Modularizing your Shiny Code

a tale of much debugging

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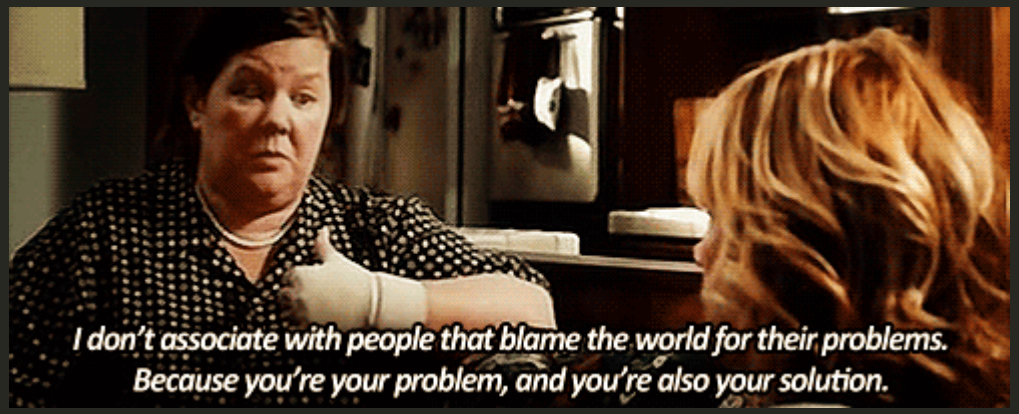
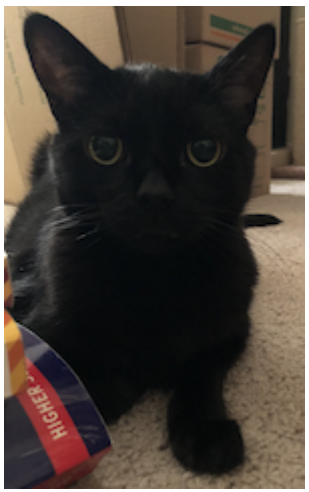
second subtitle: how I came to fix everything I broke in the first place



Who am I?

- Content Quality Analyst @ DataCamp
- Lives in NYC (formerly Chicago, New Orleans, and Michigan)
- MS in Biostatistics from Louisiana State University
- BA in Film & Women's Studies from University of Michigan
- Data Scientist/Statistician for 4 years
- Proud human to one beautiful cat, Scully



Shiny Modules

What's a Shiny Module, Anyway?

- A smaller piece of a Shiny app that *cannot* be directly run as a Shiny app itself
- Can include input, output, or both
- Can be nested, reused, put into R packages
- Simple or complicated - up to you!
- More details can be found in the RStudio Shiny Documentation on Modules.

When Should I Be Modularizing My Shiny Code?

- When your `app.R` file gets cluttered and/or long
- If you're putting many different pieces (some disparate) into the same app
- As a personal challenge for Q4 at work to see if you can

Overview of DataCamp's Content Dashboard

Show what you know: DataCamp's Content Dashboard
* the login for this will not work for anyone who isn't an `admin` (works at DataCamp) or has an external login (an instructor)

- Inherited when I began on the Content Quality team in June 2018
- Side note: I learned Shiny by taking DataCamp courses on the Shiny Fundamentals with R Track
- Main app built by Dave Robinson
- Other parts of app *not* related to CQ are maintainted by other employees @ DataCamp

Example of Shiny Code That Needs Modularizing

```
897
898
899     callModule(content_dev, "content_dev", cd_quality_metrics = cd_quality_metrics)
900     callModule(content_eng, "content_eng",
901                ce_sct_metric_df = ce_sct_metric_df,
902                contribution_to_kpi_exercises = contribution_to_kpi_exercises)
903     callModule(base_images, "base_images", base_images_df = base_images_df)
904     callModule(content_mobile, "content_mobile") # don't do this: data is not passed in explicitly
905     callModule(projects_module_server, "content_projects", projects_data = projects_data)
906   }
907
908   shinyApp(ui, server)
```

Before I modularized the DataCamp Content team Shiny dashboard, our `app.R` file was 908 lines of code.

After Modularizing...

```
126
127     callModule(content_quality, "content_quality", content_quality_data = content_quality_data, asana_content_development_data,
128     callModule(content_dev, "content_dev", cd_quality_metrics = cd_quality_metrics)
129     callModule(content_eng, "content_eng",
130                ce_sct_metric_df = ce_sct_metric_df,
131                contribution_to_kpi_exercises = contribution_to_kpi_exercises)
132     callModule(base_images, "base_images", base_images_df = base_images_df)
133     callModule(content_mobile, "content_mobile") # don't do this: data is not passed in explicitly
134     callModule(projects_module_server, "content_projects", projects_data = projects_data)
135
136     #print("after the call modules")
137     #observe(print((reactiveValuesToList(input))))
138   }
139
140   shinyApp(ui, server)
```

However, after moving the CQ related info out into a module, the `app.R` file is only 140 lines of code - and far more manageable! *

* however, that 900 lines of code still exists in the module file - more on how to deal with that at the end of this talk!

Okay, So **How** Do I Modularize my Shiny Code?

- Take all of the code necessary for your part of the app and stick it in a new `.R` file
- New file needs a UI and a Server of its own!
- Be sure to namespace appropriately with `ns()` (more on this in a few slides)
- `callModule()` back in your main `app.R` file

Module UI Function(s)

- UI function should be a meaningful name suffixed with `Input`, `Output`, or `UI`
- Beginning of main UI function in `content_quality_module.R`:

```
content_quality_ui <- function(id) {

  ns <- NS(id)

  # then the rest of your UI code - tabSetPanel(), ...
}
```

- Needs to start with `ns <- NS(id)` in order to create a namespace function
- You aren't limited to only 1 UI function - my module has 2!

Module Server Function

- Also need to create a namespace in your server:

```
content_quality <- function(input, output, session,
                            content_quality_data,
                            asana_content_development_data,
                            is_admin) {

  # create namespace -----------------------------------
  ns <- NS("content_quality")

  # then the rest of the server code - much reactives + data
```

- Will then contain the rest of your usual server things: Output, tabs, filters, data, graphs, whatever your heart desires

callModule()

- Input:
  - module name
  - module namespace name
  - any datasets needed to work correctly
  - any reactive functions/objects needed to run (more on this soon)
- Call this inside of the server function in your `app.R` file:

```
callModule(content_quality, # name
       "content_quality", # namespace/id name
       content_quality_data = content_quality_data, # data
       asana_content_development_data, # data
       is_admin # reactive object
       )
```

- and maybe don't be like me and have named data + unnamed - ????

Debugging Your Shiny Module

You haven't used ns() enough

You're probably convinced you've wrapped enough of your `inputs` and `outputs` in an `ns()` function, so as to properly namespace them so they'll render in your app...

You probably haven't.

My biggest mistake? Not `ns()`-ing in my server function for the `inputs` and `outputs` present there, like this `dataTableOutput()` id that I missed:

```
output$admin <- renderUI({
  if (!is_admin()) {
    return(NULL)
  }

  box(title = "Logins",
      dataTableOutput(ns("instructor_logins")),
      width = NULL)
})
```

Search your module for `Input(`, `Output(`, and any `radioButtons()`, plus any other `inputs` and `outputs` you may have used in your specific app.

Reactive objects vs. Reactive functions

One major mistake I struggled with was when passing `is_admin` to my `call_module()` function:

```
callModule(content_quality,
           "content_quality",
           content_quality_data = content_quality_data,
           asana_content_development_data,
           is_admin)
```

I continually tried to pass `is_admin` inside of a call to `reactive()`, as if it were a reactive *function*.

However, `is_admin` is actually a reactive *object* in our code:

```
is_admin <- reactive({
  # is null, for local testing
  is.null(session$user) || session$user == "admin"
})
```

Be sure you're clear on the difference!

observe(print(reactiveValuesToList(input)))

This was a tip we picked up from Stack Overflow that, when combined with specific `print()` statements to let us know where we'd placed the code, would output all of the `inputs`, allowing us to see what was being passed successfully to the app.

```
callModule(content_quality,
           "content_quality",
           content_quality_data = content_quality_data,
           asana_content_development_data,
           is_admin)

# then some more modules

print("after the call modules")
observe(print((reactiveValuesToList(input))))
}
```

We moved this code progressively through the module & `app.R` files with appropriate print statements to match.

Ask for Help

- Seriously though, ask for help.
- I am lucky enough to work with Dave Robinson, who assisted me in modularizing and debugging this app, for which I am incredibly grateful
- Highly recommend Stack Overflow Shiny tag, RStudio Community, and Twitter as resources for assistance

How to get list of all output elements in R Shiny

2

1

How the get a list of reactive output elements?

what works without problems is: `observe(print(reactiveValuesToList(input)) )`

what doesn't work for reasons i don't understand is: `observe( print(reactiveValuesToList(output)) )`

For a large complex app, I am writing a smart code that in part A saves all reactivevalues and all inputs as `rds` files with `saveRDS` my `reactivevalues` are build this way; `values <- reactivevalues()`

Part B loads all these values with the use of readRDS. reactive `values$x` are reassigned and input$x are updated through for instance `updateTextinput(session, inputID, value)` , which for some weird reason also works for `selectInput` elements, but that is not relevant for the problem I face.

General Tips

Do Yourself a Favor and Add Code Headings

This is a general Shiny/R/life tip, but **do** add code headings to your module and/or Shiny app. I added them after modularizing and it actually changed my life.

Me after debugging this dashboard

Questions + my non-expert answers

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