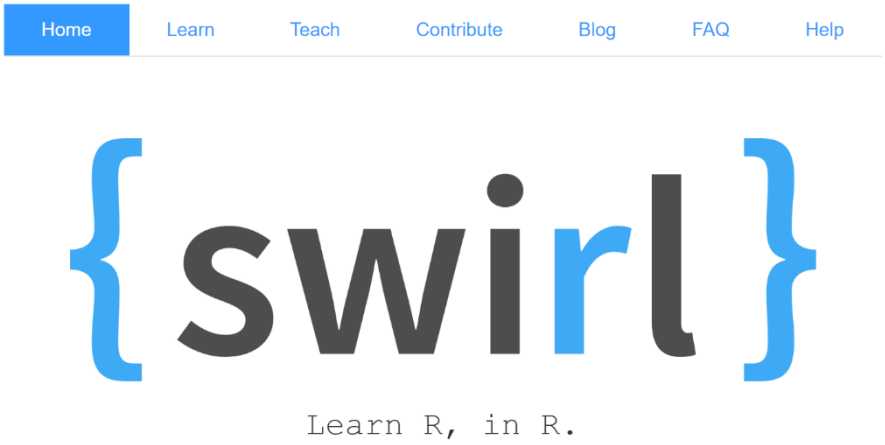
Institute of Systems Science
National University of Singapore

GRADUATE CERTIFICATE
BUSINESS ANALYTICS PRACTICE

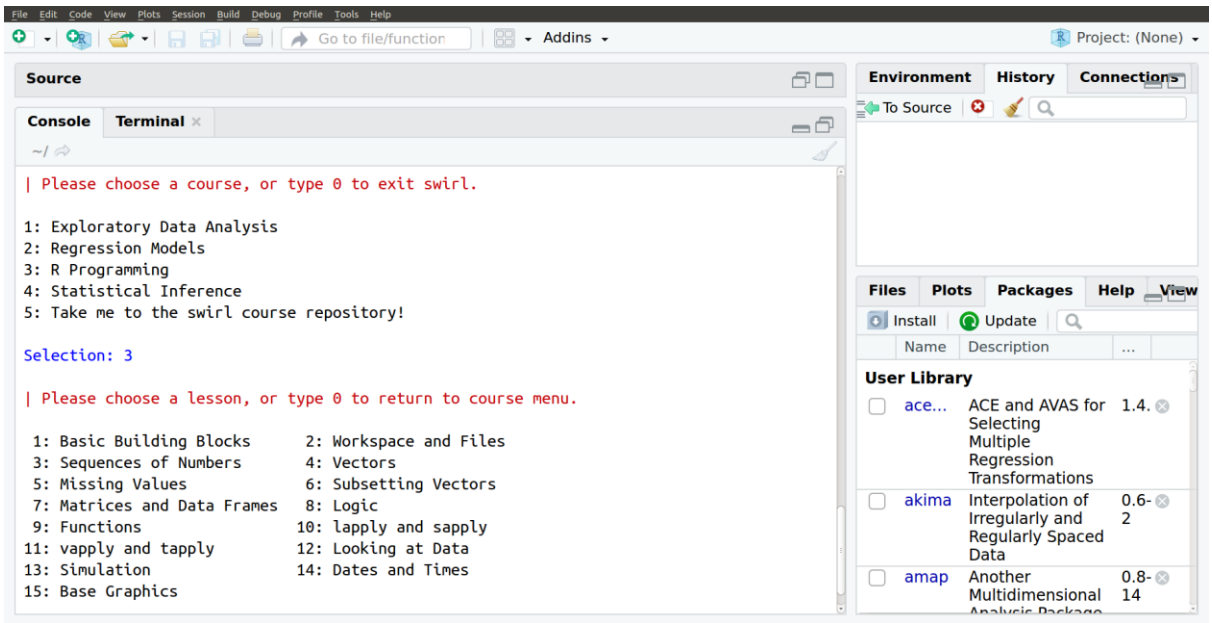
Supplementary Workshop Guide

Subject: *NICF- Statistics Bootcamp*

Interactive R Workshops



https://swirlstats.com/



RStudio Integrated Development Environment (IDE)

 # Step 1 – Install swirl package into R/RStudio:

```
install.packages("swirl")
```

 # Step 2 - Activate swirl package in R/RStudio:

```
library(swirl)
```

 # Step 3 - Install interactive workshops:

```
install_course("R Programming")
install_course("Exploratory Data Analysis")
install_course("Regression Models")
install_course("Statistical Inference")
```

 # Step 4 - Start interactive workshops:

```
swirl()
```

```
# "R Programming"                          [Day 1]
# "Exploratory Data Analysis"              [Day 1 & 2]
# "Statistical Inference"                  [Day 2]
# "Regression Models"                      [Day 3 & 4 Optional]
```

 # Video Guides https://github.com/telescopeuser/S-SB-Workshop

[Fundamental] R Programming

1: Basic Building Blocks	[Day 1A Data Processing]
2: Workspace and Files	[Day 1A Data Processing]
3: Sequences of Numbers	[Day 1A Data Processing]
4: Vectors	[Day 1A Data Processing]
5: Missing Values	[Day 1A Data Processing]
6: Subsetting Vectors	[Day 1A Data Processing]
7: Matrices and Data Frames	[Day 1A Data Processing]
8: Logic	[Day 1A **Exercise**]
9: Functions	[Optional]
10: lapply and sapply	[Day 1B **Exercise**]
11: vapply and tapply	[Optional]
12: Looking at Data	[Day 1B Data Processing]
13: Simulation	[Day 2B Sample & Norm]
14: Dates and Times	[Optional]
15: Base Graphics	[Day 1B Charting]

[Fundamental] Exploratory Data Analysis

1:	Principles of Analytic Graphs	[Optional]
2:	**Exploratory Graphs**	[Day 1B **Exercise**]
3:	Graphics Devices in R [PDF PNG SVG]	[Optional]
4:	**Plotting Systems**	[Day 2A Charting]
5:	**Base Plotting System**	[Day 2A **Exercise**]
6:	Lattice Plotting System	[Optional]
7:	Working with Colors	[Optional]
8:	**GGPlot2 Part1** [qplot]	[Day 2A Charting]
9:	**GGPlot2 Part2** [ggplot]	[Day 2A Charting]
10:	GGPlot2 Extras [qplot]	[Optional]
11:	Hierarchical Clustering [Machine Learning]	[Optional]
12:	K Means Clustering [Machine Learning]	[Optional]
13:	Dimension Reduction [Machine Learning]	[Optional]
14:	Clustering Example [Machine Learning]	[Optional]
15:	CaseStudy [pm2.5 air pollution]	[Optional]

[Advanced] Statistical Inference

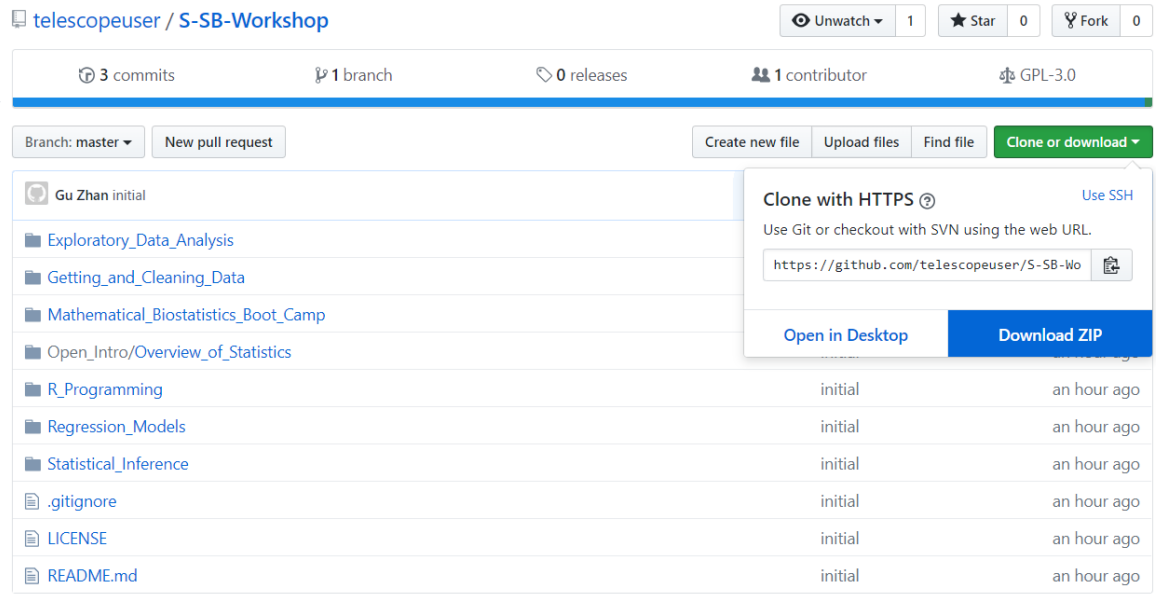
1:	**Introduction**	[Day 2A **Exercise**]
2:	Probability1 [dice, playing cards)	[Optional]
3:	Probability2 [PMF PDF CDF]	[Optional]
4:	ConditionalProbability [medic test]	[Optional]
5:	**Expectations** [E(X), CLT]	[Day 2B Sample & Norm]
6:	Variance [Var = E(X^2)-(E(X))^2]	[Optional]
7:	CommonDistros [Bernoulli Normal Poisson]	[Optional]
8:	Asymptotics [central limit theorem, CI]	[Optional]
9:	T Confidence Intervals [nitty-gritty]	[Optional]
10:	**Hypothesis Testing** [t-test, z score]	[Day 2B **Exercise**]
11:	**P Values** [nitty-gritty]	[Day 2B **Exercise**]
12:	Power [false negative, Type II error]	[Optional]
13:	Multiple Testing [confusion matrix]	[Optional]
14:	Resampling [bootstrap]	[Optional]

[Intermediate] Regression Models

1:	Introduction [regression to mean]	[Optional]
2:	Residuals [var(data)=var(estmt)+var(resdls)]	[Optional]
3:	Least Squares Estimation	[Optional]
4:	Residual Variation [R^2=1-sRes/sTot=cor()^2]	[Optional]
5:	Introduction to Multivariable Regression	[Optional]
6:	MultiVar Examples	[Optional]
7:	MultiVar Examples2	[Optional]
8:	MultiVar Examples3 [MultipleLinearRegression]	[Optional]
9:	Residuals Diagnostics and Variation	[Optional]
10:	Variance Inflation Factors [VIF]	[Optional]
11:	Overfitting and Underfitting [ANOVA, F-test]	[Optional]
12:	Binary Outcomes	[Optional]
13:	Count Outcomes	[Optional]

More Interactive Workshops

```
# Follow below for: Step 3 - Install interactive workshops:
# Download ZIP Download ZIP file; save it to R working directory
# https://github.com/telescopeuser/S-SB-Workshop
```




```
install_course_zip("S-SB-Workshop-master.zip", multi=TRUE)
```

```
# Step 4 - Start interactive workshops:
```

```
swirl()
```

```
[Intermediate] Open Intro
=========================================================
 1: Overview of Statistics                        [Optional]
=========================================================

[Intermediate] Mathematical Biostatistics Boot Camp
=========================================================
 1: One Sample t-test [nitty-gritty]              [Optional]
 2: Two Sample t-test [nitty-gritty]              [Optional]
 3: Errors Power and Sample Size                  [Optional]
=========================================================

[Advanced] Getting and Cleaning Data
=========================================================
 1: Manipulating Data with dplyr                  [Optional]
 2: Grouping and Chaining with dplyr              [Optional]
 3: Tidying Data with tidyr                       [Optional]
 4: Dates and Times with lubridate                [Optional]
=========================================================
```