Introduction to Dashboards

BMRN CSM: Building dashboards with R markdown

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`flexdashboard` = Dashboards using R Markdown (and Shiny)

Load the packages

```r
install.packages(c("tidyverse", "inspectdf",
                   "flexdashboard", "reactable"))
library(tidyverse)
library(inspectdf)
library(flexdashboard)
library(reactable)
```

Outline (1)

Recap `rmarkdown`

What belongs in a dashboard?

Layouts

- *Sidebars, Columns, and Rows*
- *Multiple Pages, Tabs*

Themes

- *Bootstrap themes*

Outline (2)

`inspectdf` package

- *graphs, syntax*

`reactable` package

- *table displays*

Examples with `shiny`

- *shiny reactivity*

Materials

Slides

https://mjfrigaard.github.io/intro-to-dashboards/Index.html

Exercises

RStudio Project

https://rstudio.cloud/project/2000287

`rmarkdown` = `YAML` + Markdown + R (or other languages)

What is RMarkdown?

Three technologies:

1) *Markdown* is a plain text markup language for capturing *human-readable* prose

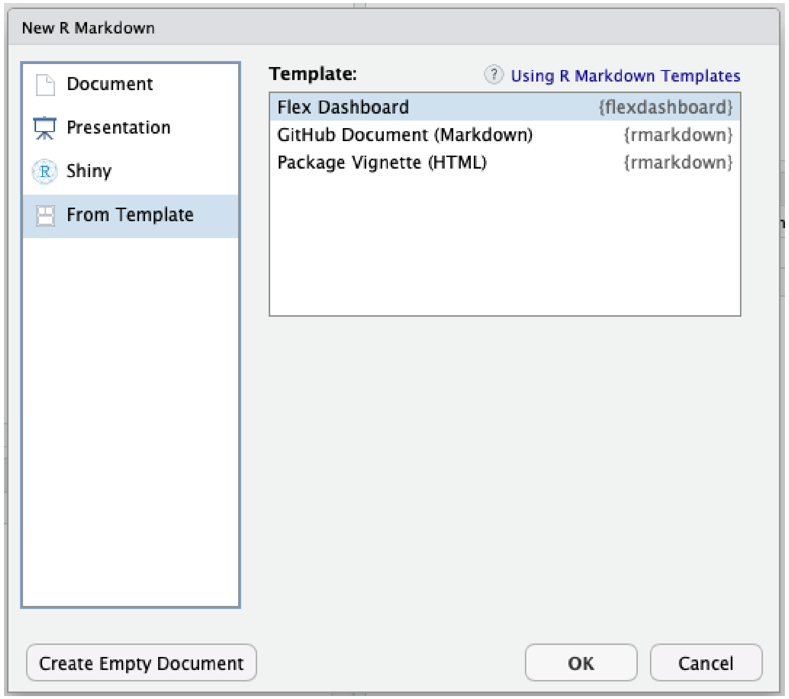
2) Data manipulation/graphing/statistical language engines for computing *machine-readable* code

3) Multiple *output options* for creating PDFs, Word docs, PowerPoints, HTML, etc.

Your Turn 1

Open a new R Markdown file

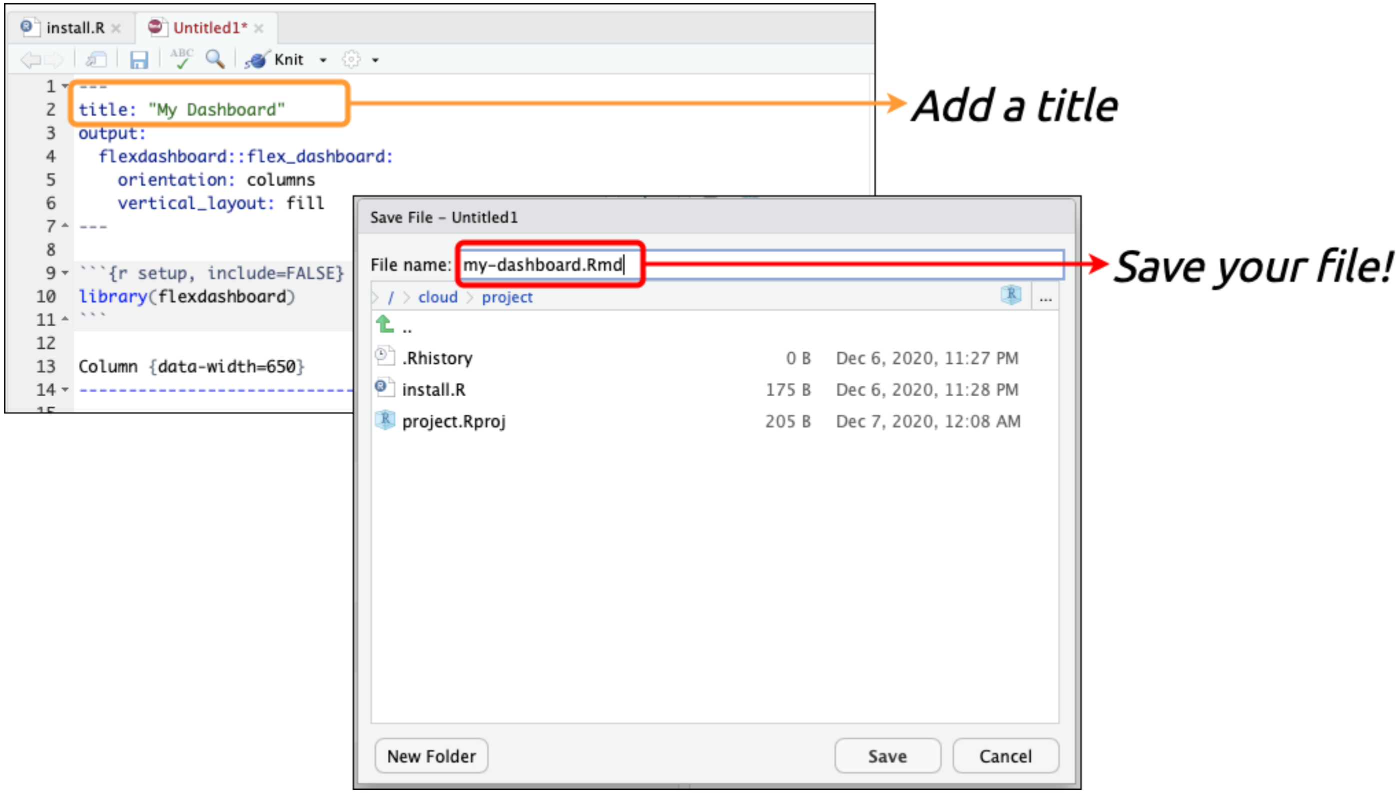
file > New File > R Markdown > From Template > `flexdashboard`


New R Markdown

Flex Dashboard {flexdashboard}
GitHub Document (Markdown) {rmarkdown}
Package Vignette (HTML) {rmarkdown}

Your Turn 2

Add title and save R Markdown file



~~~
---
title: "My Dashboard"
output:
  flexdashboard::flex_dashboard:
    orientation: columns
    vertical_layout: fill
---

```{r setup, include=FALSE}
library(flexdashboard)
```

Column {data-width=650}
-----------------------------
~~~

Add a title

File name: my-dashboard.Rmd

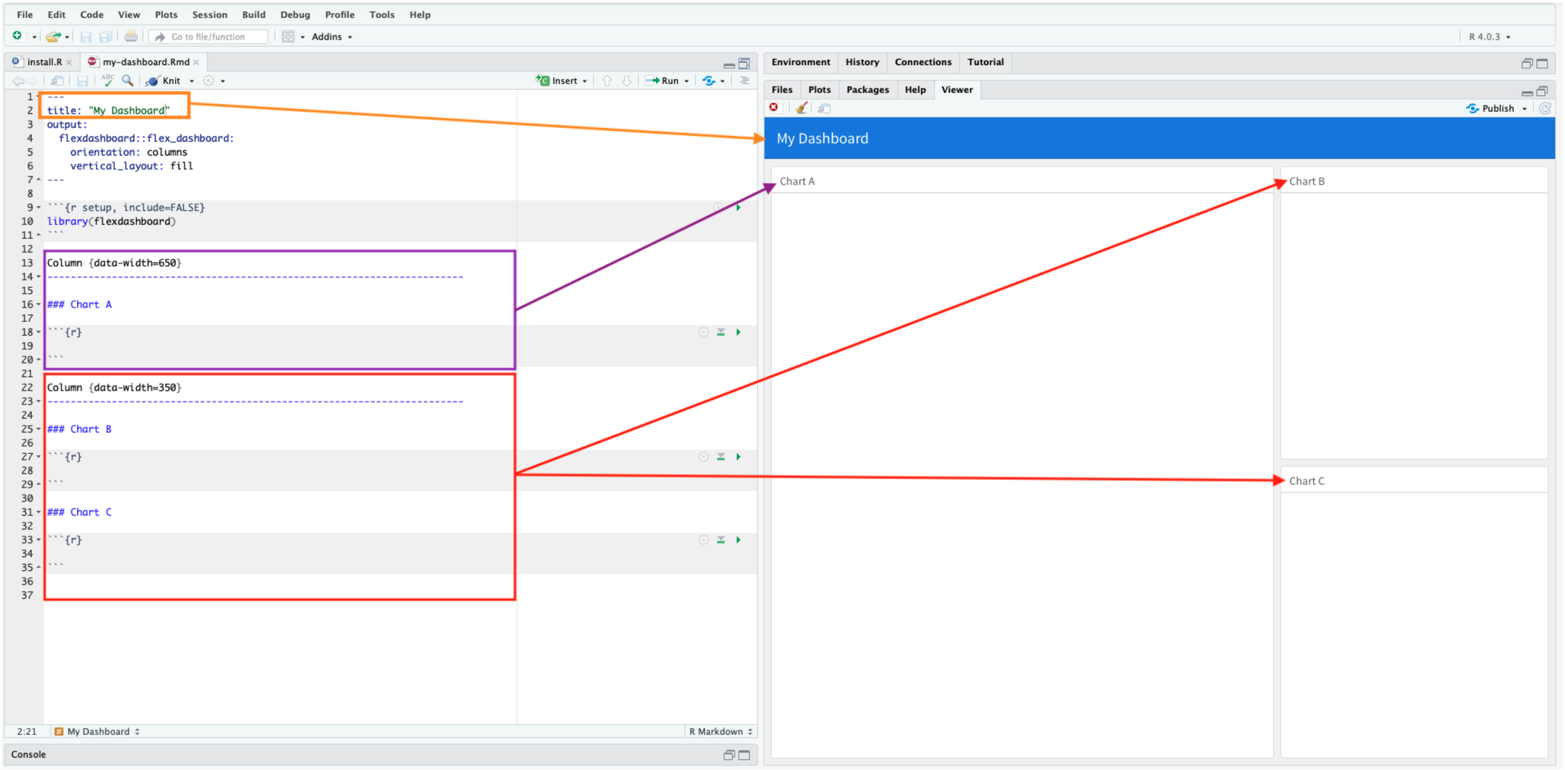
Save your file!

/ > cloud > project

..		
.Rhistory	0 B	Dec 6, 2020, 11:27 PM
install.R	175 B	Dec 6, 2020, 11:28 PM
project.Rproj	205 B	Dec 7, 2020, 12:08 AM

Your Turn 3

knit!



~~~
---
title: "My Dashboard"
output:
  flexdashboard::flex_dashboard:
    orientation: columns
    vertical_layout: fill
---

```{r setup, include=FALSE}
library(flexdashboard)
```

Column {data-width=650}
-----------------------------------------------------------------------

### Chart A

```{r}

```

Column {data-width=350}
-----------------------------------------------------------------------

### Chart B

```{r}

```

### Chart C

```{r}

```
~~~

What belongs in a dashboard?

> Dashboards are particularly common in **business-style reports**. They can be used to **highlight brief and key summaries of a report**. The layout of a dashboard is often grid-based, with components arranged in boxes of various sizes.

Dashboard Anatomy

The YAML header setting creates the dashboard:

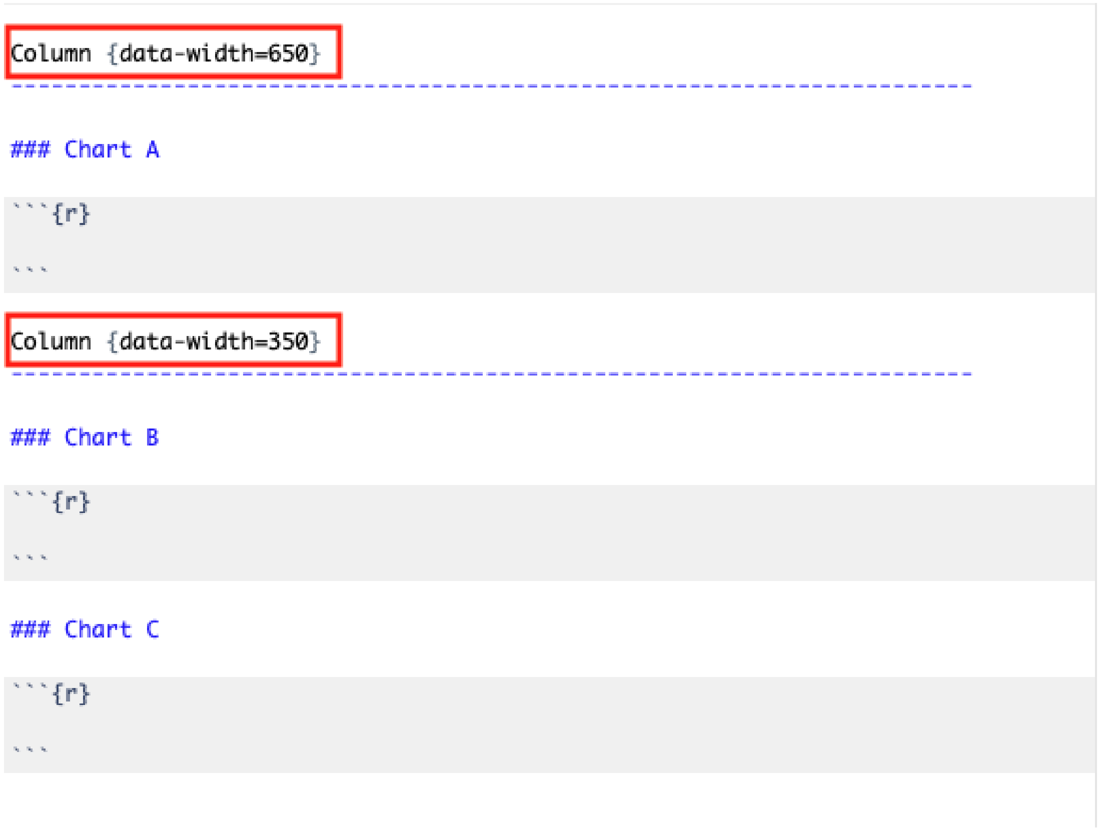
```
output:
  flexdashboard::flex_dashboard:
```

The layout is determined by the `orientation` and `vertical_layout` options.

```
    orientation: columns
    vertical_layout: fill
```

Column Widths

Column Widths must add up to `1000`



~~~
Column {data-width=650}
-----------------------------------------------------------------------

### Chart A

```{r}

~~~

Column {data-width=350}

Chart B

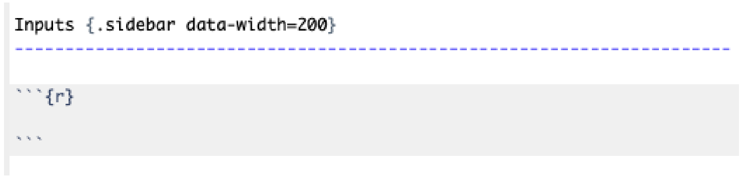
```{r}

```

Chart C

```{r}

```
```
```

Sidebars

Include a sidebar with `{.sidebar data-width=200}`



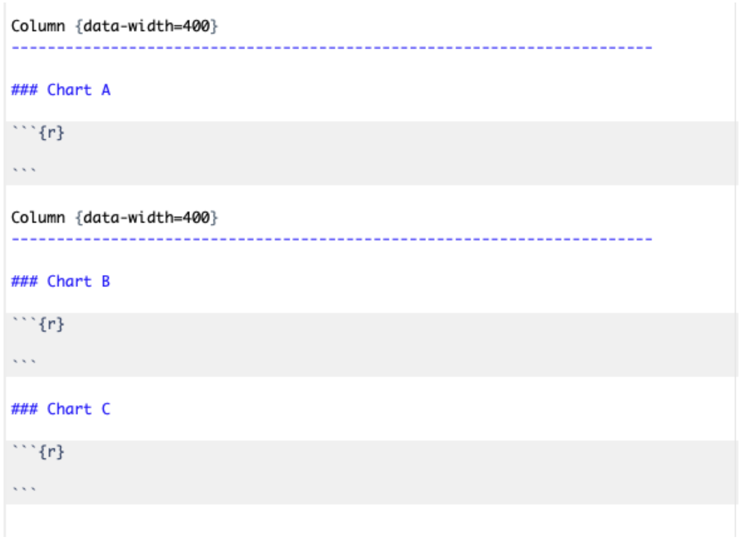
~~~
Inputs {.sidebar data-width=200}
-----------------------------------------------------------------------

```{r}

~~~
```

Adjust the column widths (set both to `{data-width=400}`)



```
Column {data-width=400}

Chart A

```{r}

```

Column {data-width=400}

Chart B

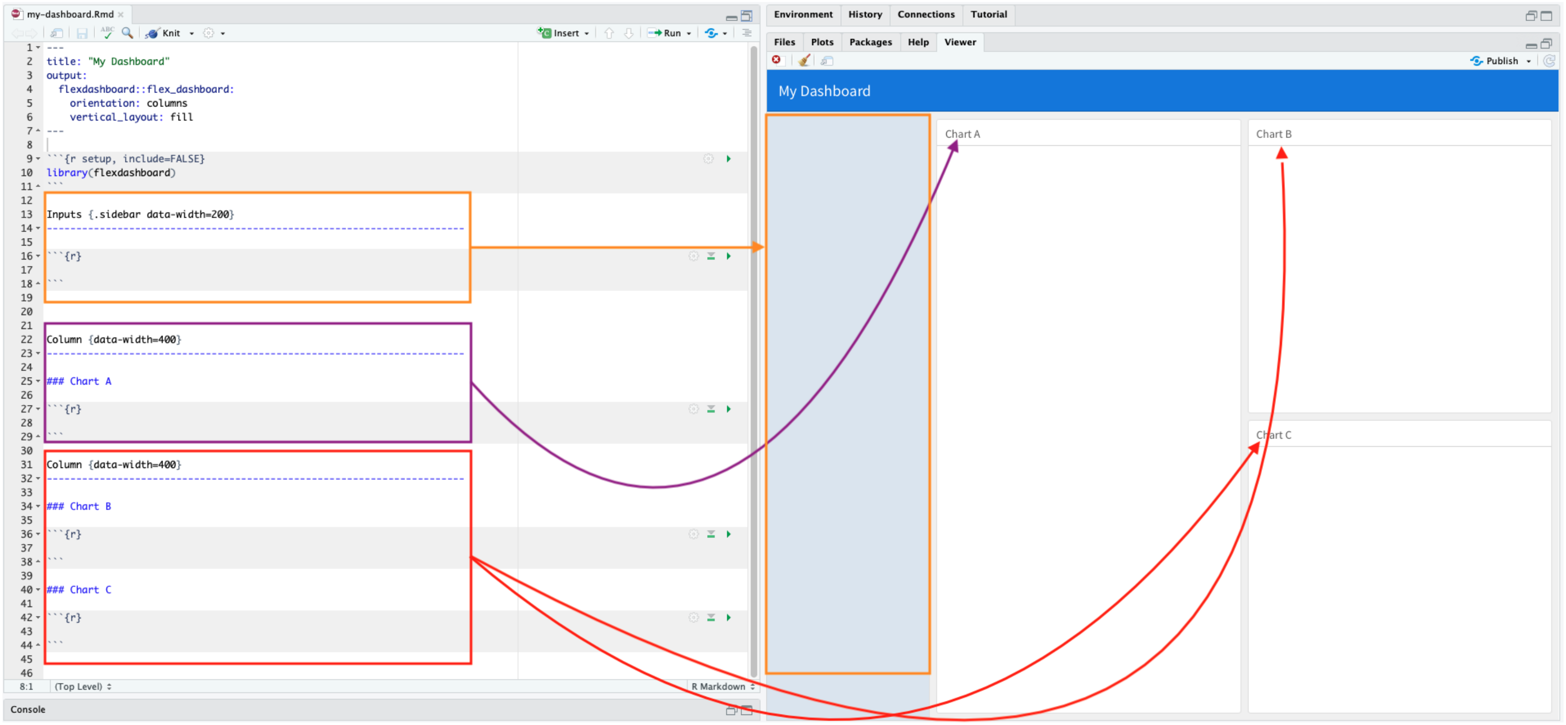
```{r}

```

Chart C

```{r}

```
```

## Knit!
```

Sidebars

Sidebars are typically used for data inputs and user-interface controls



~~~
---
title: "My Dashboard"
output:
  flexdashboard::flex_dashboard:
    orientation: columns
    vertical_layout: fill
---

```{r setup, include=FALSE}
library(flexdashboard)
~~~

Inputs {.sidebar data-width=200}

```{r}

```

Column {data-width=400}

Chart A

```{r}

```

Column {data-width=400}

Chart B

```{r}

```

Chart C

```{r}

```
```
```

Row Layout

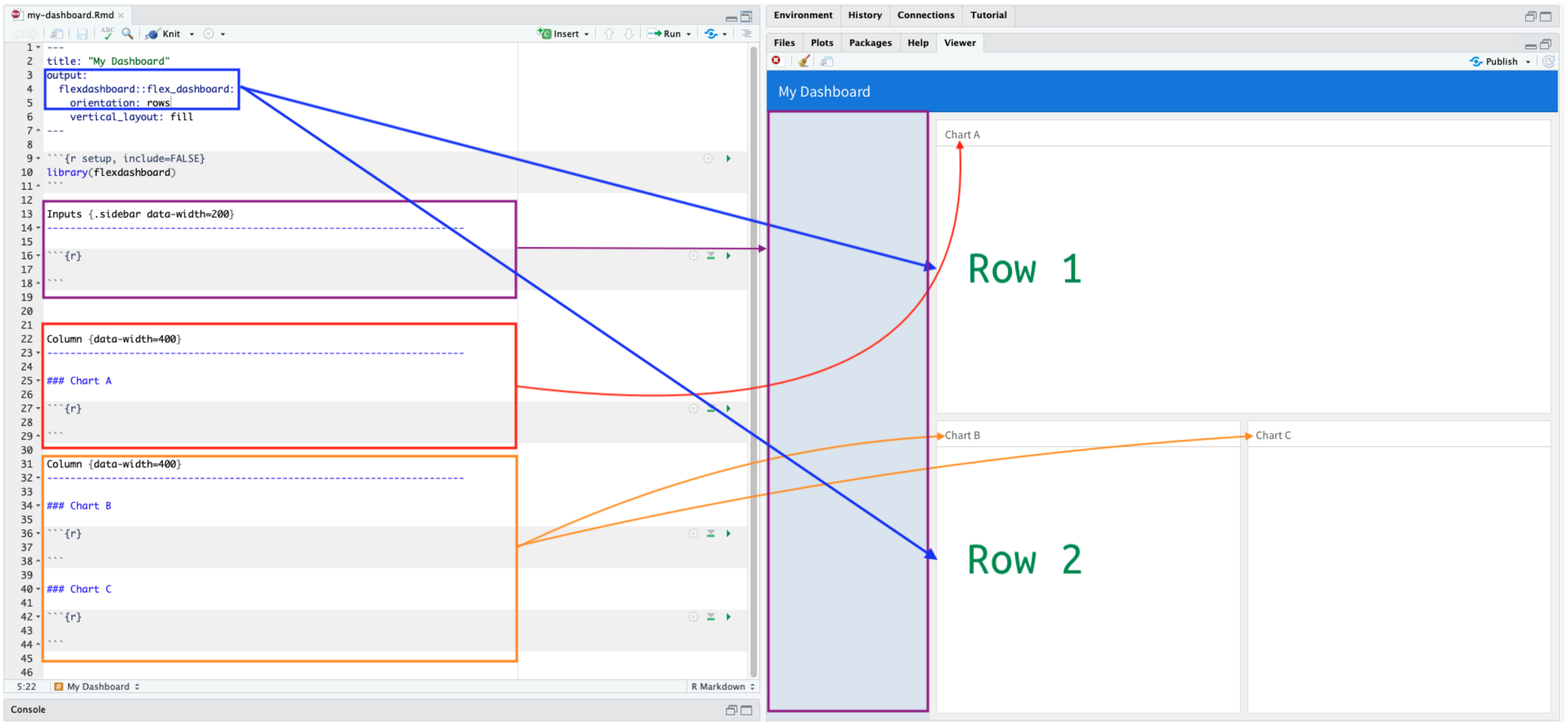
We can also orient by rows

Change the `orientation` of the dashboard

```
output:
  flexdashboard::flex_dashboard:
      orientation: columns
```

Re-knit!

Rows Layout



~~~
---
title: "My Dashboard"
output:
  flexdashboard::flex_dashboard:
    orientation: rows
    vertical_layout: fill
---

```{r setup, include=FALSE}
library(flexdashboard)
~~~

Inputs {.sidebar data-width=200}

```{r}

```

Column {data-width=400}

Chart A

```{r}

```

Column {data-width=400}

Chart B

```{r}

```

Chart C

```{r}

```

```
```

Scrolling

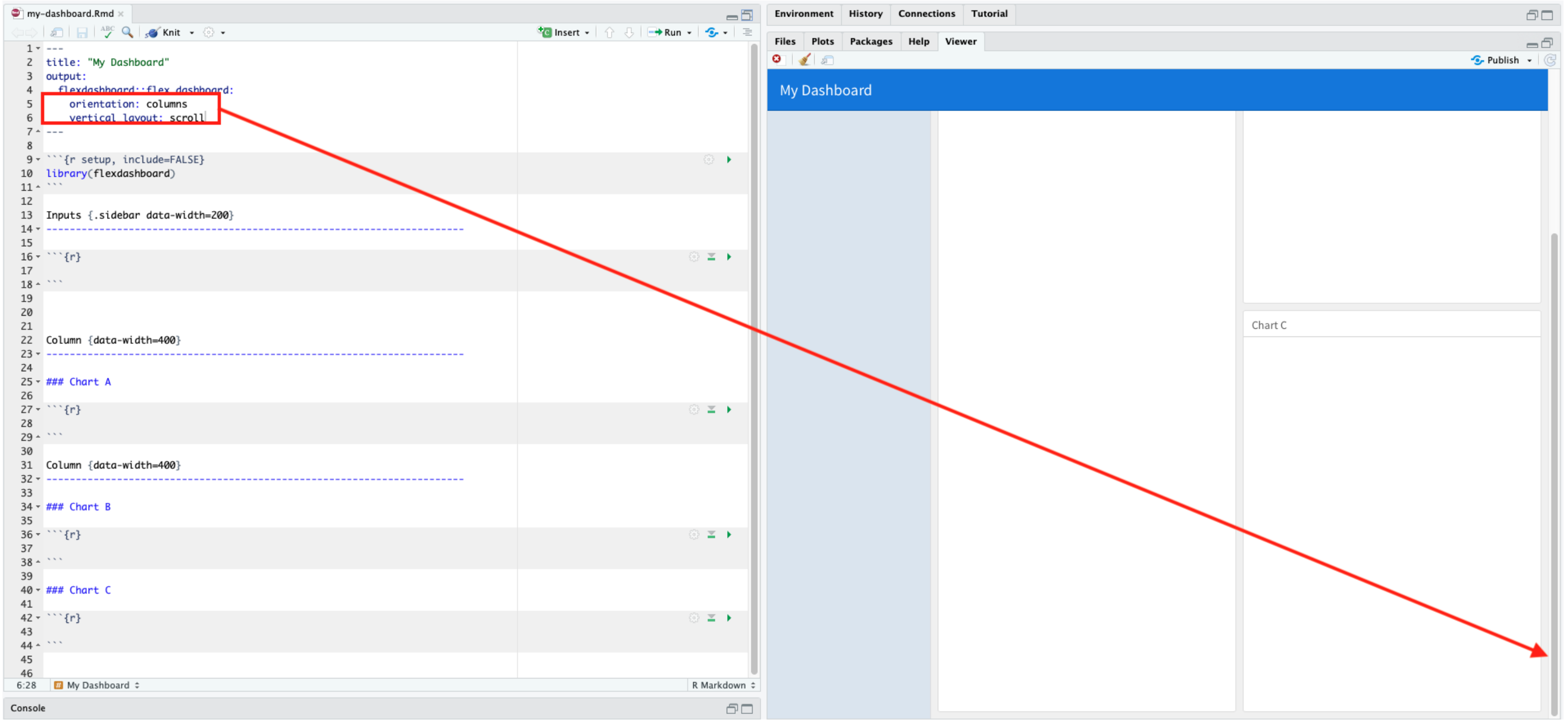
Change the `YAML` header back to `orientation: columns` and `vertical_layout: scroll`

```
    orientation: columns
    vertical_layout: scroll
```

Re-knit!

Scrolling

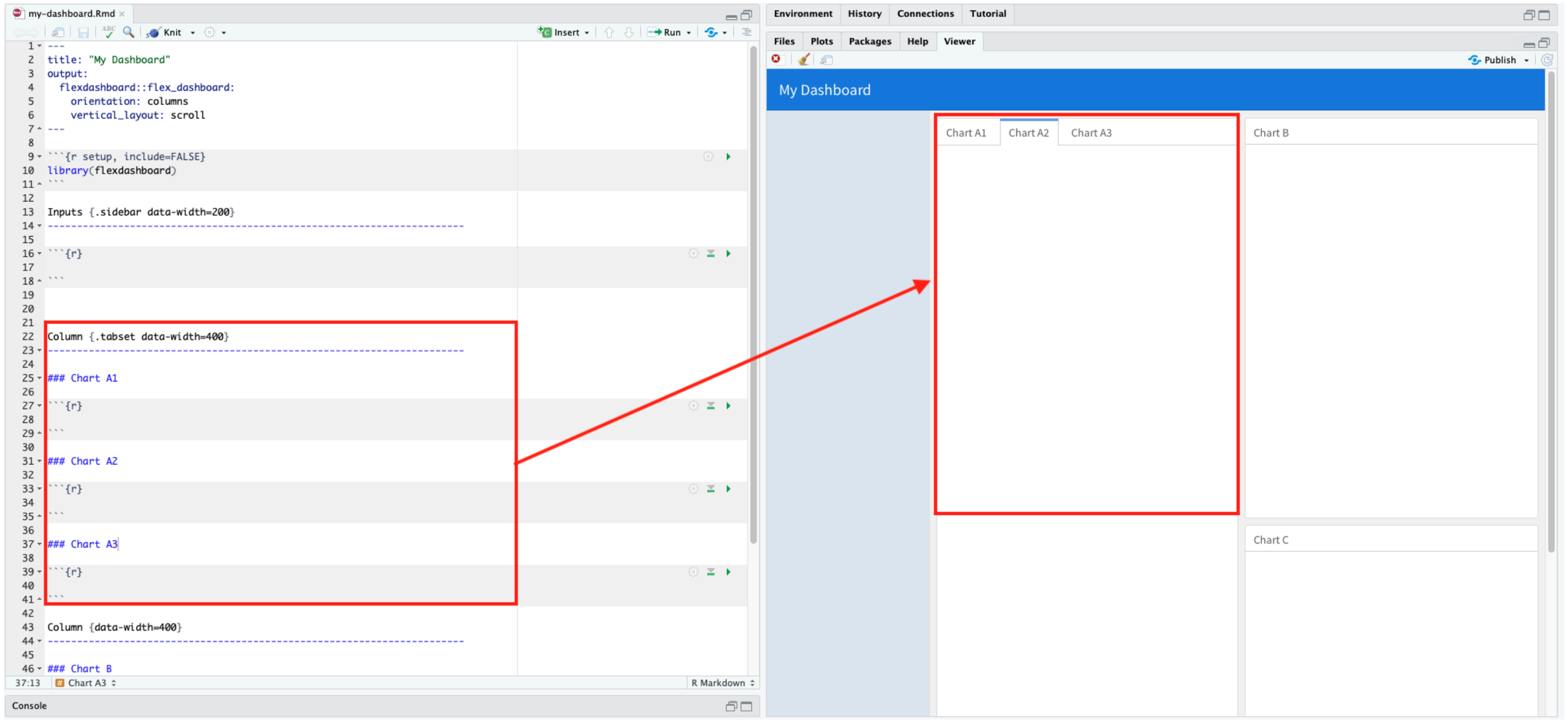
Now we can scroll past the end of the column.



~~~
---
title: "My Dashboard"
output:
  flexdashboard::flex_dashboard:
    orientation: columns
    vertical_layout: scroll
---

```{r setup, include=FALSE}
library(flexdashboard)
```

Inputs {.sidebar data-width=200}
-----------------------------------------------------------------------

```{r}

```



Column {data-width=400}
-----------------------------------------------------------------------

### Chart A

```{r}

```

Column {data-width=400}
-----------------------------------------------------------------------

### Chart B

```{r}

```

### Chart C

```{r}

```

~~~

Tabsets

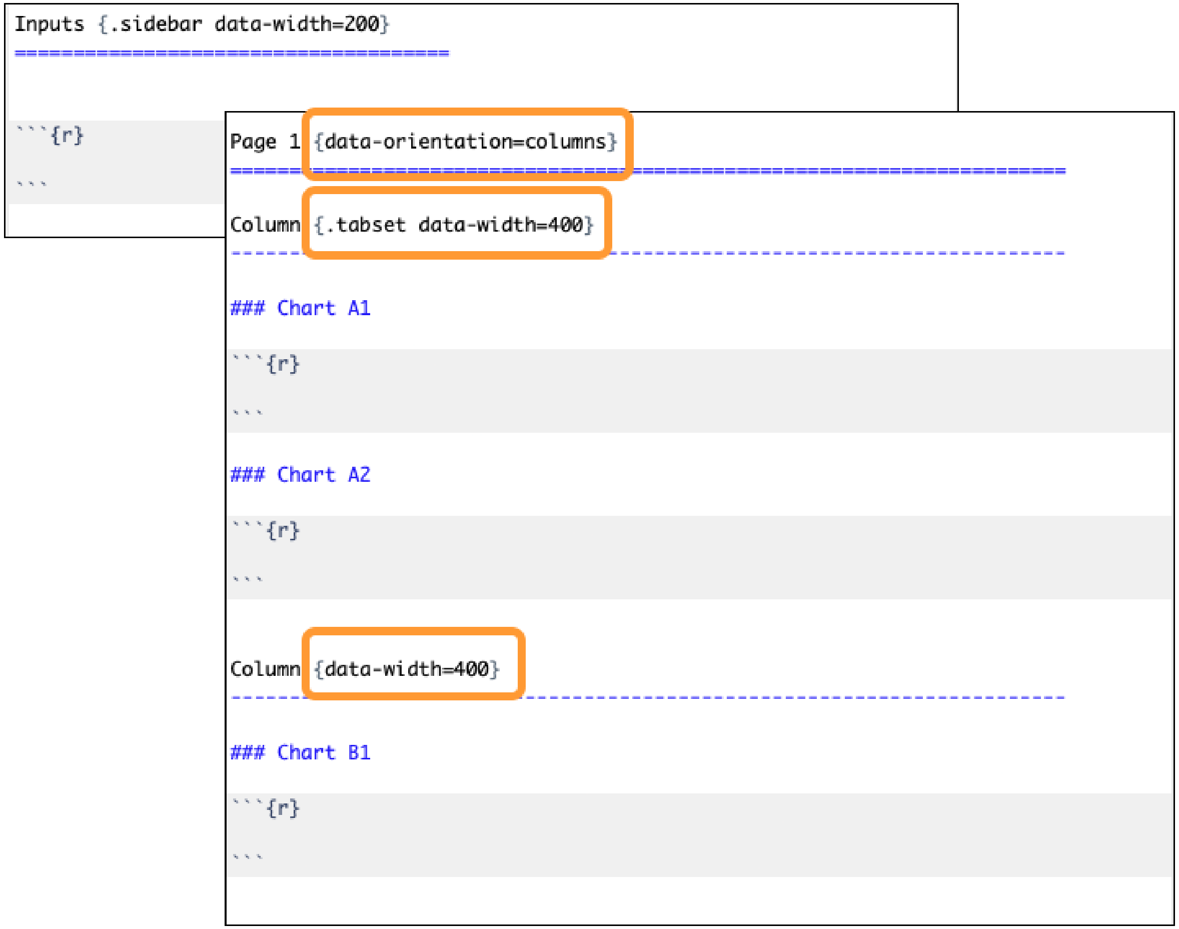
Add tabsets with `{.tabset}`



~~~
---
title: "My Dashboard"
output:
  flexdashboard::flex_dashboard:
    orientation: columns
    vertical_layout: scroll
---

```{r setup, include=FALSE}
library(flexdashboard)
```

Inputs {.sidebar data-width=200}
-----------------------------------------------------------------------

```{r}

```


Column {.tabset data-width=400}
-----------------------------------------------------------------------

### Chart A1

```{r}

```

### Chart A2

```{r}

```

### Chart A3

```{r}

```

Column {data-width=400}
-----------------------------------------------------------------------

### Chart B
~~~

Global Sidebar and Pages

For global settings, we use `=========` instead of `-----------`



~~~
Inputs {.sidebar data-width=200}
=====================================

```{r}

~~~
```

```
Page 1 {data-orientation=columns}
=====================================

Column {.tabset data-width=400}
-------------------------------------

### Chart A1

```{r}

```

Chart A2

```{r}

```

Column {data-width=400}

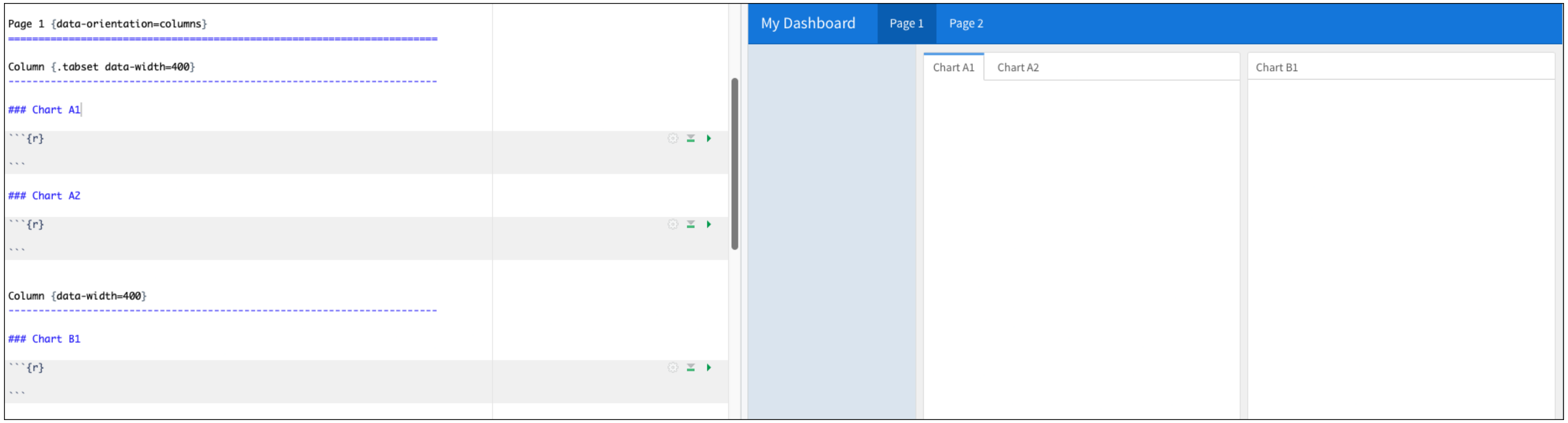
Chart B1

```{r}

```
```
```

Global Sidebar and Pages

`data-orientation=columns`

`.tabset`



~~~
Page 1 {data-orientation=columns}
=====================================================================

Column {.tabset data-width=400}
---------------------------------------------------------------------

### Chart A1

```{r}
~~~

Chart A2

```{r}
```

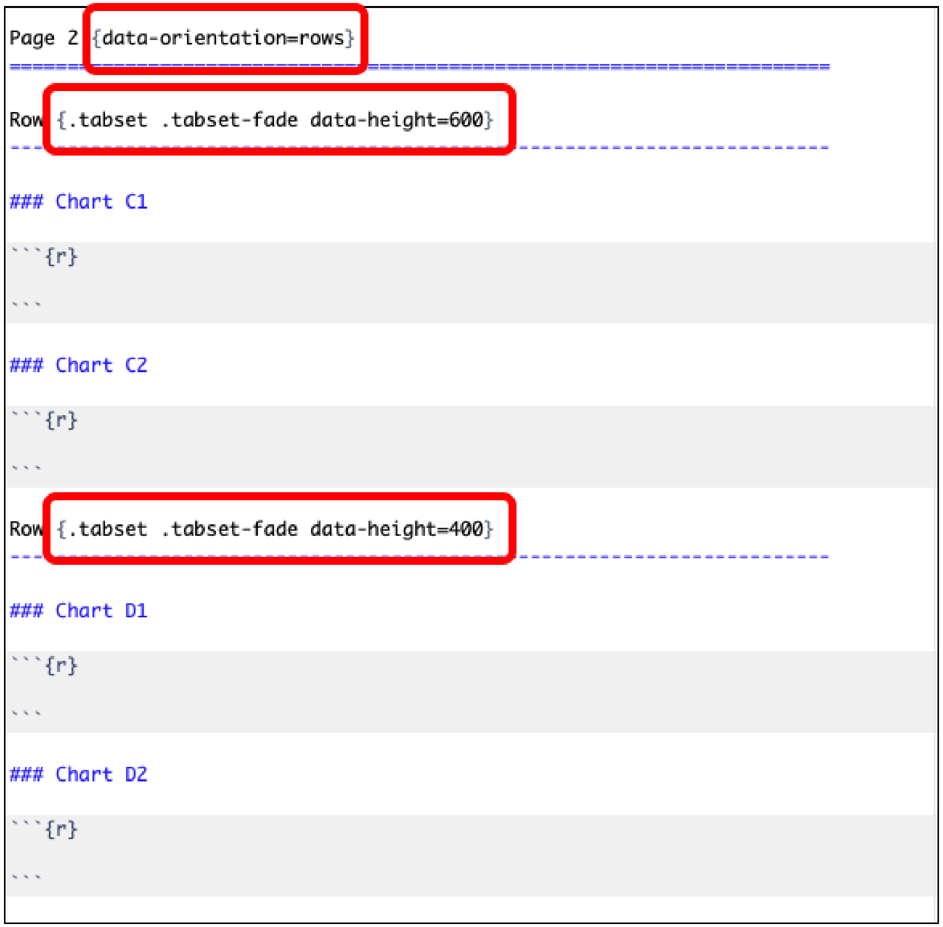
Column {data-width=400}

Chart B1

```{r}
```
```
```

Global Sidebar and Pages

For global settings, we use `=========` instead of `-----------`



~~~
Page 2 {data-orientation=rows}
==========================================================================

Row {.tabset .tabset-fade data-height=600}
--------------------------------------------------------------------------

### Chart C1

```{r}

~~~

Chart C2

```{r}

```

Row {.tabset .tabset-fade data-height=400}

Chart D1

```{r}

```

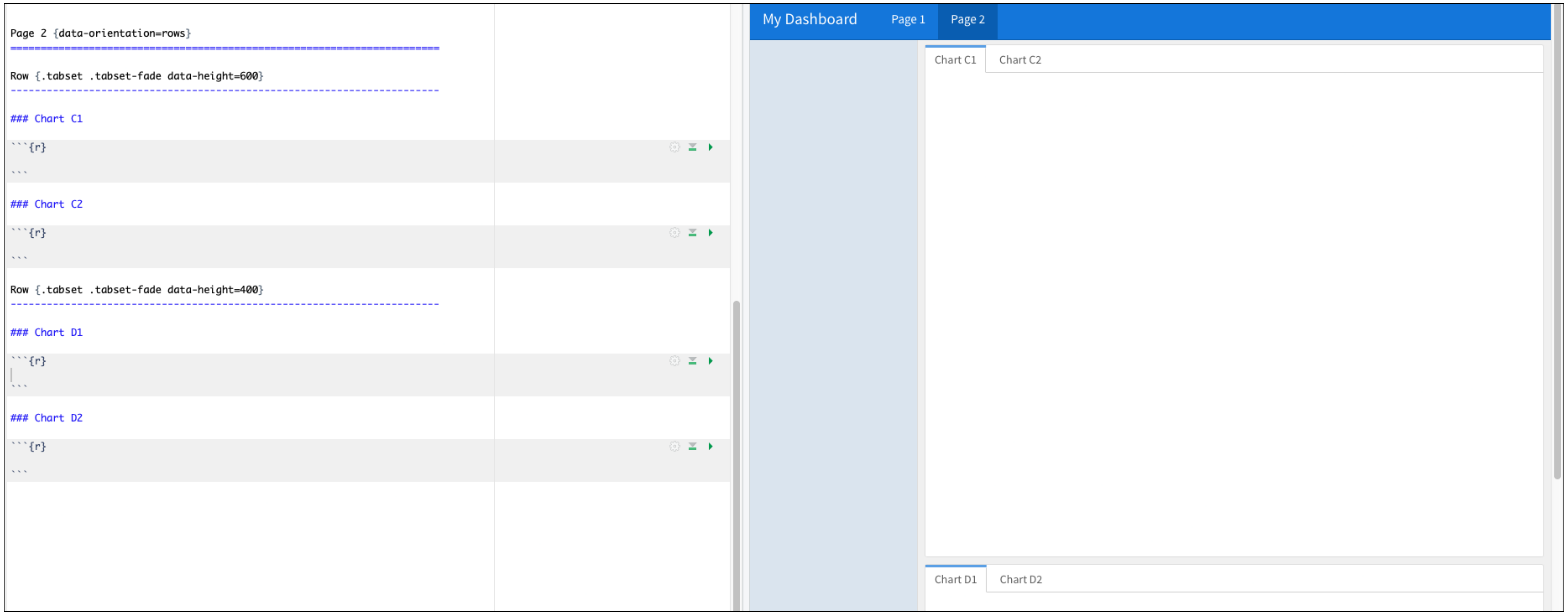
Chart D2

```{r}

```
```
```

Global Sidebar and Pages

`data-orientation=rows`

`.tabset-fade`



~~~
Page 2 {data-orientation=rows}
=====================================================================

Row {.tabset .tabset-fade data-height=600}
---------------------------------------------------------------------

### Chart C1

```{r}
~~~

Chart C2

```{r}
```

Row {.tabset .tabset-fade data-height=400}

Chart D1

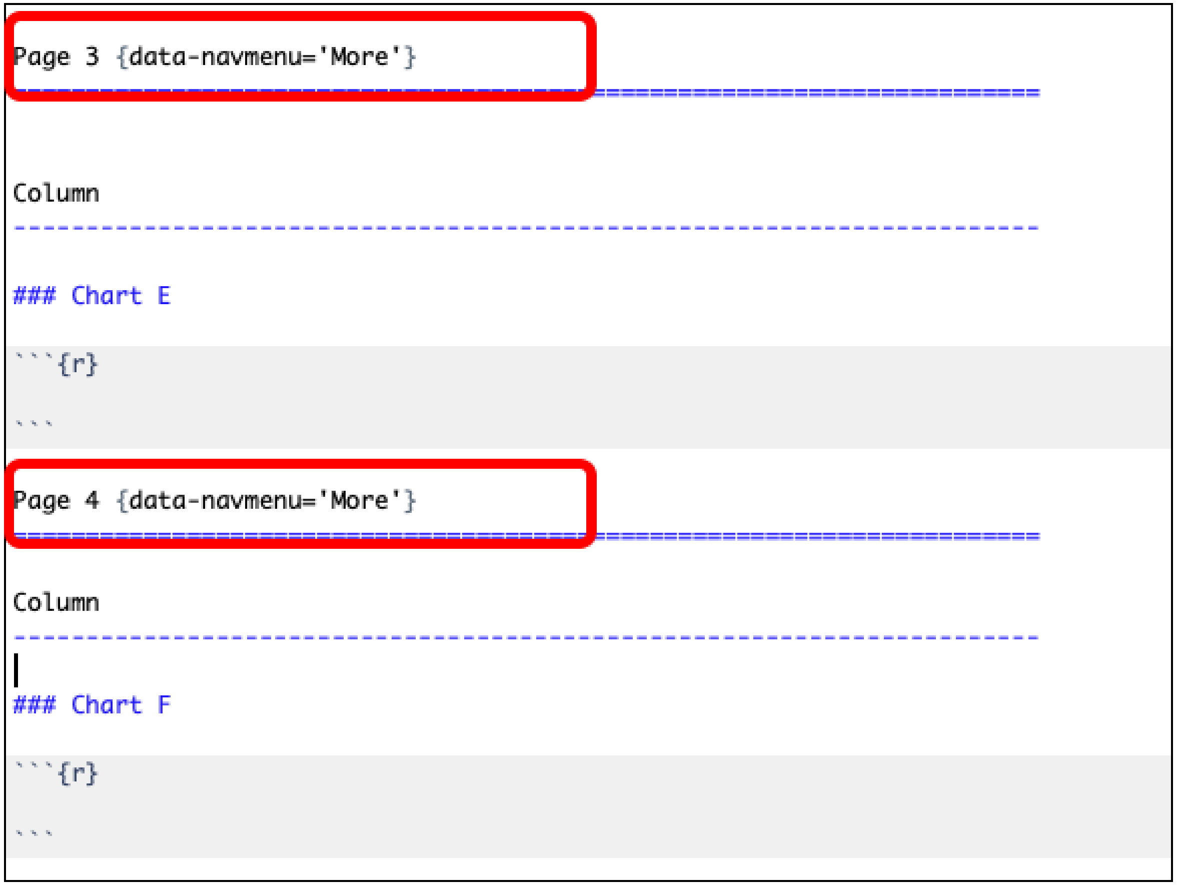
```{r}
```

Chart D2

```{r}
```
```
```

Menus

`data-navmenu=More`



~~~
Page 3 {data-navmenu='More'}
=====================================================================

Column
---------------------------------------------------------------------

### Chart E

```{r}

~~~

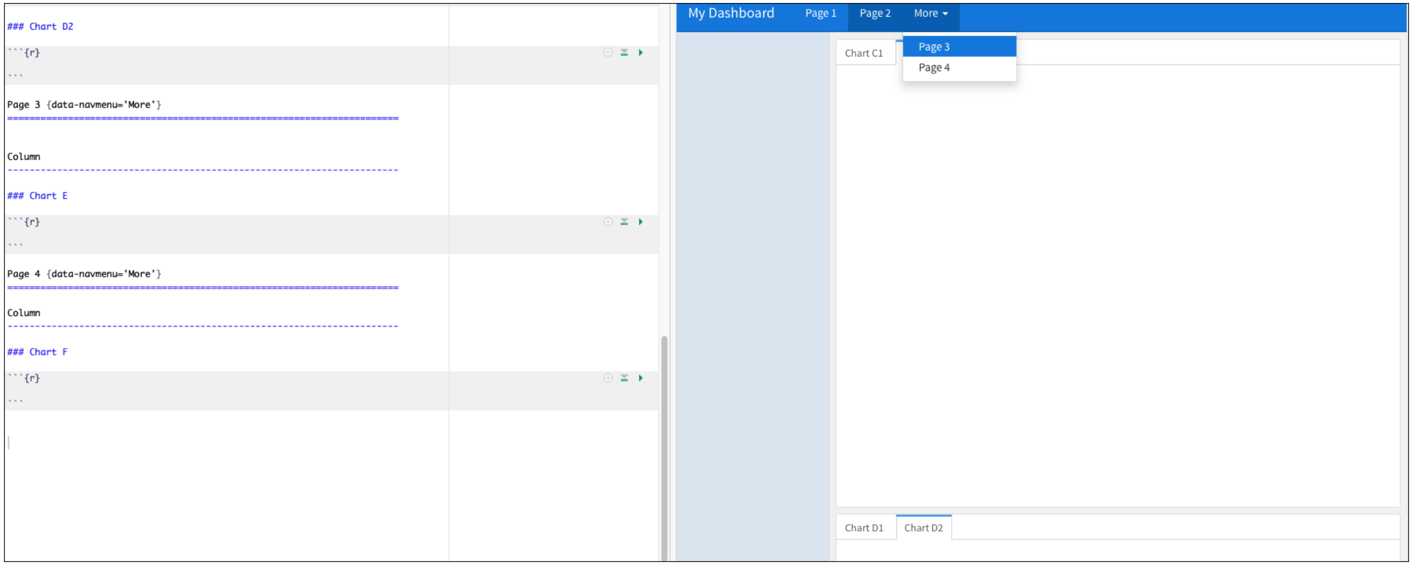
Page 4 {data-navmenu='More'}
===

Column

Chart F

```{r}

```
```
```

Menus



~~~
### Chart D2

```{r}

~~~

Page 3 {data-navmenu='More'}
===

Column

Chart E

```{r}

```

Page 4 {data-navmenu='More'}
===

Column

Chart F

```{r}

```
```
```

Themes

Change **`themes`** (just like **`html_document`**!)

```
title: "My Dashboard"
output:
  flexdashboard::flex_dashboard:
    theme: spacelab
```

See the website for more information

`inspectdf` = quicky examine datasets

Previous Slides: Apple Mobility Data

https://mjfrigaard.github.io/data-viz-as-comm/Index.html

Import Data

```
AppleMobRaw <- readr::read_csv("https://bit.ly/36tTVpe")
```

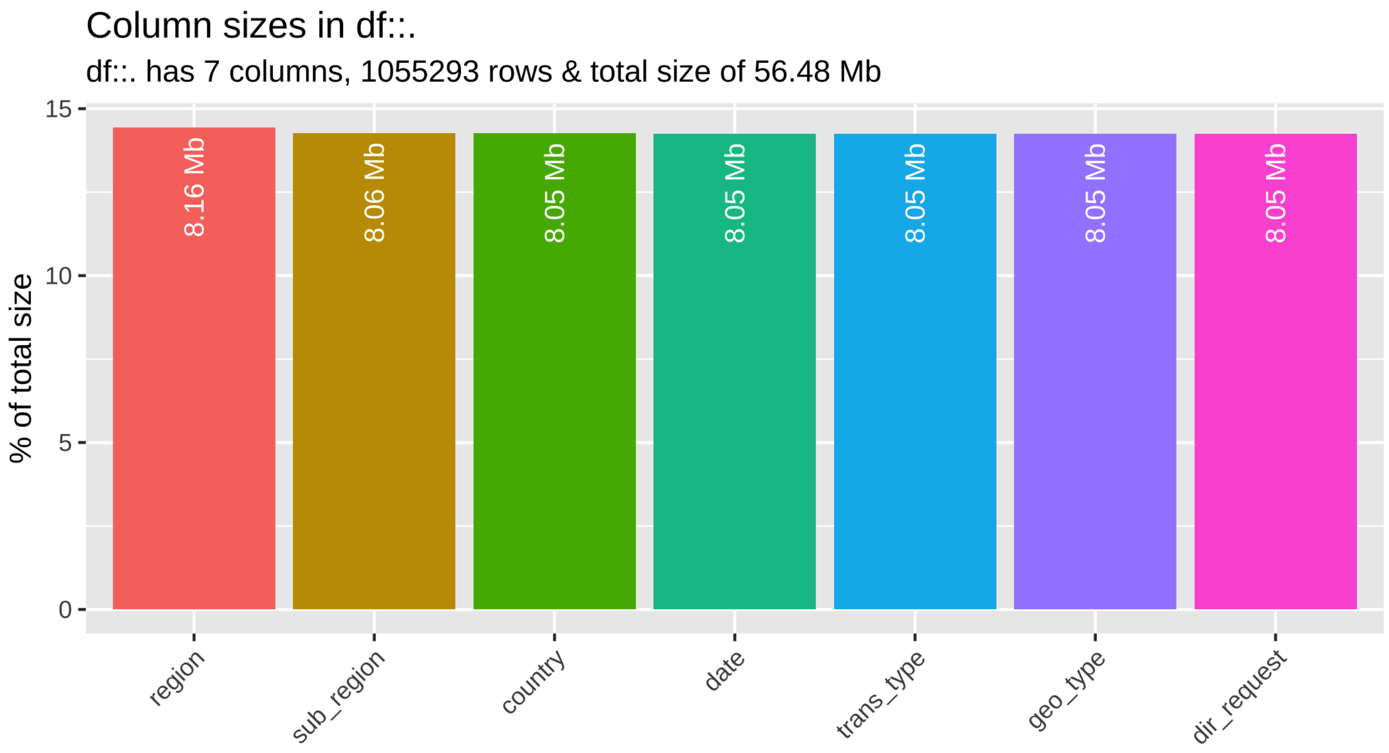
Previous Slides: Apple Mobility Data

Don't Forget Wrangling Steps!

```
AppleMobRaw %>%
  # transpose data
  tidyr::pivot_longer(cols = -c(geo_type:country),
    names_to = "date", values_to = "dir_request") %>%
    # remove missing country data
  dplyr::filter(!is.na(country) & !is.na(`sub-region`)) %>%
  # clean names
  janitor::clean_names() %>%
  # date
  mutate(date = lubridate::ymd(date)) %>%
  # create trans_type
  rename(trans_type = transportation_type) -> TidyApple
```

Dataset size in memory

```
TidyApple %>%
  inspectdf::inspect_mem() %>%
  inspectdf::show_plot(text_labels = TRUE)
```



Sidebar

Add the data to the `.sidebar`

Add the `import` and `wrangle` code to the sidebar in the dashboard.

```
# import ----
AppleMobRaw <- readr::read_csv("https://bit.ly/36tTVpe")
# wrangle ----
AppleMobRaw %>%
  # transpose data
  tidyr::pivot_longer(cols = -c(geo_type:country),
    names_to = "date", values_to = "dir_request") %>%
    # remove missing country data
  dplyr::filter(!is.na(country) & !is.na(`sub-region`)) %>%
  # clean names
  janitor::clean_names() %>%
  # date
  mutate(date = lubridate::ymd(date)) %>%
  # create trans_type
  rename(trans_type = transportation_type) -> TidyApple
```

Page 1, Column 1, Tab 1

Add the '`Memory Size`' Graph

Add this code to `A1`

```
TidyApple %>%
  inspectdf::inspect_mem() %>%
  inspectdf::show_plot(text_labels = TRUE)
```

Knit--how does it look?

Page 1, Column 1, Tab 2

Add the `Missing Data` Graph

Add this code to `A2`

```
TidyApple %>%
  inspectdf::inspect_na() %>%
  inspectdf::show_plot(text_labels = TRUE)
```

Knit--how does it look?

Page 1, Column 2, Tab 1

Add the `Categorical Data` Graph

Add this code to `B1`

```
TidyApple %>%
  select_if(is.character) %>%
  inspectdf::inspect_cat() %>%
  inspectdf::show_plot(text_labels = TRUE)
```

Knit--how does it look?

Page 1, Column 2, Tab 2

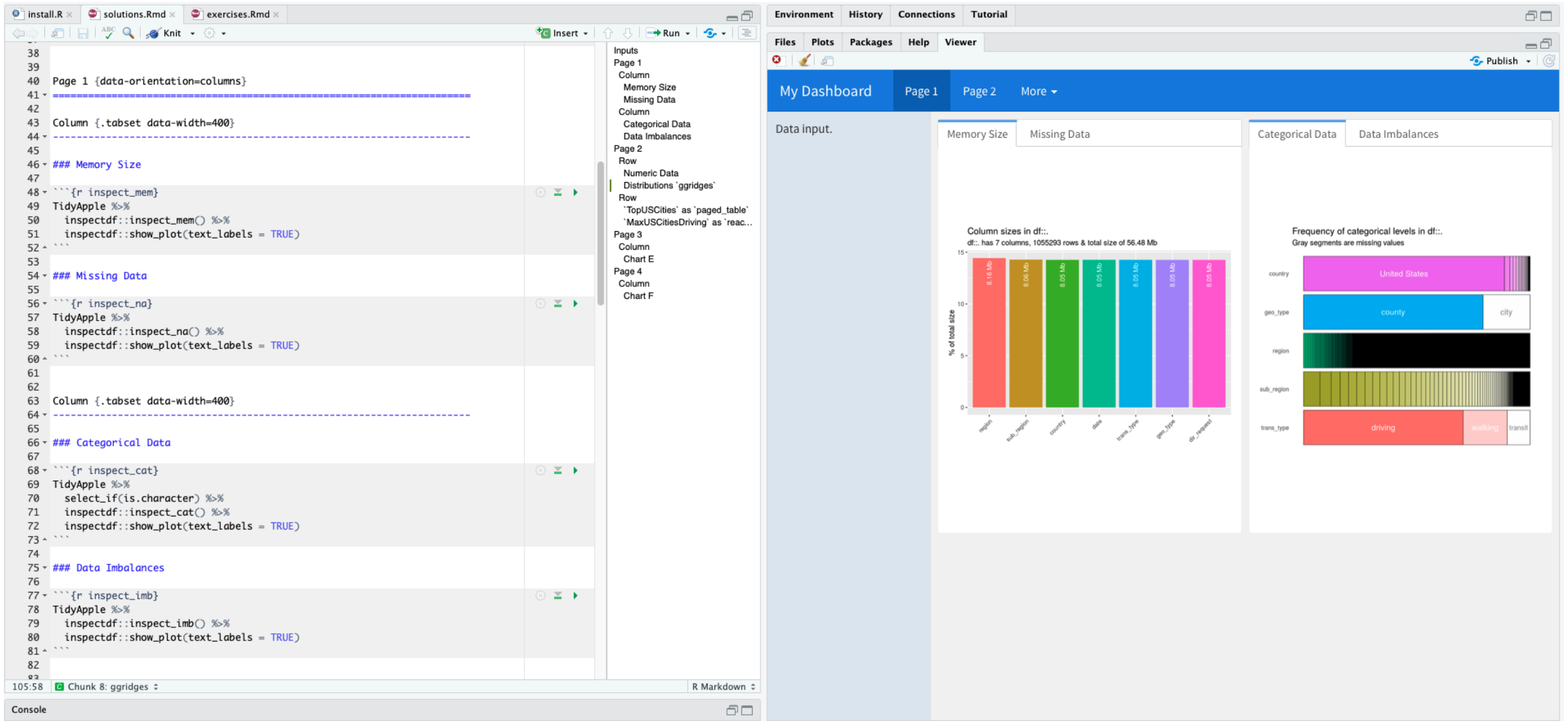
Add the `Data Imbalances` Graph

Add this code to `B2`

```
TidyApple %>%
  inspectdf::inspect_imb() %>%
  inspectdf::show_plot(text_labels = TRUE)
```

Knit--how does it look?

Page 1



~~~
Page 1 {data-orientation=columns}
=====================================================================

Column {.tabset data-width=400}
---------------------------------------------------------------------

### Memory Size

```{r inspect_mem}
TidyApple %>%
  inspectdf::inspect_mem() %>%
  inspectdf::show_plot(text_labels = TRUE)
```

### Missing Data

```{r inspect_na}
TidyApple %>%
  inspectdf::inspect_na() %>%
  inspectdf::show_plot(text_labels = TRUE)
```


Column {.tabset data-width=400}
---------------------------------------------------------------------

### Categorical Data

```{r inspect_cat}
TidyApple %>%
  select_if(is.character) %>%
  inspectdf::inspect_cat() %>%
  inspectdf::show_plot(text_labels = TRUE)
```

### Data Imbalances

```{r inspect_imb}
TidyApple %>%
  inspectdf::inspect_imb() %>%
  inspectdf::show_plot(text_labels = TRUE)
```
~~~

Page 2 (Rows)

```
Page 2 {data-orientation=rows}
========================================
```

Page 2, Row 1, Tab 1

Create a `.tabset/.tabset-fade` Row

```
Row {.tabset .tabset-fade data-height=600}
---------------------------------------------
```

Add `Numeric Data` Graph

```
TidyApple %>%
  select_if(is.numeric) %>%
  inspectdf::inspect_num() %>%
  inspectdf::show_plot(text_labels = TRUE)
```

Knit--how does it look?

Page 2, Row 1, Tab 2

Add 'Distributions `ggridges`' Graph

```r
library(ggridges)
lab_ridges <- labs(x = "Apple directions requests",
                   y = "Transportation Types",
     title = "Direction Requests by Transportation Type",
     subtitle = "source: https://covid19.apple.com/mobility")


TidyApple %>%
  ggplot() +
  geom_density_ridges(aes(x = dir_request,
                          y = trans_type,
    fill = trans_type),
    alpha = 1/5) +
  lab_ridges
```

Knit--how does it look?

Page 2, Row 2, Tab 1

Create Another `.tabset/.tabset-fade` Row

```
Row {.tabset .tabset-fade data-height=400}
-----------------------------------------------
```

In tab 1, add `TopUSCities` as `paged_table`

```
TopUSCities <- TidyApple %>%
  filter(country == "United States" &
           region %in% c("New York City","Los Angeles",
                         "Chicago", "Houston", "Phoenix"))
rmarkdown::paged_table(TopUSCities)
```

Knit--how does it look?

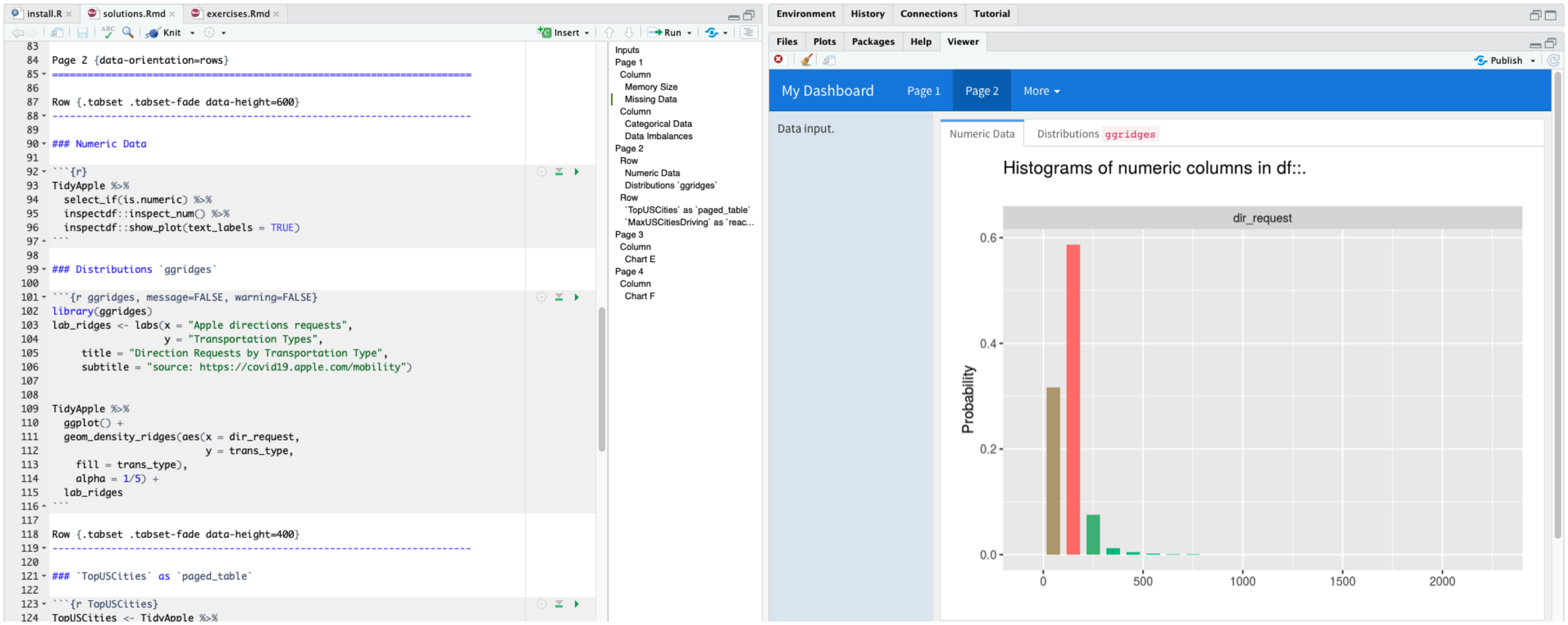
Page 2, Row 2, Tab 2

In tab 2, add `MaxUSCitiesDriving` as `reactable`

```
TopUSCities %>%
  filter(trans_type == "driving") %>%
  group_by(region) %>%
  slice_max(dir_request) %>%
  ungroup() -> MaxUSCitiesDriving
reactable(MaxUSCitiesDriving,
              resizable = TRUE, showPageSizeOptions = TRUE,
              selection = "multiple", onClick = "select")
```

Knit--how does it look?

Page 2



~~~
Page 2 {data-orientation=rows}
=====================================================================

Row {.tabset .tabset-fade data-height=600}
---------------------------------------------------------------------

### Numeric Data

```{r}
TidyApple %>%
  select_if(is.numeric) %>%
  inspectdf::inspect_num() %>%
  inspectdf::show_plot(text_labels = TRUE)
~~~

Distributions `ggridges`

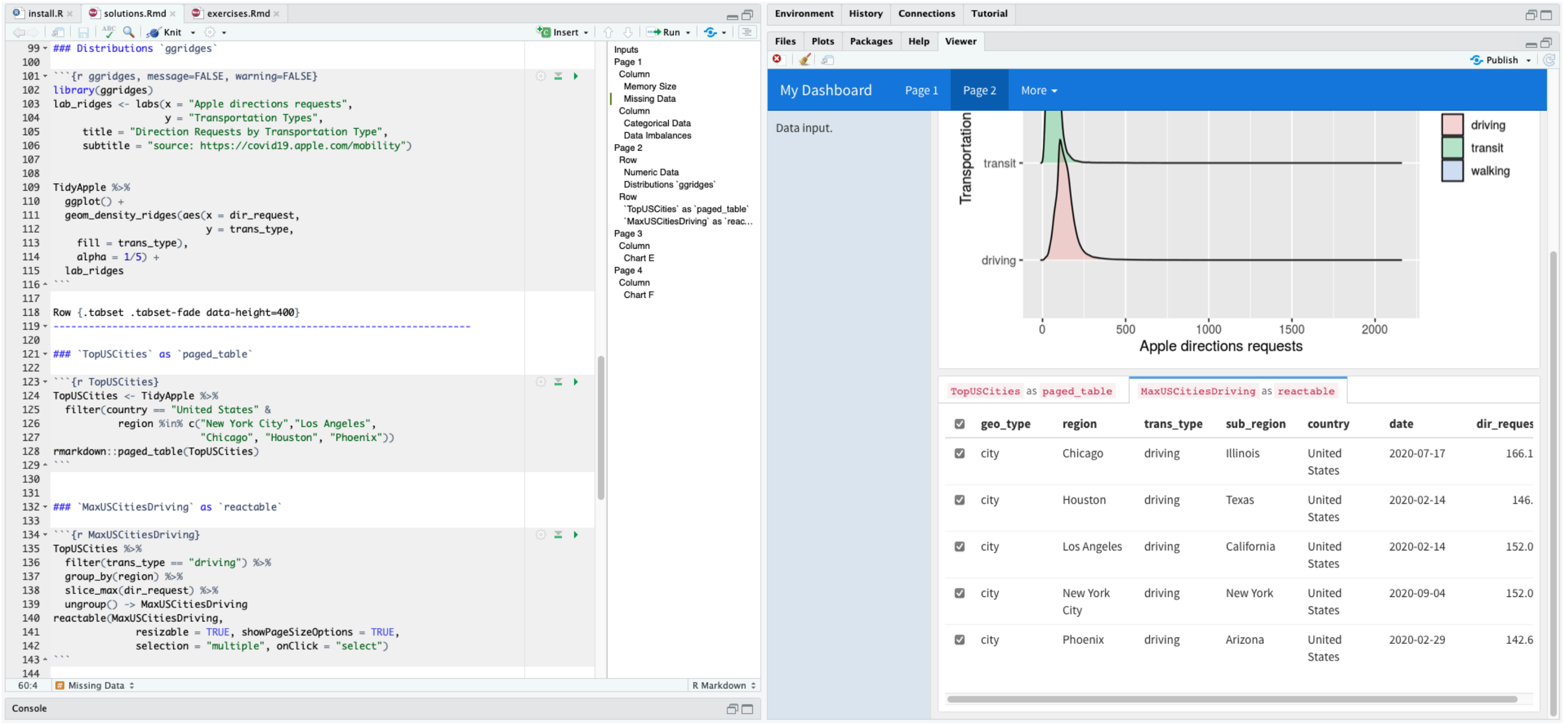
```{r ggridges, message=FALSE, warning=FALSE}
library(ggridges)
lab_ridges <- labs(x = "Apple directions requests",
                   y = "Transportation Types",
     title = "Direction Requests by Transportation Type",
     subtitle = "source: https://covid19.apple.com/mobility")


TidyApple %>%
  ggplot() +
  geom_density_ridges(aes(x = dir_request,
                          y = trans_type,
    fill = trans_type),
    alpha = 1/5) +
  lab_ridges
```

Row {.tabset .tabset-fade data-height=400}

`TopUSCities` as `paged_table`

```{r TopUSCities}
TopUSCities <- TidyApple %>%
```

Page 2



~~~
### Distributions `ggridges`

```{r ggridges, message=FALSE, warning=FALSE}
library(ggridges)
lab_ridges <- labs(x = "Apple directions requests",
                   y = "Transportation Types",
     title = "Direction Requests by Transportation Type",
     subtitle = "source: https://covid19.apple.com/mobility")


TidyApple %>%
  ggplot() +
  geom_density_ridges(aes(x = dir_request,
                          y = trans_type,
    fill = trans_type),
    alpha = 1/5) +
  lab_ridges
~~~

Row {.tabset .tabset-fade data-height=400}

`TopUSCities` as `paged_table`

```{r TopUSCities}
TopUSCities <- TidyApple %>%
  filter(country == "United States" &
           region %in% c("New York City","Los Angeles",
                         "Chicago", "Houston", "Phoenix"))
rmarkdown::paged_table(TopUSCities)
```

`MaxUSCitiesDriving` as `reactable`

```{r MaxUSCitiesDriving}
TopUSCities %>%
  filter(trans_type == "driving") %>%
  group_by(region) %>%
  slice_max(dir_request) %>%
  ungroup() -> MaxUSCitiesDriving
reactable(MaxUSCitiesDriving,
            resizable = TRUE, showPageSizeOptions = TRUE,
            selection = "multiple", onClick = "select")
```
```

Inputs
Page 1
Column
Memory Size
Missing Data
Column
Categorical Data
Data Imbalances
Page 2
Row
Numeric Data
Distributions `ggridges`
Row
`TopUSCities` as `paged_table`
`MaxUSCitiesDriving` as `reac...
Page 3
Column
Chart E
Page 4
Column
Chart F

| ✓ | geo_type | region | trans_type | sub_region | country | date | dir_reques |
|---|---|---|---|---|---|---|---|
| ✓ | city | Chicago | driving | Illinois | United States | 2020-07-17 | 166.1 |
| ✓ | city | Houston | driving | Texas | United States | 2020-02-14 | 146. |
| ✓ | city | Los Angeles | driving | California | United States | 2020-02-14 | 152.0 |
| ✓ | city | New York City | driving | New York | United States | 2020-09-04 | 152.0 |
| ✓ | city | Phoenix | driving | Arizona | United States | 2020-02-29 | 142.6 |
```

More Examples

Check out the package website and gallery

https://rmarkdown.rstudio.com/flexdashboard/examples.html