<u>Syllabus</u>

Class Dates: August 17-21, 2020
Days of Week: Monday, Tuesday, Wednesday, Thursday, Friday
Time (EDT): 18:00 - 19:00 EDT
Ideal Class Size: 300 (unlimited)
Max/Cap Class Size: 300 (unlimited)
Target Age range: 9th-12th grade

Course Description: R is a powerful statistical and computational language that allows you to synthesize, analyze, and visualize data. The RShiny framework allows users to create interactive web-based applications that utilize the powerful graphical capabilities that R provides. According to a data scientist from the Harvard Business Review, "data science is the most in-demand job of the 21st century". This course will cover a comprehensive introduction to the R programming language, data analysis and visualization functionalities in R, and web development using R Shiny. By the end of this course, you will learn how to develop and publish your very own Shiny web applications!

Course Notes:
Please come prepared with R and RStudio installed on your computer using the following links:
- **https://cran.rstudio.com**
- **https://rstudio.com/products/rstudio/download/#download**

Lecture demonstrations will run for approximately 60 minutes, followed by optional interactive app-building sessions.

Course Syllabus:

Data Analysis and Web Apps in R Shiny
- Day 1 - Basics of R
- Day 2 - Calculator Apps in RShiny
- Day 3 - Statistics
- Day 4 - Data Analysis
- Day 5 - Data Visualization

Detailed Plan:

Day 1, 08/17/20 - R Basics
- Introduction (10 min) (Karina)
  - What is R and RStudio
  - How to set up and run your first script
  - Print Hello World
- Data types (10 min) (Karina)
  - Assigning Variables
  - Numbers, Strings, Booleans
  - Reassigning values / changing data types
- Data structures (10 min) (Karina)
  - Vectors - creating, appending, accessing, operations
  - Matrices - creating, accessing, labeling
  - Lists - creating, accessing, labeling
- Conditionals/Functions (10 min) (Karina)
  - If statements
  - For loops
  - While loops
  - What are functions?
  - Print hello world
- Workshop (until 7:30)

Day 2, 08/18/20 - RShiny UI
- User Interface (15 min) (Lucas)
  - Display Layout (header, sidebar, body, box, fluidRow, column)
  - Widgets (checkbox, slider, numeric, radio, button)
  - Outputs (text, plot, table)
- Creating server that responds to user interaction (15 min) (Lucas)
- App #1: Calculator App (15 min) (Lucas)
- Workshop (until 7:30)

Day 3, 08/19/2020 - Statistics
- Review statistics (15 min) (Karina)
  - Central tendencies (mean, median, mode)
  - Spread (range, interquartile range, variance, standard deviation)
- Statistical functions in R (15 min) (Karina)
  - Generating random data
  - Implementing central tendencies and spread in R
  - Applying statistical functions to multiple rows of data

- App #2: Statistics App (15 min) (Lucas)
- Workshop (until 7:30)

Day 4, 08/20/2020 - Data Analysis
- Data Structures (15 min) (Lucas)
  - Review lists and matrices
  - Creating data frames
  - Accessing data frame elements
- Conditional Statements (15 min) (Lucas)
  - Or, And, Not operators
  - Subsetting data with conditional statements
- Data Analysis (15 min) (Lucas)
  - Reading/previewing datasets
  - Analyzing Covid data

Day 5, 08/21/2020 - Data Visualization
- Plotting Graphs (20 min) (Lucas)
  - Creating scatterplots
  - Plot elements (points, lines, curves, text, segments, arrows)
  - Barplots and histograms
  - Visualizing Covid data
- RShiny UI outputs (20 min) (Lucas)
  - plotOutput, plot_click
  - App #3: Graphing App (Lucas)
- Workshop (until 7:30)