**Introduction to Programming in R**

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**Syllabus**This class is an intensive introduction to R. It starts with the very basics of assigning variables and reading data. It then progresses to using RMarkdown for document and presentation creation.

# Week 1 Introduction to R

* The RStudio Interface
* Basic Math
* Assigning Variables
* Working Directories
* Relative Paths
* Reading Data
  + Read from text files with [readr](https://www.rdocumentation.org/packages/readr/)
  + Read from Excel files with [readxl](https://www.rdocumentation.org/packages/readxl/)
* Writing Functions

## RMarkdown

* RMarkdown Primer
  + Sections
  + Text Formatting
  + Lists
  + Links
* Integrating R into Markdown
  + Code Chunks
  + Chunk Options
* Including Figures
* Output Formats
  + HTML
  + PDF
  + Word
* Presentations

# Week 2 Data Manipulation with [dplyr](https://www.rdocumentation.org/packages/dplyr/)

* Understanding a [tbl](https://www.rdocumentation.org/packages/tibble/topics/tbl)
* Use pipes for cleaner code
* Select columns with [select](https://www.rdocumentation.org/packages/dplyr/topics/select)
* Filter rows with [filter](https://www.rdocumentation.org/packages/dplyr/topics/filter)
* Change and create columns with [mutate](https://www.rdocumentation.org/packages/dplyr/topics/mutate)
* Calculate summary statistics with [summarize](https://www.rdocumentation.org/packages/dplyr/topics/summarize)
* Group data for calculations with [group\_by](https://www.rdocumentation.org/packages/dplyr/topics/group_by)
* Joins with [left\_join](https://www.rdocumentation.org/packages/dplyr/topics/left_join)

## Creating Visualizations

* [ggplot2](https://www.rdocumentation.org/packages/ggplot2/) paradigm
* Aesthetics
* Scatter plots
  + Color Coding
  + Size
  + Shape
  + Opacity
* Small multiple plots
* Histograms
* Density Plots
* Combining Layers
* Violin Plots
* Themes

# Week 3 Reading Data

* CSVs with [readr](https://www.rdocumentation.org/packages/readr/)
* Databases with [DBI](https://www.rdocumentation.org/packages/DBI/)
* JSON with [jsonlite](https://www.rdocumentation.org/packages/jsonlite/)
* Web pages with [rvest](https://www.rdocumentation.org/packages/rvest/)

## Iterate Over Lists with [purrr](https://www.rdocumentation.org/packages/purrr/)

* Basics of functional programming
* Mapping over a list
* Difference from [lapply](https://www.rdocumentation.org/packages/base/topics/lapply)
* Consistent Data Types
* Mapping to different data types
  + chacracter
  + numeric
  + data.frame
* Mapping functions with multiple arguments

## Reshaping Data

* Convert from wide to long with [gather](https://www.rdocumentation.org/packages/tidyr/topics/gather)
* Convert from long to wide with [spread](https://www.rdocumentation.org/packages/tidyr/topics/spread)

# Week 4 Linear Models

* Simple Linear Model with [lm](https://www.rdocumentation.org/packages/stats/topics/lm)
* The Formula Interface
* Multiple Regression
* Tidying models with [broom](https://www.rdocumentation.org/packages/broom/)
* Visualizing models with [coefplot](https://www.rdocumentation.org/packages/coefplot/)

## Generalized Linear Models

* Logistic Regression for Binary Data
* Poisson Regression for Count Data
* Quasipoisson Regression for Overdispersed Count Data

## Assessing Model Quality

* AIC
* BIC

# 

# Week 5 Cross-Validation

* Use Cross-Validation for Model Assessment

## Penalized Regression

* L1 Penalty (Lasso)
* L2 Penalty (Ridge)
* Implement via the Elastic Net with [glmnet](https://www.rdocumentation.org/packages/glmnet/)
* Tuning Hyperparameters

## Boosted Trees

* Decision Trees
* Boosted Trees
* Fit Model with [xgboost](https://www.rdocumentation.org/packages/xgboost/)

# Week 6 Shiny Basics

* Inputs
* Outputs
* Reactive Expressions
* HTML Widgets
  + Interactive Plots
  + Interactive Maps
  + Interactive Tables

# Shiny Dashboard

* Server Code
* UI Code
* Dashboard Layout

# Instructor Bio

Jared P. Lander is the Chief Data Scientist of [Lander Analytics](file:///C:/Users/wl284/AppData/Local/Microsoft/Windows/Temporary%20Internet%20Files/Content.Outlook/R1PN1TIT/www.landeranalytics.com), a data science and artificial intelligence consulting and training firm based in New York City; the organizer of the [New York Open Statistical Programming Meetup](file:///C:/Users/wl284/AppData/Local/Microsoft/Windows/Temporary%20Internet%20Files/Content.Outlook/R1PN1TIT/www.nyhackr.org)—the world’s largest R meetup—–and the [New York R Conference](file:///C:/Users/wl284/AppData/Local/Microsoft/Windows/Temporary%20Internet%20Files/Content.Outlook/R1PN1TIT/www.rstats.nyc)); author of [R for Everyone](file:///C:/Users/wl284/AppData/Local/Microsoft/Windows/Temporary%20Internet%20Files/Content.Outlook/R1PN1TIT/www.jaredlander.com/r-for-everyone) and an adjunct professor at [Columbia University](file:///C:/Users/wl284/AppData/Local/Microsoft/Windows/Temporary%20Internet%20Files/Content.Outlook/R1PN1TIT/www.columbia.edu). With an M.A. from [Columbia University](file:///C:/Users/wl284/AppData/Local/Microsoft/Windows/Temporary%20Internet%20Files/Content.Outlook/R1PN1TIT/www.columbia.edu) in statistics and a B.S. from [Muhlenberg College](file:///C:/Users/wl284/AppData/Local/Microsoft/Windows/Temporary%20Internet%20Files/Content.Outlook/R1PN1TIT/www.muhlenberg.edu) in mathematics, he has experience in both academic research and industry. Very active in the data community, Jared is a frequent speaker at conferences, universities and meetups around the world. His writings on statistics can be found at [jaredlander.com](file:///C:/Users/wl284/AppData/Local/Microsoft/Windows/Temporary%20Internet%20Files/Content.Outlook/R1PN1TIT/jaredlander.com) and his work has been featured in publications such as Forbes and the Wall Street Journal.

# Textbook

[R for Everyone, Second Edition](http://amzn.to/2upiUrA)