Power Analysis Simulation

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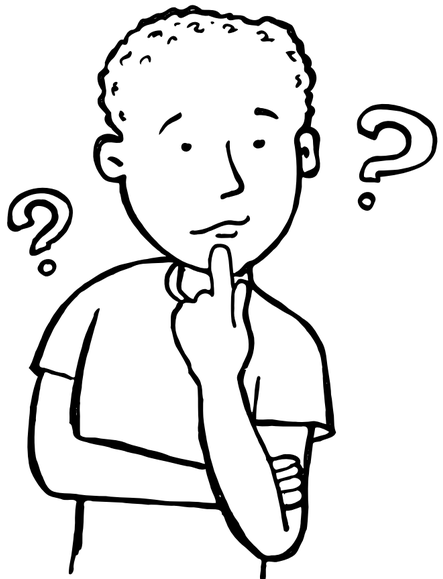
Shiny App Prototype

Test of Hypothesis

Null Hypothesis (*H0*)



Alternetive Hypothesis (*H1*)

- generated from the data

POWER

(of the implied statistical test)

P(H0 is rejected | H0 is false)

Type II Error

Accepting H0 when H0 is false (β)

1 COLLECT THE DATA

2 CALCULATE THE TEST STATISTICS AND IT'S P-VALUE

Decision to Accept or Reject the Null Hypothesis

How to estimate Power?

1

Specify the model

- the statistical model
- parameters
- the effect size

2

Simulate Data

- generate observations from the model

3

Calculate the P-value

4

Repeat the Process

POWER: proportion of times where the test actually gave a significant result

Simulating the Power of Statistical Tests: A Collection of R Examples

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Abstract

This paper illustrates how to calculate the power of a statistical test by computer simulation. It provides R code for power simulations of several classical inference procedures including one- and two-sample t tests, chi-squared tests, regression, and analysis of variance.

Simulating the Power of Statistical Tests: A Collection of R Examples

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This paper illustrates how to ca
It provides R code for power si
one- and two-sample t tests, chi

Regression | BinomialTest | ANOVA | Test of Correlation | Two-Sample t-Test | One-Sample t-Test

2-sample t-test for independent samples

Two-sample t-test tests the hypothesis $H_0 : \mu_x - \mu_y = \delta = 0$, where μ_x and μ_y are the means of each sample. The present application generates 2000 times a pair of samples based on the parameters that are entered below and at each iteration performs a t-test and calculates the accompanying p-value. Power is the proportion of times where the test actually gave a signicant result (p<0.05).

Please enter the parameters for your samples

First sample

sample size	sample mean	standard deviation
100	0	1

Second sample

sample size	sample mean	standard deviation
100	0	1

Calculate power

Shiny App!

```
ui <- fluidPage(
  titlePanel("Test of Correlation"),
  withMathJax(),
  "Power (also called true positive rate, hit rate, sensitivity, or recall) is defined as $$1 - \\beta$$
  It is the probability of a statistical test to detect an efect of a given size. Therefore, designing an
  experiment to have a good chance to find an efect means making sure its power is high enough.
  High power is a necessary condition for valid inference. A high power value can be
  considered when the proportion of significant results is about 0.8 or higher.",
  hr(),
  fluidRow(
  column(2, numericInput("n", "Number of observations", 60, min = 10, max = 500, step = 1)),
  column(2, offset = 1, numericInput("s", "Standard deviation:", 15, min = 1, max = 100, step = .1)),
  column(2, offset = 1, numericInput("r", "Effect size:", .3, min = 0, max = 1, step = .01)),
  column(2, offset = 1, numericInput("rho0", "Null Hypothesis (H0):", .6, min = 0, max = 1, step = .01)),
  column(2, offset = 5, actionButton("goButton", "Calculate power")),
  column(10, offset = 0, verbatimTextOutput("results")),
  plotOutput("plotResults")
  )
)

corr <- function(n, s, r, rho0){
  pval <- replicate(2000, {
    sxy <- r*s*s
    x <- MASS::mvrnorm(n, mu = c(100, 100),
                       Sigma = matrix(c(s^2, sxy, sxy, s^2), 2
    z <- 1/2 * (log((1 + cor(x[, 1], x[, 2])) / (1 - cor(x[, 1
                log((1 + rho0) / (1 - rho0))) * sqrt(n - 3)
    2*pnorm(-abs(z))
  })
}

server <- function(input, output){

  rv <- eventReactive(input$goButton,
                      corr(input$n, input$s, input$r, input$rh

  output$results <- renderPrint({
    data2 <- rv() < 0.05
    input$goButton
    isolate(
      cat("The sample size of", input$n, "is suficient to dete
          input$r, "from de null hypothesis (H0 =", input$rho0
    )
  })

  output$plotResults <- renderPlot({
    input$goButton
    data <- rv()
```

Test of Correlation

Power (also called true positive rate, hit rate, sensitivity, or recall) is defined as $1 - \beta$. It is the probability of a statistical test to detect an efect of a given size. Therefore, designing an experiment to have a good chance to find an efect means making sure its power is high enough. High power is a necessary condition for valid inference. A high power value can be considered when the proportion of significant results is about 0.8 or higher.

Number of observations 60

Standard deviation: 15

Effect size: 0,3

Null Hypothesis (H0): 0,6

Calculate power

```
The sample size of 60 is suficient to detect a deviation of 0.3 from de null hypothesis (H0 = 0.6 ) with a power of 0.831
```