

**Data-Driven Dashboards with R and Shiny**

**Course Number: custom**  
**Duration:** 5 days

**Overview**

Accelebrate's Data-Driven Dashboards with R and Shiny course includes an intensive ramp-up to the fundamentals of the R language, followed by ways to leverage R’s analytical prowess in interactive apps using the Shiny framework.

**Prerequisites**

Students should have knowledge of basic descriptive statistics (summaries, visualization, tables) and know the difference between descriptive and inferential statistics. No programming experience is needed.

**Materials**

All attendees receive comprehensive courseware and a textbook.

**Software Needed on Each Student PC**

* A recent release of R 4.x
* IDE or text editor of your choice (RStudio recommended)

**Objectives**

* Master the use of the R and RStudio interactive environment
* Expand R by installing R packages
* Explore and understand how to use the R documentation
* Read Structured Data into R from various sources
* Understand the different data types in R
* Understand the different data structures in R
* Understand how to create and manipulate dates in R
* Use the tidyverse collection of packages to manipulate dataframes
* Write user-defined R functions
* Use control statements
* Write Loop constructs in R
* Reshape data from long to wide and back to support different analyses
* Perform merge operations with R
* Understand split-apply-combine (group-wise operations) in R
* Identify and deal with missing data
* Manipulate strings in R
* Understand base R graphics
* Focus on GGplot2 graphics for R for generating charts
* Use RMarkdown to programmatically generate reproducible reports
* Use R for descriptive statistics
* Identify differences between flexdashboard and Shiny
* Understand how to create a Shiny Project
* Design a working user interface for Shiny
* Activate a Shiny app through server functions
* Launch a Shiny App
* Connect a Shiny App to data

**Outline**

* **Part 1: Exploratory data analysis with R!**
* Brief overview of R
  + History of R
  + Advantages and disadvantages
  + Downloading and installing
  + How to find documentation
* Using and understanding RStudio
  + Using the R console and RStudio
  + Getting help
  + Learning about the environment
  + Writing and executing scripts
  + Object oriented programming
  + Introduction to vectorized calculations
  + Introduction to data frames
  + Installing and loading packages
  + Working directory
  + Saving your work
* Base R coding with vectors and dataframe
  + Variables and assignment
  + Data types
    - Numeric, character, boolean, and factors
  + Data structures
    - Vectors, matrices, arrays, dataframes, lists
  + Indexing, subsetting
  + Assigning new values
  + Viewing data and summaries
  + Naming conventions
  + Objects
* Dataframe manipulation with **dplyr**
  + Introduction to tibbles, enhanced data frames
  + Renaming columns
  + Adding new columns
  + Binning data (continuous to categorical)
  + Combining categorical values
  + Transforming variables
  + Handling missing data
  + Merging datasets together
  + Stacking datasets together (concatenation)
* Handling dates in R using **lubridate**
  + Date and date-time classes in R
* Exploratory data analysis (descriptive statistics)
  + Continuous data
    - Distributions
    - Quantiles, mean
    - Bi-modal distributions
    - Histograms, box-plots
  + Categorical data
    - Tables
    - Barplots
  + Group by calculations with dplyr
    - Split-apply-combine
  + Reshaping and pivoting data in R (long to wide with aggregation)
    - Melt and cast
    - pivot\_wider and pivot\_longer with **tidyr**
* Advanced data visualization with **ggplot2**
  + Base graphics system in R
  + Scatterplots, histograms, barcharts, box and whiskers, dotplots
  + Labels, legends, titles, axes
  + Understanding the grammar of graphics
  + Quick plots (qplot function)
  + Building graphics by pieces (ggplot function)
  + Understanding geoms (geometries)
  + Linking chart elements to variable values
* **Part 2: Developing applications with Shiny!**
* Brief overview of RMarkdown and flexdashboard
  + Example rmarkdown document
  + Conversion to simple flexdashboard
  + But what if we want interactivity?
* What is Shiny?
  + A Simple App that We Will Build on Day 1
  + A Fancy App that We Will Build on Day 2
  + The shiny gallery for inspiration
* The Shiny App Skeleton
  + ui: the user interface design
  + server: the engine that does the work
  + the shinyApp brings it all together
  + app.R and runApp
  + Other Local Launching Methods
* Widgets and the Input List Elements They Create
  + Examples
  + verbatimTextOutput
  + Input List Elements and Their Role in Server
  + Output List Elements and Their Role in UI
* Connecting to data
  + data included in the project
  + connecting to a database
  + dbplyr
  + the pool package
* Application Layout
  + sidebar
  + basics of HTML and web technologies
  + The Bootstrap 12-Wide Grid System
  + tabsets, navlist, and navbarPage
  + Application Themes
* The Reactive Dependency Chain
  + What is reactivity?
  + How to manage user interaction
  + How and when to update output
* Shiny Extensions
  + DataTables
  + dygraphs
  + shinyRGL
* Sharing Your App With Others
  + Encapsulating your app on disk
  + Launching Via [shinyapps.io](http://shinyapps.io)
* **Part 3: Building your own Shiny data explorer from start to finish**
  + Planning your layout
  + Templating and scaffolding your app
  + Scoping your data
  + Adding components
  + Enriching with reactivity
  + Testing your working dashboard
  + Planning for maintenance and updates
* **Conclusion**