

Word Equations	Summary Tables	Simple Statistics
<pre>outcome = explanatory + other stuff Y = X + other stuff</pre>	<pre># compute five-number summary favstats(~ Y, data = data_set)  # create frequency table tally(data_set\$Y) tally(~ Y, data = data_set)  # tally by condition tally(~ Y &lt; 1900, data = data_set)  # two-way frequency table tally(Y ~ X, data = data_set, margin = TRUE, format = "proportion")</pre>	<pre>mean(data_set\$Y) var(data_set\$Y) sd(data_set\$Y)  cohensD(Y ~ X, data = data_set) cor(Y ~ X, data = data_set)  b1(Y ~ X, data = data_set) b1(one_model)  pre(Y ~ X, data = data_set) f(Y ~ X, data = data_set)</pre>
<h3>Basics</h3> <pre>print("Hello world!")  # assign value to object myNumber &lt;- 5  # combine values into vector myVector &lt;- c(1, 2, 3)  # first element in vector myVector[1]  # orders values or cases sort(myVector)  # arithmetic operations sum(1, 2, 100), +, -, *, / sqrt(157) abs(data_set\$Y)  # logical operations &gt;, &lt;, &gt;=, &lt;=, ==, !=,  , &amp;  # results in a variable with values # of TRUE or FALSE data_set\$C &lt;- data_set\$A &gt; data_set\$B</pre>	<h3>Data Frame</h3> <pre># structure of data frame str(data_set)  # view first/last six rows head(data_set) tail(data_set)  # select multiple variables select(data_set, Y1, Y2)  # first six rows of selected variables head(select(data_set, Y1, Y2))  # select variable (a column) data_set\$Y  # find rows that meet condition data_set[data_set\$Y &gt; 40] filter(data_set, Y &gt; 300) filter(data_set, Y != "NA")</pre>	<pre># arrange rows by variable arrange(data_set, Y)  # creates data frame from csv file data_set &lt;- read.csv("file_name", header = TRUE)  # convert quantitative variable # to categorical factor(data_set\$Y) factor(data_set\$Y, levels = c(1,2), labels = c("A", "B"))  # transform values recode(data_set\$Y, "0" = 0, "1" = 50, "2" = 100)  # creates two equal sized groups ntile(data_set\$Y, 2)  # convert categorical variable # to quantitative as.numeric(data_set\$Y)</pre>
<h3>Probability Distribution</h3> <pre># calculate the probability area xpnorm(65.1, data_set\$mean, data_set\$sd)  zscore(data_set\$Y)  # returns t at this probability qt(.975, df = 999) # returns F at this probability qf(.95, df1 = 1, df2 = 100)  # CI using t distribution confint(empty_model)  # calculate p-value using F-distribution xpf(sample_F, df1 = 2, df2 = 10)</pre>		

## Simulation

```
# sample without replacement
sample(data_set, 6)

# sample with replacement
resample(data_set, 10)

do(3) * resample (data_set, 10)

# mixes up values in a variable
shuffle(data_set$Y)

# simulate sampling 10000 Ys
# from normal distribution
sim_Y <- rnorm(10000, Y_stats$mean,
Y_stats$sd)

# put simulated Ys into dataframe
data_set<- data.frame(sim_Y)

# simulate sampling distribution of
means
sim_SDoM <- do(10000) * mean(rnorm(157,
Y_stats$mean, Y_stats$sd))

# bootstrap sampling distribution of
means
bootSDoM <- do(10000) *
mean(resample(data_set$Y, 157))

# randomize sampling distribution
# of b1s, centered on 0
sdob1 <- do(1000) *
b1(shuffle(Y) ~ X, data = data_set)
```

```
# bootstrap sampling distribution of b1s,
# centered on sample b1
sdob1_boot <- do(1000) *
b1(Y ~ X, data = resample(data_set))

# count the number of b1s at the upper
# and lower extreme
tally(sdob1$b1 > sample_b1 |
sdob1$b1 < -sample_b1)

# return TRUE for middle 95% of distribution
middle(sdob1$b1, .95)

# randomize sampling distribution of PRES
sdopRE <- do(1000) * PRE(shuffle(Y) ~ X,
data = data_set)

# randomize sampling distribution of Fs
sdof <- do(1000) *
fVal(shuffle(Y) ~ X, data = data_set)

# counts extreme Fs
tally(~fVal > sample_F, data = sdof)
```

## Fitting and Evaluating Models

```
# empty model
empty_model <- lm(Y ~ NULL,
data = data_set)

# use one explanatory variable
one_model <- lm(Y ~ X, data = data_set)

# create a function from a formula
one_model_fun <- makeFun(one_model)

one_model_fun(x_level_1)

# model predictions and residuals
data_set$empty_predict <- predict(empty_model)
data_set$empty_resid <- resid(empty_model)

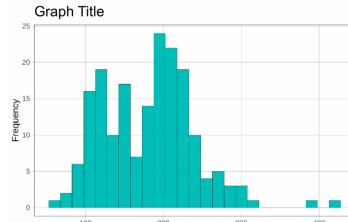
# produce ANOVA table
anova(empty_model)
supernova(one_model)

# t-test, using pooled variance
t.test(Tip ~ Condition, data = data_set,
var.equal=TRUE)

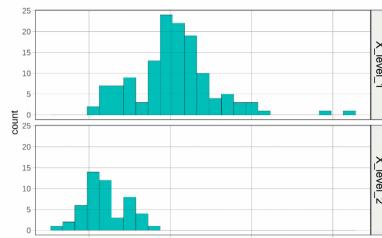
# pairwise comparison
# corrections: "Bonferroni" or "none"
pairwise(one_model, correction = "none")
```

## Visualizations

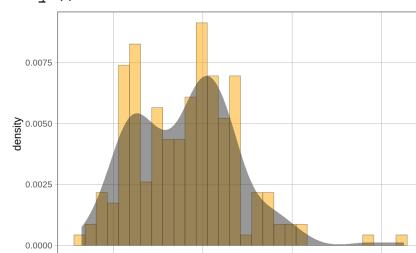
```
gf_histogram(~ Y, data = data_set) %>%
# change labels
  gf_labs(title = "Graph Title", x = "Y_Name",
y = "Frequency")
```



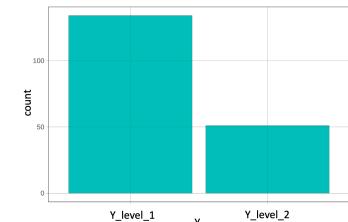
```
# faceted grid of histograms
gf_histogram(~ Y, data = data_set) %>%
  gf_facet_grid(X ~ .)
```



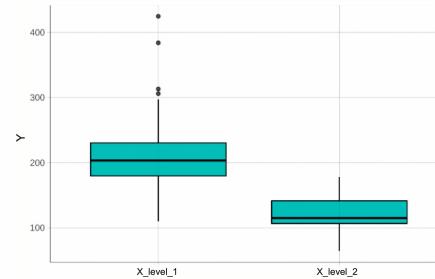
```
gf_dhistogram(~ Y, data = data_set, fill =
"orange") %>%
  gf_density()
```



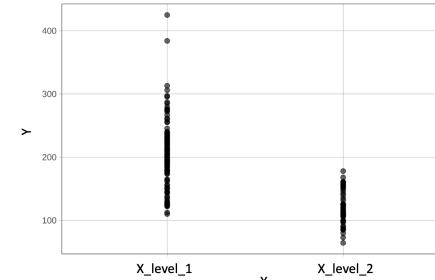
```
gf_bar( ~ Y, data = data_set)
```



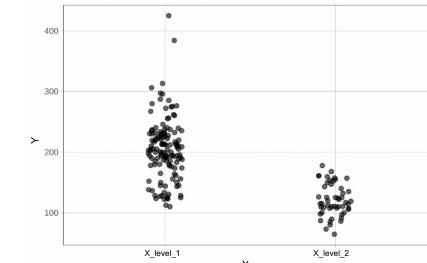
```
gf_boxplot(Y ~ X, data = data_set)
```



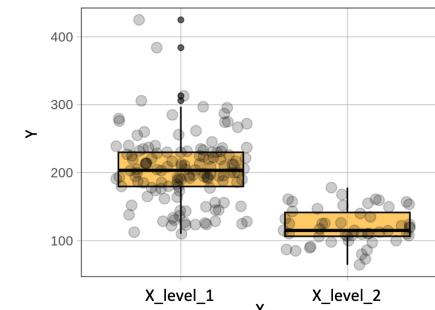
```
gf_point(Y ~ X, data = data_set)
```



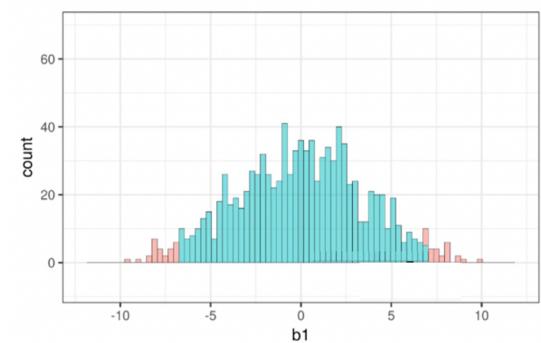
```
gf_jitter(Y ~ X, data = data_set)
```



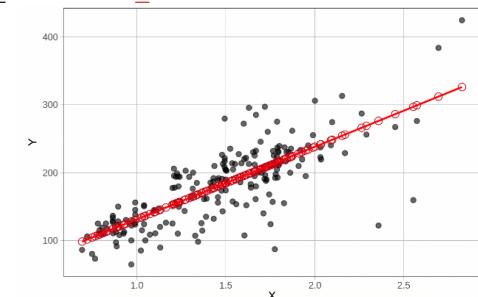
```
gf_boxplot(Y ~ X, data = data_set, fill =
"orange") %>%
  gf_jitter(height = 0, alpha = .2, size = 3)
```



```
# sampling distribution of b1
gf_histogram(~b1, data = sdob1,
  fill = ~middle(b1, .95)) %>%
# modify the limits on x- and y-axes
  gf_lims(x = c(-12, 12), y = c(0, 70))
```



```
gf_point(Y ~ X, data = data_set) %>%
# add model predictions as red points
  gf_point(Y ~ X , shape = 1, size = 3,
color = "firebrick") %>%
# add best fitting model as a red line
  gf_model(one_model, color = "red")
```



```
pairwise(one_model, plot = TRUE)
```

