

Applied Statistics Seminar Series: R Shiny

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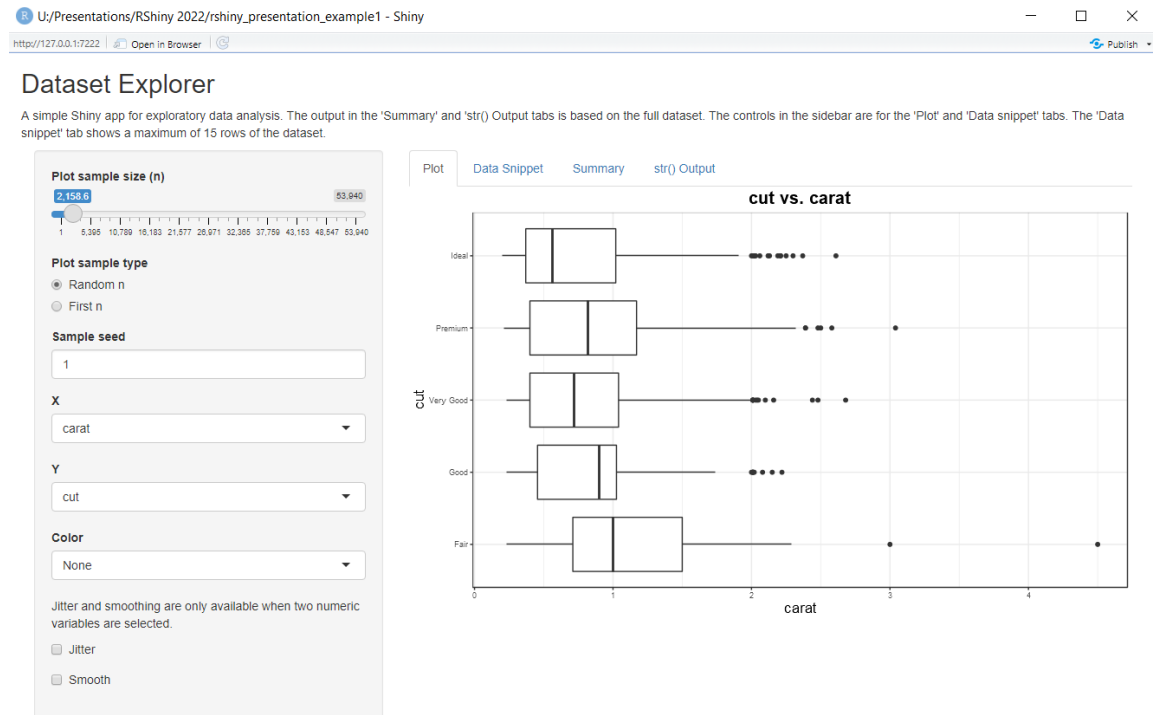
What is R Shiny?

- An R package that makes it easy to turn your analyses into interactive web apps using R
- Needs no knowledge of HTML, CSS, or Javascript

Why use Shiny?

Why use Shiny?

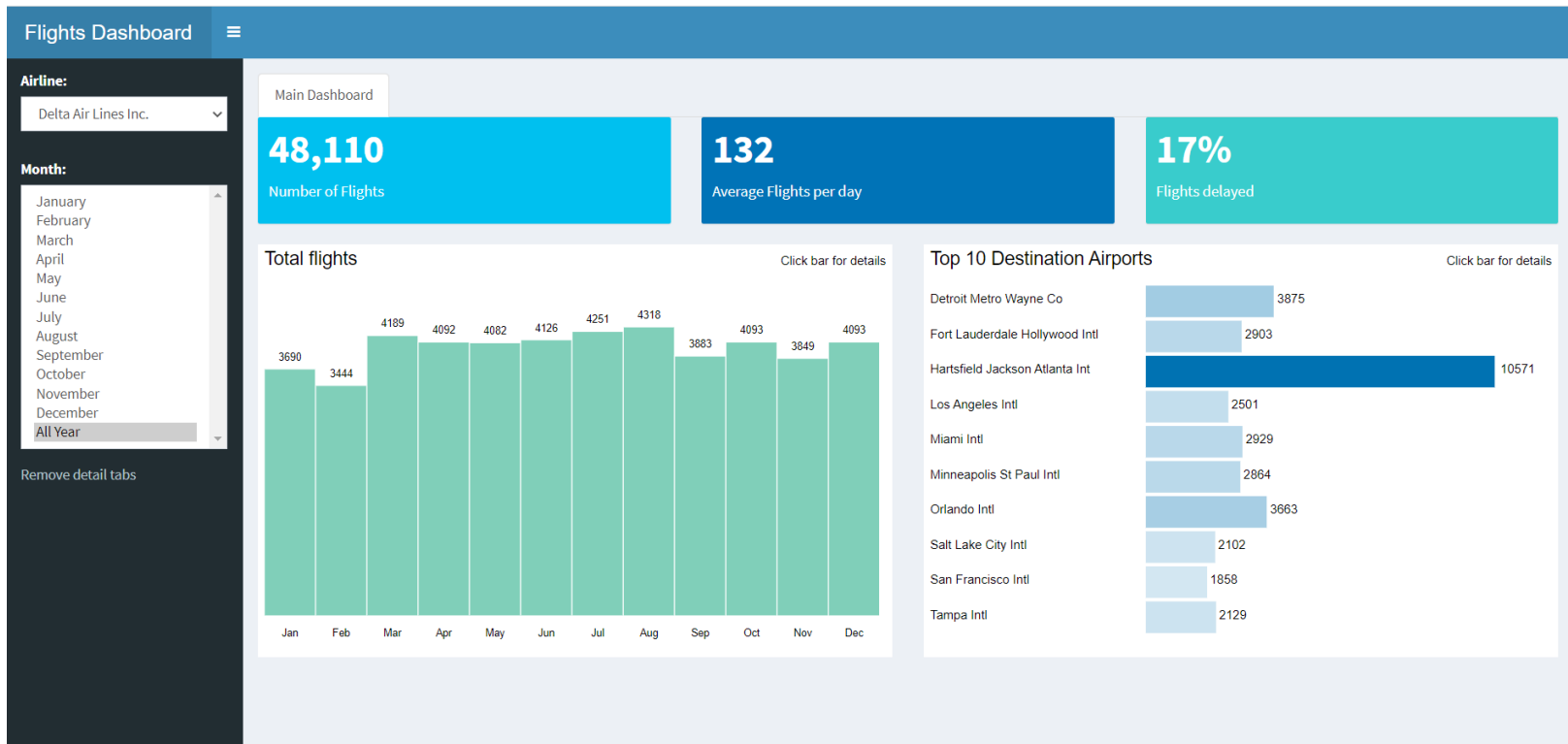
- Exploratory Data Analysis



<https://www.r-bloggers.com/2020/12/a-shiny-app-for-exploratory-data-analysis/>

Why use Shiny?

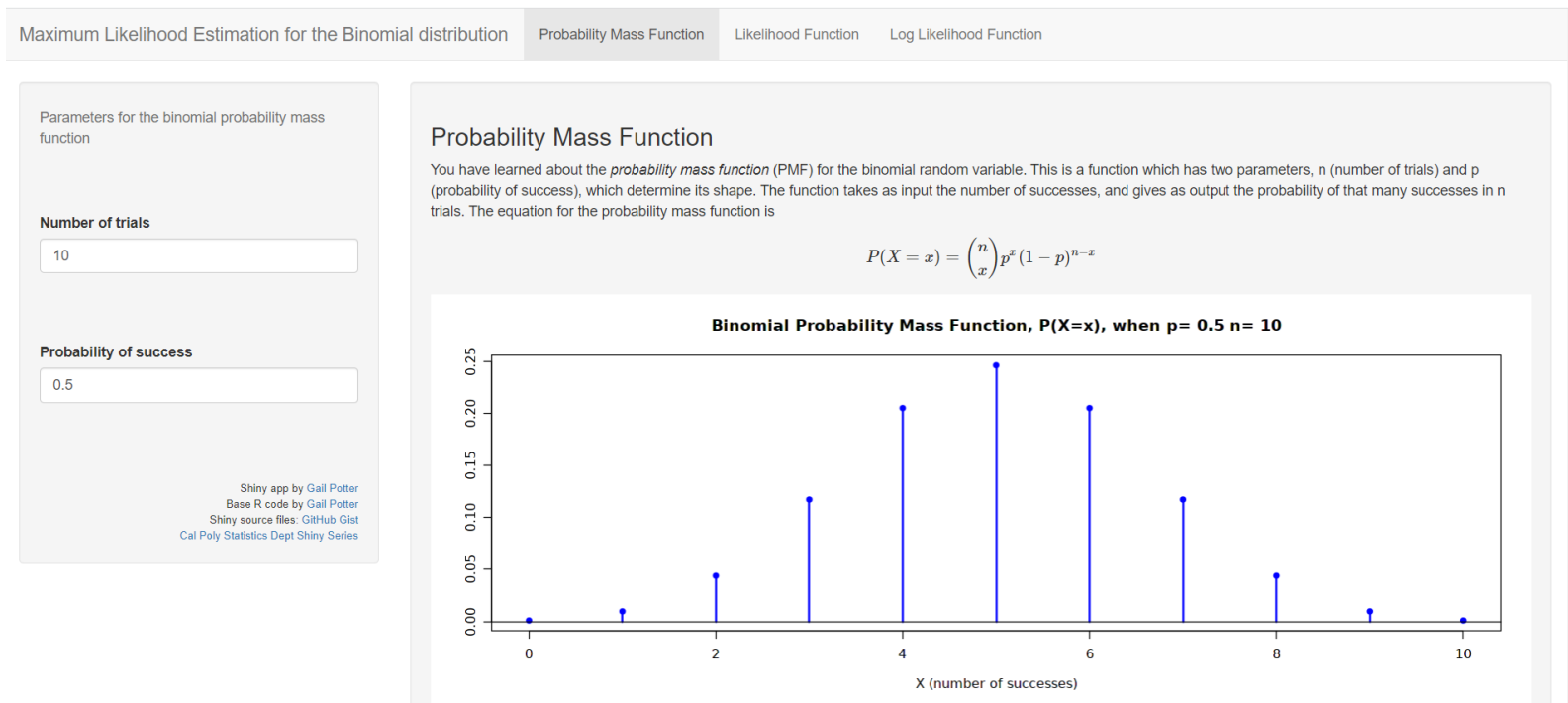
- Dashboards



<https://edgarruiz.shinyapps.io/db-dashboard/>

Why use Shiny?

- Teaching statistics



http://shiny.calpoly.sh/MLE_Binomial/

Why use Shiny?

- Apps for your collaborators

GO MOMs - Estimated Study Visits

Participant ID

A9999

In Vitro Fertilization:

- No
 Yes

Is a date for the first date of the potential participant's LMP known?

- Yes
 No

LMP Date:

01/01/2021

Input gestational age from ultrasound

Weeks

10

Days

0

Ultrasound Date:

03/13/2022

Today's Date:

03/13/2022

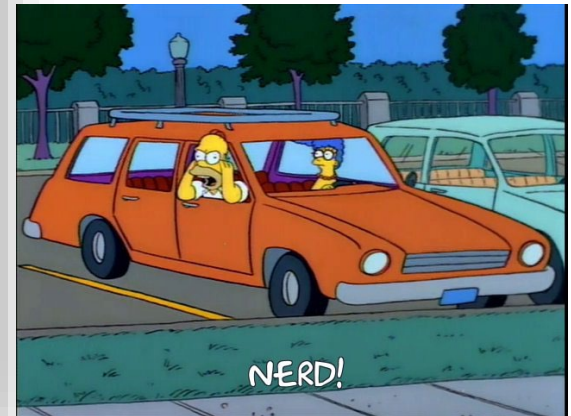
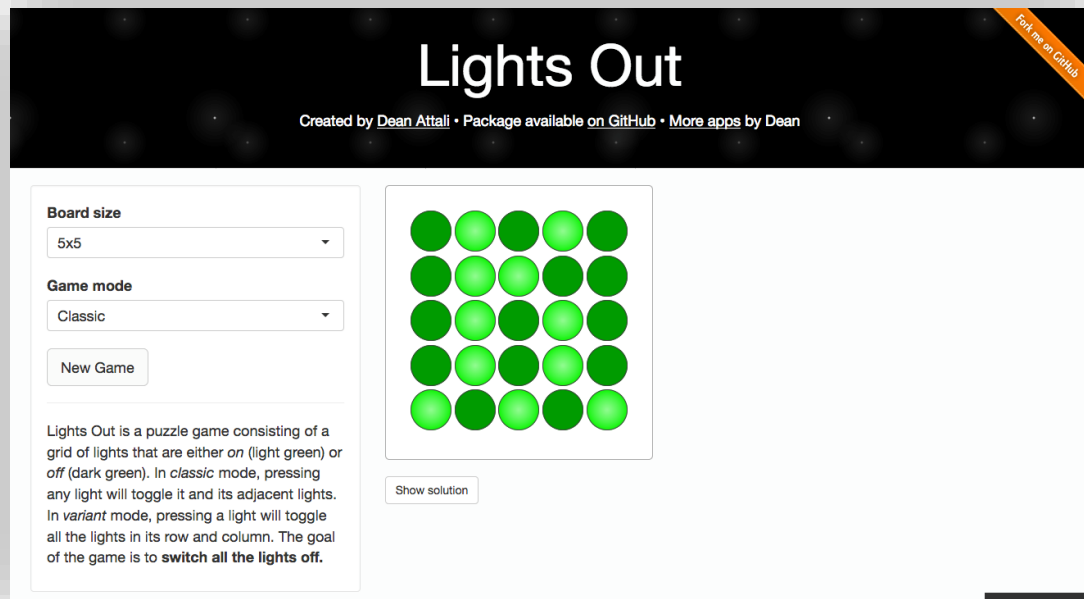
Gestational Age Today

Today's gestational age is 10 weeks and 0 days

Estimated delivery date (EDD)

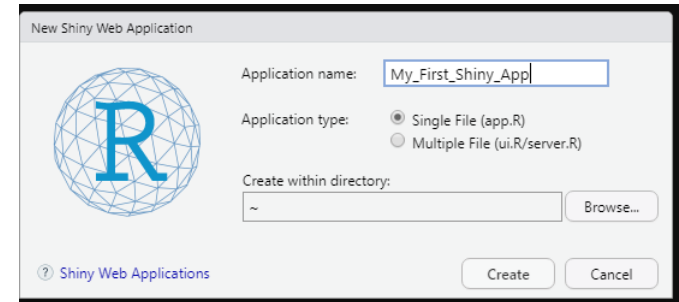
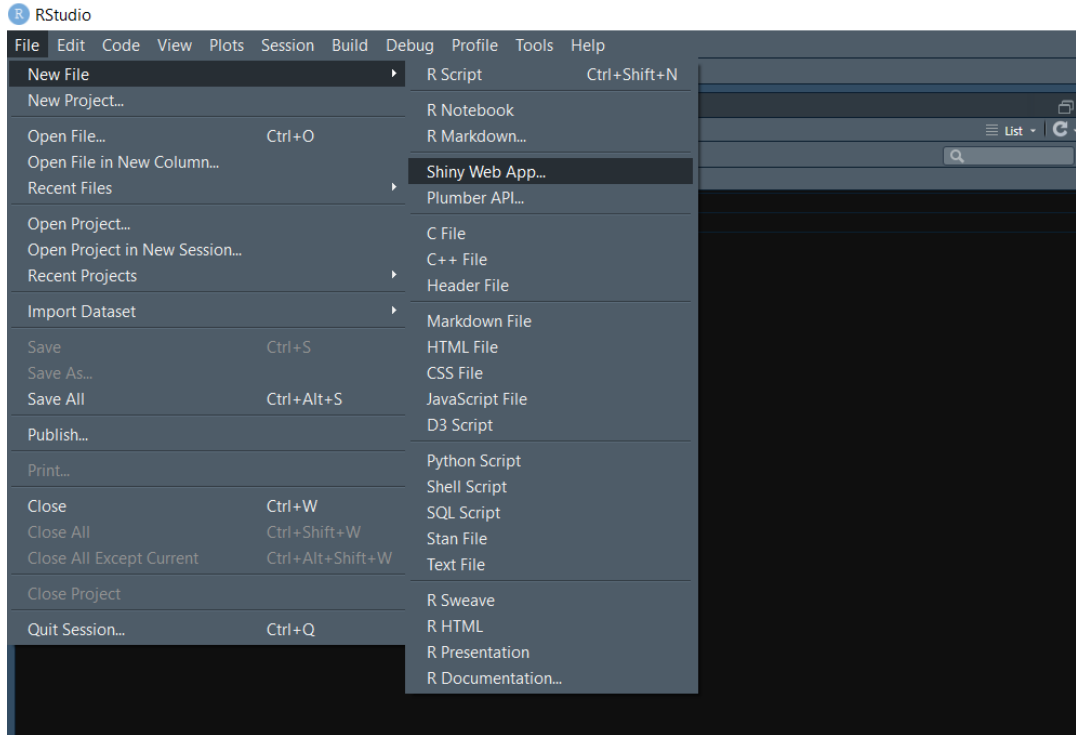
Why use Shiny?

- Fun!



<https://daattali.com/shiny/lightsout/>

Create your first Shiny app



Structure of a Shiny App

- 4 main parts to creating a Shiny app:
 - `library(shiny)`
 - `ui <- fluidPage()`
 - `server <- function(input, output) {}`
 - `shinyApp(ui = ui, server = server)`

Structure of a Shiny App

- `library(shiny)`

This loads the shiny package

Structure of a Shiny App

- `ui <- fluidPage()`

This defines the user interface, which is the HTML webpage that you will create and interact with

Structure of a Shiny App

- `server <- function(input, output) {}`

This specifies the behavior of the app.

This is where all of the behind the scenes machinery of the app lives that will get calculated, plotted, analyzed, etc.

Structure of a Shiny App

- `shinyApp(ui = ui, server = server)`

This creates a shinyApp object that can then be run and output as an HTML webpage.

Shiny Resources

- Shiny Cheat Sheet
 - <https://shiny.rstudio.com/images/shiny-cheatsheet.pdf>
- Mastering Shiny
 - <https://mastering-shiny.org/index.html>

GO MOMs



GO MOMs

- Glycemic Observation and Metabolic Outcomes in Mothers and Offspring
- Prospective, observational study involving an anticipated 2150 participants across 9 study sites
- 4 study visits plus additional data collected at delivery and post partum

GO MOMs

- Study visit windows based on gestational age
 - 10 – 14 weeks
 - 16 – 20 weeks
 - 24 – 28
 - 32 – 36 weeks gestation
- RAs across 9 study sites need to quickly calculate gestational age, estimated delivery date, and study visit windows for recruitment and scheduling of participants
- We created a Shiny app for this

GO MOMs Shiny App

- Inputs

- Participant ID
- In vitro fertilization
- LMP date (if available)
- Gestational age from ultrasound
- Ultrasound date
- Today's Date

- Outputs

- Gestational age today
- Estimated delivery date
- Date ranges for each study visit window
- Save output as .csv (optional)

GO MOMs - UI

GO MOMs Shiny App - ui

- Title

```
h1("GO MOMs - Estimated Study Visits",  
   style = "color:DarkMagenta")
```

- Typically you would use `titlePanel()` for the title of your app.
- This allowed for more customization

GO MOMs Shiny App - ui

- Input ID

```
textInput("id",  
          "Participant ID",  
          value="A9999")
```

GO MOMs Shiny App - ui

- In vitro fertilization

```
radioButtons("in_vitro",  
            "In Vitro Fertilization:",  
            c("No", "Yes"))
```

GO MOMs Shiny App - ui

- Conditional Panels
- We want additional inputs to appear, conditional on the answer of the In Vitro Fertilization radio button

```
conditionalPanel(  
  condition = "input.in_vitro == 'No' ",  
  .  
  .  
  .  
)
```


GO MOMs Shiny App - ui

- Input gestational age from ultrasound in terms of weeks and days

```
splitLayout(  
  numericInput("gestage_wks",  
    "Weeks",  
    value=1, min=0, max=40),  
  
  numericInput("gestage_days",  
    "Days",  
    value=0, min=0, max=6))  
,
```

GO MOMs Shiny App - ui

- Input Dates

```
splitLayout(  
  dateInput("ultrasound_dt",  
            "Ultrasound Date:",  
            value = "2021-01-01",  
            format="mm/dd/yyyy"),  
  dateInput("todays_dt",  
            "Todays Date:",  
            value = Sys.Date(),  
            format="mm/dd/yyyy")  
)
```

GO MOMs Shiny App - ui

- Output text for gestational age based on today's date

```
verbatimTextOutput("gest_age_today_text")
```

GO MOMs Shiny App - ui

- Output table (data frame)

```
fluidRow(  
  column(12, tableOutput('table'))  
)
```

GO MOMs Shiny App - ui

- Download button for saving results from the app

```
downloadButton("downloadData",  
              "Download study visit date ranges")
```

GO MOMs - Server

GO MOMs Shiny App - server

Takes inputs from ui as arguments into the output function below

```
output$dateText <- renderText({  
    .  
    .  
    .  
    edd = format(edd, "%m/%d/%Y")  
    paste("The study defined estimated due date is",  
          as.character(edd))  
})
```

GO MOMs Shiny App - server

Output a data frame of study visit windows

```
df.visits = reactive({  
    .  
    .  
    .  
    data.frame(ID, Visit, Earliest_Date, Latest_Date, EDD)  
})  
  
output$table <- renderTable(df.visits())
```


GO MOMs Shiny App - server

Save a data frame of study visit windows as a .csv file

```
output$downloadData <- downloadHandler(  
  filename = function() {  
    paste("study_visits_id_",  
          input$id, ".csv", sep = "")  
  },  
  content = function(file) {  
    write.csv(df.visits(), file, row.names = FALSE)  
  }  
)
```

Share your app: One possible approach

- Upload to Gist
 - Gist is a product of Github
 - A way to anonymously post and share files online
- To share your app as a gist:
 - Copy and paste your app.R files to the Gist web page.
 - Copy the URL that GitHub gives the Gist.
 - Once you have made a gist, your users can launch the app with

```
shiny::runGist("12345ABCDEF", launch.browser=T)
```
 - Where “12345ABCDEF” is the unique number that appears at the end of your Gist address

Thank you!