Art of Stat

Mobile Apps for Teaching & Learning Statistics

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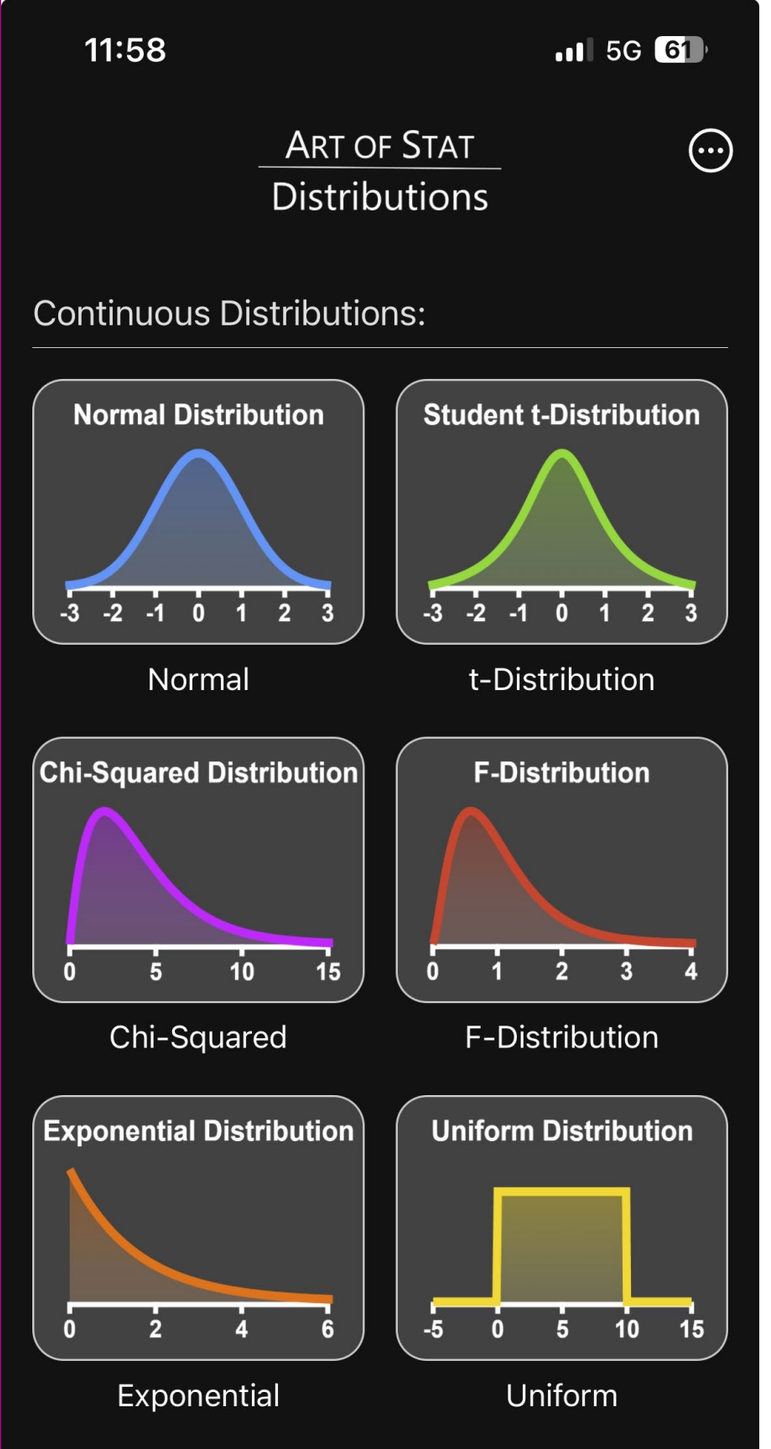


Agenda

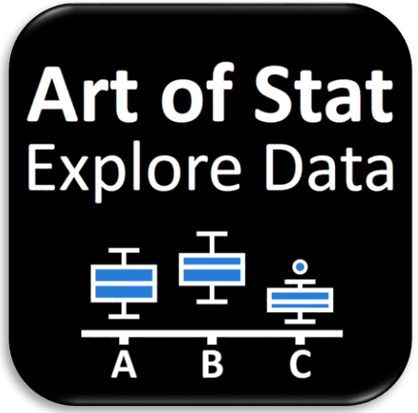
1. The Six Art of Stat Mobile Apps
2. Technology: Screen Share, Videos, Zoom, Uploading Data, Airplane Mode
3. Case Studies:
   - Art of Stat: Explore Data & Distributions
   - Art of Stat: Inference & Regression
4. Your Turn: Q&A or Creating Class Material

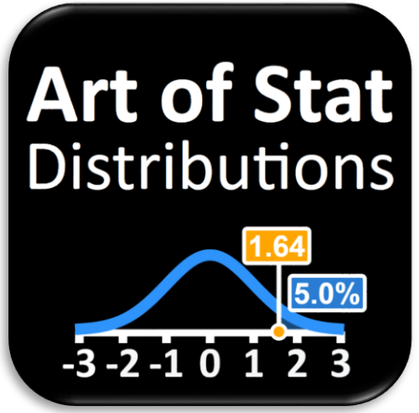
1) The Six Art of Stat Mobile Apps

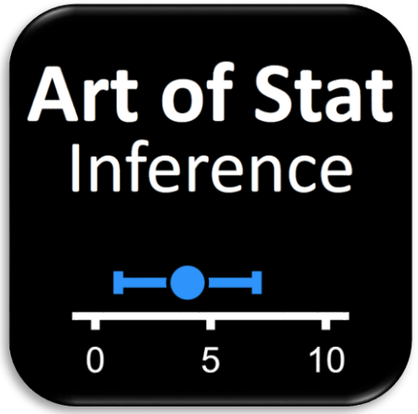
- Explore Data
- Inference
- Concepts
- Distributions
- Regression
- Resampling

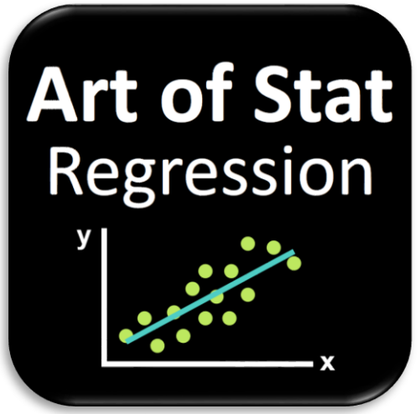
Download on the App Store

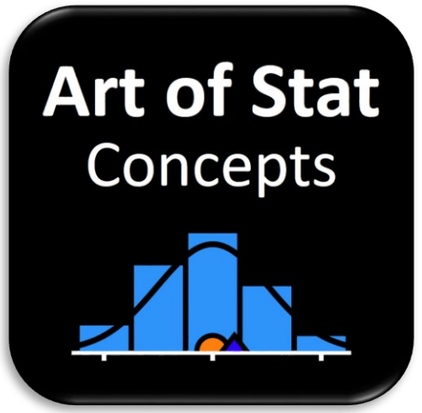
GET IT ON Google Play

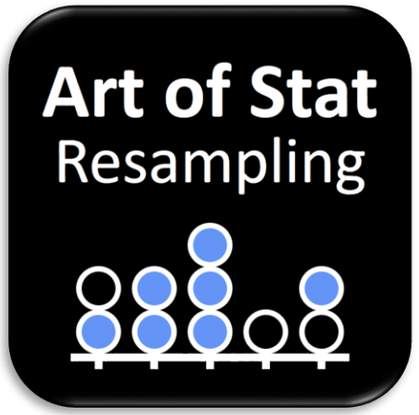




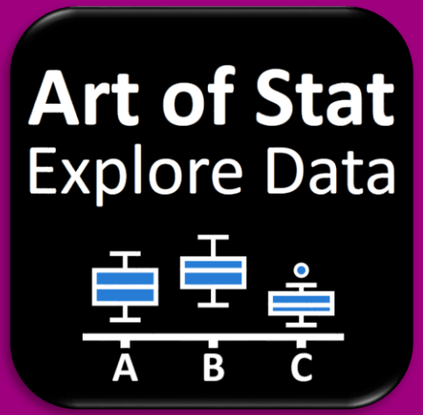




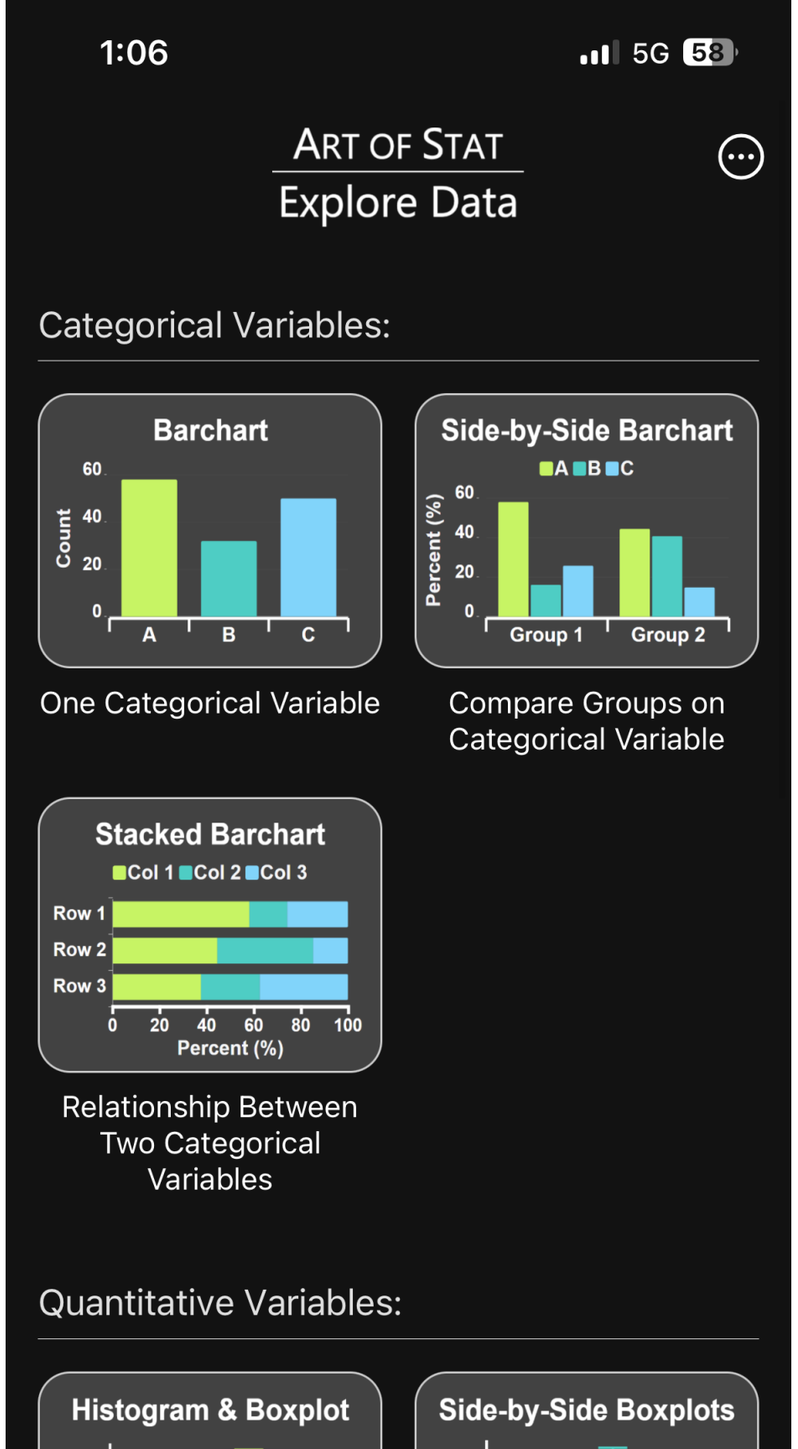


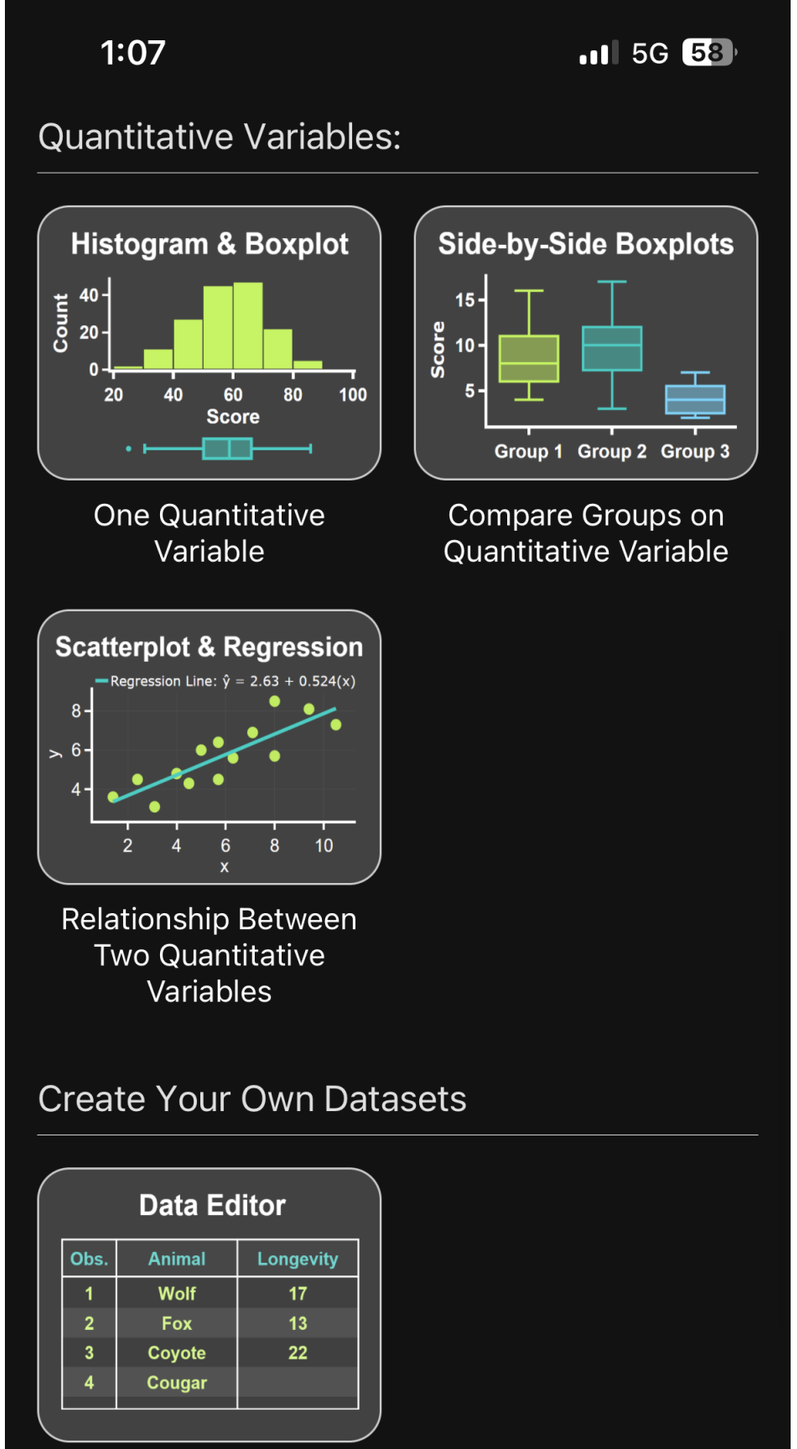


Art of Stat: Explore Data

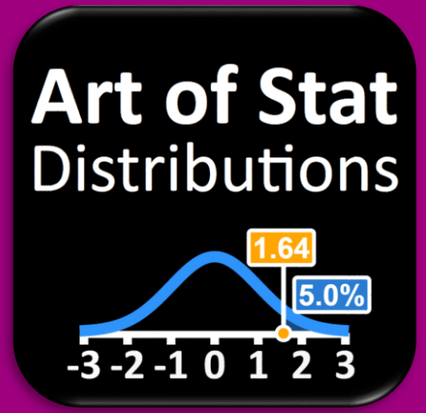


Descriptive Statistics & Plots for Categorical and Quantitative Variables

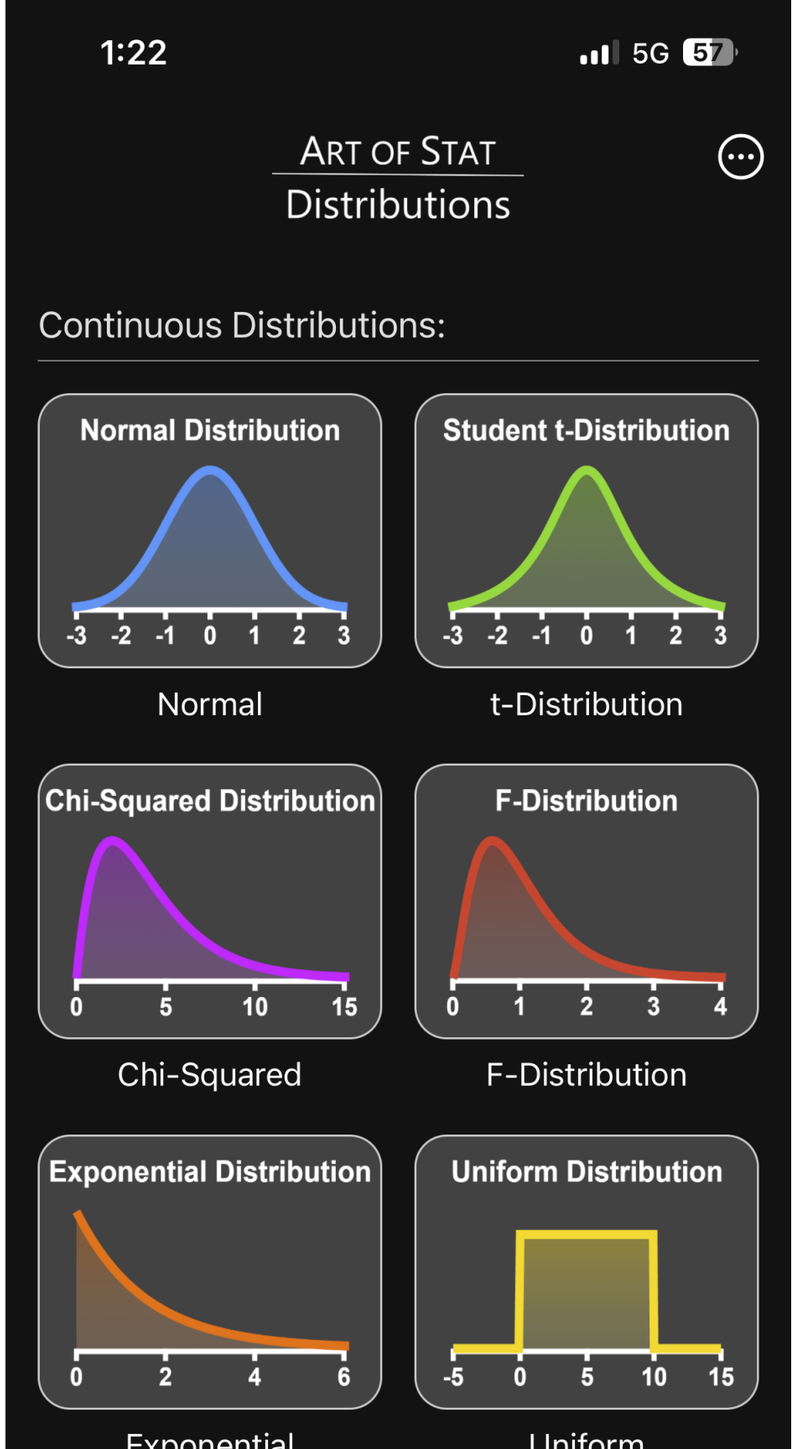


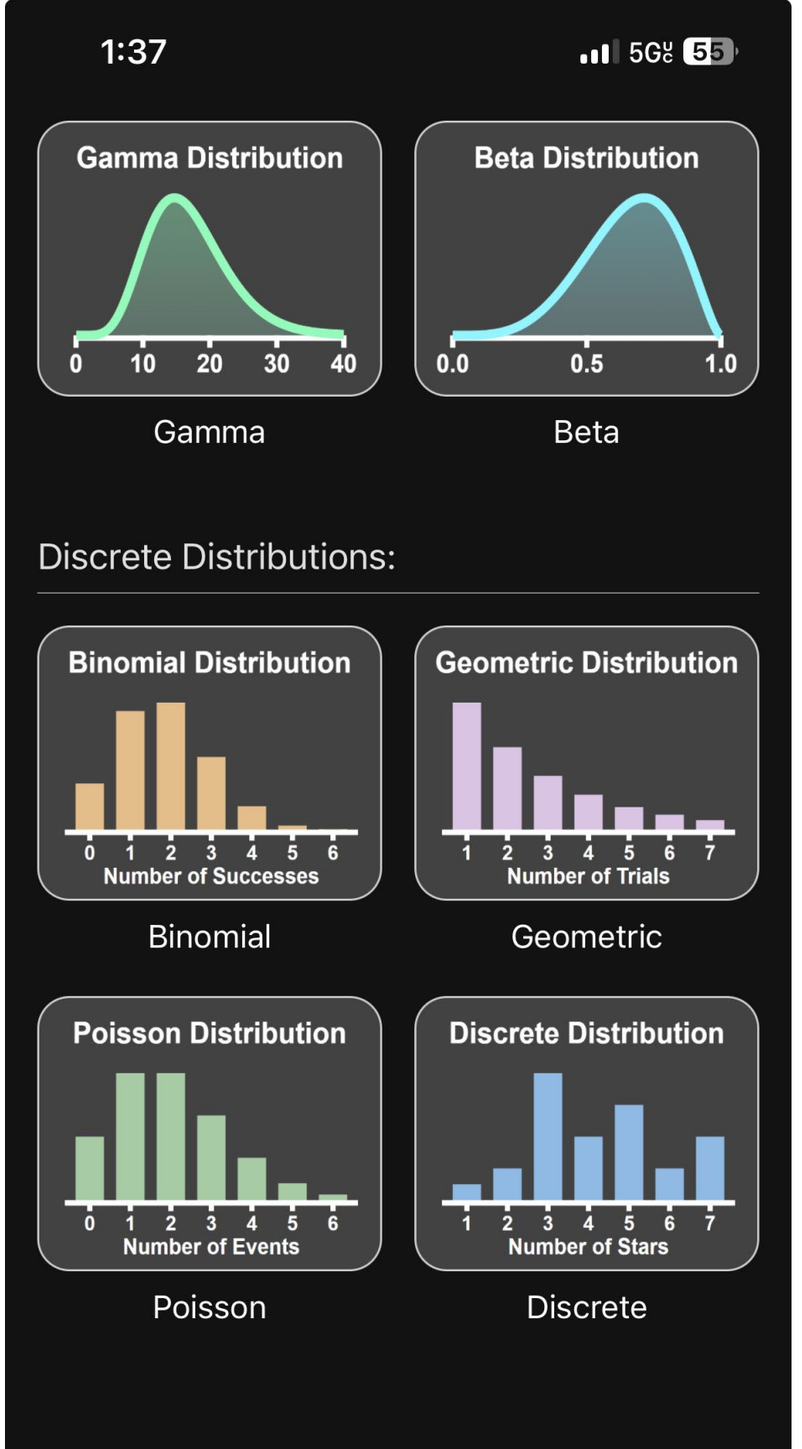


Art of Stat: Distribution

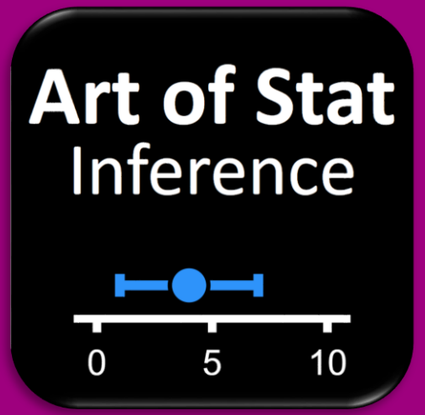


Explore & Visualize Discrete and Continuous Probability Distributions

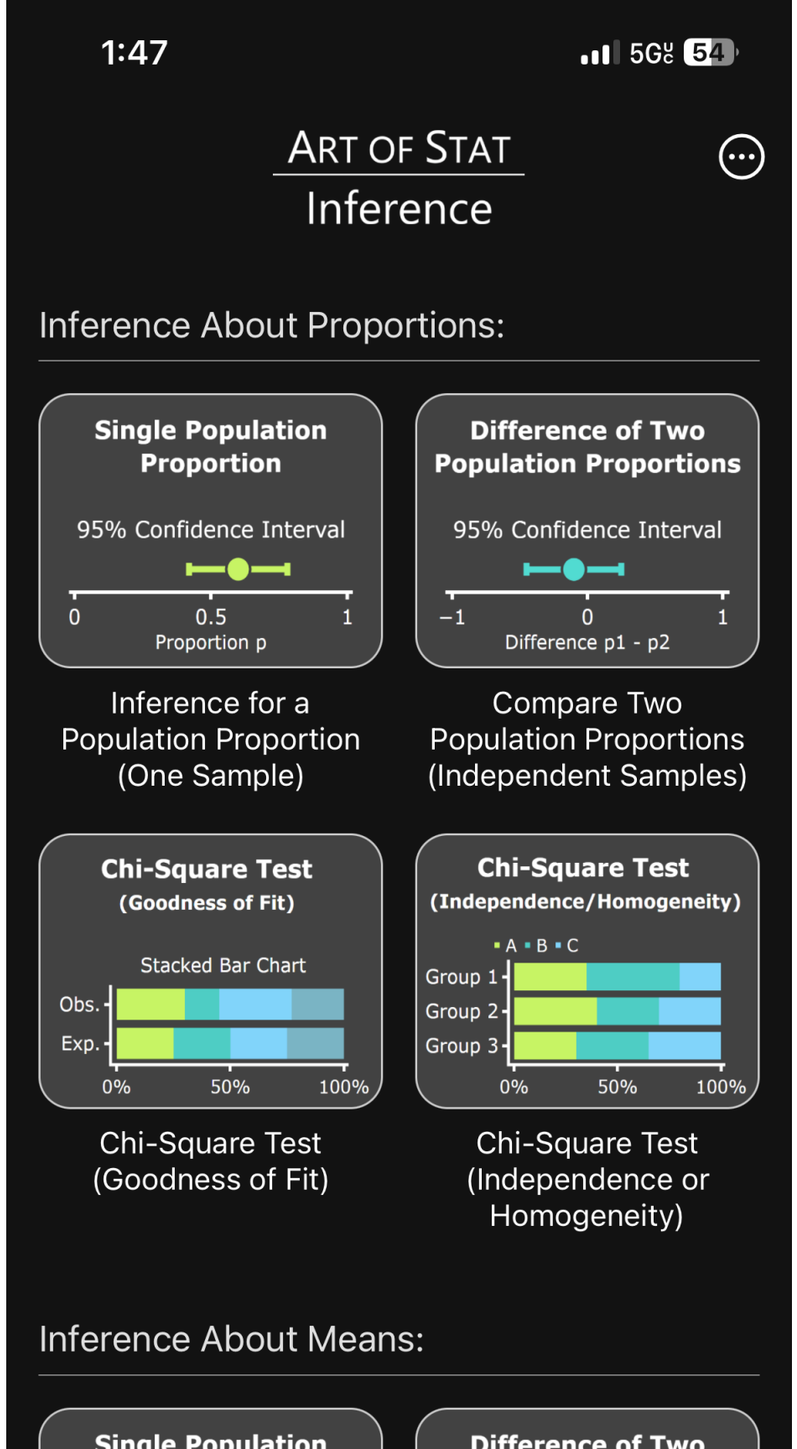


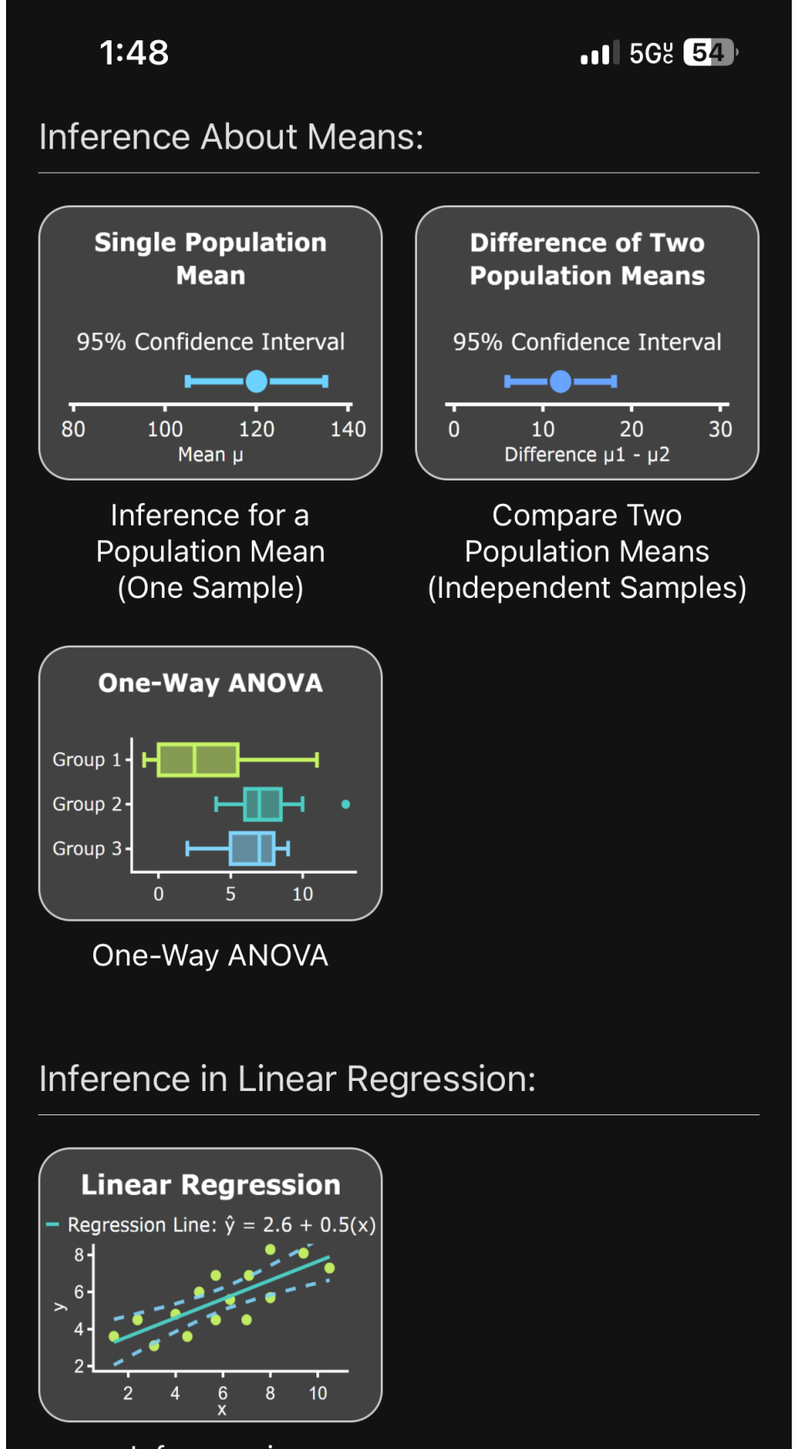


Art of Stat: Inference

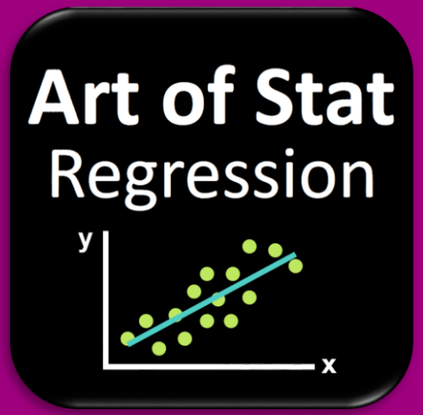


Confidence Intervals & Hypothesis Tests

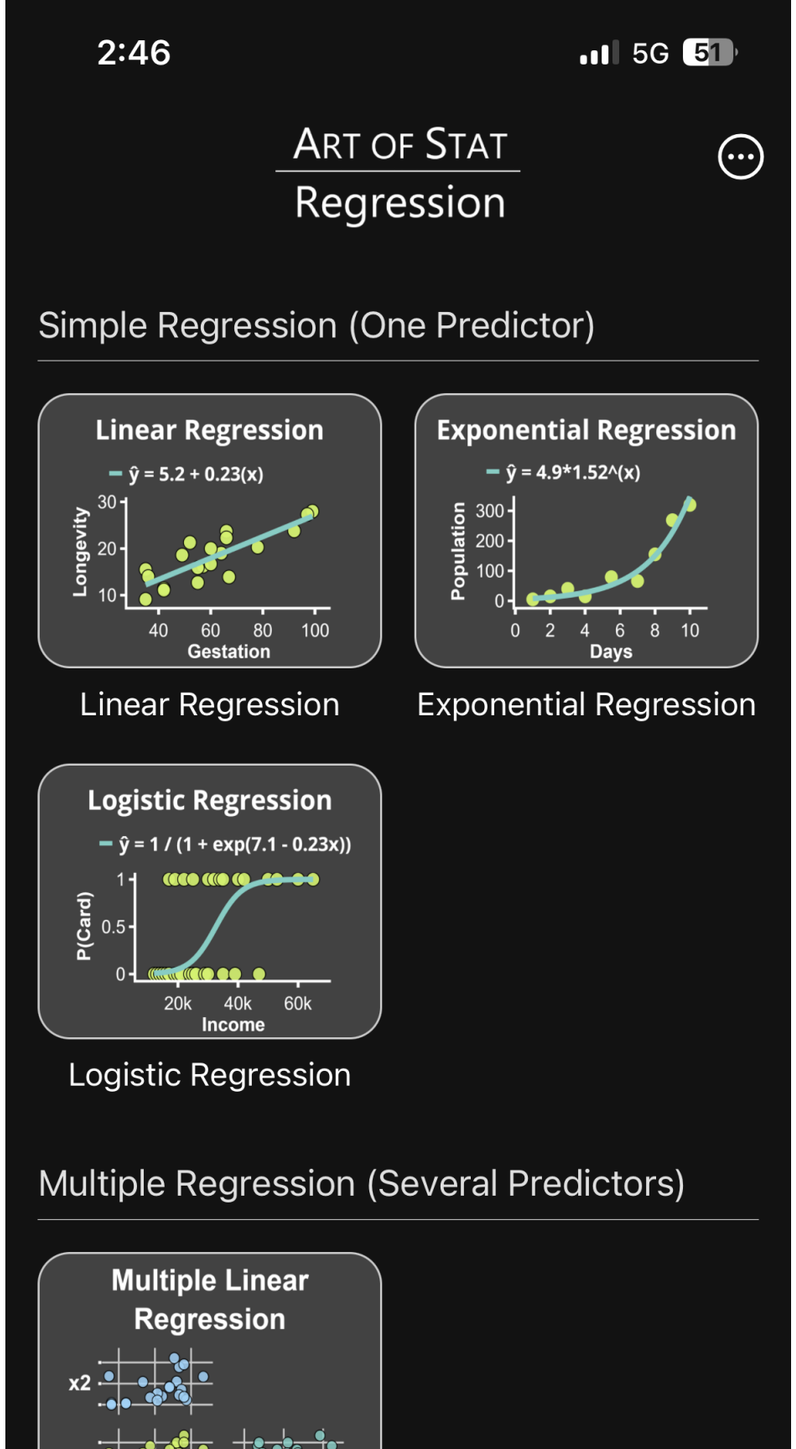




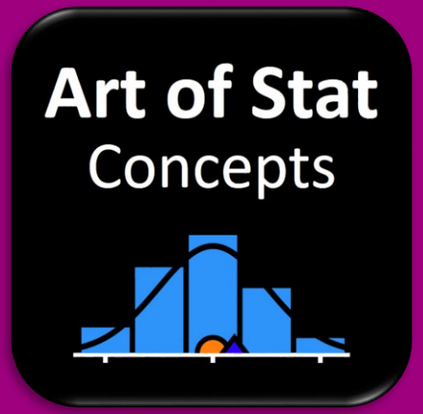
Art of Stat: Regression



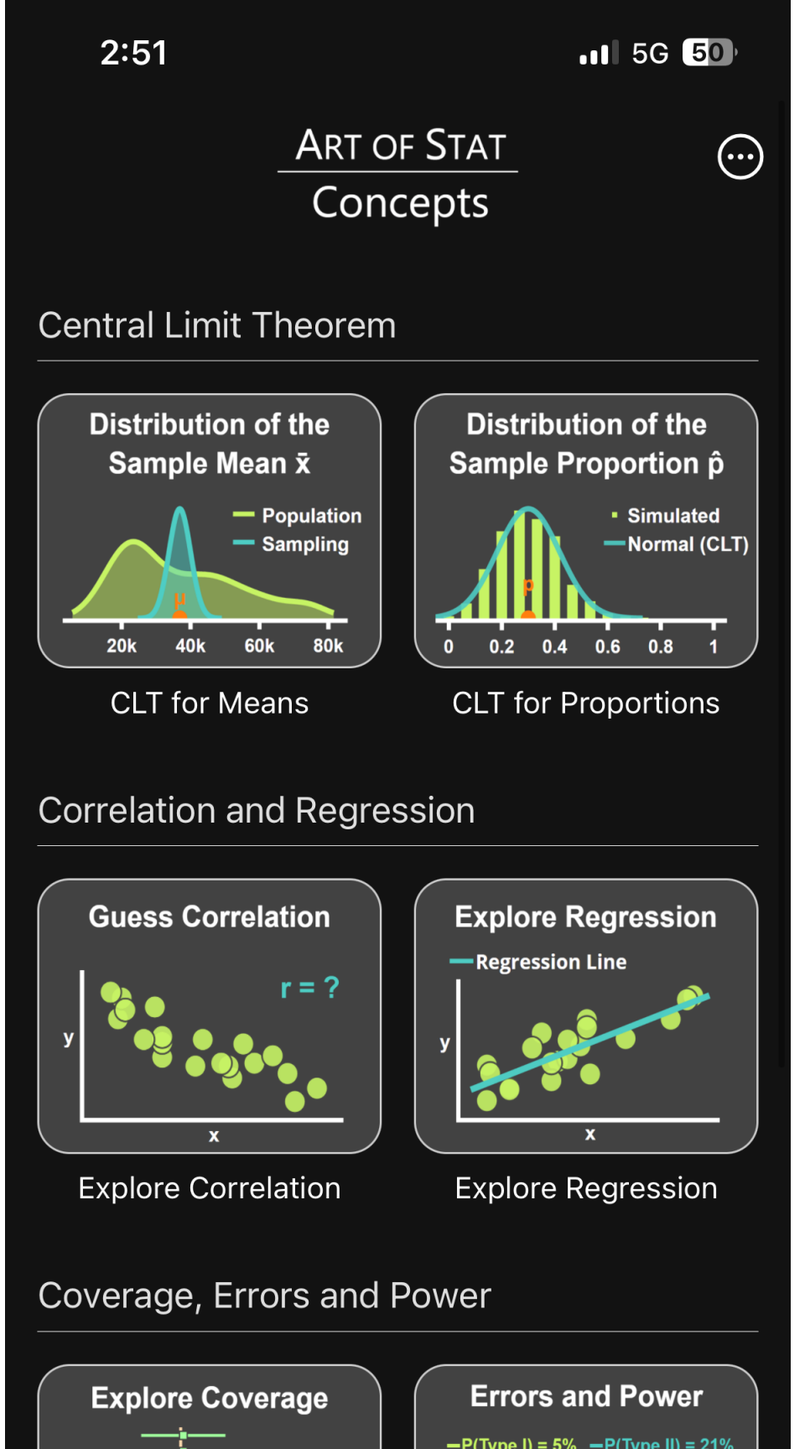
Simple Linear and Logistic Regression & Multiple Linear Regression

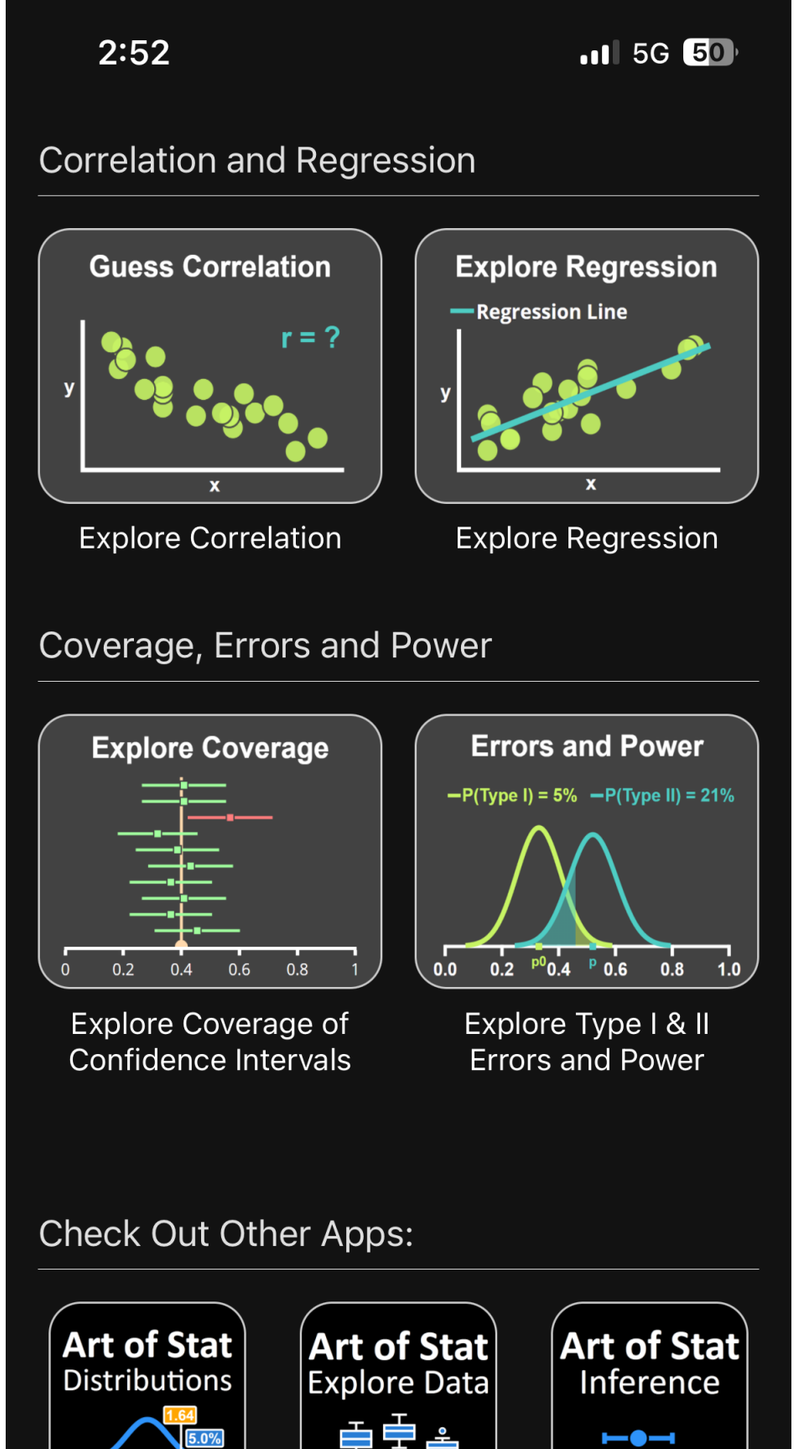


Art of Stat: Concepts



Central Limit Theorem,
Correlation,
Regression,
Coverage & Power

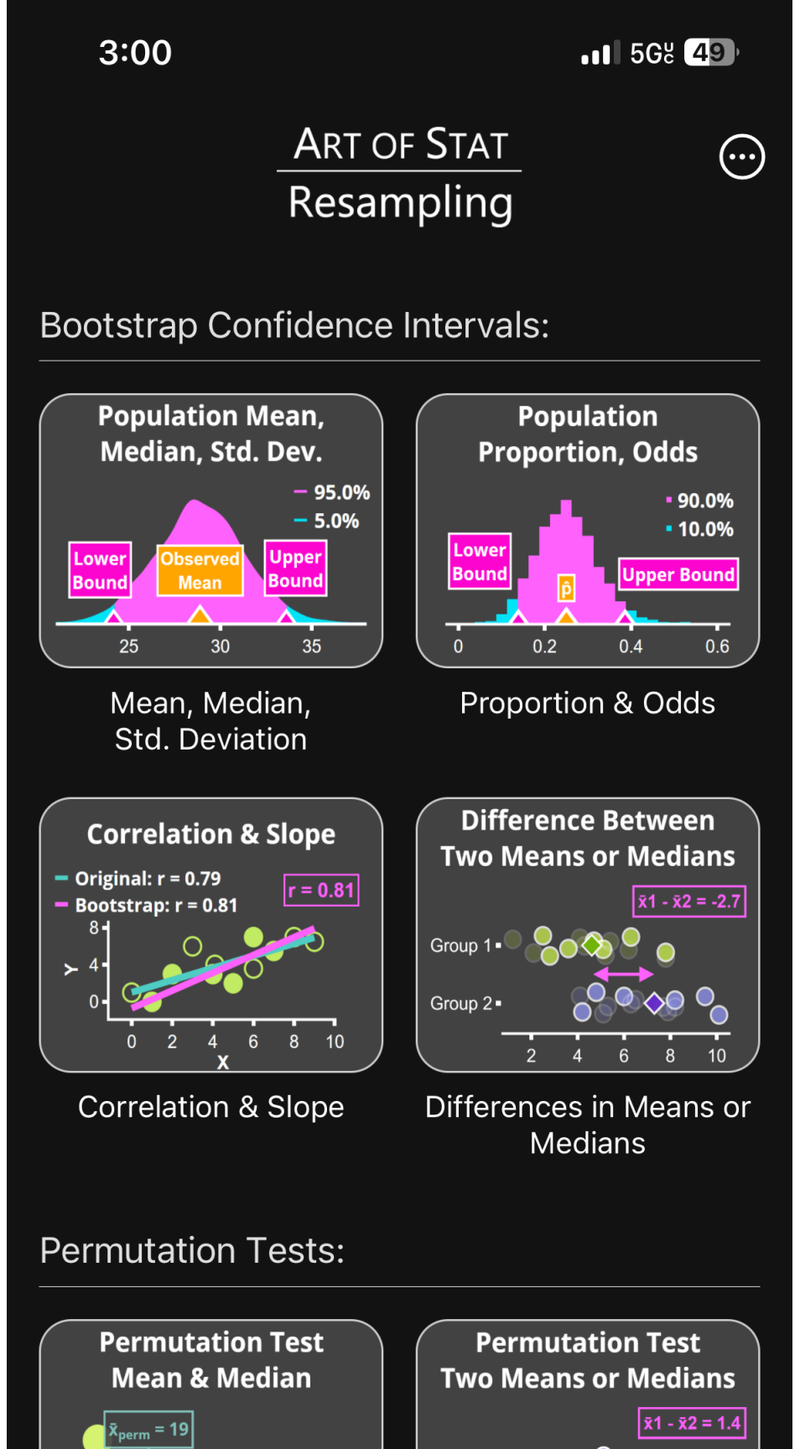


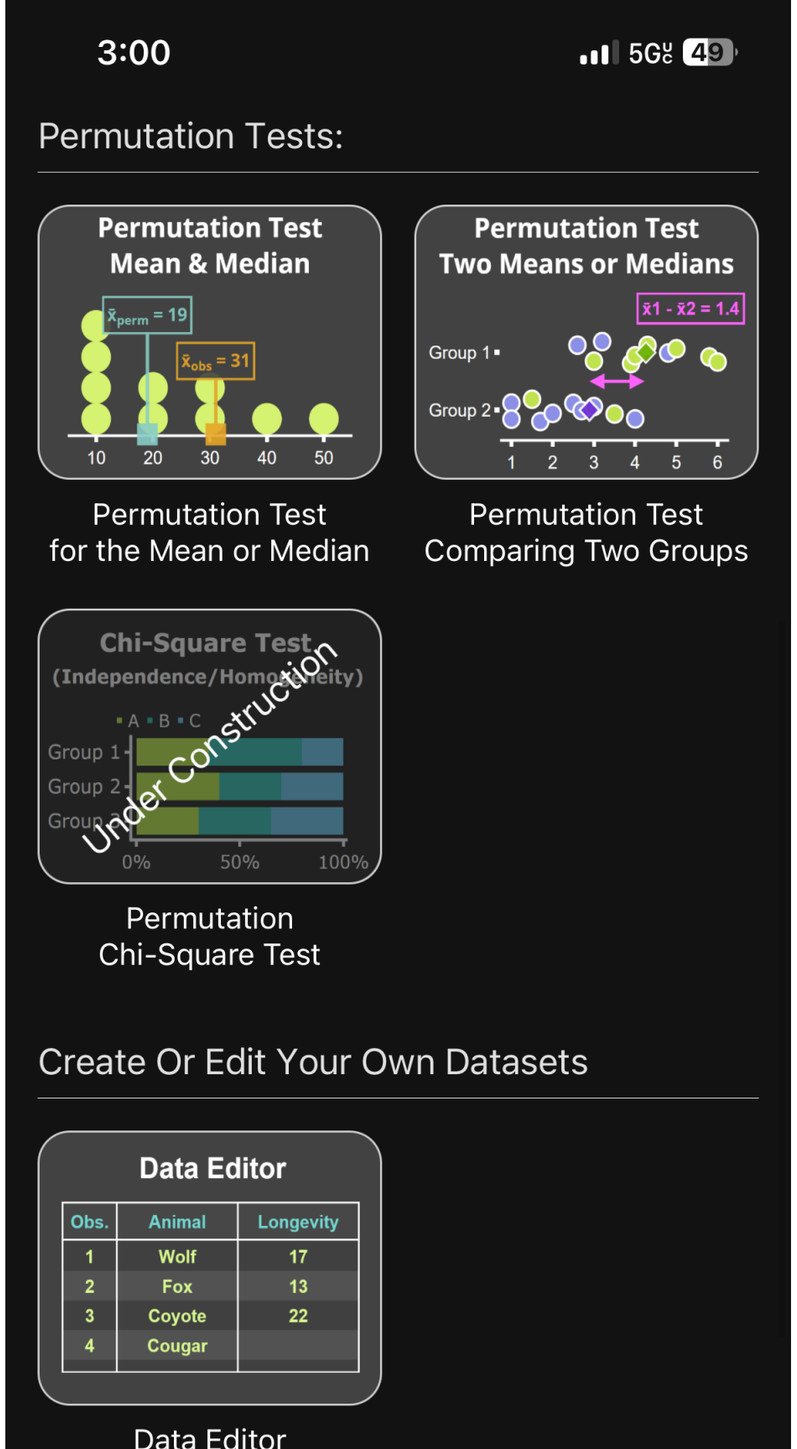


Art of Stat: Resampling

Art of Stat
Resampling

Bootstrap Confidence Intervals & Permutation Tests

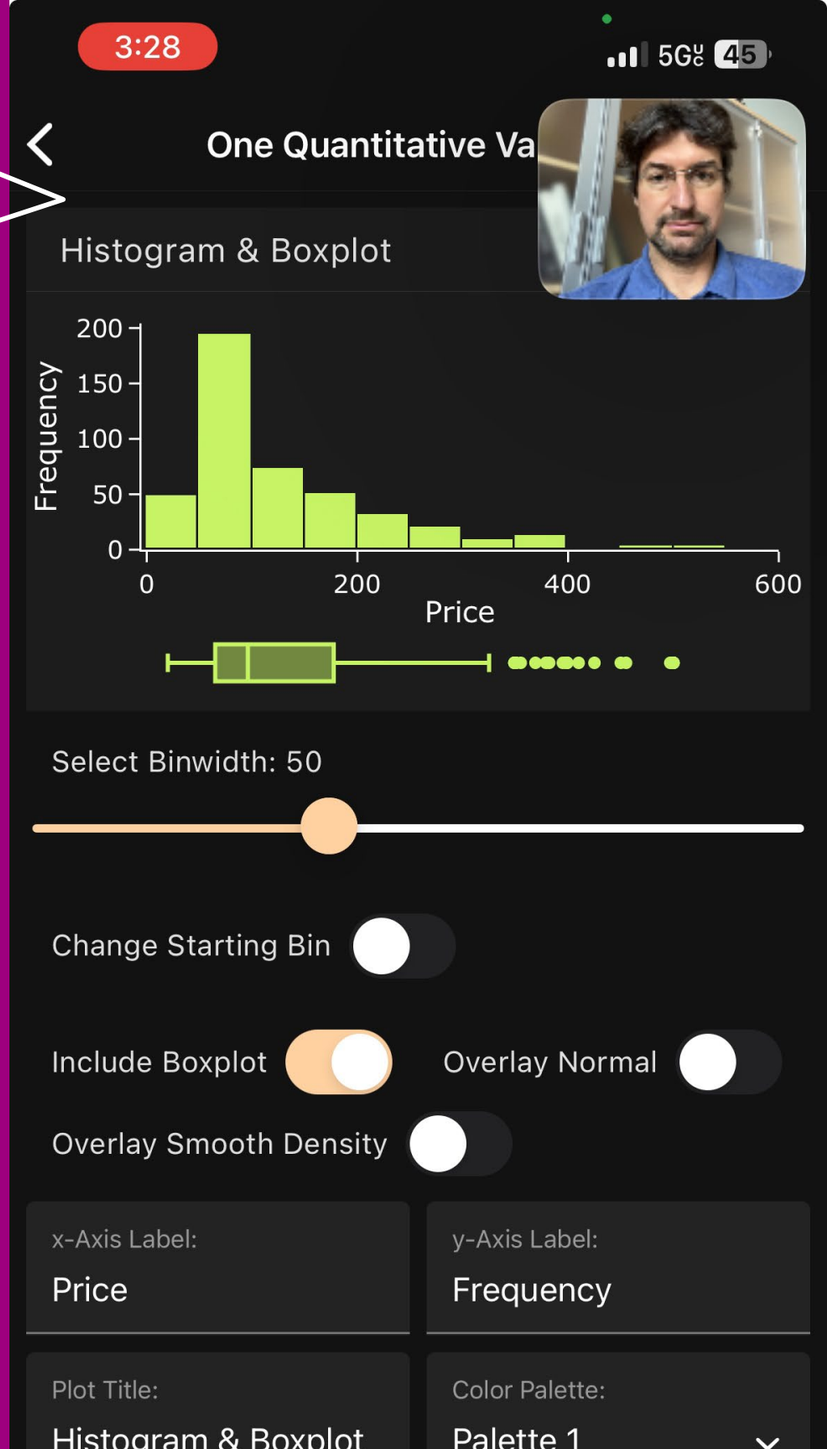




2) Technology

- Connect Cell Phone to Screen
- Screen Shots & Sharing
- Screen Recording (Videos)
- Join Zoom Call (Share Screen)
- Upload Data
- Price

Me in a Zoom call sharing my screen with the class



Technology: Connect to Screen

Connect Device to a Screen/Projector via an HDMI Adapter

- Connect to a Projector or Screen via HDMI

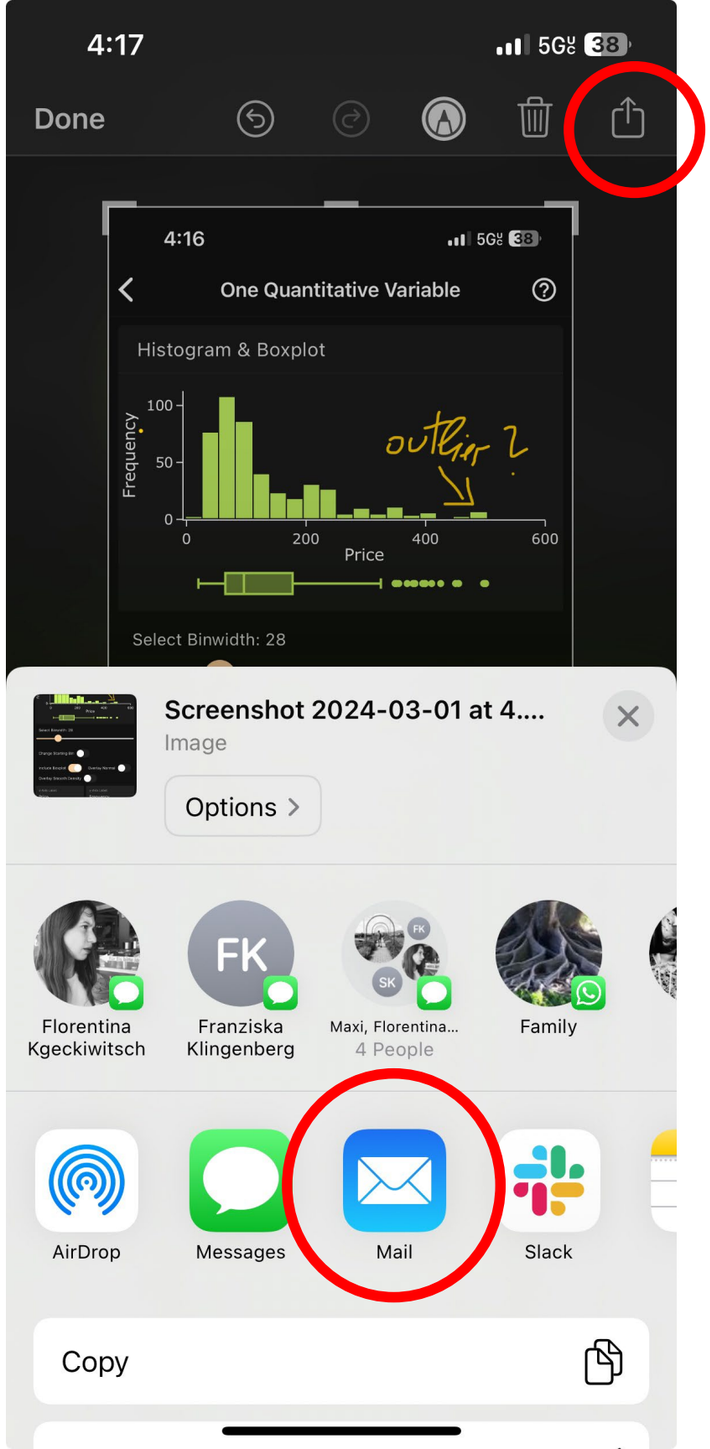
For older iPhone models

For Android Phones, most tablets, iPads, etc.

- Another Option: Screen Casting or Mirroring to another screen

Technology: Screen Shots & Sharing

Connect Device to a Screen/Projector via an HDMI Adapter

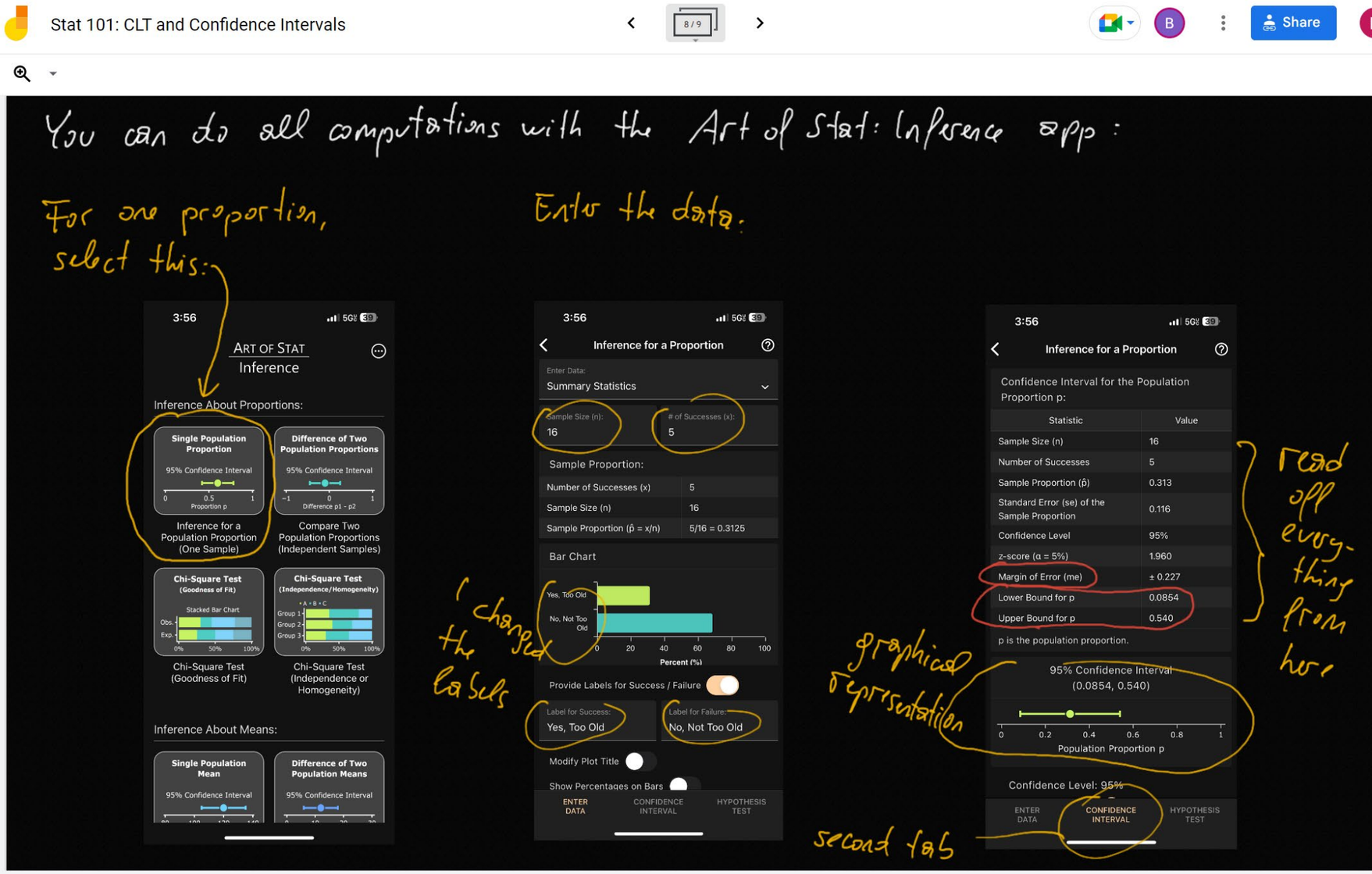


- For both iOS and Android, easy to take screen shot
- Annotate screenshots
- Share via text message, email, Social Media, etc.

Technology: Screen Shots & Sharing

Upload screenshots and annotate

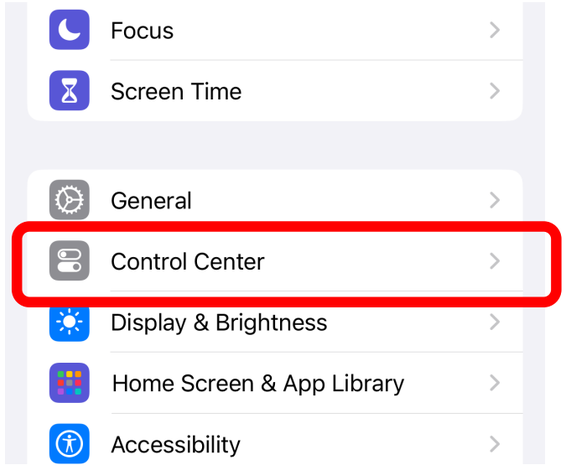
Annotated screenshots from my Stat 101 class

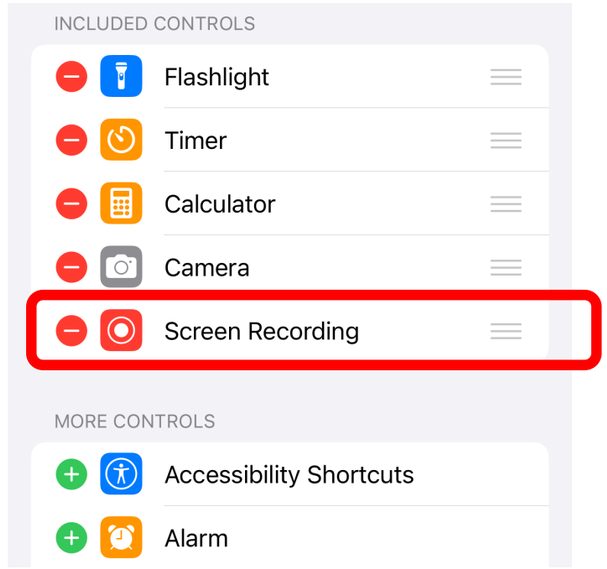


Technology: Screen Casting

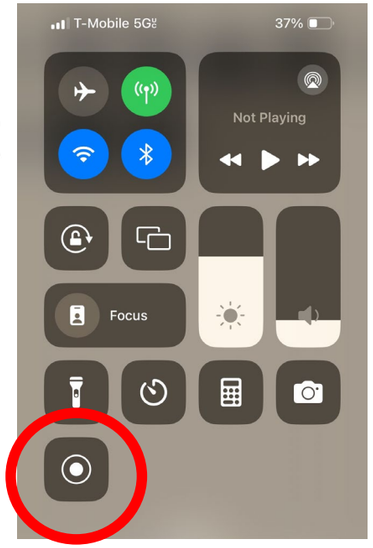
Record your Screen to Produce a Short Video of a Concept or Analysis

Settings > Control Center > Customize Controls

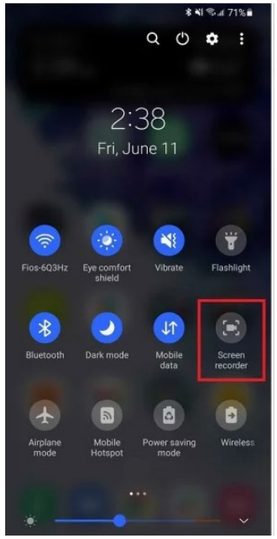




Swipe down, start recording



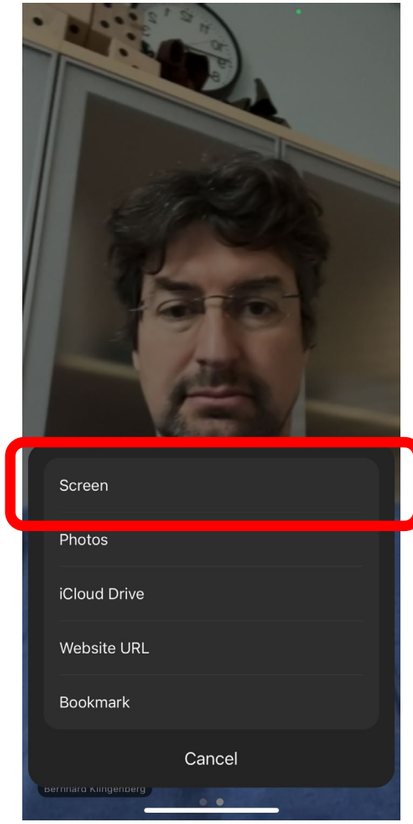
On Android, swipe down from the top once or twice, to reveal Screen Recorder



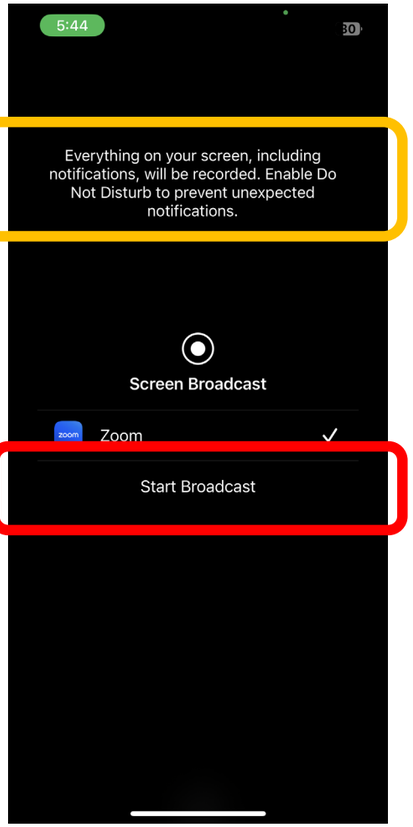
Technology: Zoom Calls

Start (or Join) a Zoom Call and Share your Screen to Teach Statistics

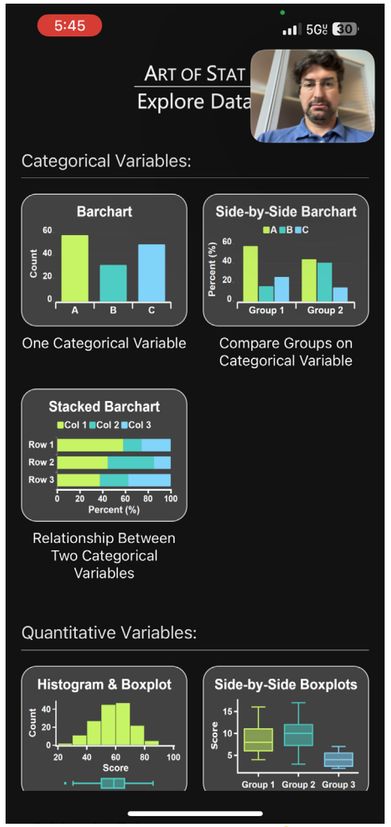
In the Zoom call, select “Share”



Select “Screen”



Enable *Do Not Disturb* on your phone and start broadcasting



Teach with the apps

Technology: Upload Data

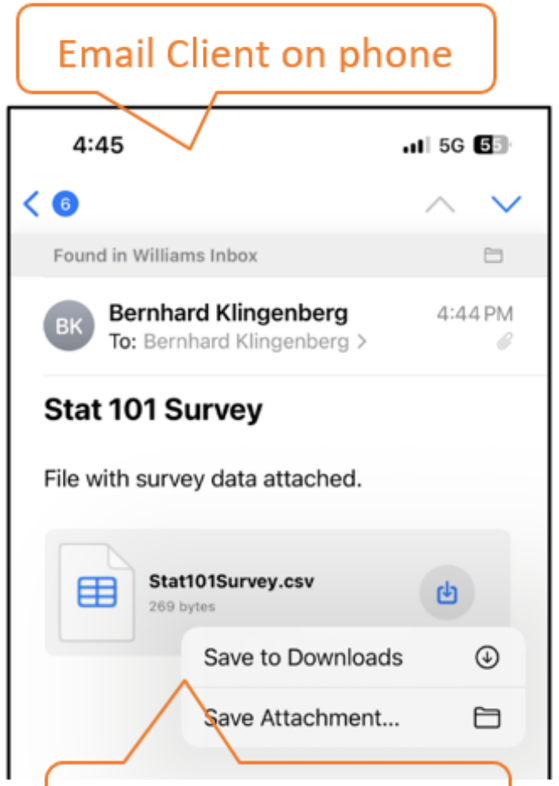
In every app, you can not only type in your own data, but also upload a CSV file and select columns from it

1) Create a dataset

	A	B	C
1	Frosh	Preference	Cost
2	No	milk	0
3	No	dark	200
4	No	milk	0
5	Yes	white	500
6	No	dark	400
7	Yes	dark	80
8	No	milk	130

File: Stat101Survey.csv

2a) Email it to yourself and then long-press to save it on your device

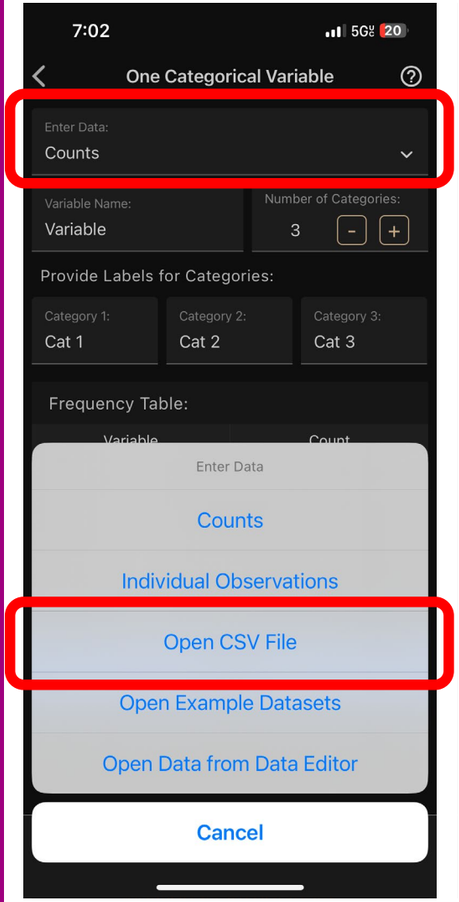


2b) Alternatively, put it on iCloud or Google Drive so you can access it from your phone/tablet

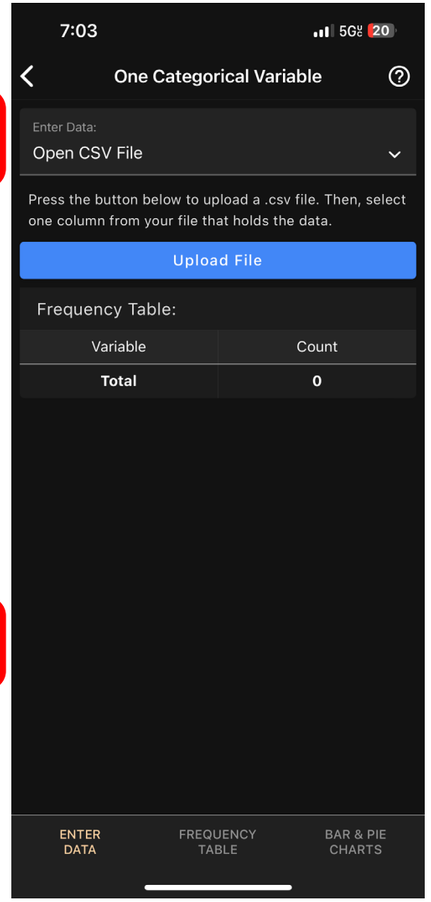
Technology: Upload Data

In every app, you can upload a CSV file and select columns from it.

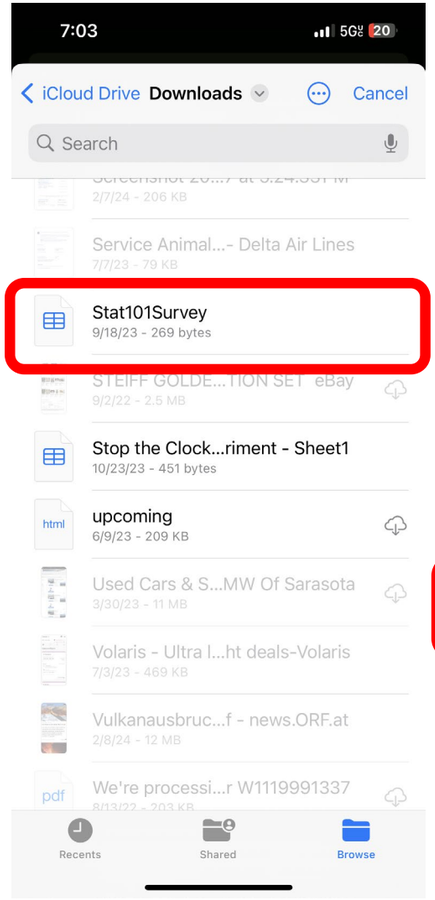
Alternatively, you can create or edit datasets with the Data Editor.



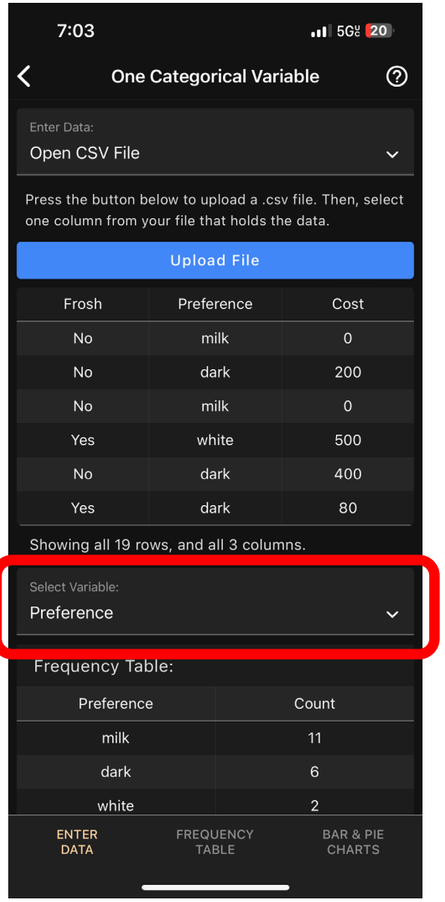
In any app, under *Enter Data*, select *Upload CSV File*



Press *Upload File* button



Navigate to folder and select file. File loads and is displayed

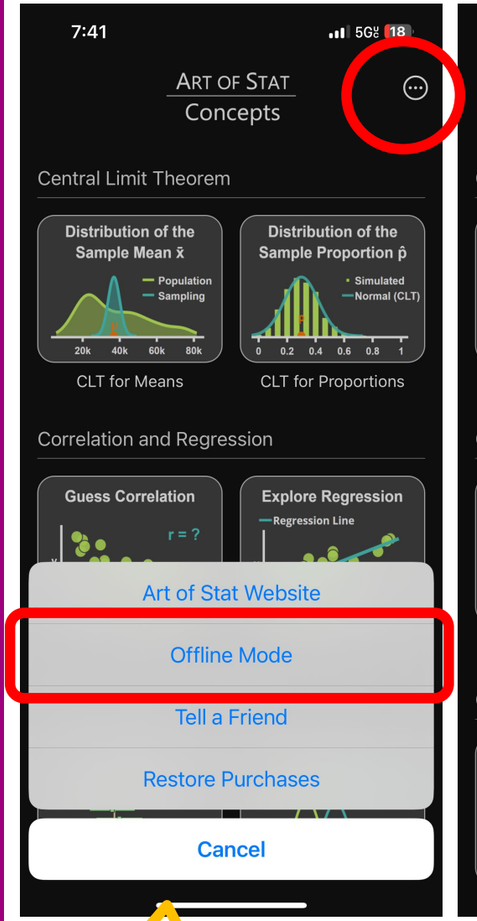


Select variable from file

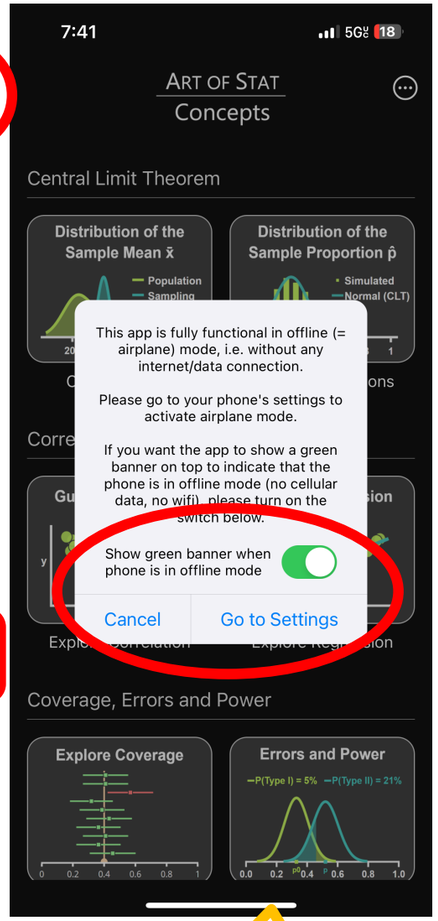
Technology: Airplane Mode

All apps work in Airplane Mode.

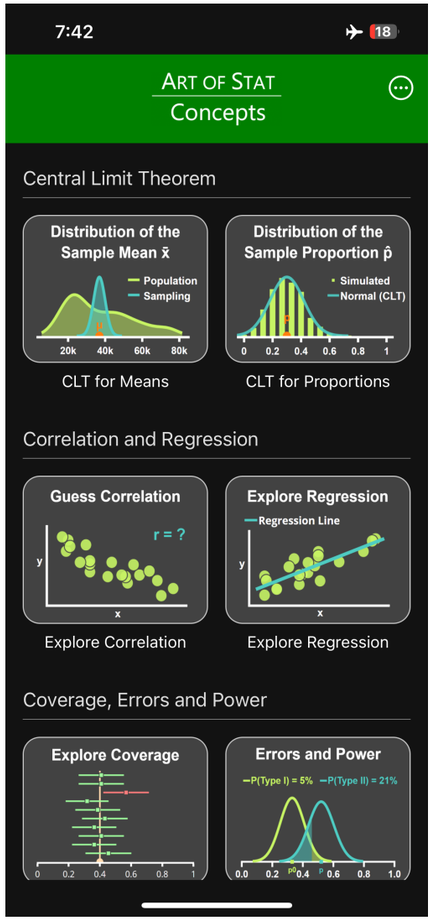
No wifi or cellular connection necessary.

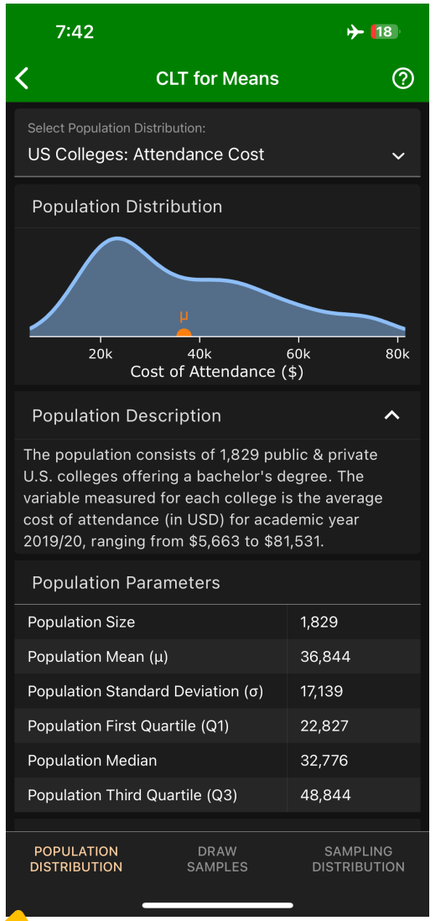


In any app, tab on the three dots in the upper right corner and select *Offline Mode*



Toggle switch for showing green banner, then go to Settings and enable airplane mode.





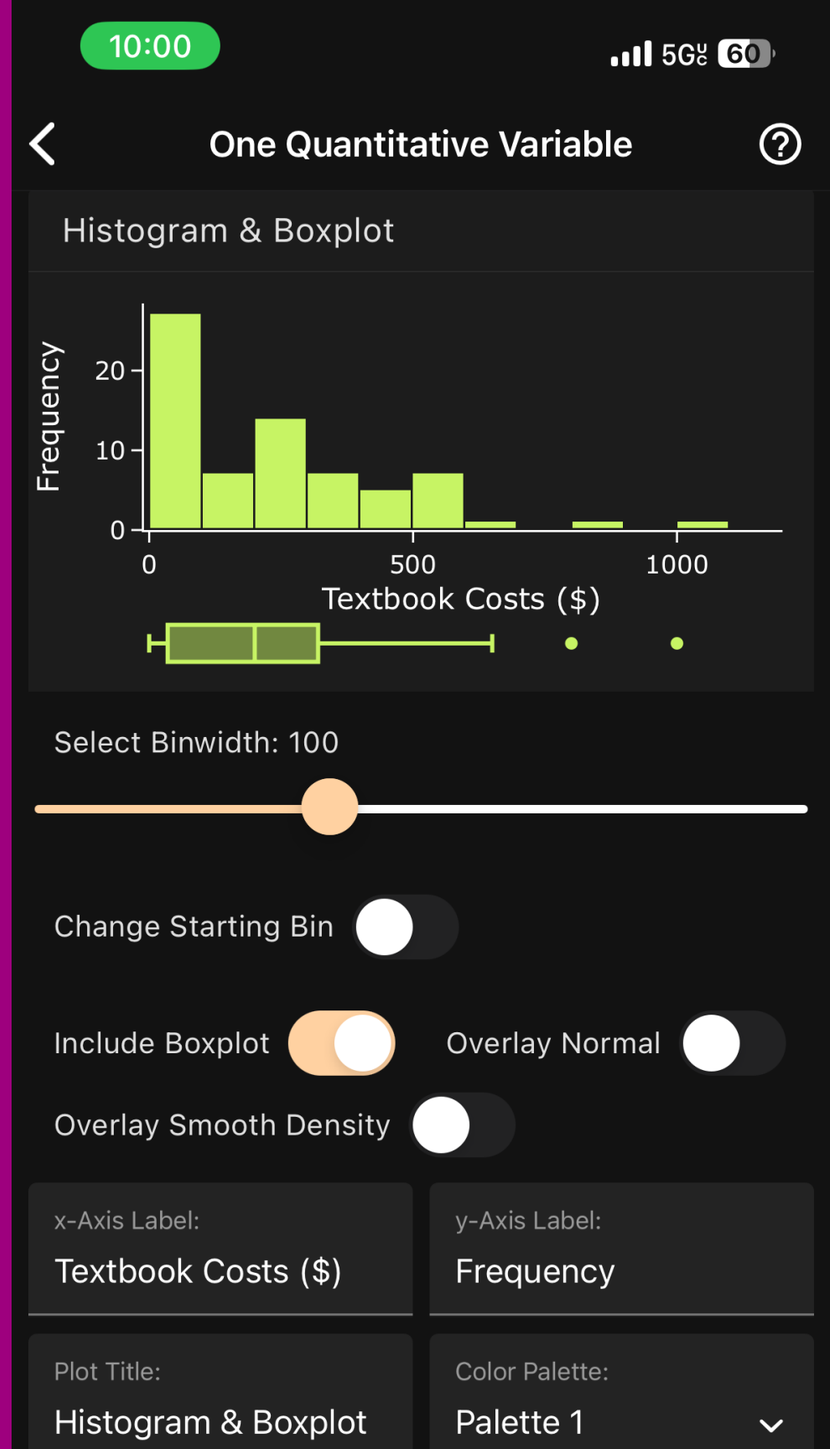
Every screen now shows green banner on top to indicate no internet/data connection

3) Case Studies

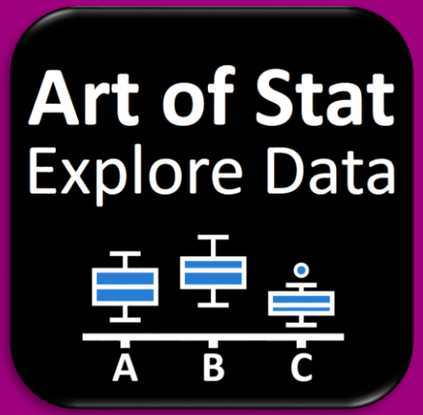
- Art of Stat: *Explore Data* app
    - One Quantitative Variable
    - Two Categorical Variables

- Art of Stat: *Distributions* app
    - Normal Distribution
    - Binomial Distribution

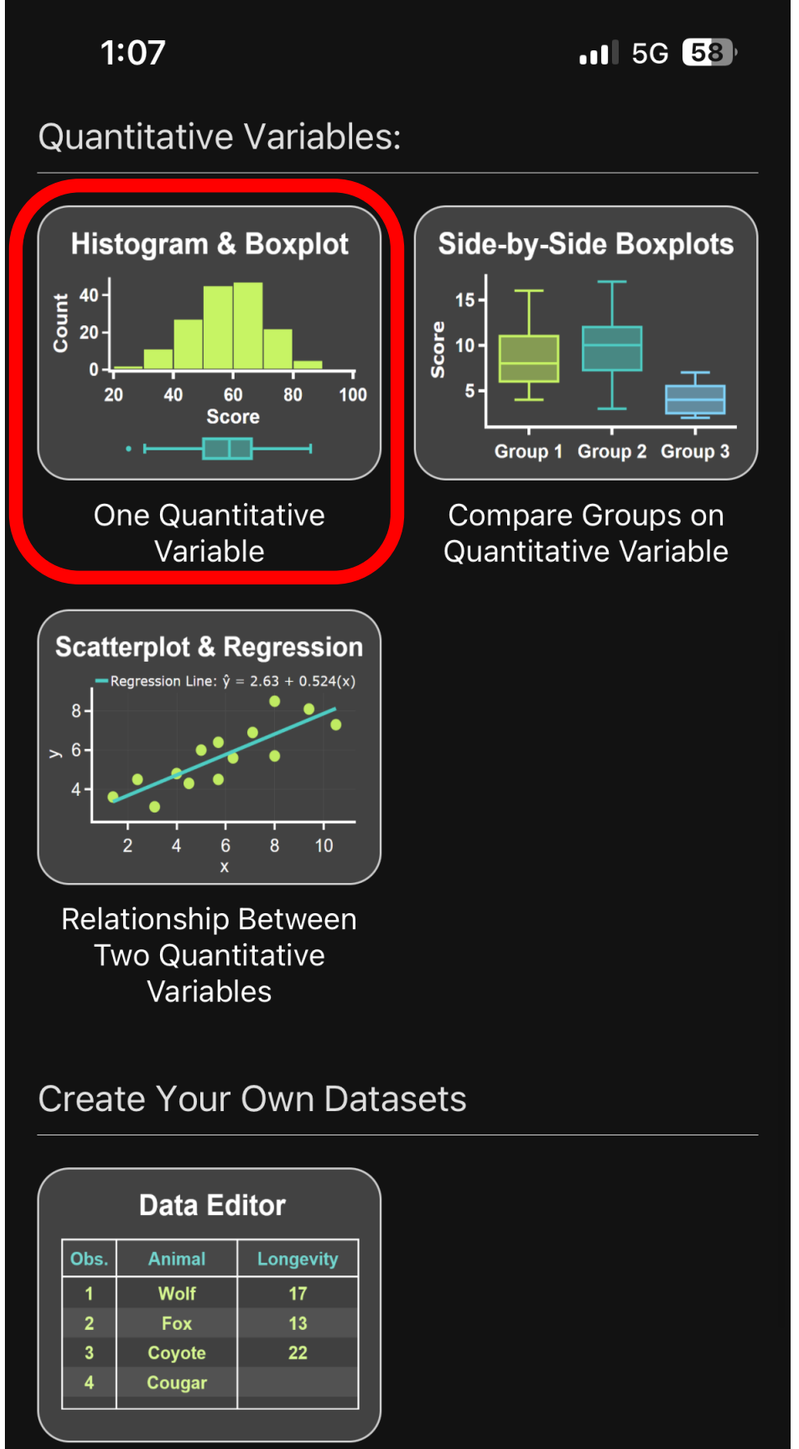
- Art of Stat: *Concepts* app
    - Central Limit Theorem



Art of Stat: Explore Data

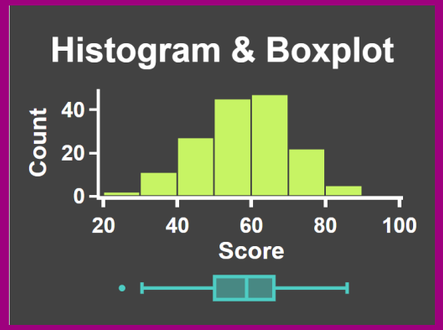


Descriptive Statistics & Plots for Categorical and Quantitative Variables

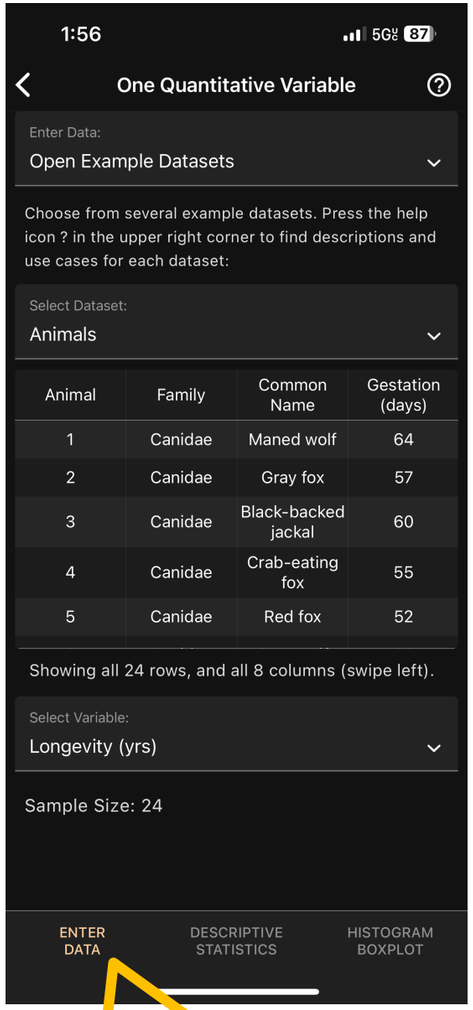


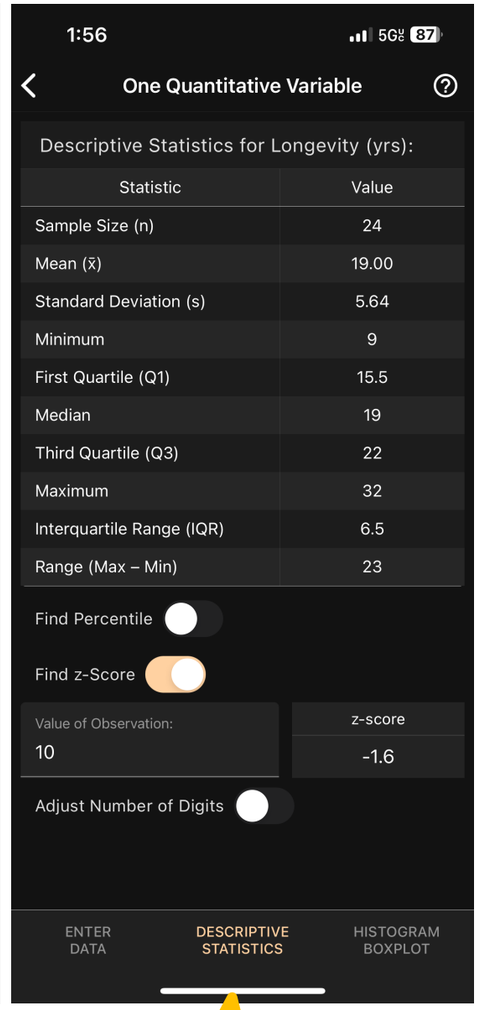
Art of Stat: Explore Data

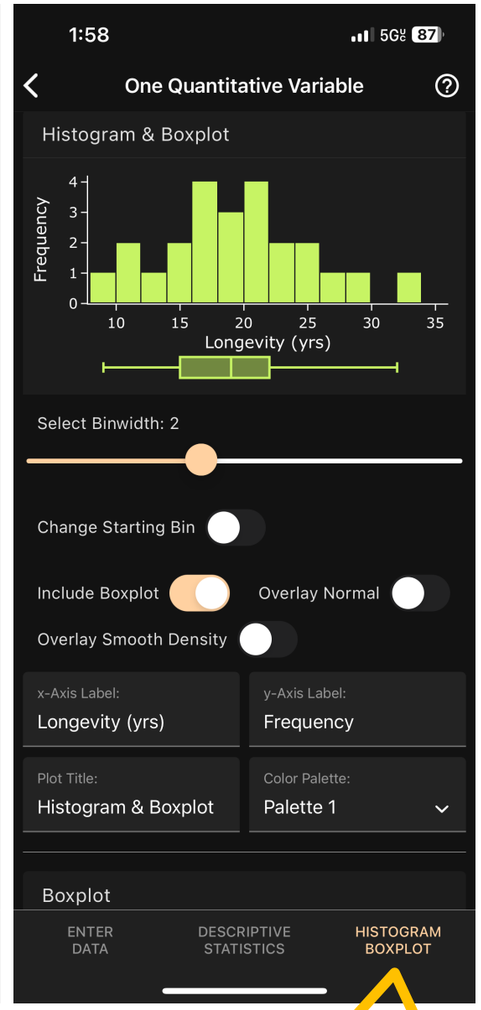
One Quantitative Variable

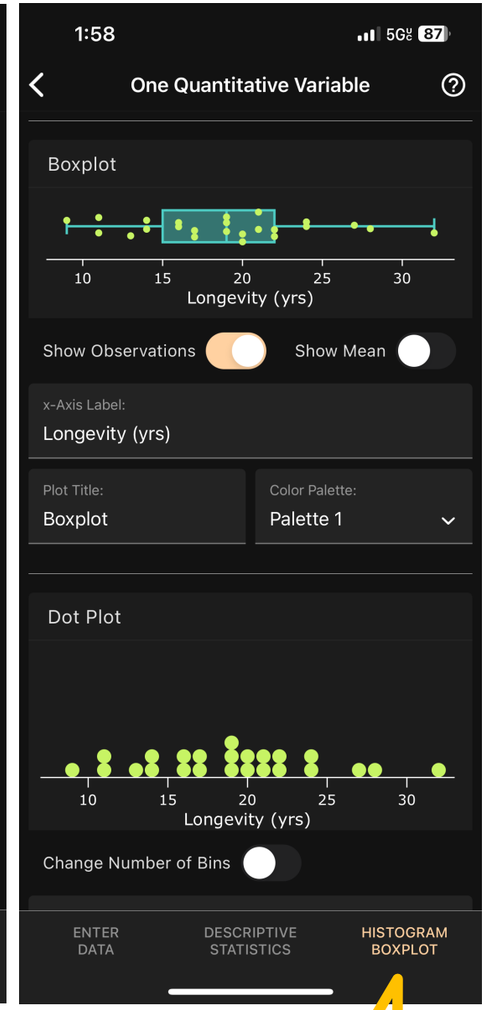


Screens:
- Enter Data
- Descriptive Statistics
- Histogram, Boxplot









Enter data manually or copy and paste from somewhere else. You can also upload a CSV file, or use one of several example datasets.

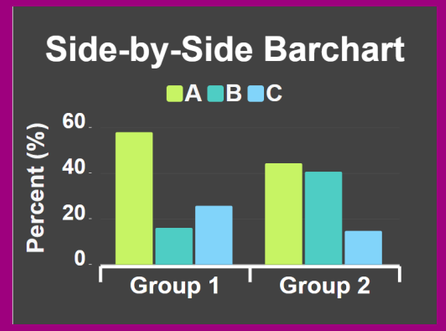
Study descriptive statistics, and find percentiles.

Obtain histogram, vary the bin-size or starting bin, include boxplot, overlay normal or smooth density.

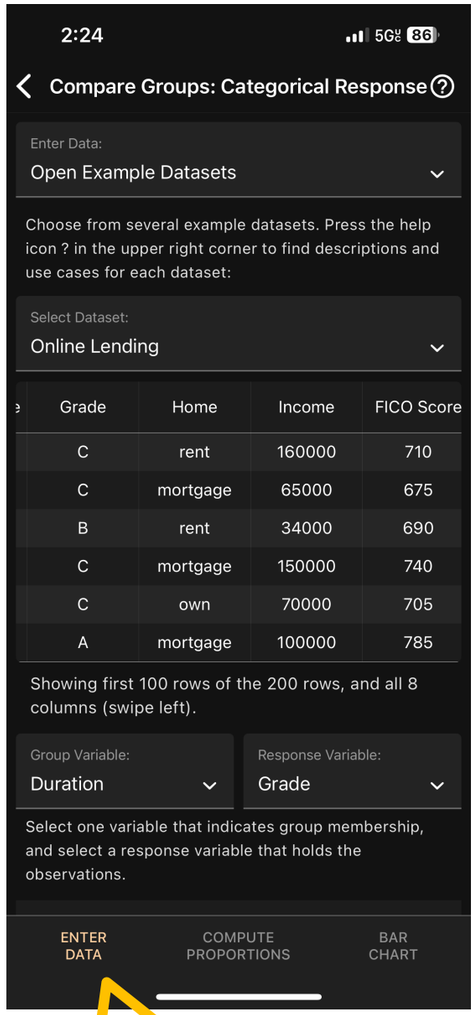
Interact with boxplot, obtain dotplot.

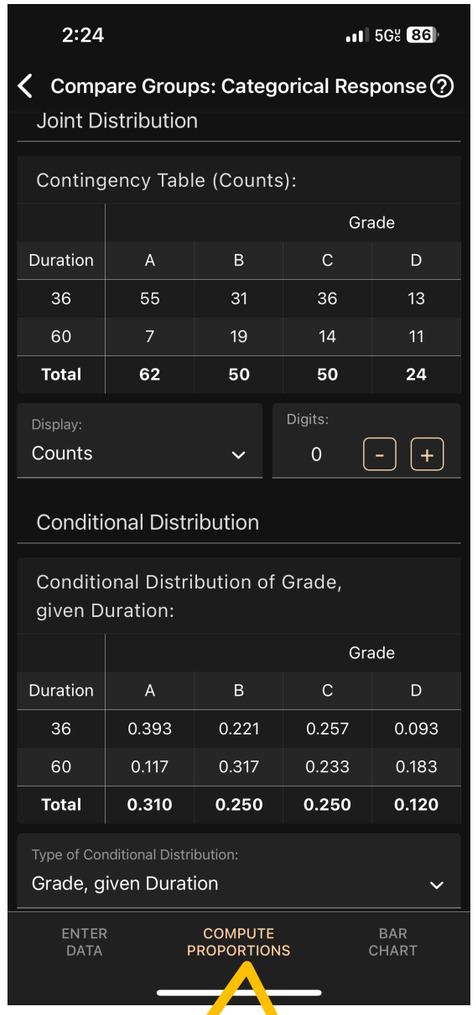
Art of Stat: Explore Data

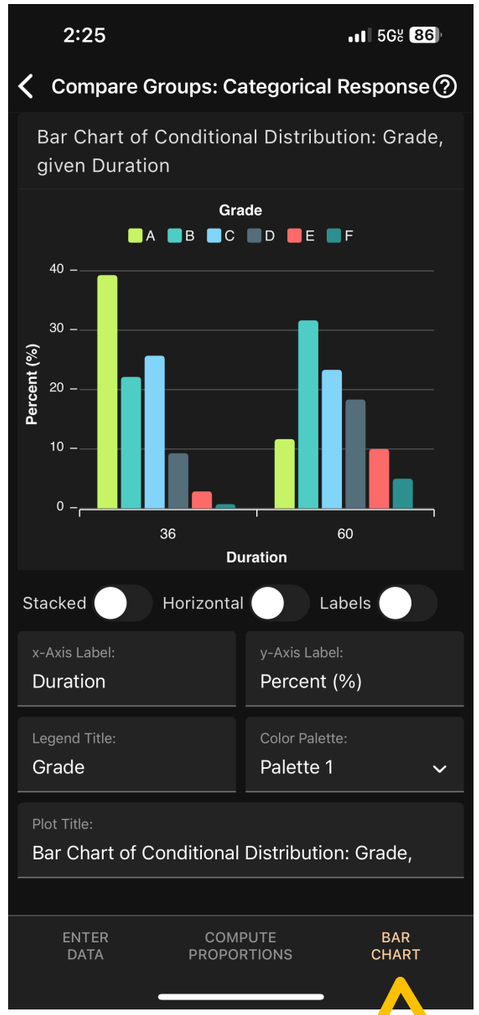
Two Categorical Variables

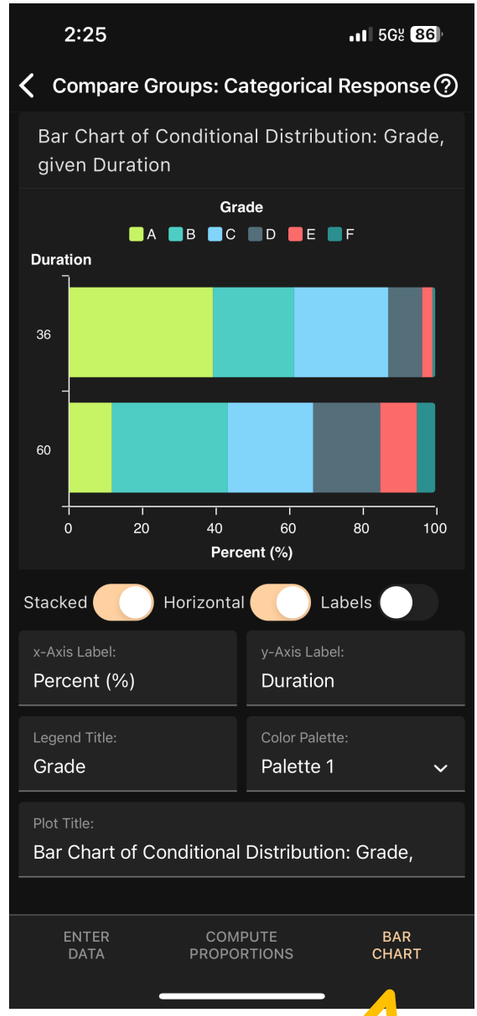


Screens:
- Enter Data
- Descriptive Statistics
- Histogram, Boxplot









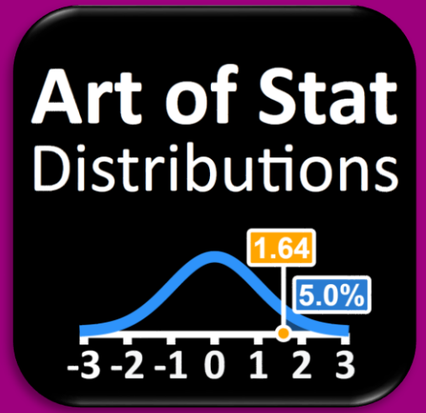
Datasets about online lending. Can sort categories of variable (not shown, used to sort loan grade categories)

Obtain contingency table, joint, conditional and marginal distributions. (Row or column percentages.)

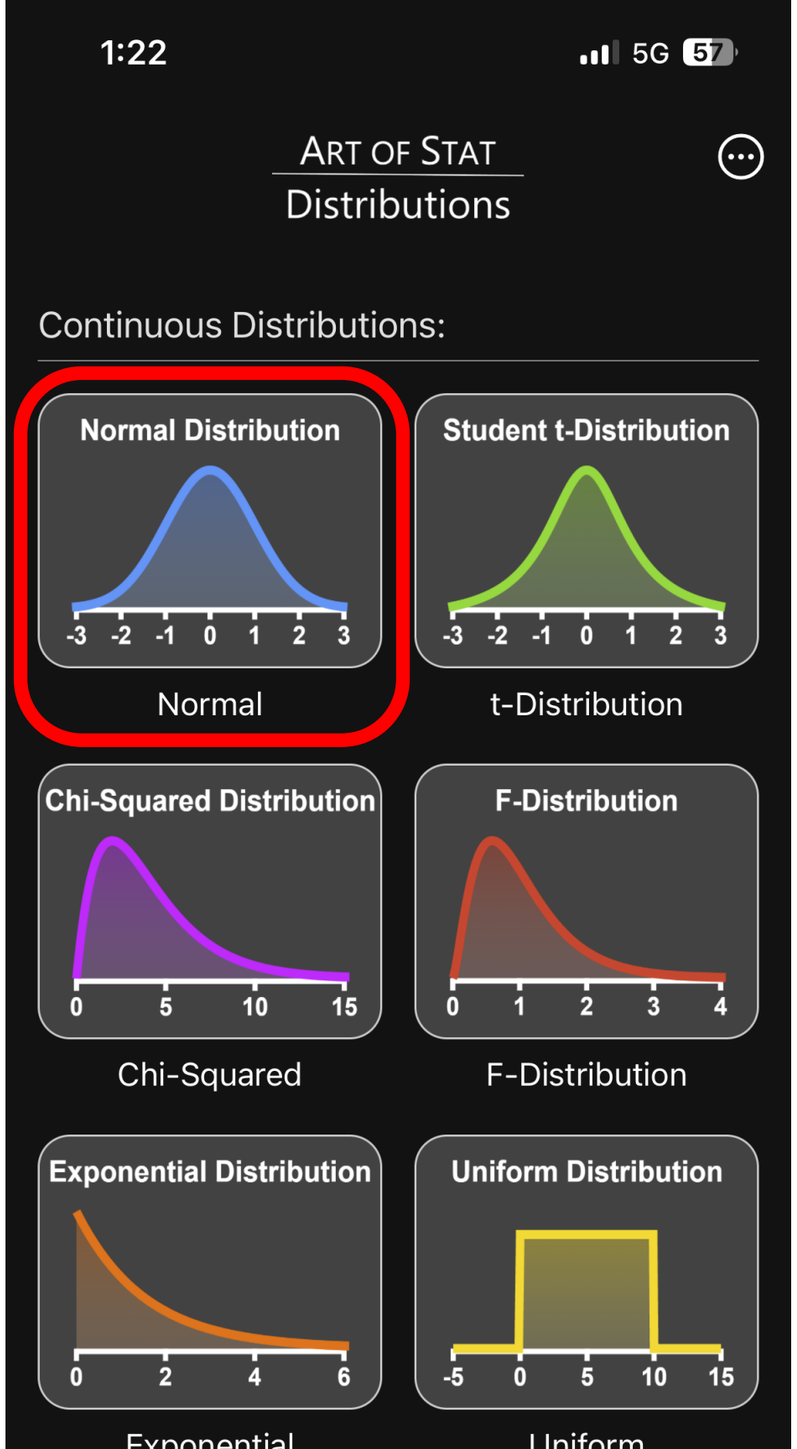
Side-by-Side bar charts

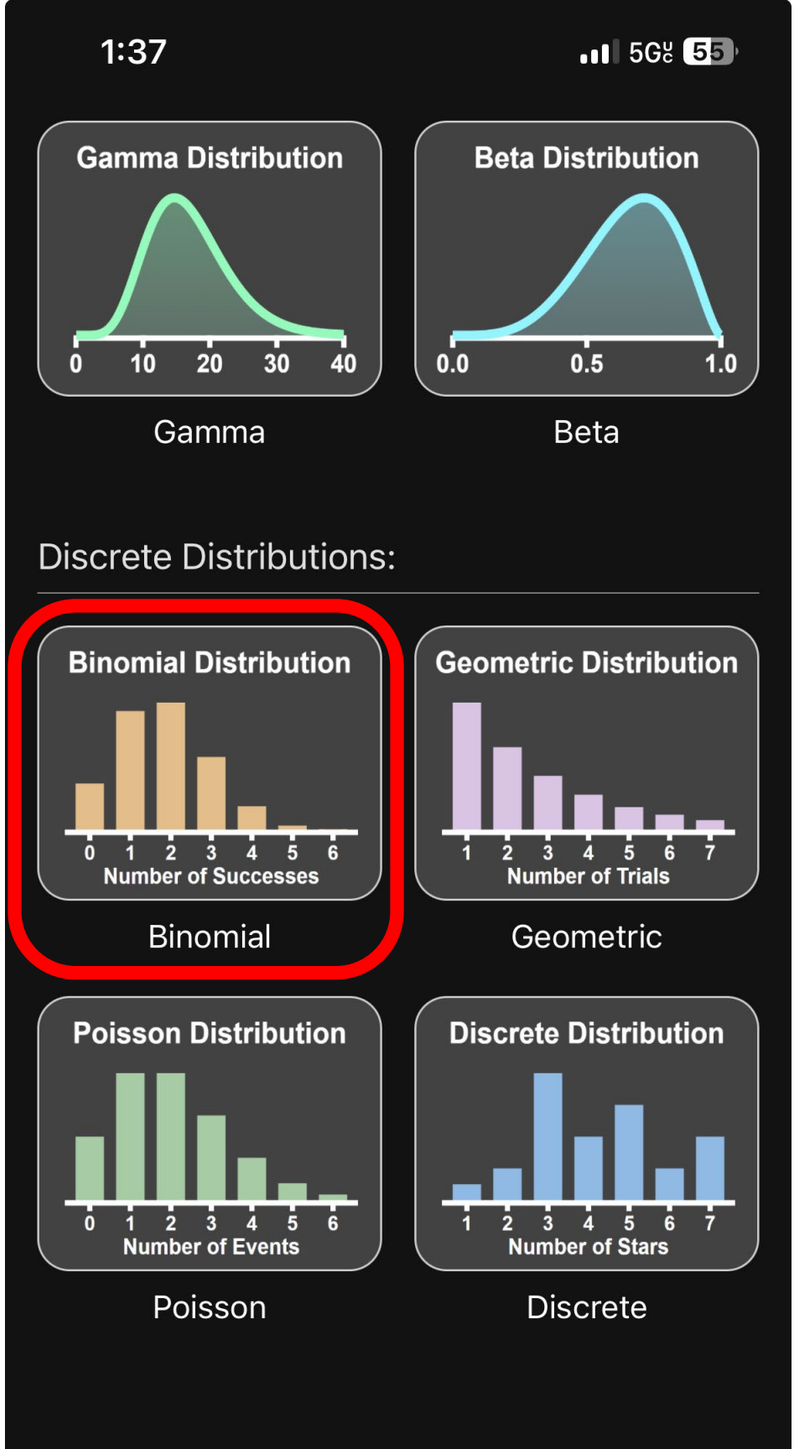
Stacked bar charts

Art of Stat: Distribution



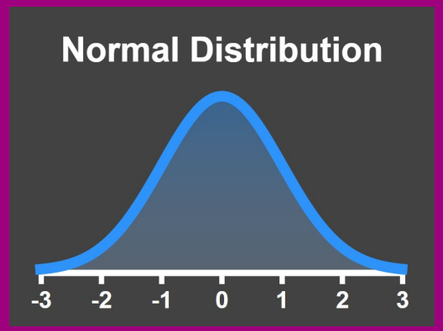
Explore & Visualize Discrete and Continuous Probability Distributions



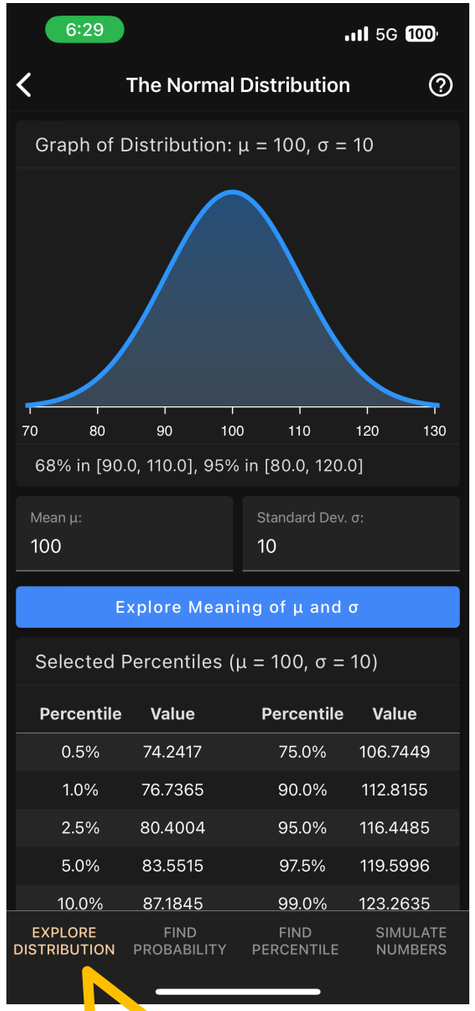


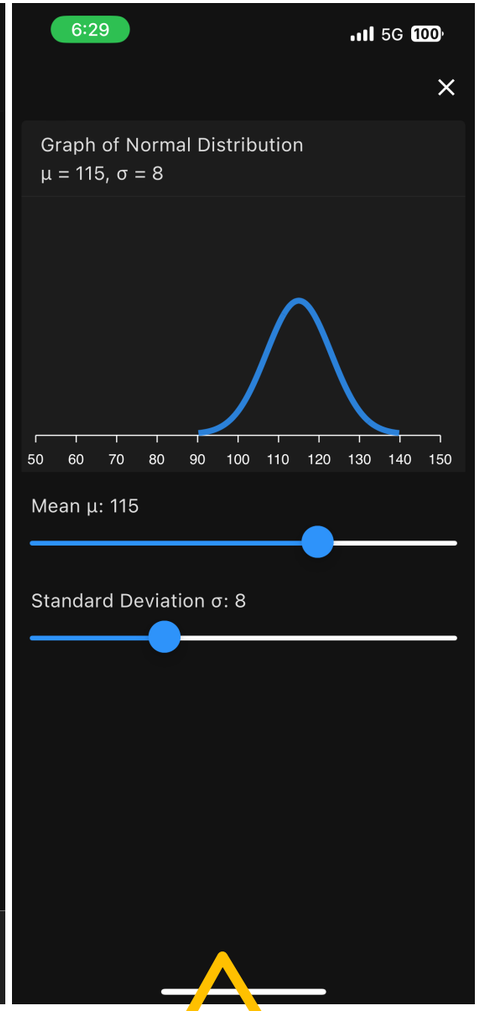
Art of Stat: Distributions

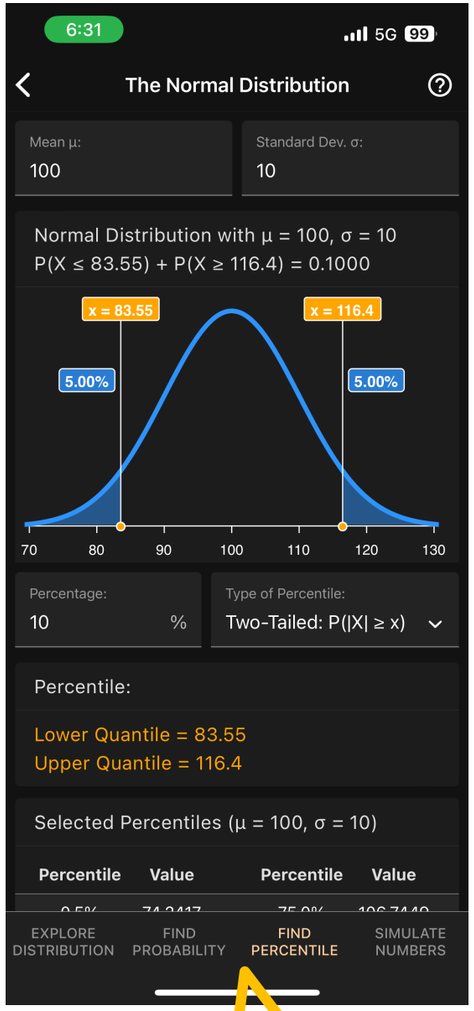
Normal Distribution

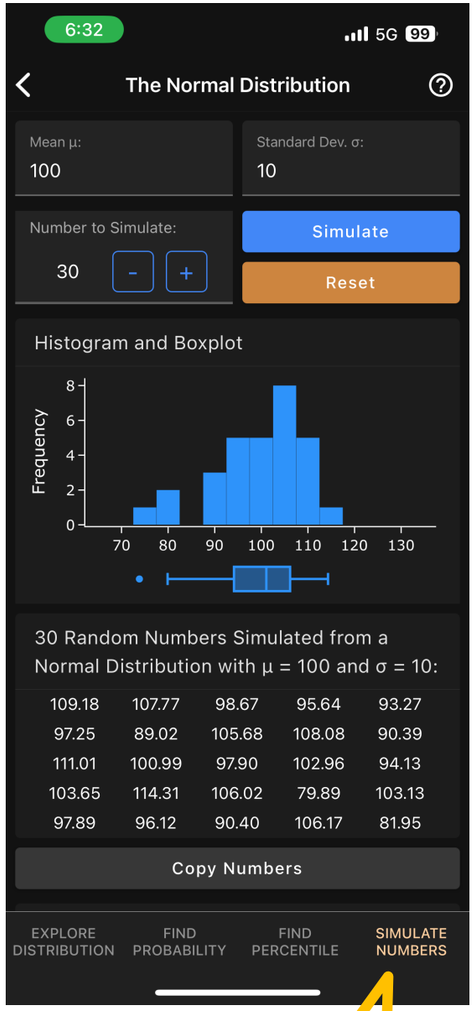


Screens:
- Explore Distribution
- Find Probability
- Find Percentiles
- Histogram, Boxplot









Enter values for the mean and standard deviation, and get an overview of all the essentials

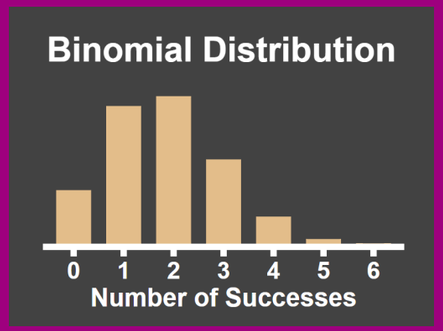
To understand the meaning of “mu” and “sigma”, use sliders to see that these describe location and variability

You can find probabilities and percentiles, an confirm them visually

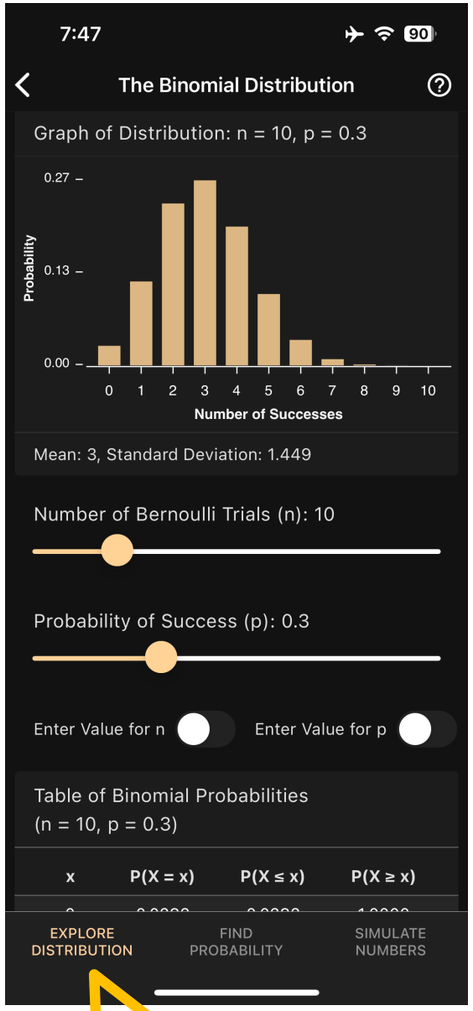
Simulate from a normal distribution

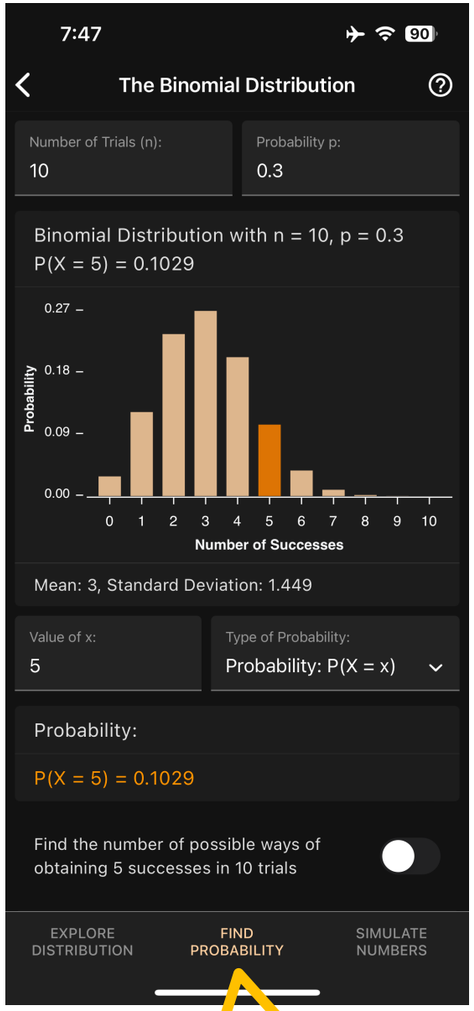
Art of Stat: Distributions

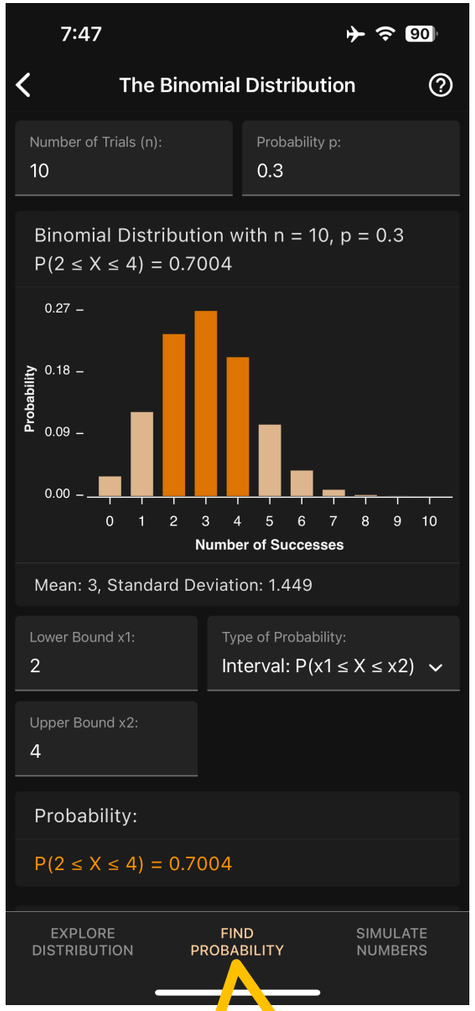
Binomial Distribution

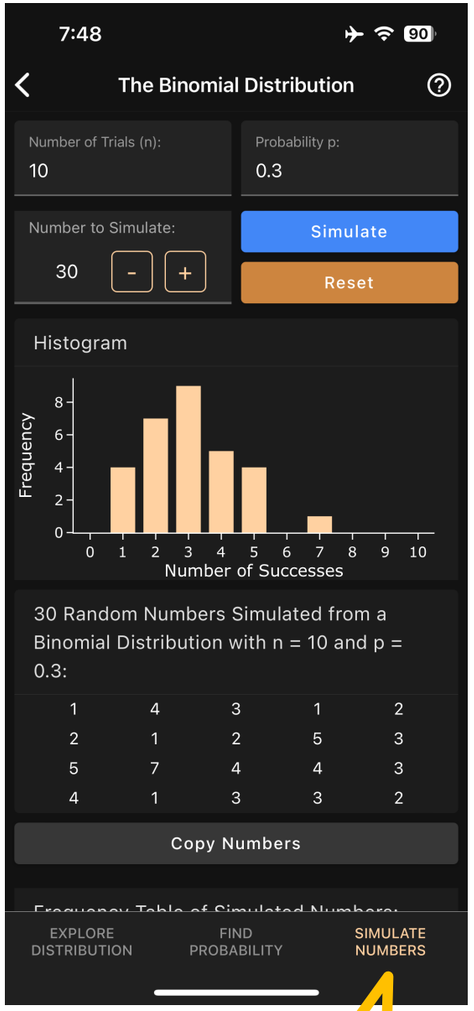


Screens:
- Explore Distribution
- Find Probability
- Simulate Numbers









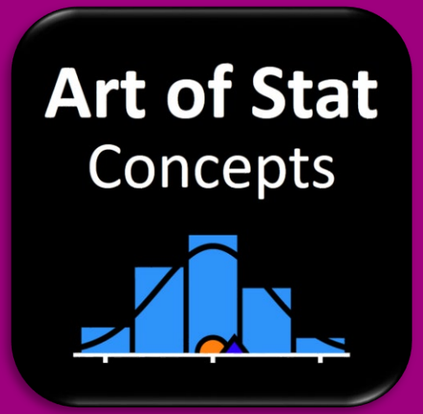
Visualize the binomial distribution, see how it changes with p, get the probability table for any value of n and p.

Easily find and visualize binomial probabilities…

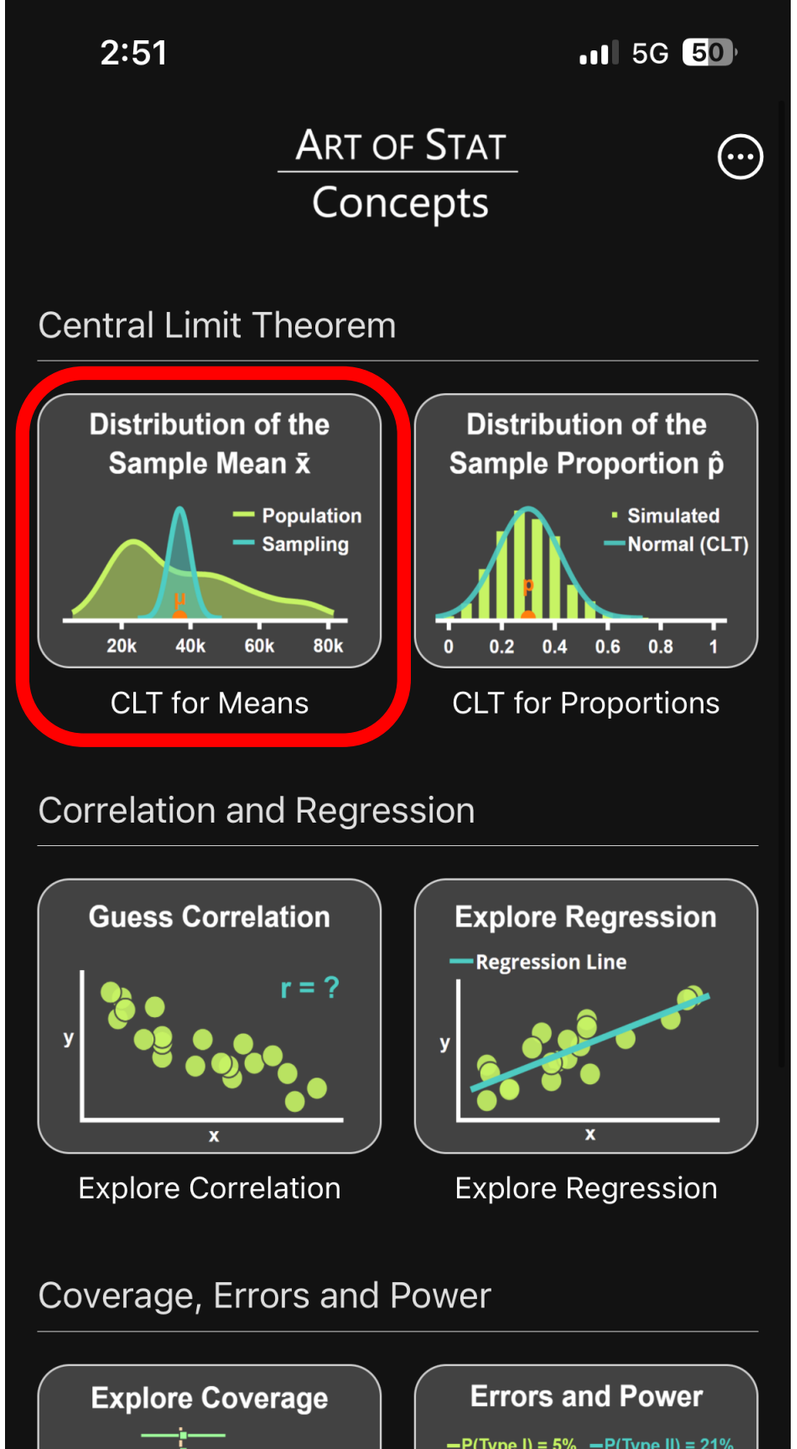
… of any type, individual, lower tail, upper tail or interval.

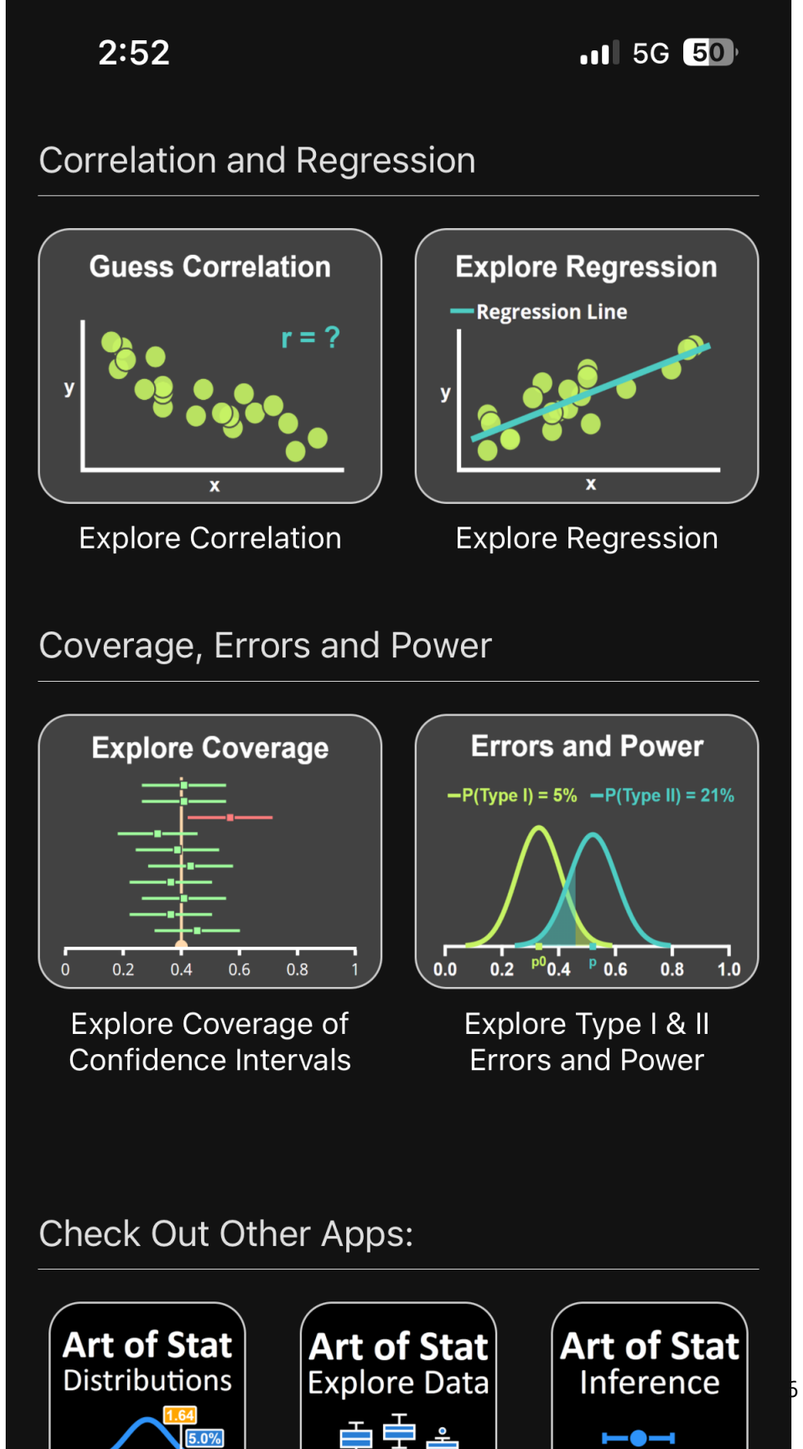
Simulate from a binomial distribution

Art of Stat: Concepts



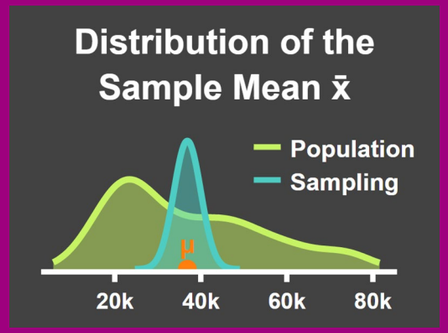
Central Limit Theorem,
Correlation,
Regression,
Coverage & Power



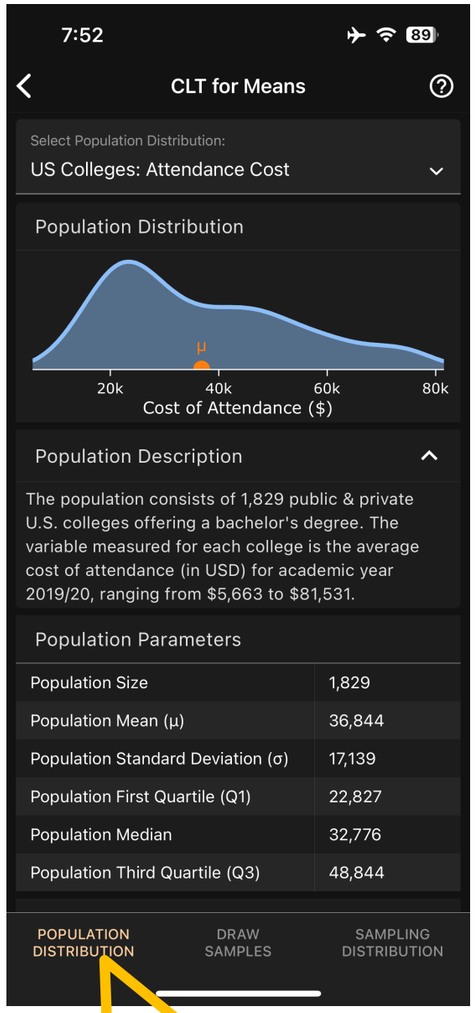


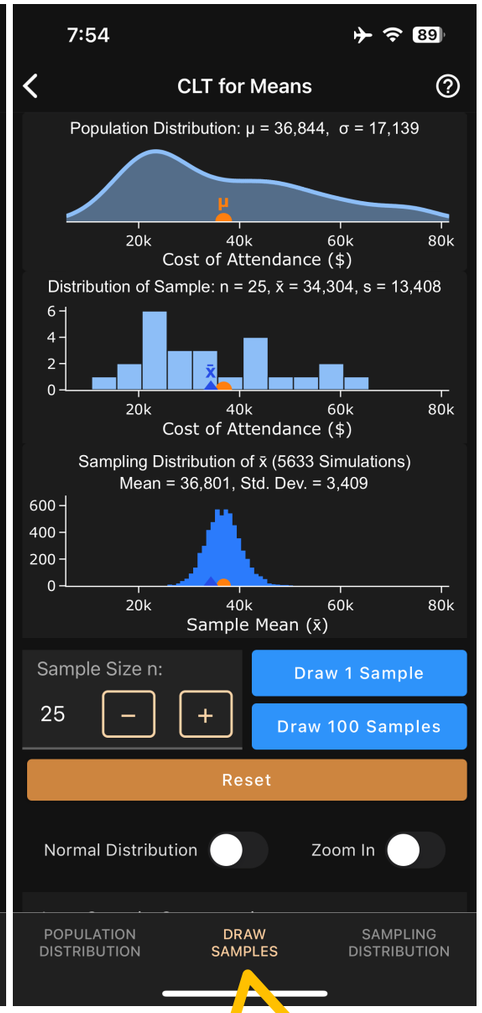
Art of Stat: Concepts

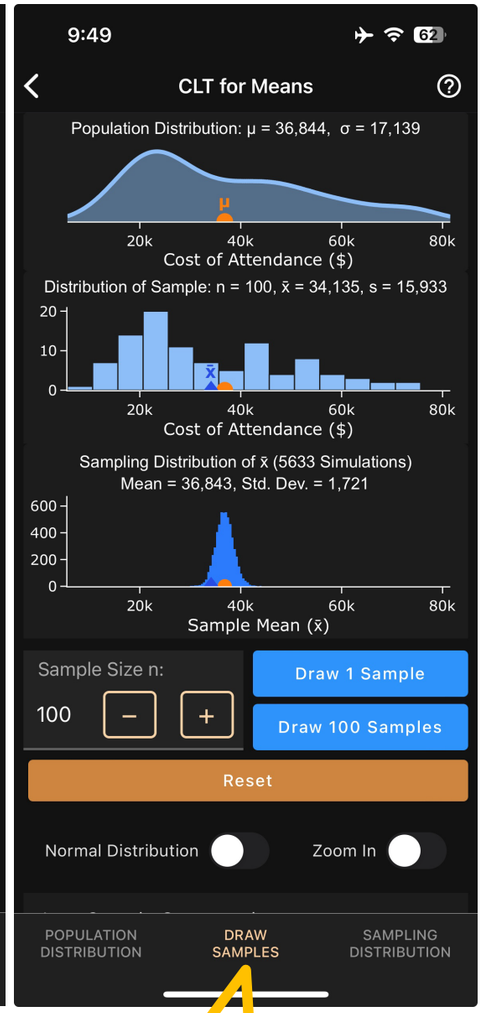
Central Limit Theorem for Means

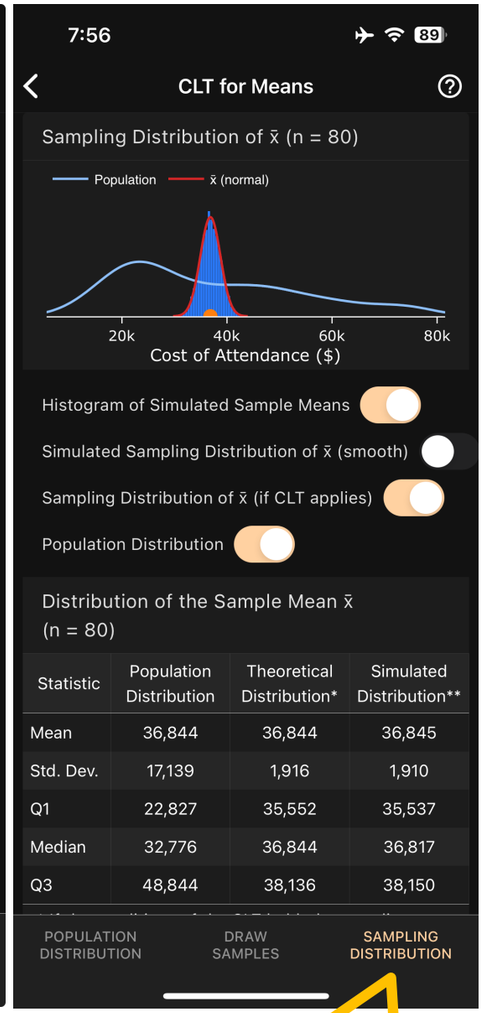


Screens:
- Population Distribution
- Draw Samples
- Sampling Distribution









Look at a real population distribution, and its parameters (population mean, standard deviation). Several examples available.

Draw samples of a given size from this population distribution, and keep track of the sample means

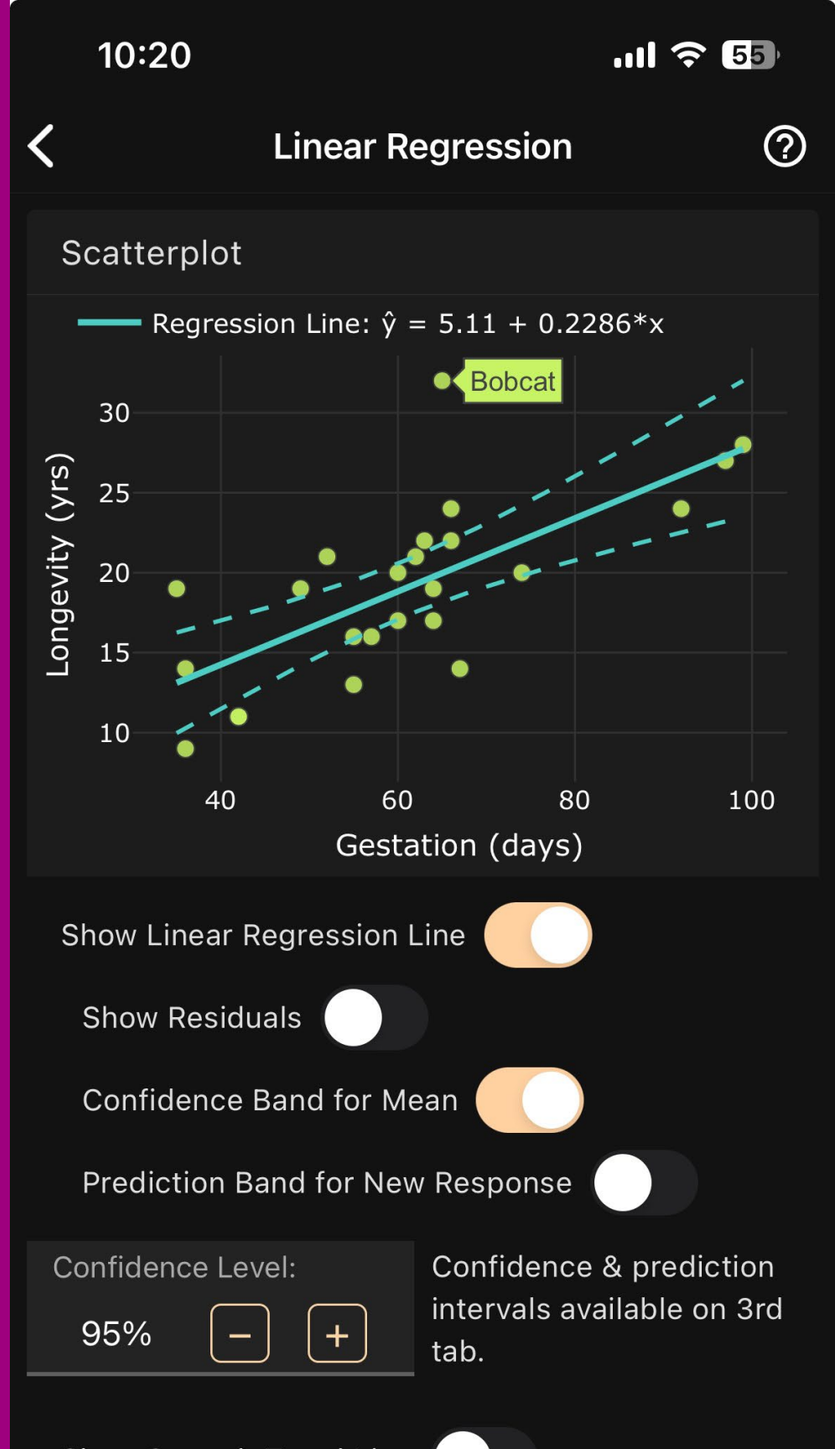
See what happens as the sample size increases

Show (simulated) sampling distribution, compare to population distribution

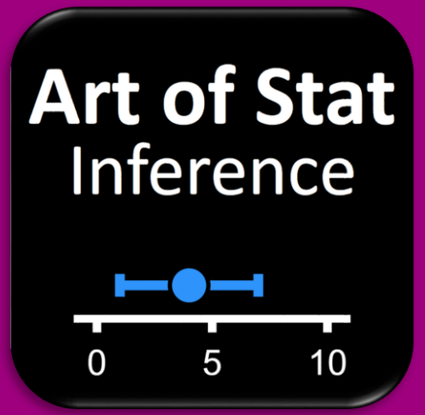
3) Case Studies (cont.)

- Art of Stat: *Inference* app
  - Inference for a Population Mean
  - Inference Comparing Two Population Proportions

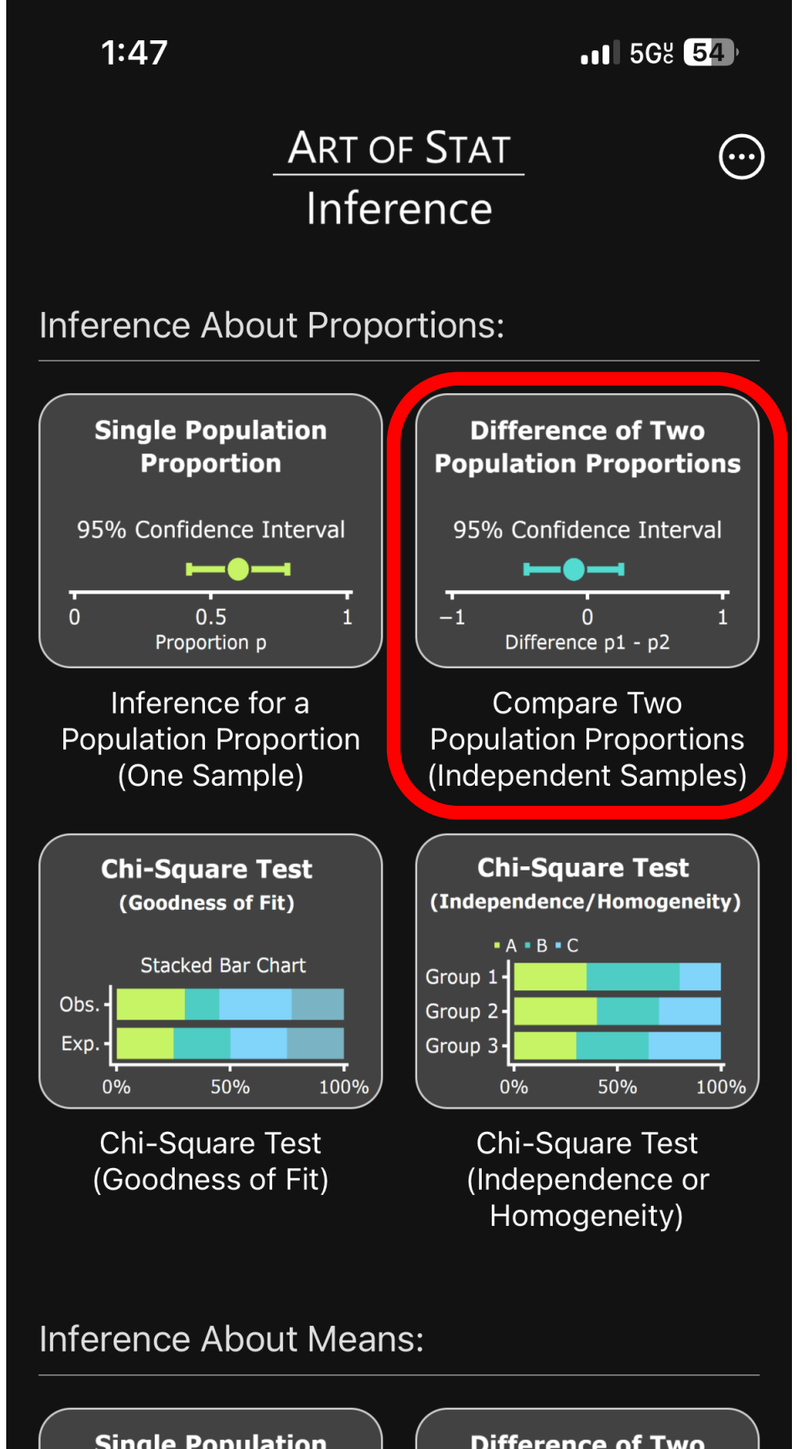
- Art of Stat: *Regression* app
  - Linear Regression

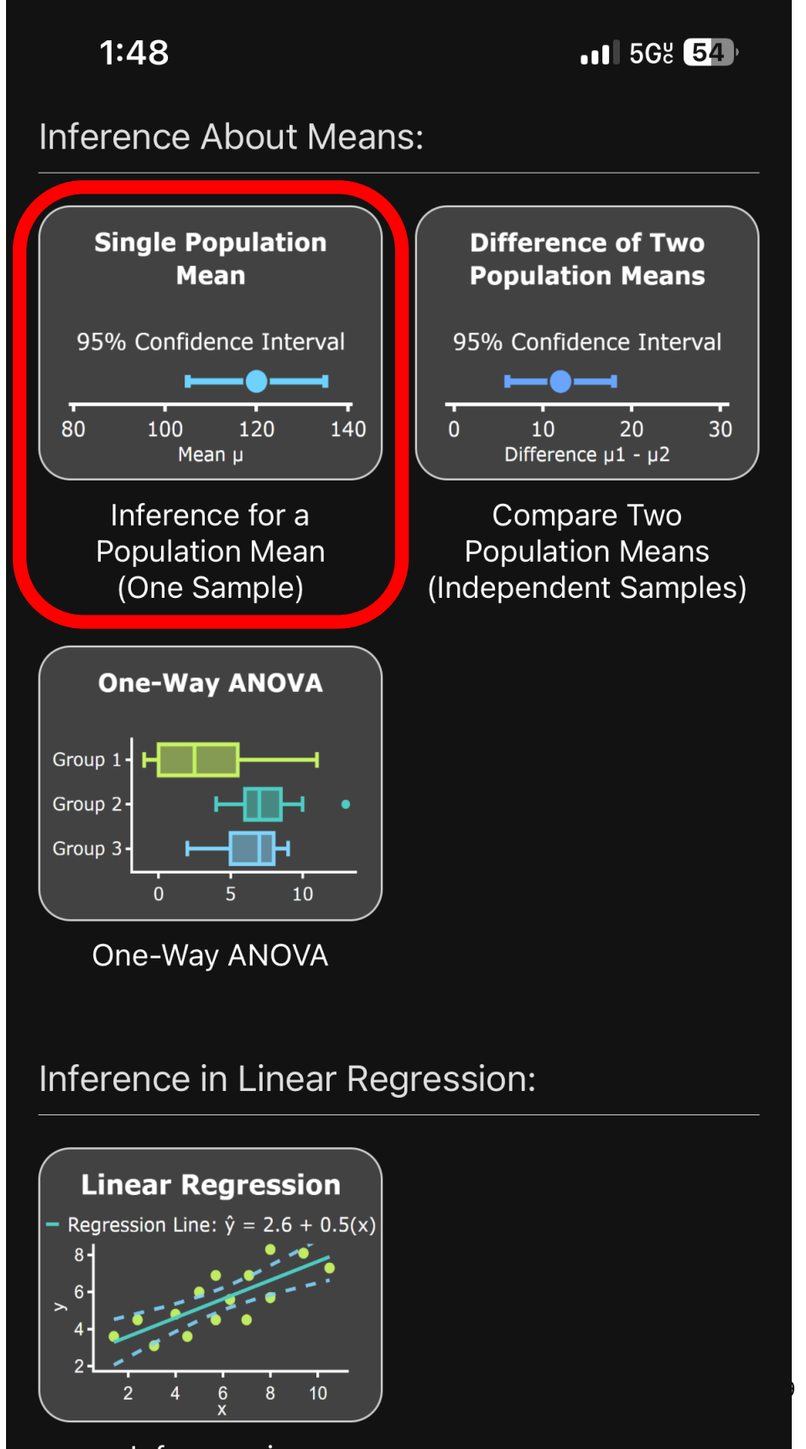


Art of Stat: Inference



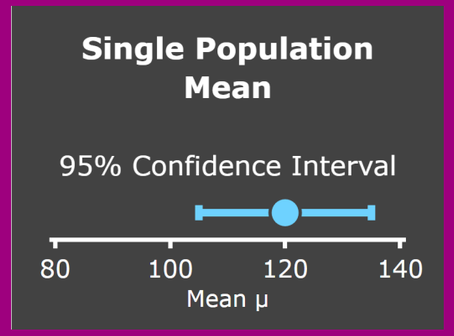
Confidence Intervals & Hypothesis Tests



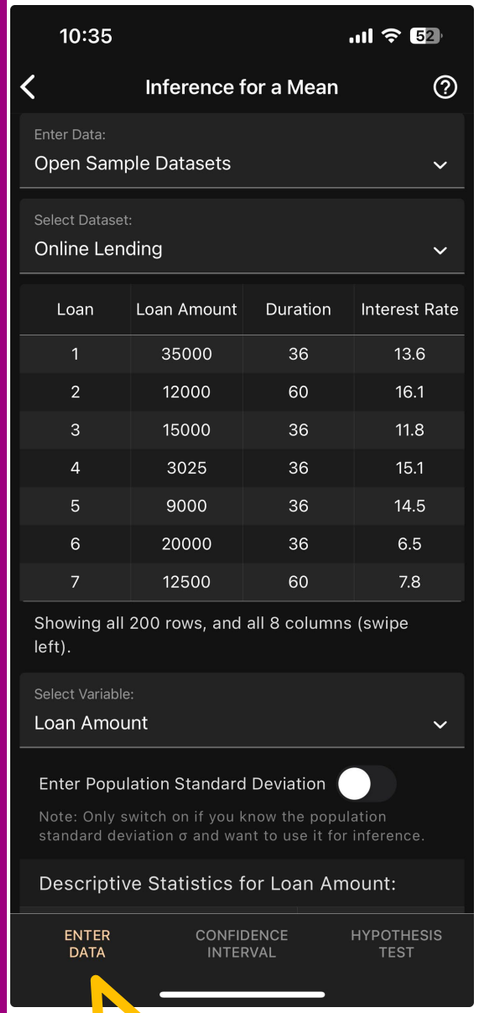


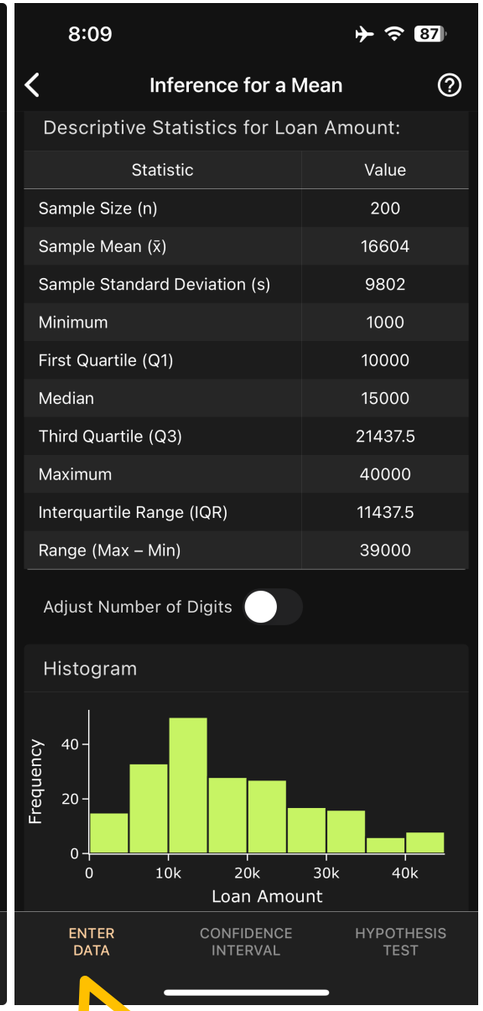
Art of Stat: Inference

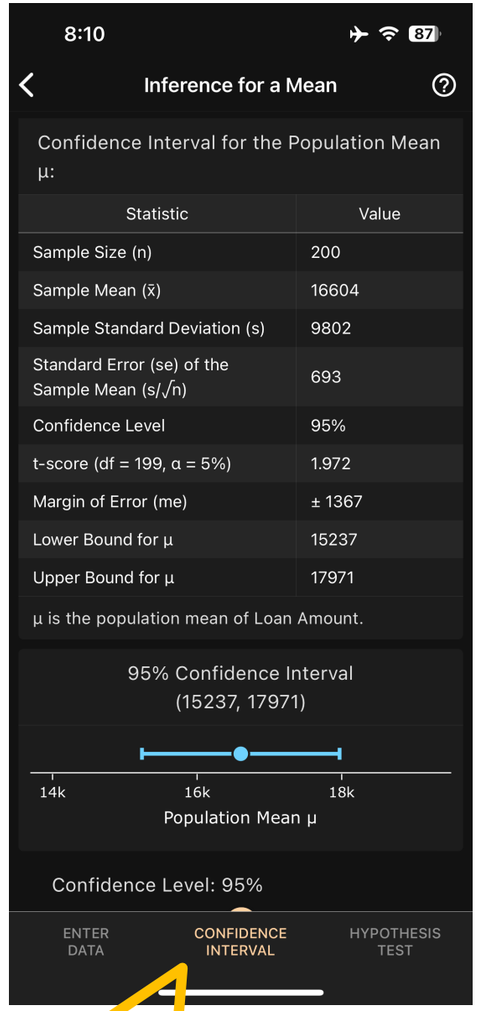
Inference for a Population Mean

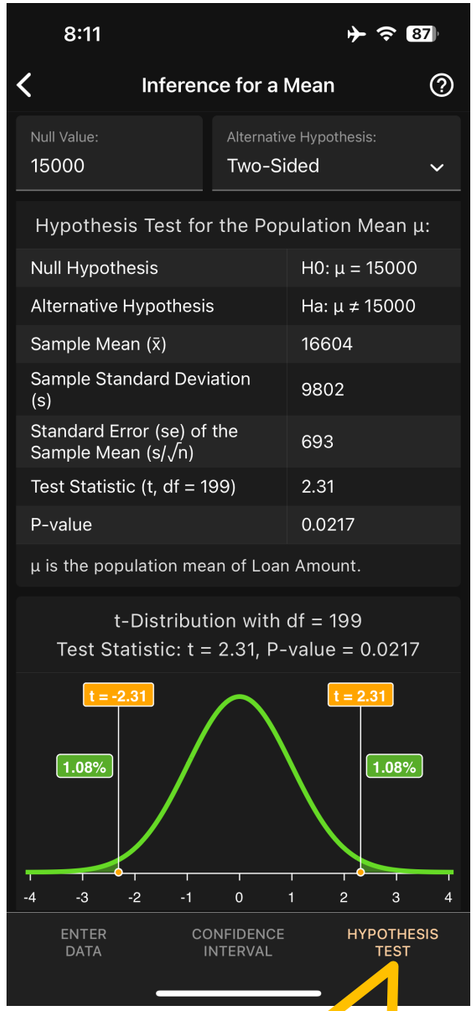


Screens:
- Enter Data
- Confidence Interval
- Hypothesis Testing









Type in or copy & paste data, load CSV file, or use example dataset

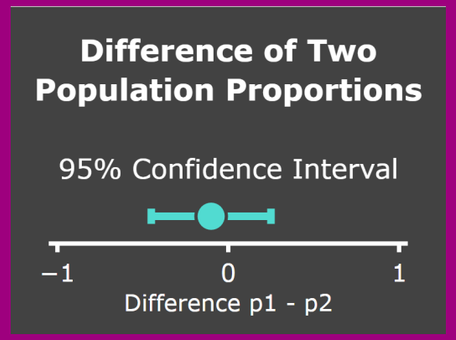
Immediately get descriptive statistics and graphs to check assumptions

Obtain confidence interval for mean, including all intermediate steps. Change slider for confidence coefficient.

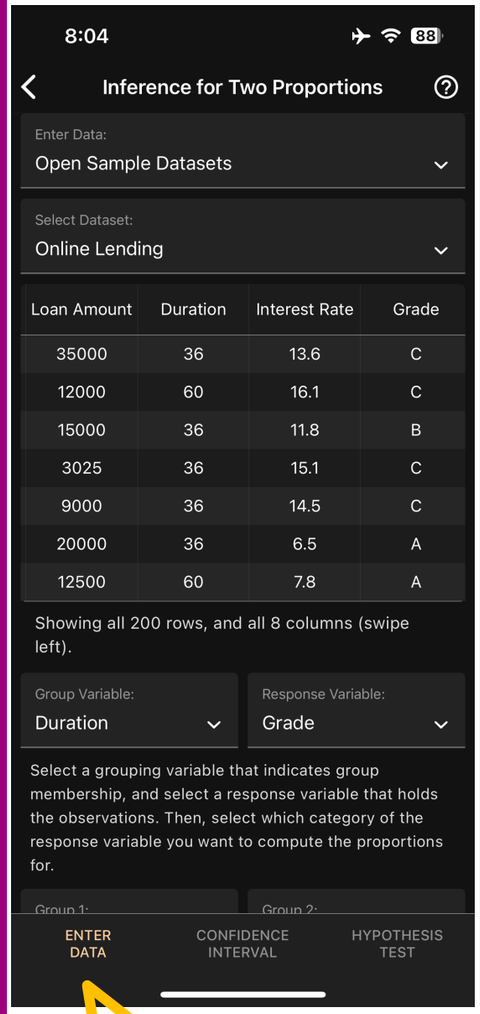
Carry out t-test, and obtain all intermediate steps leading to P-value. Visualize P-value on t-distribution.

Art of Stat: Inference

Inference for a Population Mean

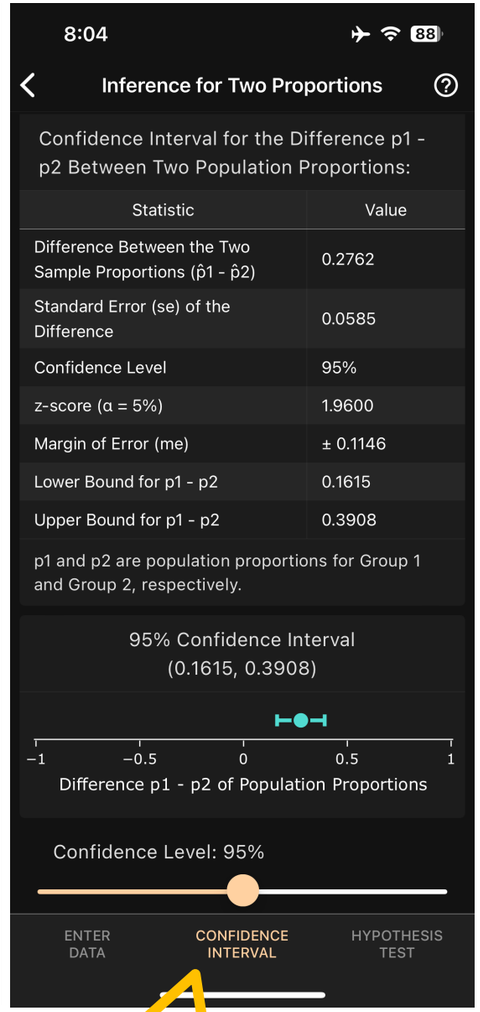


Screens:
- Enter Data
- Confidence Interval
- Hypothesis Testing

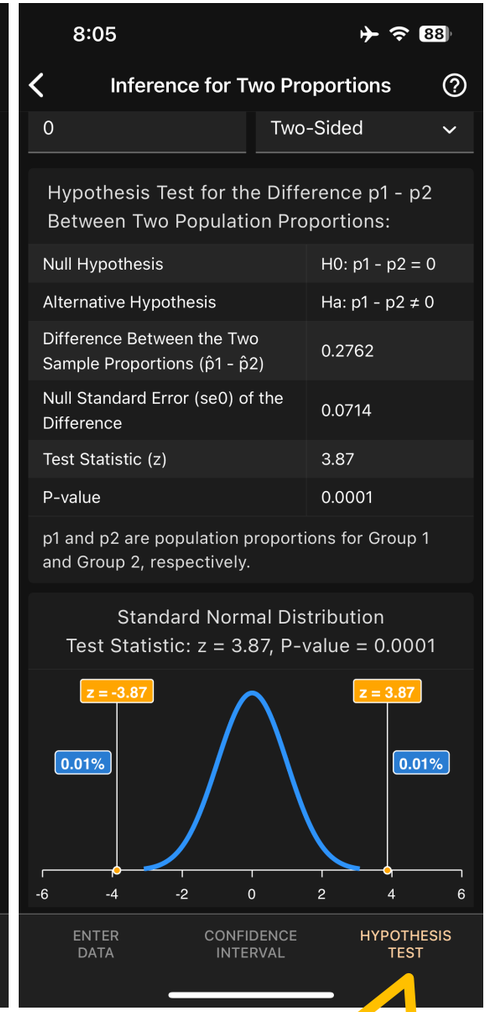


Type in number of successes and trials (not shown), or load CSV file, or use example dataset

Immediately get sample proportions in each group and bar graph to describe data

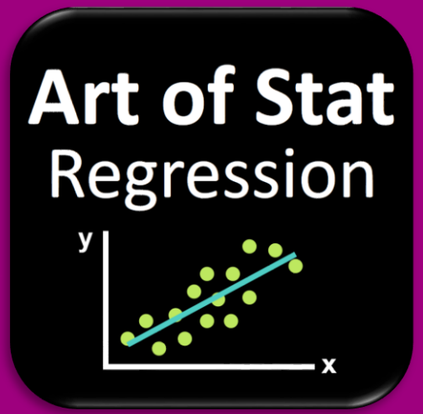


Obtain confidence interval for difference of proportions, including intermediate steps.

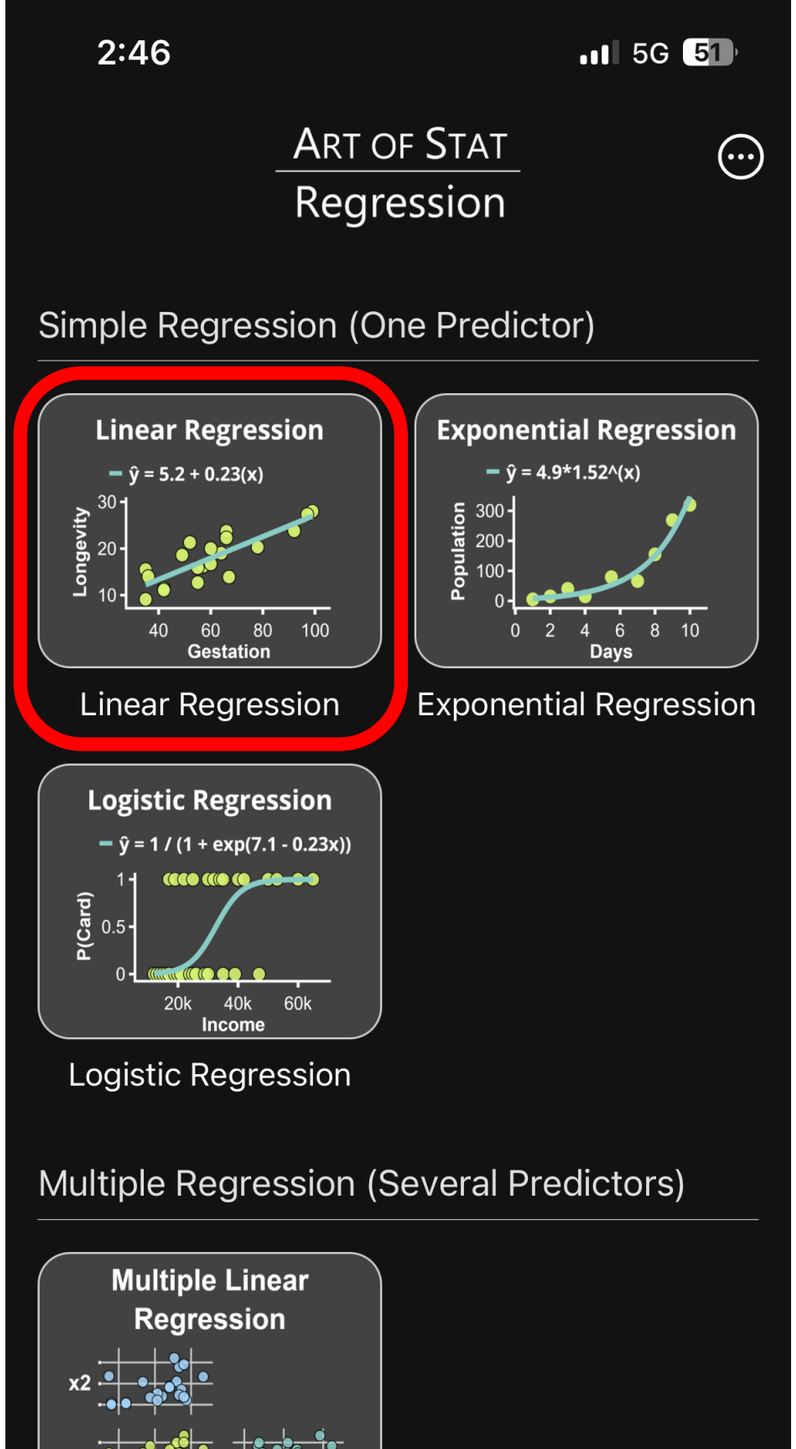


Carry out hypothesis test. Visualize P-value on normal distribution graph.

Art of Stat: Regression

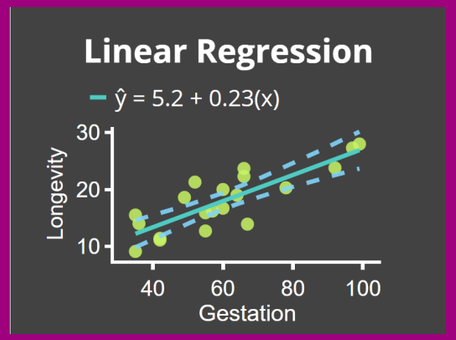


Simple Linear and Logistic Regression & Multiple Linear Regression

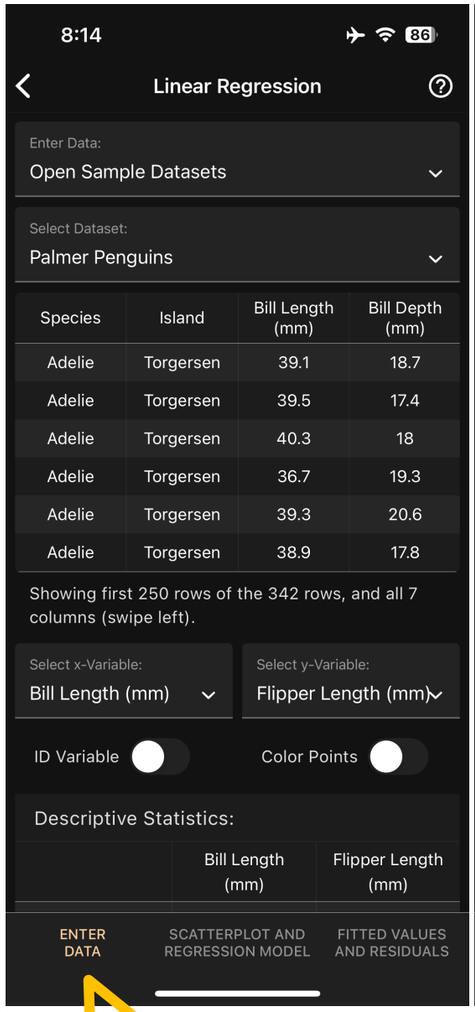


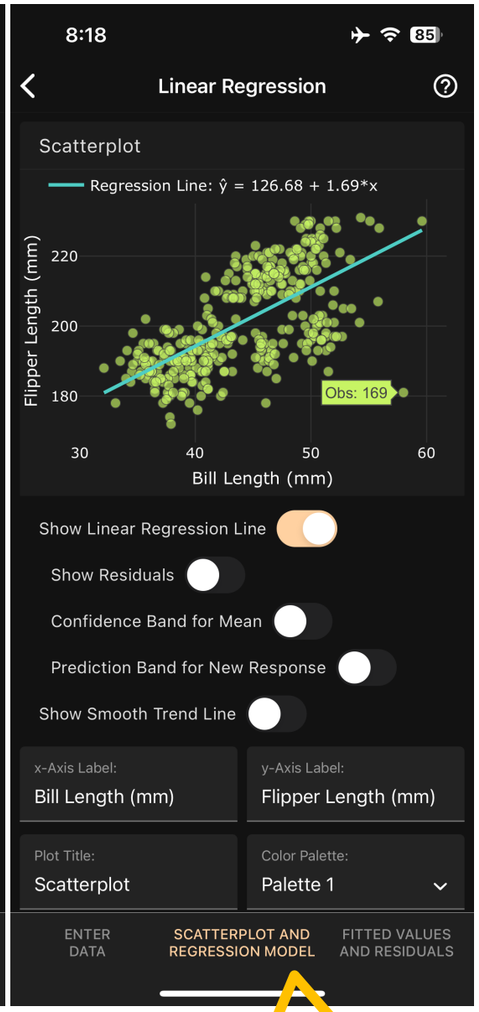
Art of Stat: Inference

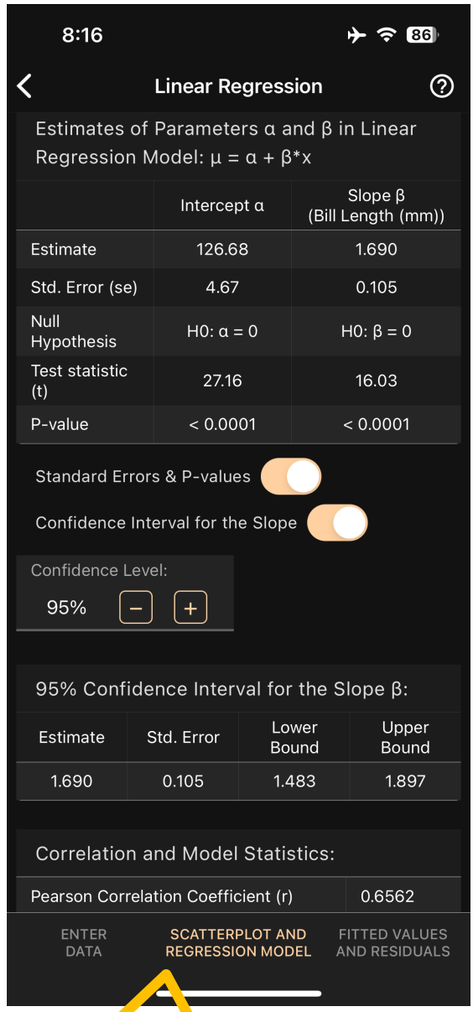
Inference for a Population Mean

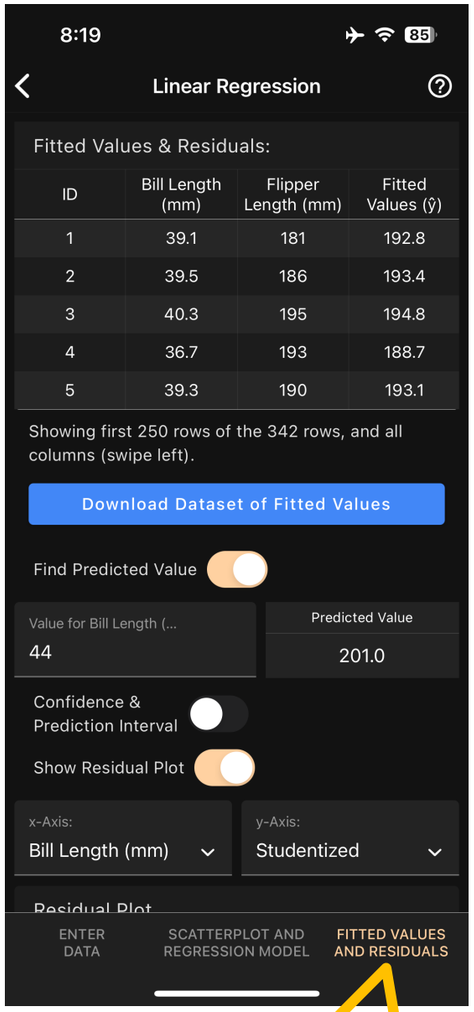


Screens:
- Enter Data
- Scatterplot & Model
- Fitted Values, Residuals









Type in or copy & paste data, load CSV file, or use example dataset.

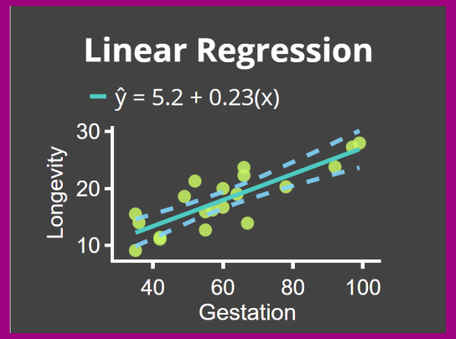
Obtain scatterplot and superimpose linear regression line.
Identify observations.

Get estimates of intercept and slope, their standard errors, and P-values. Get R^2.

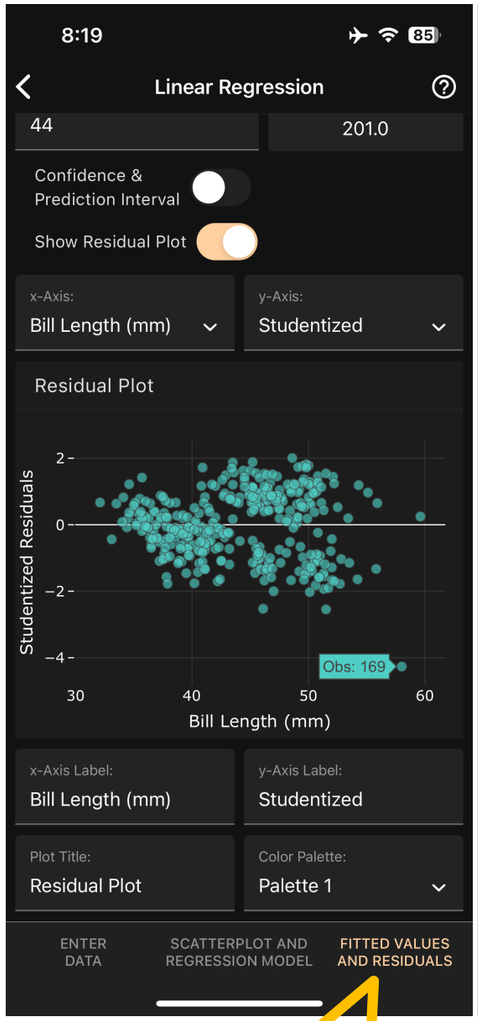
Obtain fitted values, and make predictions for new x values.

Art of Stat: Inference

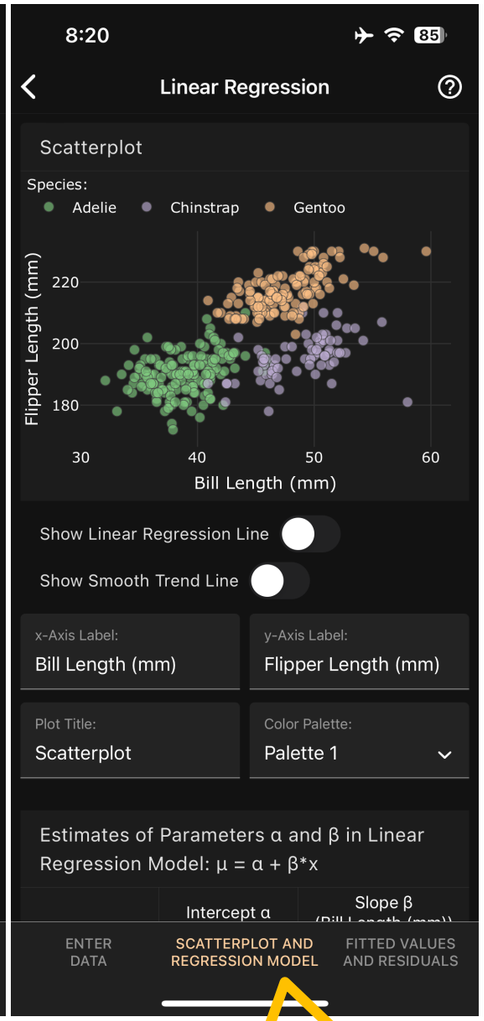
Inference for a Population Mean



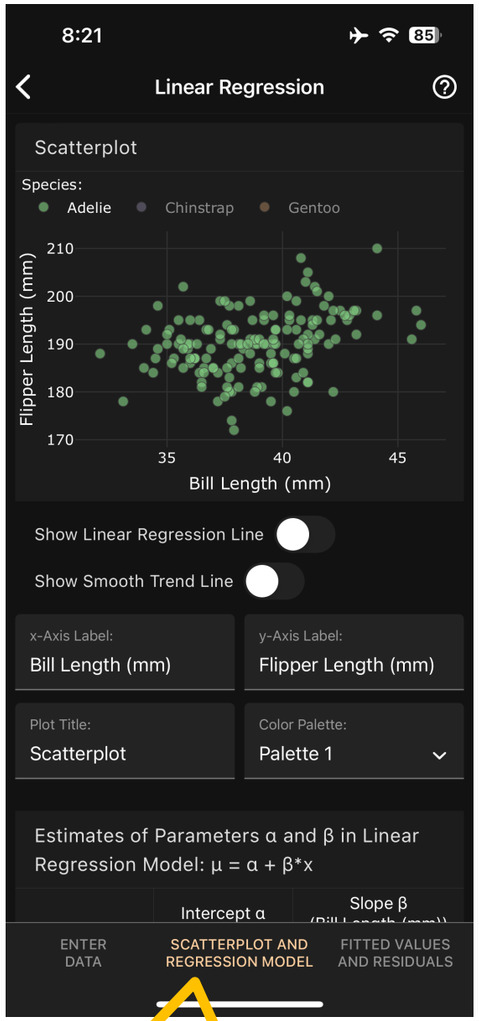
Screens:
- Enter Data
- Scatterplot & Model
- Fitted Values, Residuals



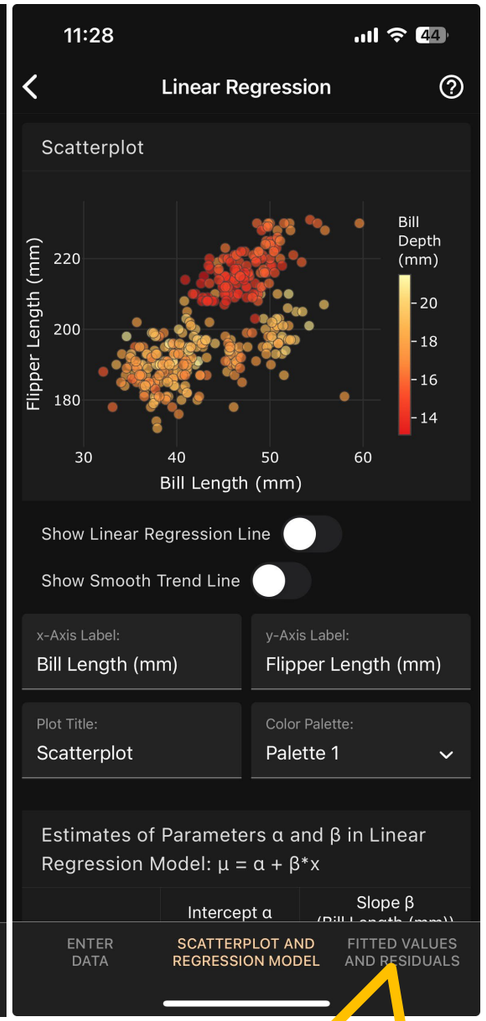
Obtain residual plot, using standardized residuals.



Use a third variable to color the dots (selected in Enter Data screen) to reveal group structures.



Tab on legend to look at only one group.



Can also color dots according to a third continuous variable

4) Q&A

Thank You!

Any Questions?