

Online Hands-on Training



Practical R for Biologists

Data Manipulation, Visualization & Analysis

(08-12 March 2025)

Course Module (5 Days)

Day 1: Introduction to R and Basic Programming

Objective: Familiarize participants with the basics of R and RStudio, and introduce simple programming concepts

Session 1: Getting Started with R and RStudio

- Introduction to R and RStudio.
- Installing R and RStudio.
- Exploring the RStudio interface.
- Running simple commands in the R console.

Session 2: Basics of R Programming

- Variables and data types: Vectors, Lists, Matrices, Data Frames.
- Operators and basic calculations.
- Indexing and subsetting data.
- Hands-On: Practice manipulating small datasets and writing simple calculations.

Session 3: Reading and Writing Data

- Importing data with `read.csv()` and `read.table()`.
- Exporting data with `write.csv()`.
- **Hands-On:** Work with sample biological datasets (e.g., gene expression tables).

Day 2: Data Manipulation with dplyr

Objective: Introduce participants to powerful data manipulation tools using the dplyr package.

Session 1: Data Manipulation with dplyr

- Key functions: `filter()`, `select()`, `mutate()`, `arrange()`, `summarize()`.
- Combining commands with pipes (`%>%`).
- Hands-On: Manipulate biological datasets (e.g., gene or protein data).

Session 2: Working with Data Frames and Tidy Data

- Data wrangling: Transforming datasets for analysis.
- Creating new variables, reshaping data.
- **Hands-On:** Practice working with real-life biological datasets.

Contact Us



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Day 3: Basic Data Visualization with ggplot2

Objective: Introduce participants to basic data visualization using ggplot2

Session 1: Introduction to ggplot2

- Structure of ggplot2: Aesthetic mappings and geoms.
- Creating scatter plots, bar plots, and box plots.
- Customizing visuals: Themes, labels, colors.
- **Hands-On:** Create visualizations for biological datasets.

Session 2: Customizing Visualizations

- Adjusting scales, adding regression lines, and faceting.
- Working with colors and themes for publication-quality plots.
- **Hands-On:** Advanced customization of ggplot2 visualizations.

Day 4: Statistical Analysis in R

Objective: Teach statistical analysis using R with a focus on basic tests and integrating results into visualizations

Session 1: Introduction to Statistical Analysis

- Overview of statistical workflows in R.
- Conducting t-tests and ANOVA.
- **Hands-On:** Apply t-tests and ANOVA to biological data (e.g., gene expression).

Session 2: Statistical Analysis with Visualization

- Adding statistical test results to plots (e.g., p-values on boxplots).
- Exploring correlation and linear regression in biological datasets.
- **Hands-On:** Integrate statistical analysis with visualizations (boxplots, violin plots).

Day 5: Advanced Data Visualization and Heatmaps

Objective: Teach advanced data visualization techniques, including the creation of heatmaps and multi-panel plots

Session 1: Heatmaps and Clustering

- Creating heatmaps with pheatmap or ComplexHeatmap.
- Visualizing large datasets (e.g., expression matrices).
- **Hands-On:** Create customized heatmaps for biological data.

Session 2: Advanced Visualization with ggplot2

- Creating and customizing complex plots.
- Multi-panel visualizations and interactive plots.
- **Hands-On:** Develop and customize multi-panel visualizations using ggplot2.