# Day 1

### Morning

* Arsenio: Introduction and week plan
  + Go over the main goals of the course.
  + Go over the main goals of each day.
* Ben: What is R? Why use R?
  + Intuitive, powerful, and popular.
  + Open source: it’s free and maintained and upadated by programmers all over the world.
* Joe: The learning curve and motivation
* All programming languages have a learning curve, but R is as accesible as it is efficient.
* Analzye data and produce impressive visualizations with limited knowledge.
* Arsenio: **Preparing the environment**
* Setting up Rstudio and understanding the interface.
* Learn the 4 panels in Rstudio.
* The scripts.
* The console.
* The global environment.
* The plots.
* Installing packages and using them during a session.

### Afternoon

* Arsenio: **Preparing the data** (basic only, save databases, etc. for day 5)
* Exploring packages and functions to read in data.
* Cleaning column names, removing missing values, and formatting variables.
* Preparing the data for analysis and visualization.
* Ben: **Introduction to ggplot2** (context, rationale, structure)
* The advantages of ggplot.
* Quick, simple, and beautiful.
* Adding layers to a plot.
* Exploring the basics as well as showing the potential.
* Joe: First chart
* Build a basic bar, scatter, or line plot with data from R packages.
* Explain how aesthetics (aes) works in ggplot.
* Exercises: reading-in different types of data with rio
* Importing and exporting data to a repository.

# Day 2

### Morning

* Arsenio: **Univariate graphs** - Categorical
* Use different color schemes in ggplot to visualize a bar chart.
* Ben: **Univeriate graphs** - Quantitative
* Use ggplot to show density and distributions for univariate frequency data.
* Joe: **Univariate graphs** - Exercises
* Give the students data and ask them to produce a categorical and quantitative univariate graph.

### Afternoon

* Ben: **Bivariate graphs** - Introduction
* Show how two variables can be grouped and shown in a bar chart.
* Introduction to line/scatter plots.
* Arsenio: **Bivariate graphs**|Categorical vs Categorical
* Show frequency data in a bivariate scenario.
* Joe: **Bivariate graphs**|Quantitative vs Quantitative
* Scatter plots.
* Correlation charts.
* Ben: **Bivariate graphs**|Categorical vs Quantitative
* Time series graphs.
* Arsenio: **Bivariate graphs** - Exercises
* Provide the students with data and ask them to produce all the charts from variables of their choosing.

# Day 3

### Morning

* Ben: **Multivariate graphs** - Introduction
* Show the grouping functionality on ggplot.
* Show the color functionality in ggplot.
* Show the fill functionality in ggplot.
* Joe: **Multivariate graphs** - Preparing the data (dplyr, grouping, etc.).
* Introduction to tidyverse/tidyr/dplyr.
* Go over dplyr “verbs”.
* long data vs wide data for plotting ease.
* Arsenio: **Multivariate graphs** - Practical instruction
* Show the different ways you can visualize the same data.
* All: **Multivariate graphs** - Exercises
* Give the students wide data and have them use dplyr functions to make it long.
* Plot the multivariate data using colors and groups.

### Afternoon

* Joe: **Mapping** - Introduction
* Show all the libraries that can produce maps in R.
* Introudction to shape files.
* Introduction to ggmap package.
* Introduction to leaflet package.
* Arsenio: **Mapping** - Point maps / dot density maps
* Use leaflet to show point maps and density maps.
* Ben: **Mapping** - Choropleth maps
* Show heat maps.
* All: **Mapping** - Exercises
* Give the students a dataset with lat/long information and have them use one of the packages to produce a map.

# Day 4

### Morning

* Ben: **Time-dependent maps** - Introduction
* Introudction to packages that handle time dependent maps (plotly).
* Advantages and disadvantages to using plotly.
* Joe: **Time-dependent maps** - Time series
* Show how plotly can animate basic maps (and other plots).
* Arsenio: **Time-dependent maps** - Dumbbell, slope, area charts
* Using plotly show examples of the charts above.
* All: **Time-dependent maps** - Exercises
* Give the students data and have them animate a map or basic plot (bar, line, scatter, etc) using the plotly package.

### Afternoon

* Arsenio: **Statistical models** - Introduction
* Explain how R, unlike other languages, was built for statistical analysis.
* Go over basic statistical principles and how R handles them with various packages.
* Ben: **Statistical models** - Correlation plots
* Show how are can visualize correlation in different ways.
* Show bivariate correlation.
* Show multivariate correlation plot/tables.
* Arsenio: **Statistical models** - Linear regression
* Introduction to the lm (linear model) function in R.
* Show how to run a basic bivariate linear regression.
* Show how to run a basic multivariate linear regression.
* Demonstrate how to access the object returned by models (estimates, std deviation, R squared, etc)
* Joe: **Statistical models** - Logistic regression
* Show how to test if the relationship between predictors and outcomes are not linear.
* Use the glm (generalized linear model) function to run a logistic regression for non-linear relationships.
* Show how to extract the odds ratios from logistic regressions.
* Ben: **Statistical models** - Mosaic plots
* Show how mosaic plots can visualize data with multiple qualitative data.
* Ben: **Statistical models** - Survival plots
* Use survival analysis to visualise time to event.
* Distinguish between right censored and left censored data and how to properly visualize that distinction.
* All: **Statistical models** - Exercises
* Give the students data and have them run a basic linear regression (univariate or multivariate)
* Have them identify non linear relationships in the data and model a logistic regression.
* Have them conduct a basic survival analysis and visualize the time to event.

# Day 5:

### Morning

* Arsenio: **Other graphs** - Introduction
* Introduction to basic plotting in R.
* Introduce alternative plotting methods - using candle stick plots instead of bar charts.
* Introduction to jittering scatter plots.
* Introduction to more in depth ggplot functionality - using alpha for transparency, annotating plots, etc.
* Joe: **Interactive graphs** - Overview
* Revisit plotly using maps.
* Customizing the hover functionality in plotly.
* Ben: **Customizing graphs** - Tips
* Introudction to ggthemes.
* Show how to programmtically annotate a plot.
* Show how to manually annotate a plot.
* Joe: **Saving graphs** - Overview
* Exporting plots to your desktop.
* Use the pdf function to save plots to pdfs.
* Publishing plots on plotly.
* Arsenio: **Advice**
* Q&A with students to prioritize what useful advice we can give.

# Afternoon:

* Visualization competition
* Give the students data and have them produce any plot/map they learned during the course.
* Extra / personal project help time
* Individual help for students that have specific questions about a project they are working on.