Introducing R Academy

Andrew Redd, PhD. VINCI Helpdesk R Expert

VINCI CyberSeminar May 13, 2021
Introduction
R Academy

https://sps.vinci.med.va.gov/prod/vinicipedia/VINCIIPedia/R_Academy

(Accessible only within VA network)

• Resource Center
• Modules & Tutorials
• Outside & Inside Workspace
• Tailored for VA research
Inside/Outside Workspace

**Inside**
- VINCI package
  - Learnr interactive tutorials
  - Each module must be launched separately
  - Interactive code sections
  - Interactive quizzes

**Outside**
- VINCIPedia
  - SharePoint based
  - Easily link and navigate through modules
  - Code & results are static
  - Self-administered quizzes
Core Competencies

- Getting Started
- Objects & Classes
- Packages
- Using R Effectively
- Graphics

- Models
- Bayesian & Stochastic Methods
- Parallel Processing
- Language Interfaces
- Command Line & Batch Operation
Modules

Individual modules denoted in bold
Currently ready modules denoted by underline
Subject to change
Getting Started Modules

• Accessing R in VINCI
  • R & Rstudio

• Syntax
  • Variables
  • Functions
  • Expressions & Control Structures
  • Operators
  • Special Values
  • Formulas

• Data Structures
  • Vectors
  • Matrices
  • Lists
  • Data Frames
  • Tibbles

• Environments
  • Stack
  • scope
Getting Started Continued

• Reading Data
  • CSV
  • Excel
  (Database data is in Using R Efficiently)

• Environments
  • Stack
  • Scope

• Help
  • Reading helpfiles
  • Online Documentation
  • Twitter
  • RUGs
Objects & Classes

- **S3 Class System**
  - Duck type
  - Class attribute
  - ‘Dot’ methods
- **S4**
  - Rigorous Classes
  - Defining Classes
  - Defining Methods
- **Reference Classes**
  - Mutable objects
  - Copy on edit
  - Defining
  - Uses
- **R6**
Packages

- Intro to packages
  - Finding packages
  - Package documentation
  - Repositories
    - CRAN
    - BioConductor
    - GitHub

- Building Packages
  - Why?
  - File structure
  - Help files
  - Roxygen
  - Testing
  - Distribution
Using R Effectively

- **Tidyverse**
  - dplyr
  - tidyr
  - forcats
  - etcetera

- **Map/Reduce**
  - **Base**
    - For loops
    - lapply, sapply, etc.
    - Map & Reduce
  - **purrr (tidyverse)**

- **Databases**
  - Connections
    - Manual
    - Rstudio
  - DBI, dplyr & dbplyr
  - Tibbles
    - Remote vs. local data
    - Collect vs. compute
    - Build/show query
Graphics

• **Base**
  • plot
  • hist
  • etc.

• **Grid**
  • Lattice
  • Viewports
  • Etc.

• **ggplot2**
  • Data
  • Layers
  • Aesthetics
  • Themes
  • Etc.
Models

- Linear Models
  - Specifying
  - Fitting
  - Extracting components
  - Evaluating

- Advanced
  - Non-linear & mixed effects (nlme)
  - Generalized
    - Logistic
    - Poisson
    - etc.

- Non-Parametric
  - gam
  - mgcv
Bayesian & Stochastic Methods

- Bootstrapping
- Markov Chain Monte Carlo (mcmc)
- WinBUGS
Special Topics

- Parallel Processing
  - Foreach
  - Futures
  - Reproducibility
  - Fault Tolerance
- Language Interfaces
  - Rcpp (C++)
  - Reticulate (python)
  - Calling R from SAS
- Command Line & Batch Mode
  - rscript
  - R CMD batch
  - Scripts from RStudio
- R6
Navigating to VINCIPedia
Navigating to R Academy
Welcome to the VINCI R Academy!

This is an outline of the training topics. Links to content will be provided as they become available.

This training seeks to familiarize the user with the R programming language and how to use it in the VINCI Workspace environment including its use with SAS.

R Training

This training is based on meeting 10 core competencies:

- Getting Started
- Objects & Classes
- Packages
- Using R Effectively
- Graphics
- Models
- Bayesian & Stochastic models
- Parallel processing
- Language interfaces
- Command line and batch mode

These core competencies are broken down as follows:

Introduction to R

Getting Started

- Accessing R in VINCI
  - R

VINCI R Support Contacts

If you need help with R in the VINCI environment, please request it from VINCI@va.gov and include "R help" in the subject line for faster routing to the appropriate VINCI Convergence.

R Resources

- R Project
- R Consortium
- RStudio
  - Cheatsheets
- R User Groups
  - link (https://www.meetup.com/pro/r-user-groups/) is not accessible within VA network.
  - StackOverflow R Questions

How to access R Training in the Workspace

Coming soon.

R Training Videos
Support Information

• Includes information for contacting the VINCI Helpdesk

VINCI R Support Contacts
If you need help with R in the VINCI environment, please request it from VINCI@va.gov and include “R help” in the subject line for faster routing to the appropriate VINCI Concierge.
Resources

• List of useful resources

R Resources

• R Project
• R Consortium
• RStudio
  ◦ Cheatsheets
• R User Groups
  ◦ link (https://www.meetup.com/pro/r-user-groups/) is not accessible within VA network.
• StackOverflow R Questions

• Still in progress
Cyber Seminars

R Training Videos

Video

[Efficiently Accessing VINCI Data in R](#)

[Diagnosing Large and Long Running Models in R](#)

Slides

[PDF](#)

[PDF](#)
R Syntax: Variables

Variables Overview

One of the most important components of any language is variables. Variables are symbols or names that hold the value of something else. In R practically anything can be assigned to a variable including:

- numbers (numeric and integer),
- boolean values `TRUE` and `FALSE`,
- character vectors (also known as an array of strings),
- objects,
- language elements such as
  - functions,
  - expressions,
  - and calls.

Variable Assignment

A value is assigned to a variable through the left arrow operator `<-` or the arrow operator for short.
Code Samples

Example

\( x \leftarrow \text{TRUE} \)

Here the value of \texttt{TRUE} is assigned to the variable \( x \).
Quizzes

Quiz

Let’s take a minute to assess your knowledge with a quiz.

Which of the following is/are valid variable names?

- x
- L’Hopital
- prev
- next
- private
- ‘model for racial inequality in healthcare.’

Which of the names is/are valid and informative?

- x
- L’Hopital
- prev
- next
- private
- ‘model for racial inequality in healthcare.’
Prerequisites

• Later modules include prerequisites

Prerequisites

It is assumed that you are familiar with the material covered in

• R Syntax Variables
• R Syntax Functions
SharePoint Notes

• VINCI Pedia modules include instructions of how to run the same module inside the workspace as an interactive tutorial

SharePoint Note

This presentation will also available inside the VINCI workspace as an interactive tutorial and may be accessed by running

```
learnr::run_tutorial("R Syntax Variables", package="VINCI")
```
VINCI package

(Inside Workspace)
Inside Workspace

- Rstudio + Shiny + learnr = Interactive Tutorials

1. Launch Rstudio
2. Load the VINCI Package
3. Run the tutorial e.g.

```r
learnr::run_tutorial("R Syntax Variables", package="VINCI")
```
R Syntax - Special Values

Introduction
This tutorial introduces the special values and the reserved keywords. These are broken into

- Missing Values
- Infinities
- Not a Numbers
- The nothing value, NULL

Introduction
Missing Values
Infinity
Not a Number, NaN
Nothing value, NULL
Quiz

Next Topic

Start Over
Exercises

- Exercises are interactive
- Modify and re-evaluate code
Quizzes

- Interactive, evaluates correct answers & gives feedback.

What is the type of `NA`?
- numeric
- integer
- logical
- missing
- NULL

Correct!

What is the length of `Inf`?
Enter answer here...
Questions?

Or comments?