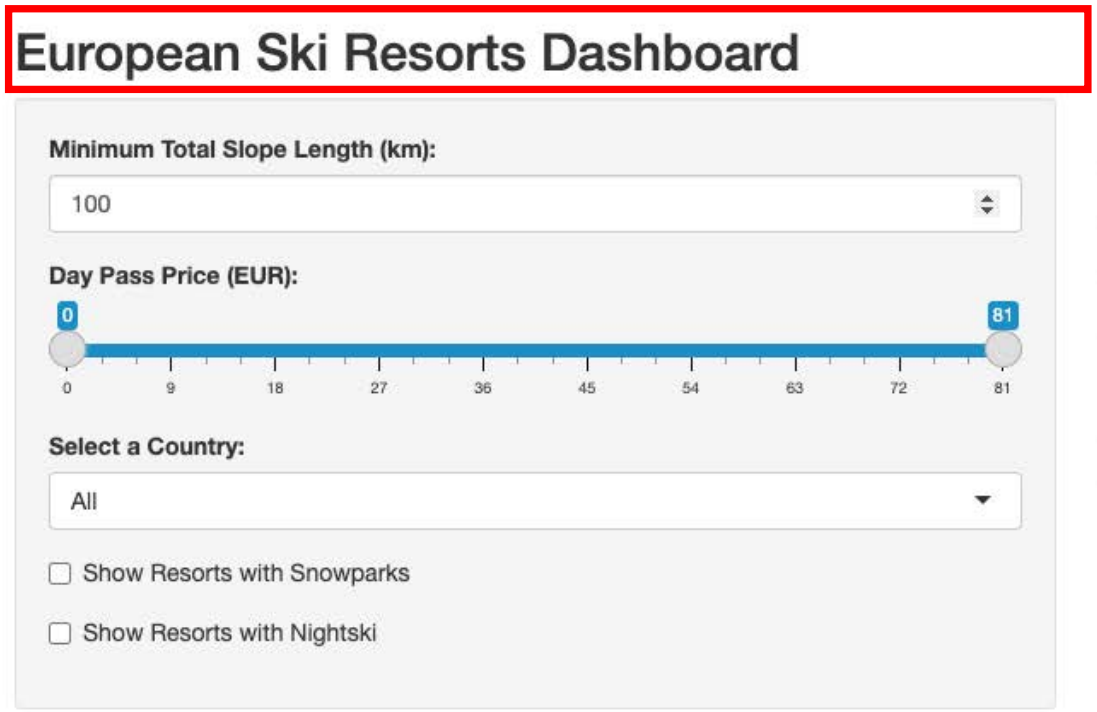
The layout is the overall structure of your UI. In Shiny, `fluidPage()` is commonly used to create a flexible and responsive layout, where elements automatically adjust to the screen size.




```
# Layout or fluid page
library(shiny)

  ui <- fluidPage(
    titlePanel("My Dynamic App"),

    # Define the layout structure
    fluidRow(
      column(4,
             sidebarPanel(
               sliderInput("num",
                           "Choose a number",
                            min = 1, max = 100,
                            value = 50))),
      column(8,
             mainPanel(
               plotOutput("plot")))))

  server <- function(input, output) {
    output$plot <- renderPlot({
      hist(rnorm(input$num))})}

  shinyApp(ui = ui, server = server)
```

# User Interface (UI): `titlePanel`

You can adjust the title by changing the string inside the `titlePanel()` function.



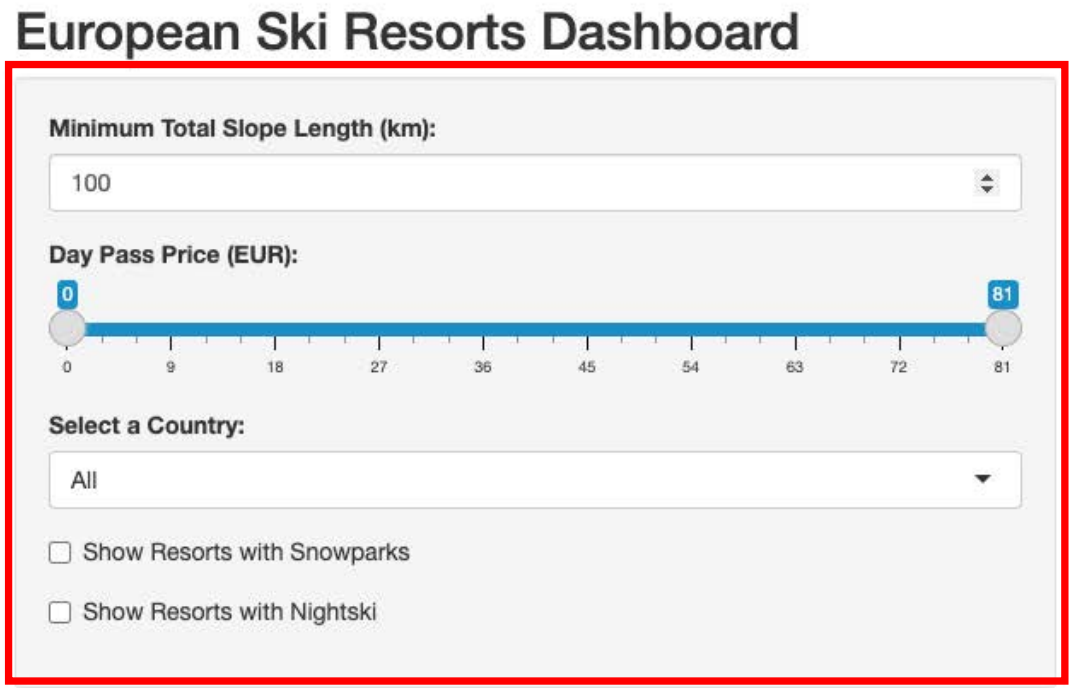

Filtered Resorts | Summary by Country

| Country | Average_Price | Total_Slope | Number_of_Resorts |
|---|---|---|---|
| Andorra | 47.00 | 630 | 3 |
| Austria | 51.20 | 4762 | 25 |
| France | 45.78 | 10405 | 37 |
| Italy | 46.31 | 2238 | 13 |
| Spain | 46.50 | 535 | 4 |
| Switzerland | 64.44 | 3646 | 16 |

```
ui <- fluidPage(
  titlePanel("European Ski Resorts Dashboard"),
  …
```

# User Interface (UI): `sidebarPanel`

The `sidebarPanel` is used to create a sidebar in your app where inputs or navigation controls are placed.




Filtered Resorts | Summary by Country

| Country | Average_Price | Total_Slope | Number_of_Resorts |
|---|---|---|---|
| Andorra | 47.00 | 630 | 3 |
| Austria | 51.20 | 4762 | 25 |
| France | 45.78 | 10405 | 37 |
| Italy | 46.31 | 2238 | 13 |
| Spain | 46.50 | 535 | 4 |
| Switzerland | 64.44 | 3646 | 16 |

```
…
sidebarPanel(
  sliderInput("pricerange", "Day Pass Price(EUR)", value = c(30, 100))
  …
```

# User Interface (UI): `mainPanel`

The `mainPanel` is used to display the main content area of the application. This is where the output or results of the user interaction (like plots, tables, or text) will appear.



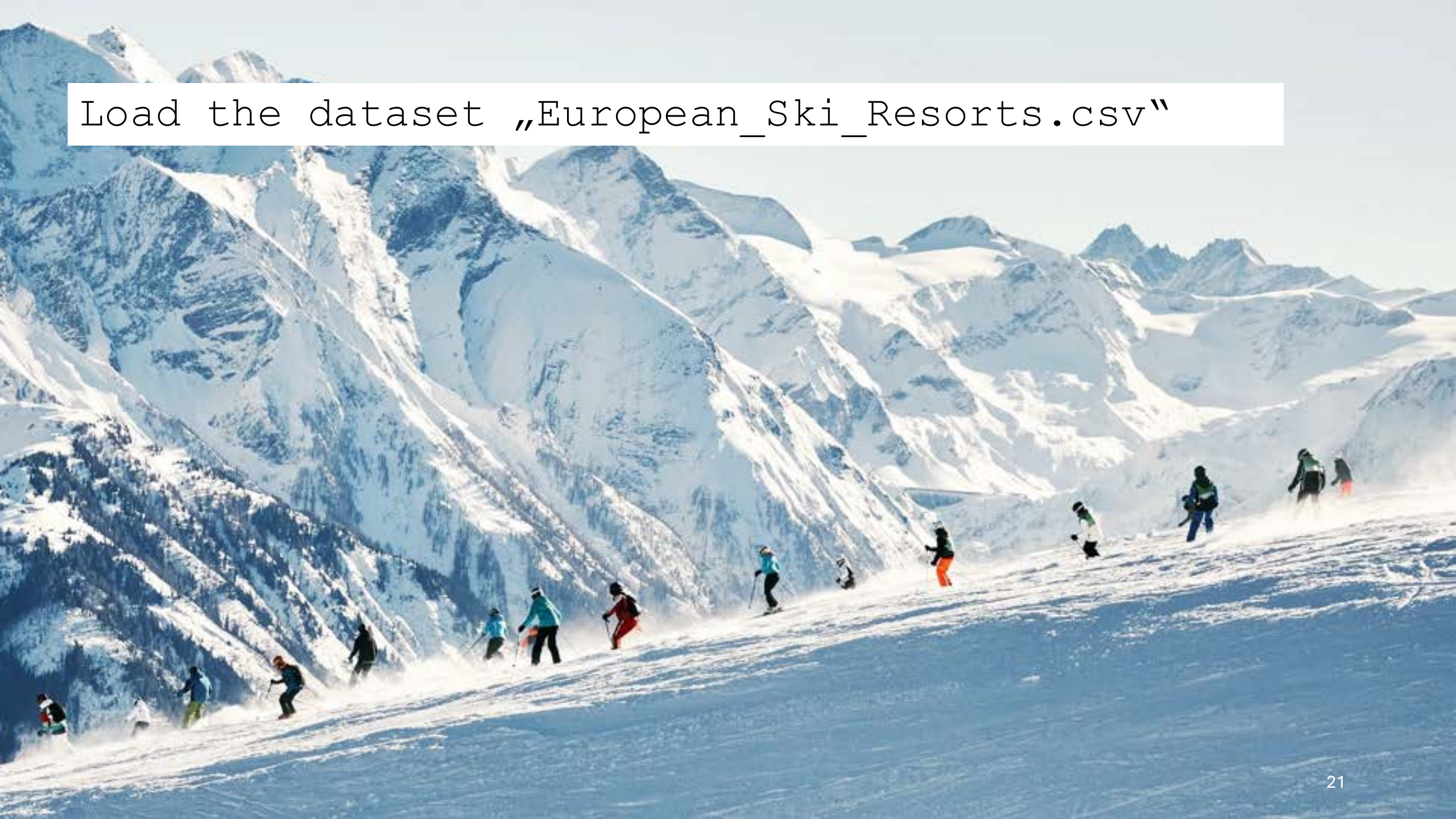
| Country | Average_Price | Total_Slope | Number_of_Resorts |
|---|---|---|---|
| Andorra | 47.00 | 630 | 3 |
| Austria | 51.20 | 4762 | 25 |
| France | 45.78 | 10405 | 37 |
| Italy | 46.31 | 2238 | 13 |
| Spain | 46.50 | 535 | 4 |
| Switzerland | 64.44 | 3646 | 16 |

```
…
mainPanel(
  tableOutput("result"))
  …
```

# **User Interface (UI):** some more adjustment options

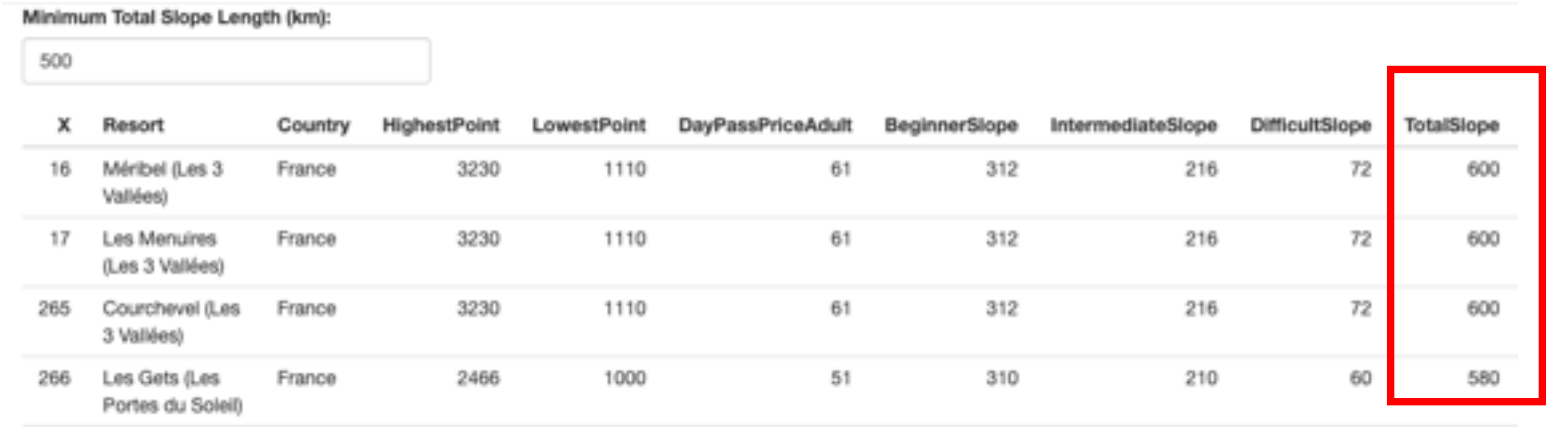
| | |
|---|---|
| `width & height` | adjusts the width and height of elements |
| `style` | allows to apply custom CSS styles to UI components |
| `tabset & tabpanel` | organizes content into tabs, allowing to switch between different sections of your app |
| `wellPanel` | Groups elements together in a styled container, typically with a subtle border and padding |
| `collapse` | makes a UI component collapsible. This can be used for sidebars or other panels to save space. |
| `offset` | adds an offset to a column, shifting it to the right |
| `conditionalPanel` | Allows for rendering specific UI components based on user input or other conditions |
| `navbarPage` | Creates a navigation bar at the top of the app with tabs to switch between different pages |

Load the dataset „European_Ski_Resorts.csv“



# Input elements: `numericInput`

Allows users to filter the data by a given numeric input e.g., based on their desired minimum slope length.

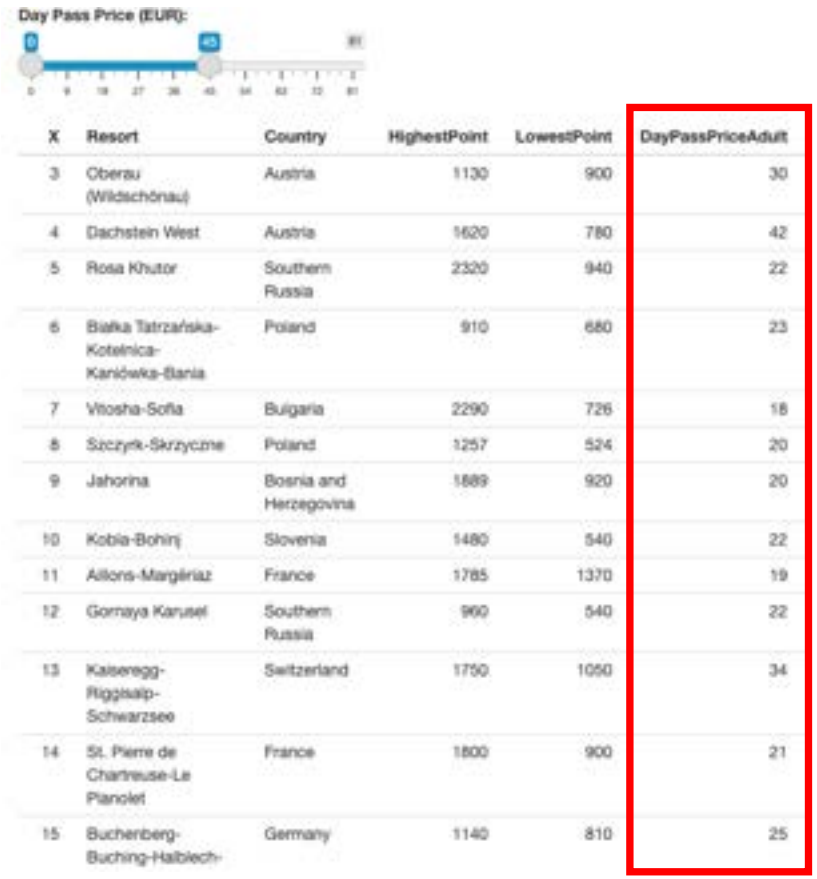



| X | Resort | Country | HighestPoint | LowestPoint | DayPassPriceAdult | BeginnerSlope | IntermediateSlope | DifficultSlope | TotalSlope |
|---|---|---|---|---|---|---|---|---|---|
| 16 | Méribel (Les 3 Vallées) | France | 3230 | 1110 | 61 | 312 | 216 | 72 | 600 |
| 17 | Les Menuires (Les 3 Vallées) | France | 3230 | 1110 | 61 | 312 | 216 | 72 | 600 |
| 265 | Courchevel (Les 3 Vallées) | France | 3230 | 1110 | 61 | 312 | 216 | 72 | 600 |
| 266 | Les Gets (Les Portes du Soleil) | France | 2466 | 1000 | 51 | 310 | 210 | 60 | 580 |

```
ui <- fluidPage(
  numericInput("min_slope", "Minimum Total Slope Length (km):", value = 50, min = 0),
  tableOutput("filtered_resorts"))

server <- function(input, output) {
  filteredData <- reactive({
    data %>% filter(TotalSlope >= input$min_slope)})

  output$filtered_resorts <- renderTable({
    filteredData()
  })}

shinyApp(ui, server)
```

# Input elements: `sliderInput`

Allows users to filter the data based on a range of the input variable such as e.g. day pass prices




| X | Resort | Country | HighestPoint | LowestPoint | DayPassPriceAdult |
|---|---|---|---|---|---|
| 3 | Oberau (Wildschönau) | Austria | 1130 | 900 | 30 |
| 4 | Dachstein West | Austria | 1620 | 780 | 42 |
| 5 | Rosa Khutor | Southern Russia | 2320 | 940 | 22 |
| 6 | Białka Tatrzańska-Kotelnica-Kaniówka-Bania | Poland | 910 | 680 | 23 |
| 7 | Vitosha-Sofia | Bulgaria | 2290 | 726 | 18 |
| 8 | Szczyrk-Skrzyczne | Poland | 1257 | 524 | 20 |
| 9 | Jahorina | Bosnia and Herzegovina | 1889 | 920 | 20 |
| 10 | Kobla-Bohinj | Slovenia | 1480 | 540 | 22 |
| 11 | Ailons-Margériaz | France | 1785 | 1370 | 19 |
| 12 | Gornaya Karusel | Southern Russia | 960 | 540 | 22 |
| 13 | Kaiseregg-Riggisalp-Schwarzsee | Switzerland | 1750 | 1050 | 34 |
| 14 | St. Pierre de Chartreuse-Le Planolet | France | 1800 | 900 | 21 |
| 15 | Buchenberg-Buching-Halblech- | Germany | 1140 | 810 | 25 |

```
ui <- fluidPage(
    sliderInput("price_range", "Day Pass Price (EUR):",
                min = min(data$DayPassPriceAdult, na.rm = TRUE),
                max = max(data$DayPassPriceAdult, na.rm = TRUE),
                value = c(30, 100)),
    tableOutput("price_filtered_resorts")
  )

  server <- function(input, output) {
    filteredData <- reactive({
      data %>% filter(DayPassPriceAdult >= input$price_range[1],
                      DayPassPriceAdult <= input$price_range[2])
    })

    output$price_filtered_resorts <- renderTable({
      filteredData()
    })
  }

  shinyApp(ui, server)
```

# Input elements: `selectInput`

Provides a dropdown menu to filter the data based on the selected input.

```
ui <- fluidPage(
  selectInput("country", "Select a Country:",
              choices = c("All", unique(data$Country))),
  tableOutput("country_filtered_resorts")
)

server <- function(input, output) {
  filteredData <- reactive({
    if (input$country == "All") {
      data
    } else {
      data %>% filter(Country == input$country)
    }
  })

  output$country_filtered_resorts <- renderTable({
    filteredData()
  })
}

shinyApp(ui, server)
```


| X | Resort | Country | HighestPoint | LowestPoint |
|---|---|---|---|---|
| 15 | Buchenberg-Buching-Halblech- | Germany | 1140 | 810 |
| 128 | Zugspitze | Germany | 2000 | 700 |
| 142 | Garmisch-Classic-Garmisch-Partenkirchen | Germany | 2050 | 732 |
| 174 | Wendelstein-Brannenburg-Osterhofen | Germany | 1723 | 791 |
| 182 | Feldberg-Seebuck-Grafenmatt-Fahl | Germany | 1448 | 888 |
| 199 | Mitterdorf-Almberg—Mitterfirmiansreut | Germany | 1139 | 841 |
| 201 | Geißkopf-Bischofsmais | Germany | 1116 | 835 |
| 203 | Indoor ski area Snow Dome Bispingen | Germany | 122 | 90 |
| 204 | Sudelfeld-Bayrischzell | Germany | 1563 | 850 |
| 205 | Grüntenlifte-Kranzegg-Rettenberg- | Germany | 1700 | 900 |
| 208 | Nebelhorn-Oberstdorf | Germany | 2224 | 828 |

# Input elements: `checkboxInput`

Provides a dropdown menu to filter the data based on the selected input.

```
ui <- fluidPage(
    checkboxInput("show_all", "Show All Resorts", value = TRUE),
    checkboxInput("filter_slope", "Filter by Slope Length >= 100 km", value = FALSE),
    checkboxInput("filter_price", "Filter by Day Pass Price <= 50 EUR", value = FALSE),
    tableOutput("resorts_table"))

server <- function(input, output) {
    filteredData <- reactive({
      df <- data

      if (input$show_all) {
        return(df)}

      if (input$filter_slope) {
        df <- df %>% filter(TotalSlope >= 100)}

      if (input$filter_price) {
        df <- df %>% filter(DayPassPriceAdult <= 50)}df})

    output$resorts_table <- renderTable({
      filteredData()})}

  shinyApp(ui, server)
```


| X | Resort | Country | HighestPoint | LowestPoint |
|---|---|---|---|---|
| 1 | Alpendorf (Ski amedé) | Austria | 1980 | 740 |
| 2 | Soldeu-Pas de la Casa/Grau Roig/El Tarter/ Canillo/ Encamp (Grandvalira) | Andorra | 2640 | 1710 |
| 16 | Méribel (Les 3 Vallées) | France | 3230 | 1110 |
| 17 | Les Menuires (Les 3 Vallées) | France | 3230 | 1110 |

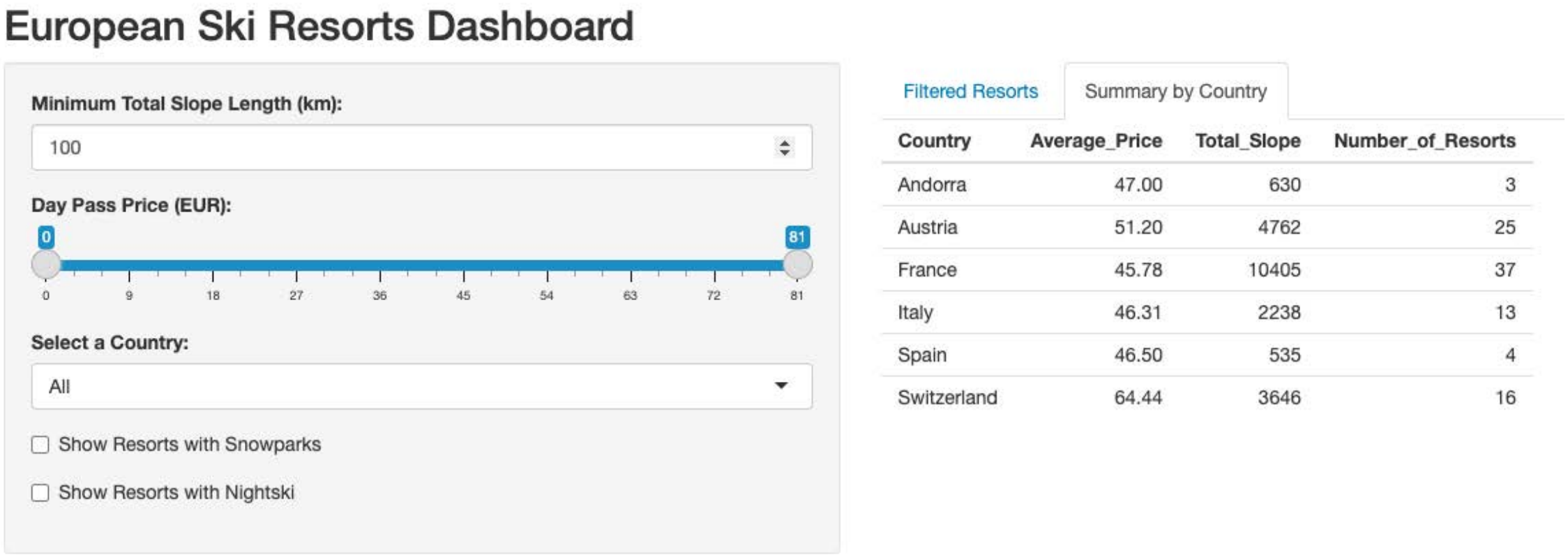
# Input elements: `radioButtons`

Allows the user to select a specific metric to summarize the data


| Country | Value |
|---|---|
| Andorra | 5.00 |
| Austria | 89.00 |
| Bosnia and Herzegovina | 1.00 |
| Bulgaria | 4.00 |
| Czech Republic | 2.00 |
| Denmark | 8.00 |
| Finland | 3.00 |
| France | 83.00 |
| Germany | 24.00 |
| Greece | 1.00 |

```
ui <- fluidPage(
    radioButtons("summary_metric", "Select a Metric to Summarize:",
                 choices = c("Average Price" = "price",
                             "Total Slope Length" = "slope",
                             "Number of Resorts" = "count")),
    tableOutput("summary_table")
  )

  server <- function(input, output) {
    summaryData <- reactive({
      data %>%
        group_by(Country) %>%
        summarise(Metric = case_when(
          input$summary_metric == "price" ~ mean(DayPassPriceAdult, na.rm = TRUE),
          input$summary_metric == "slope" ~ sum(TotalSlope, na.rm = TRUE),
          input$summary_metric == "count" ~ n()
        )) %>%
        rename(Value = Metric)
    })

    output$summary_table <- renderTable({
      summaryData()
    })
  }

  shinyApp(ui, server)
```

# **Input elements:** combined example

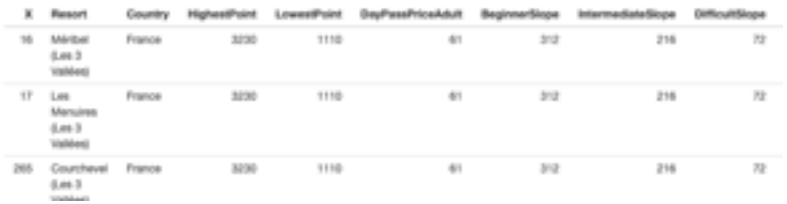



```
# Combined Example: Interactive Dashboard with Multiple Inputs
```

# Output elements

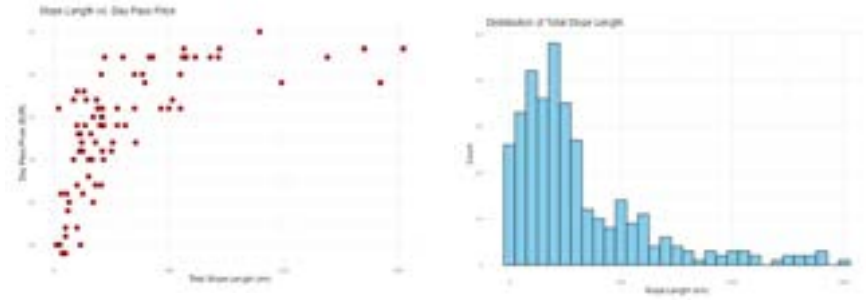
Output elements show data visualizations or tables based on user input.


`textOutput:` display simple, dynamically generated text



| X | Resort | Country | HighestPoint | LowestPoint | DayPassPriceAdult | BeginnerSlope | IntermediateSlope | DifficultSlope |
|---|---|---|---|---|---|---|---|---|
| 16 | Méribel (Les 3 Vallées) | France | 3230 | 1110 | 61 | 312 | 216 | 72 |
| 17 | Les Menuires (Les 3 Vallées) | France | 3230 | 1110 | 61 | 312 | 216 | 72 |
| 265 | Courchevel (Les 3 | France | 3230 | 1110 | 61 | 312 | 216 | 72 |

`tableOutput:` is for showing data frames or tables



`plotOutput`: plotOutput is used for visualizing data through charts or graphs. Integrates seamlessly with `ggplot`

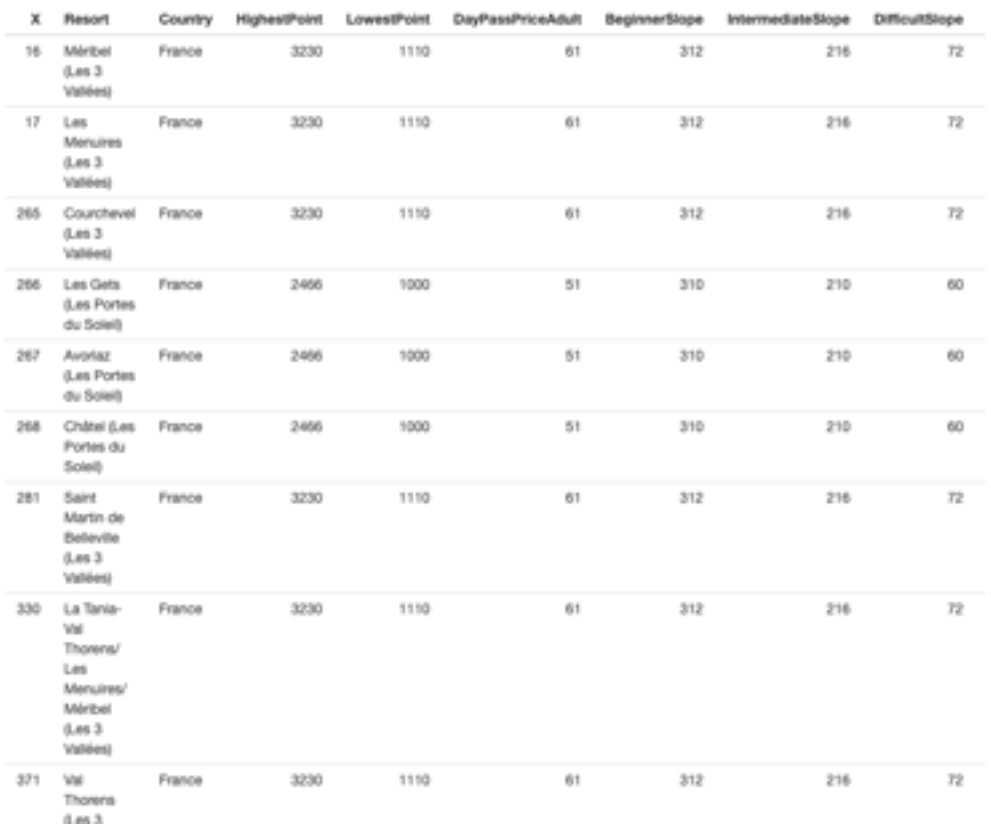
# Output elements: `textOutput`

`textOutput` is used to display simple, dynamically generated text. It can be used for summaries, key metrics, or any text-based feedback.


```
text_ui <- fluidPage(
  titlePanel("TextOutput Example: Summary of Data"),
  sidebarLayout(
    sidebarPanel(
      numericInput("min_slope", "Minimum Total Slope Length (km):", value = 50, min = 0)),

 mainPanel(
      textOutput("summary_text"))))

text_server <- function(input, output) {
  output$summary_text <- renderText({
    filtered <- data %>% filter(TotalSlope >= input$min_slope)
    paste0(
      "Number of Resorts: ", nrow(filtered), ", ",
      "Average Slope Length: ", round(mean(filtered$TotalSlope, na.rm = TRUE), 2), " km"
    )})}

# Run TextOutput App
shinyApp(ui = text_ui, server = text_server)
```

# Output elements: `tableOutput`

Used to display data frames or tables. It's like embedding an Excel table into your dashboard.



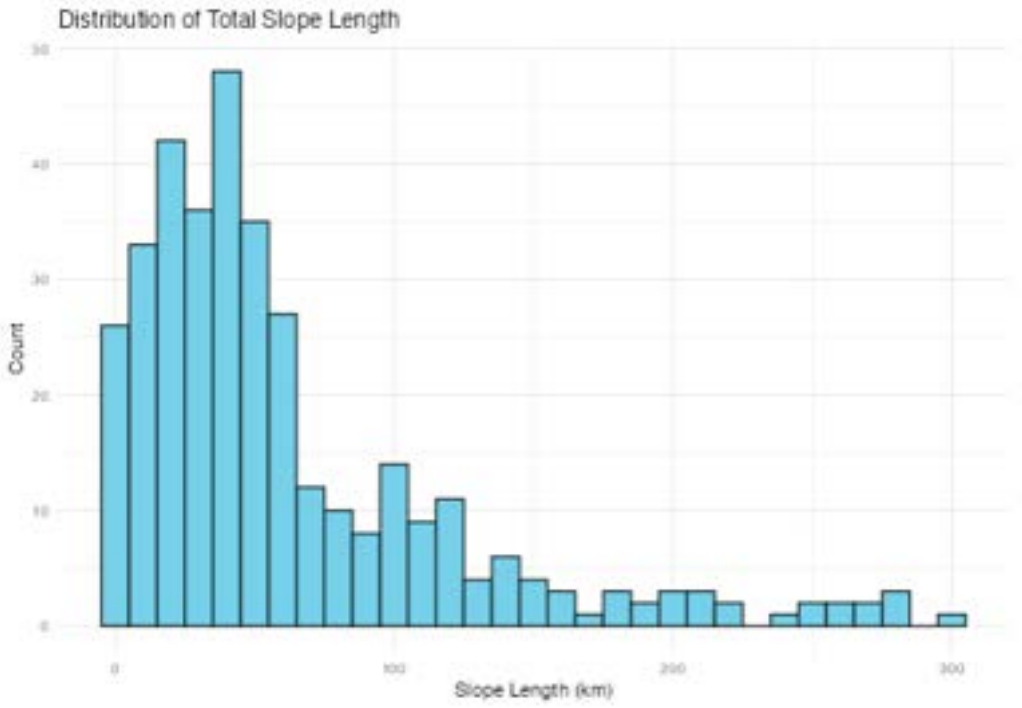
| X | Resort | Country | HighestPoint | LowestPoint | DayPassPriceAdult | BeginnerSlope | IntermediateSlope | DifficultSlope |
|---|---|---|---|---|---|---|---|---|
| 16 | Méribel (Les 3 Vallées) | France | 3230 | 1110 | 61 | 312 | 216 | 72 |
| 17 | Les Menuires (Les 3 Vallées) | France | 3230 | 1110 | 61 | 312 | 216 | 72 |
| 265 | Courchevel (Les 3 Vallées) | France | 3230 | 1110 | 61 | 312 | 216 | 72 |
| 266 | Les Gets (Les Portes du Soleil) | France | 2466 | 1000 | 51 | 310 | 210 | 60 |
| 267 | Avoriaz (Les Portes du Soleil) | France | 2466 | 1000 | 51 | 310 | 210 | 60 |
| 268 | Châtel (Les Portes du Soleil) | France | 2466 | 1000 | 51 | 310 | 210 | 60 |
| 281 | Saint Martin de Belleville (Les 3 Vallées) | France | 3230 | 1110 | 61 | 312 | 216 | 72 |
| 330 | La Tania-Val Thorens/ Les Menuires/ Méribel (Les 3 Vallées) | France | 3230 | 1110 | 61 | 312 | 216 | 72 |
| 371 | Val Thorens (Les 3 | France | 3230 | 1110 | 61 | 312 | 216 | 72 |

```
# Table Output Example with Slider Input
  ui <- fluidPage(
    titlePanel("Table Output Example with Slider Input"),

    sidebarLayout(
      sidebarPanel(
        # Slider input for slope length range
        sliderInput("slope_range", "Select Total Slope Length (km):",
                    min = min(data$TotalSlope, na.rm = TRUE),
                    max = max(data$TotalSlope, na.rm = TRUE),
                    value = c(50, 150))),

      mainPanel(
        tableOutput("filtered_table"))))

  server <- function(input, output) {
    # Reactive filtering based on slider input
    output$filtered_table <- renderTable({
      data %>%
        filter(TotalSlope >= input$slope_range[1],
               TotalSlope <= input$slope_range[2])})}

  shinyApp(ui, server)
```

# Output elements: `plotOutput`

Used to display plots (e.g., bar charts, line graphs) created with ggplot2 or base R. This is the “chart area” where you visualize trends and comparisons.

```
histogram_ui <- fluidPage(
  titlePanel("Histogram: Distribution of Total Slope Length"),
  sidebarLayout(
    sidebarPanel(
      sliderInput("slope_range", "Slope Length Range (km):",
                  min = min(data$TotalSlope, na.rm = TRUE),
                  max = max(data$TotalSlope, na.rm = TRUE),
                  value = c(0, 300))),
    mainPanel(
      plotOutput("histogram_plot"))))

histogram_server <- function(input, output) {
  output$histogram_plot <- renderPlot({
    filtered <- data %>%
      filter(TotalSlope >= input$slope_range[1],
             TotalSlope <= input$slope_range[2])

    ggplot(filtered, aes(x = TotalSlope)) +
      geom_histogram(binwidth = 10, fill = "skyblue", color =
"black") +
      labs(title = "Distribution of Total Slope Length", x = "Slope
Length (km)", y = "Count") +
      theme_minimal()})}

# Run Histogram App
shinyApp(ui = histogram_ui, server = histogram_server)
```

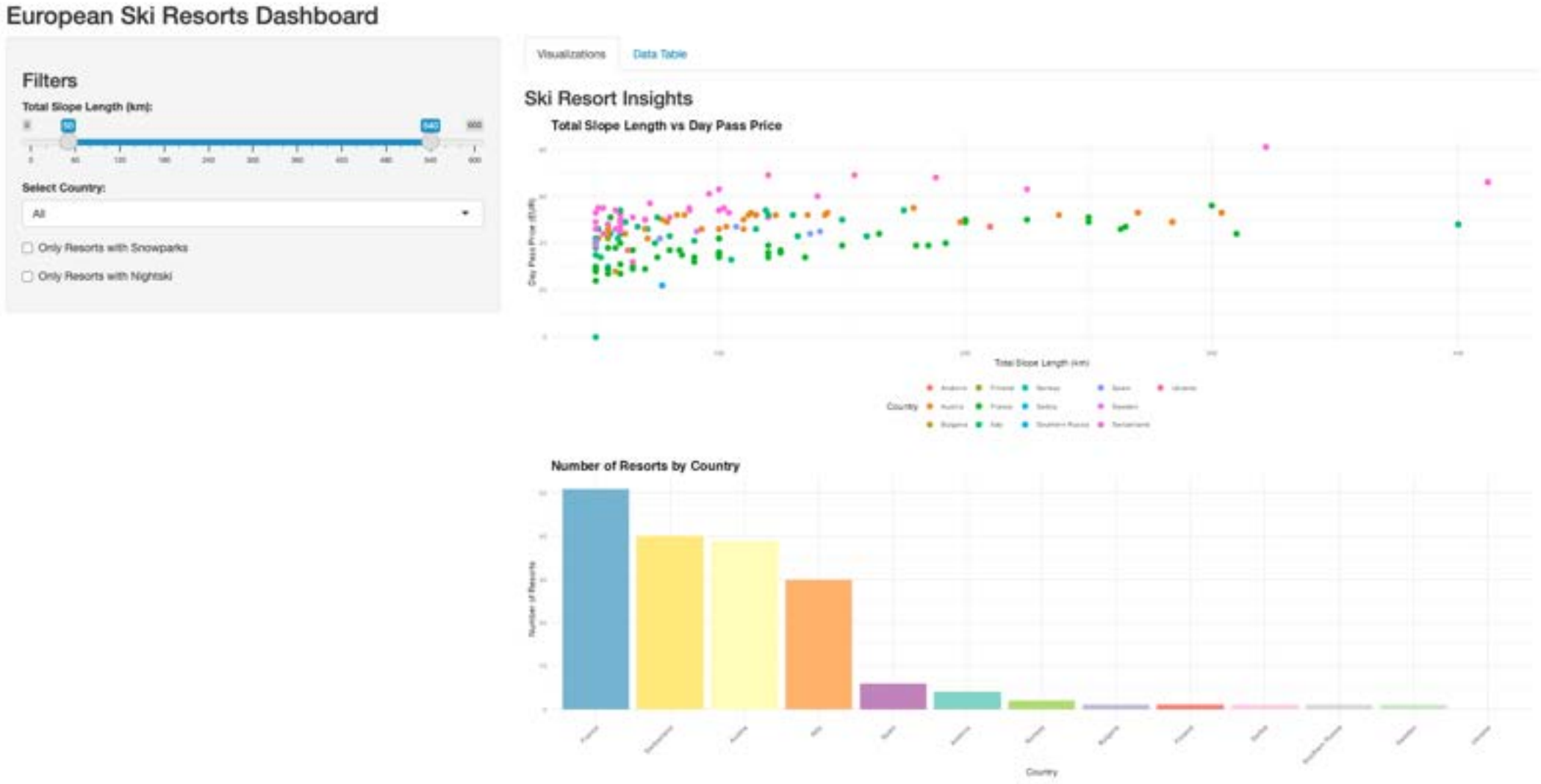


# Output elements: `plotOutput`

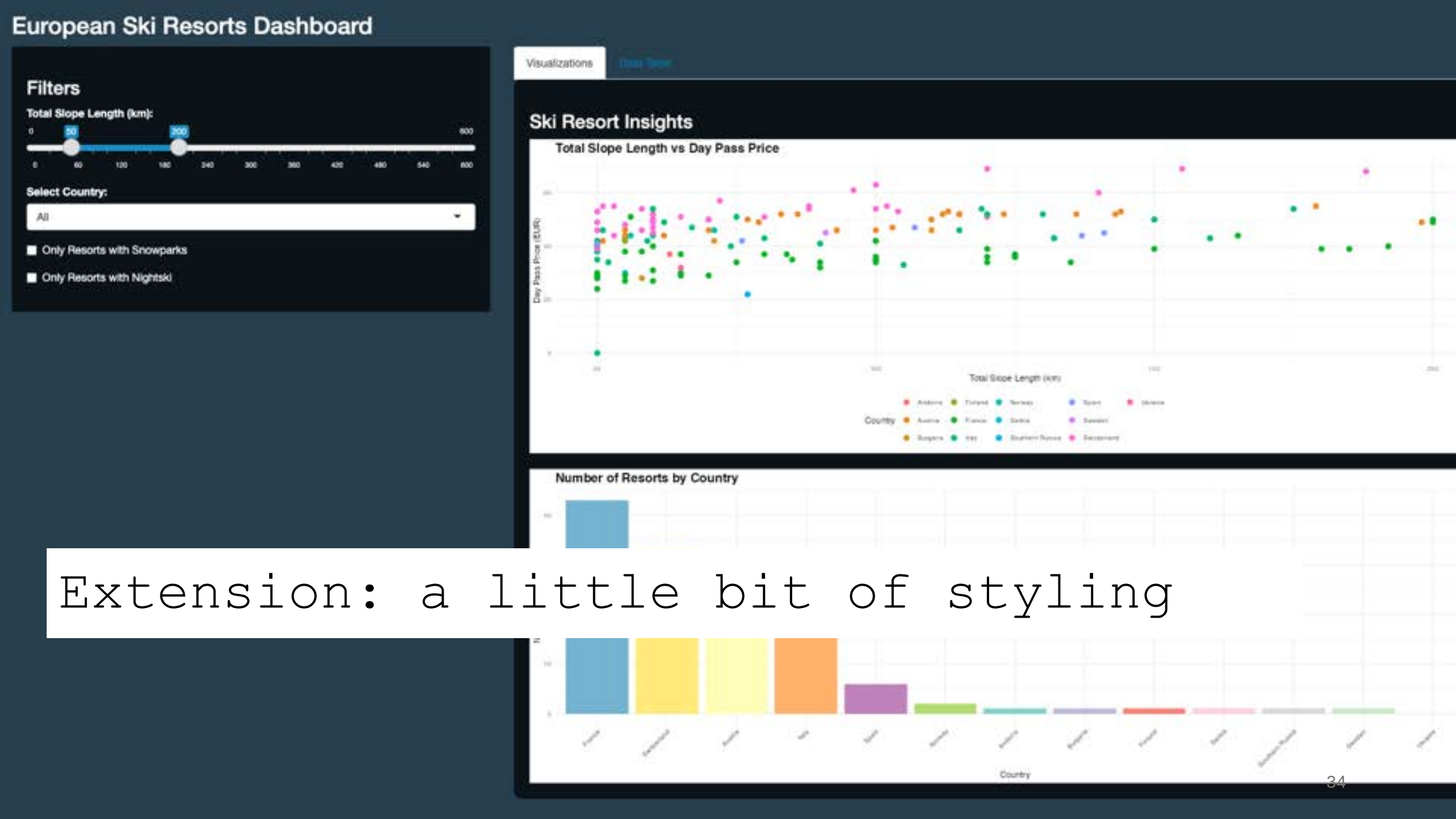
Used to display plots (e.g., bar charts, line graphs) created with ggplot2 or base R. This is the “chart area” where you visualize trends and comparisons.


```
scatter_plot_ui <- fluidPage(
  titlePanel("Scatter Plot: Slope Length vs. Day Pass Price"),
  sidebarLayout(
    sidebarPanel(
      selectInput("country", "Select Country:",
                  choices = unique(data$Country),
                  selected = unique(data$Country)[1])),
    mainPanel(
      plotOutput("scatter_plot"))))

scatter_plot_server <- function(input, output) {
  output$scatter_plot <- renderPlot({
    filtered <- data %>%
      filter(Country == input$country)

    ggplot(filtered, aes(x = TotalSlope, y = DayPassPriceAdult)) +
      geom_point(color = "darkred", size = 3) +
      labs(title = "Slope Length vs. Day Pass Price", x = "Total Slope
Length (km)", y = "Day Pass Price (EUR)") +
      theme_minimal()})}

# Run Scatter Plot App

shinyApp(ui = scatter_plot_ui, server = scatter_plot_server)
```

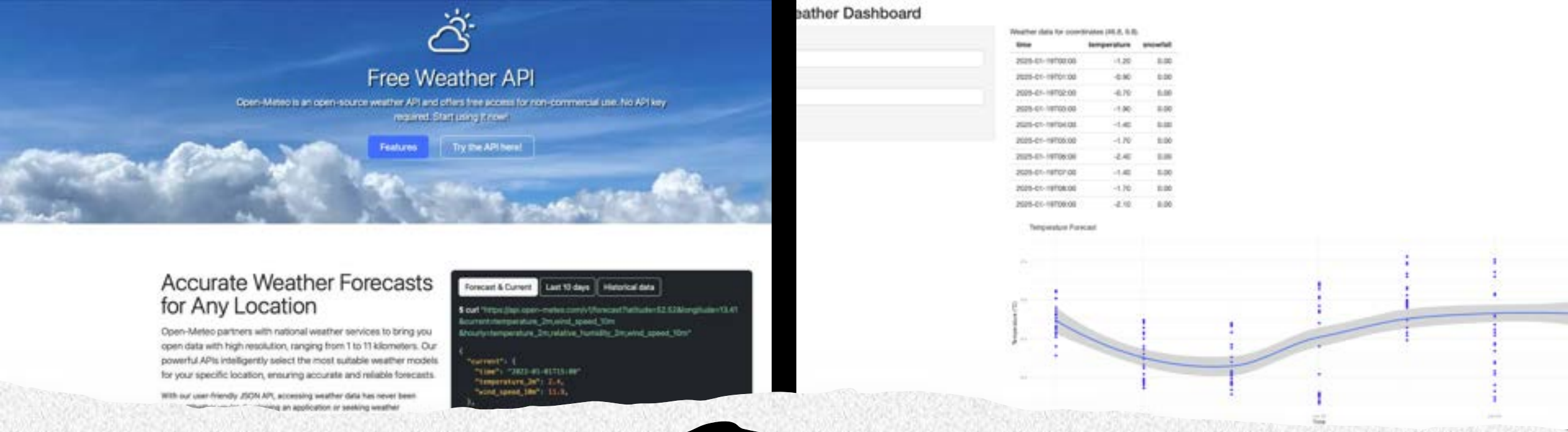
# **Example:** Building a dashboard for European Ski Resorts




```
## example complete dashboard
```



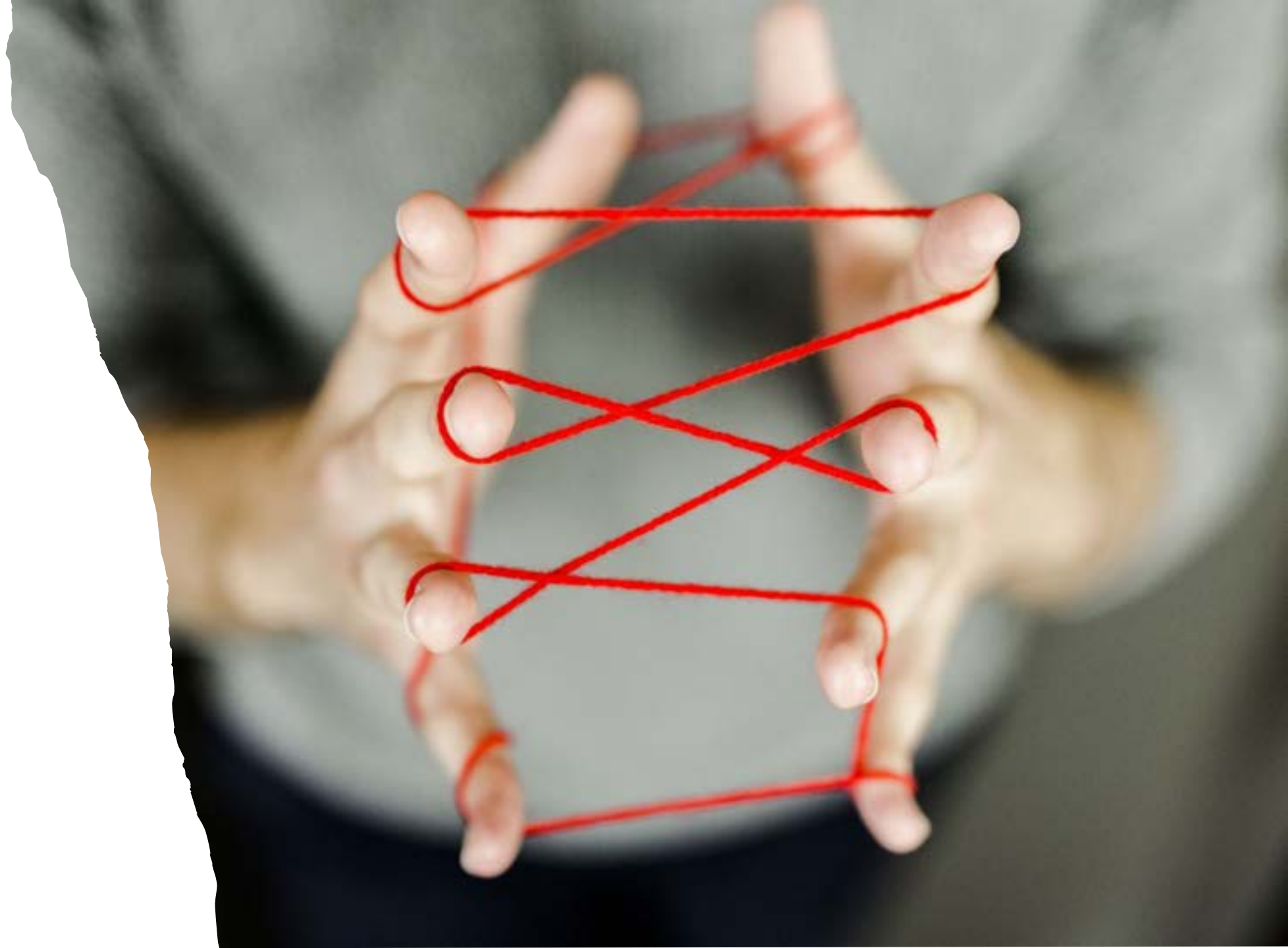

# Extension: a little bit of styling




# Integration of APIs

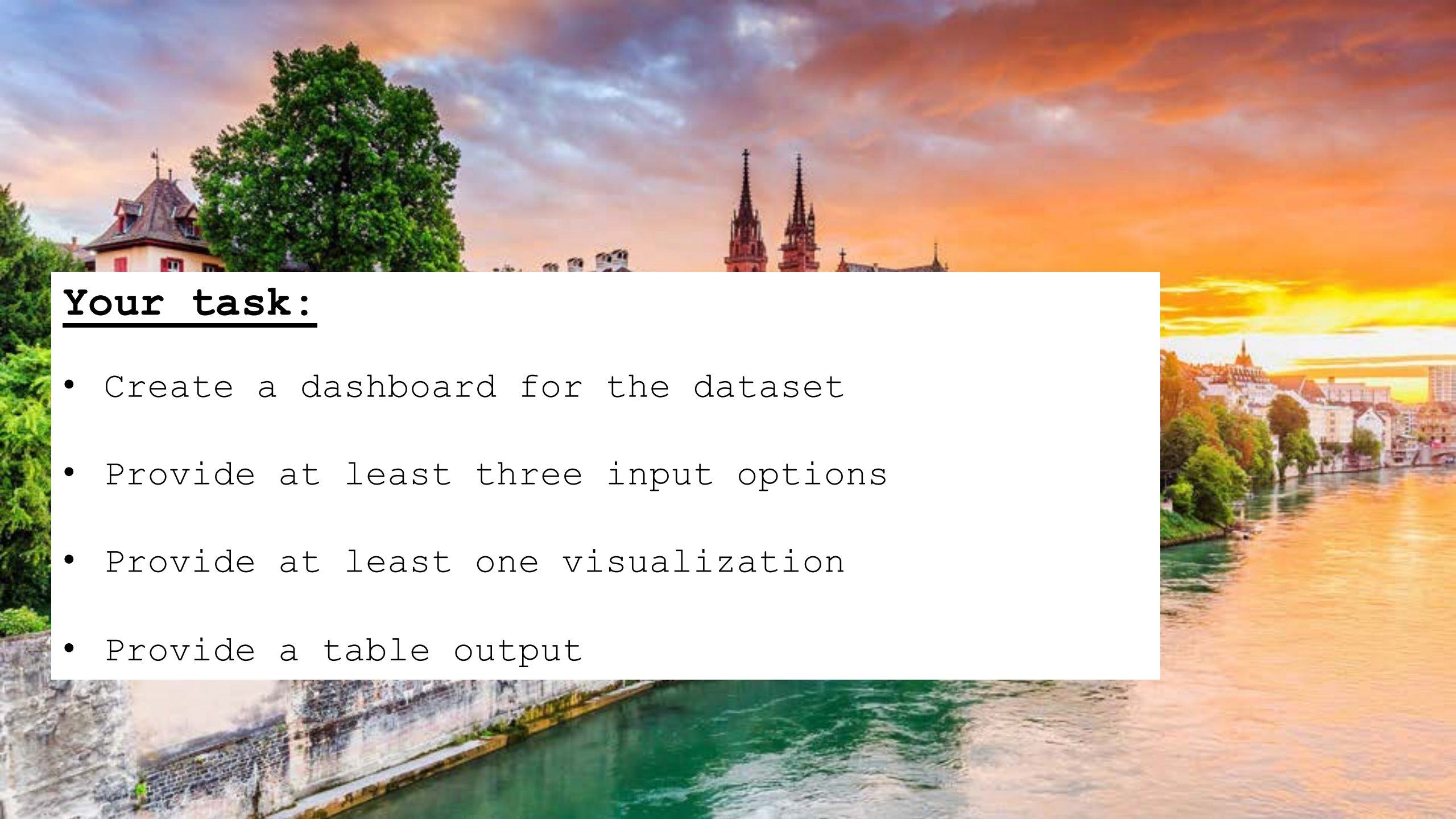
# API integration

# Practice



# Load and Explore Data

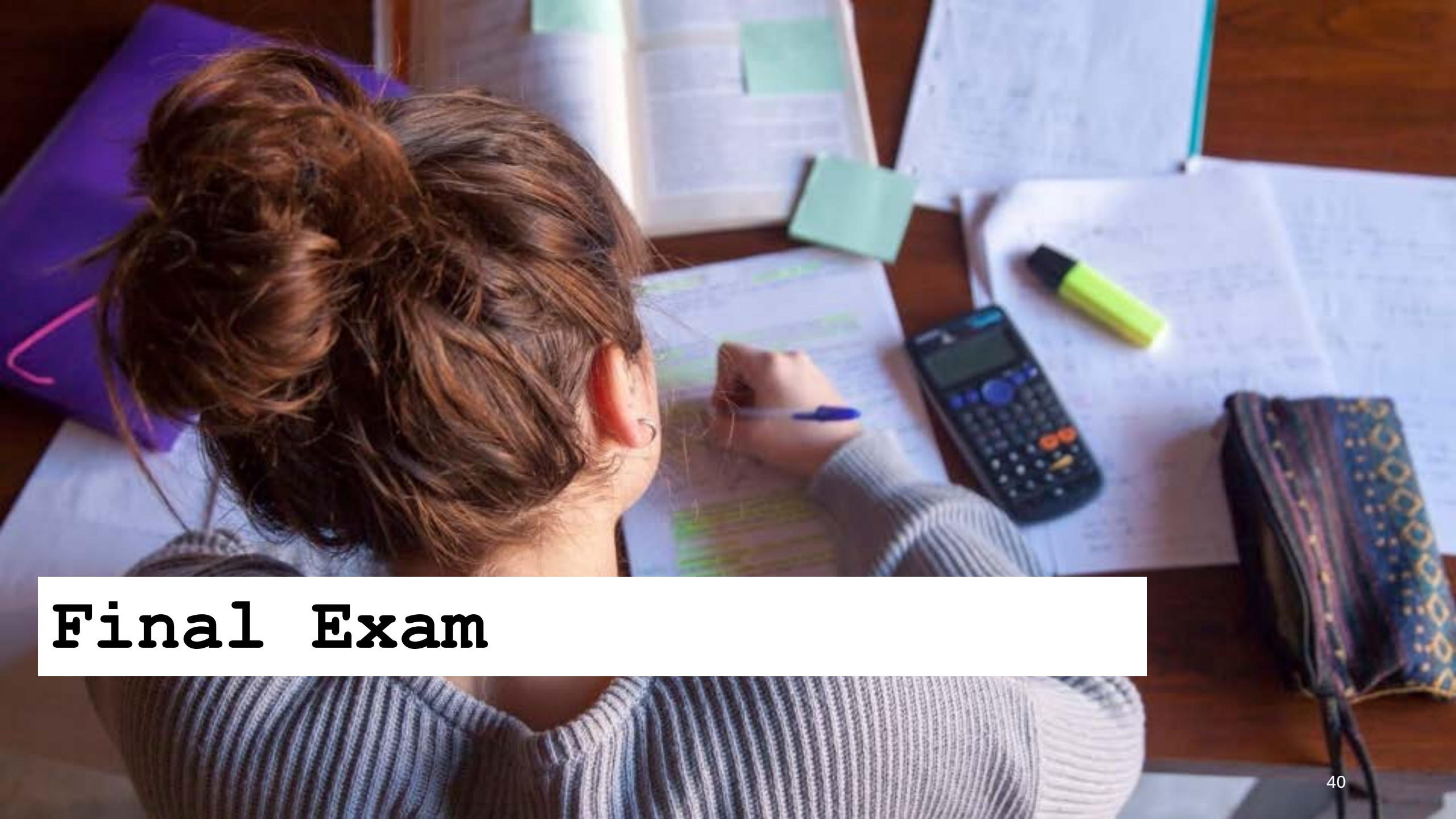
```
# import libraries
library(tidyverse)

# get Basel, Switzerland Tax data
basel <- read_csv("taxation.csv")
```



## Your task:

- Create a dashboard for the dataset
- Provide at least three input options
- Provide at least one visualization
- Provide a table output

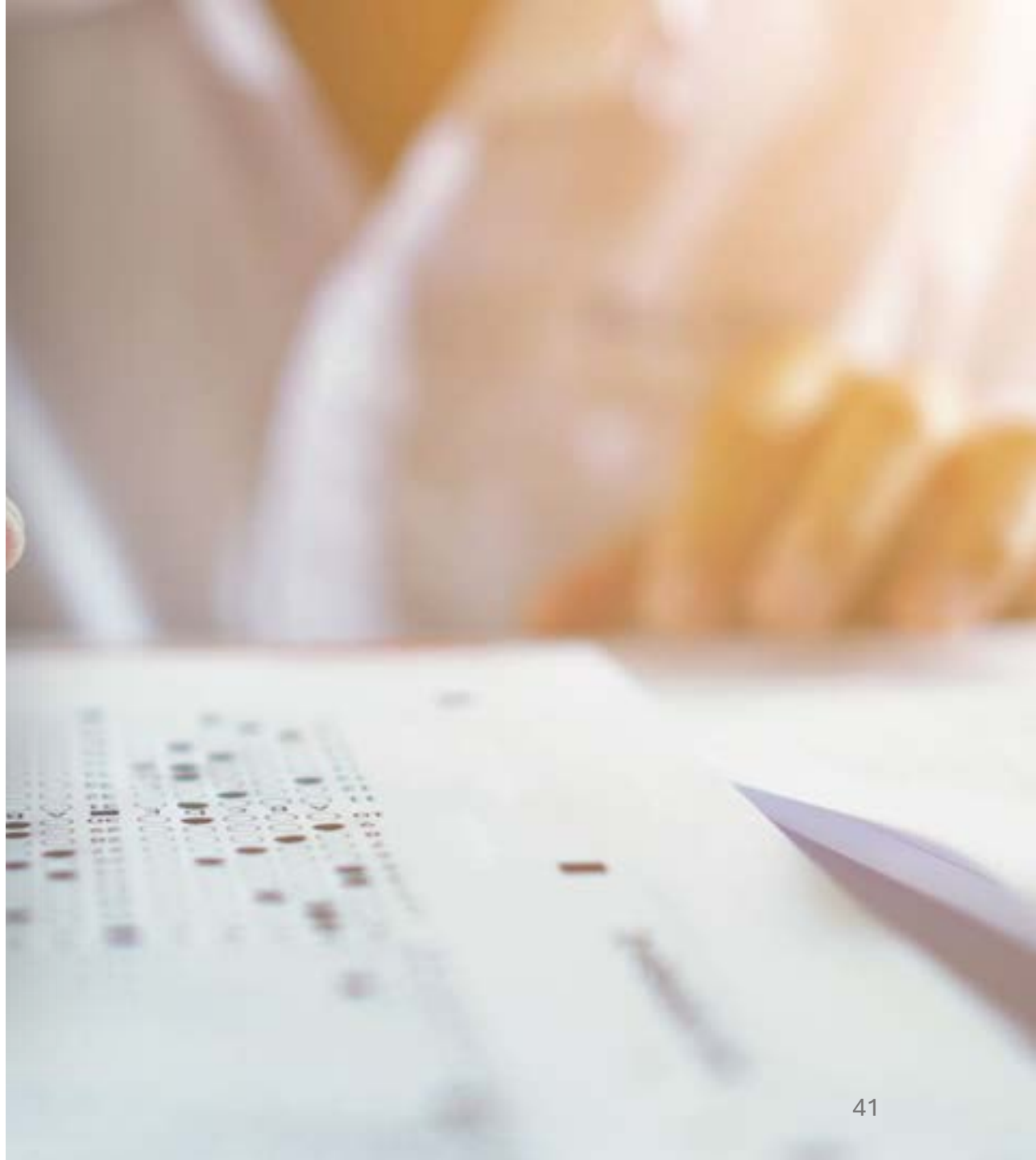
# And the winner is…



# Final Exam

# Final Exam

- First Exam Day DMAV
  - Tuesday, February 23, 2026 at 10:40
  - Building 103, S89 & S58
- Second Exam Day DMAV
  - Thursday, March 23, 2026 at 15:40
  - Building 103, S56



# Final Exam Information

- 30 questions
- 30 minutes time limit
- Each question is worth 1 point
- e-Exam
- Multiple choice
- Closed book, closed note, closed internet, etc.
- Individual
- Please choose the best answer for each question.

# Final Exam Review

# API Data Collection

- Which of the following are examples of data sources?
- What are the two primary ways to get data?
- Third party data typically comes in which of the following formats?
- What is an API call?
- What is the difference between REST, SOAP, and RPC API calls?
- What is the difference between GET and POST API calls?
- List what information you typically need to make an API call?
- What R library can you use to make API calls?
- Some high-level questions about R syntax to make API calls (what certain lines of code do)

# Web Scraping Data Collection

- What is web scraping?
- What are the pros and cons of web scraping compared to API calls?
- What are some examples of use cases where web scraping is commonly used?
- What legal and ethical considerations should you consider when web scraping? How does this differ across different contexts (private versus public data; personal use, research use, and commercial use; etc.)
- How does it differ for private use, research use, and commercial use?
- How are targets identified in HTML that scrapers can use?
- What are the steps in web scraping?
- Some high-level questions about R syntax to scrape data.

# Data Wrangling

- What is regex / gsub?
- What do common regex / gsub commands do (\\w \\d \\s . * + ^ $ ?)
- How do you get data versus replace data in gsub?
- What do common commands do in tidyverse (select, summarize, filter, group by, arrange desc, mutate, table, pivot_longer, pivot_winder)
- What is the difference between long versus wide data

# Data Visualization

- Why use data visualization?
- What makes a good data visualization?
- Why are the characteristics of your audience important to know about?
- What is the difference between top-down biases and bottom-up biases?
- What are the three data visualization (design) principles?
- What are good reasons to use colors?
- When are good times to use different types of charts (heat map, bar plot, violin, radar plot, scatter plot, bubble plot, line chart, time series)?
- Name a few commercial data visualization tools.

# ggplot

- If I were to give you a line of code, could you select the correct answer explaining what the code does?

- If I give a plot to create, could you select the right line of code?

# Storytelling

- What is data storytelling?
- What tools can be used to create stories?
- What are best practices of story telling?
- What do basic elements of r markdown do?

# Introduction to Web-Visualizations

- What is the basic structure of a Shiny app (UI & server components?
- What are the basic elements of the UI?
- What are different input elements?
- What are different output elements?
- Some questions about R code to build dashboards with shiny.

# M.SC. BUSINESS ANALYTICS & ECONOMETRICS

## Capstone Kickoff 2025

Photo: Lisa Beller

**04 February, 16:00**
**The Ship, Vitalisstraße 67, 50827 Köln**
Directions (GoogleMaps)

# Our Partners 2026

# Agenda 04.02.2026

| Start | End | Topic |
|---|---|---|
| 16:00 | 16:10 | Arrival & Registration |
| 16:10 | 16:30 | Welcome |
| 16:30 | 16:45 | xDeck Keynote |
| 16:45 | 17:05 | Break |
| 17:05 | 17:50 | Company Pitches (1) |
| 17:50 | 18:00 | Break |
| 18:00 | 18:45 | Company Pitches (2) |
| 18:45 | 19:30 | Aperitif & Networking |
| 19:30 | 21:00 | Speed Dating Dinner |
| 21:00 | Open end | Networking & Get-Together |