Day 4

Basics of Rmarkdown and data visualization with ggplot2

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Content

- Basics of Rmarkdown
  - Main elements
  - unhcrdown
  - Recap of data cleaning from Day 3
  - Knit file into different outputs
- ggplot2
  - Main elements
  - unhcrthemes

Image of Vinicius presenting Rmarkdown and ggplot2 in 2 hours

Rmarkdown

Illustration by Allison Horst

Exploratory versus explanatory analysis

- Exploratory: understand the data, represent complexities, analytical, expert user group
- Explanatory: wider audiences, understandable visual data / editorial decisions

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What is Rmarkdown?

- Rmarkdown is based on Markdown.

What is ~~Rmarkdown~~ Markdown?

- Markdown is a system for writing simple, readable text that is easily converted to HTML.
- Make the syntax of the raw (pre-HTML) document as readable possible.

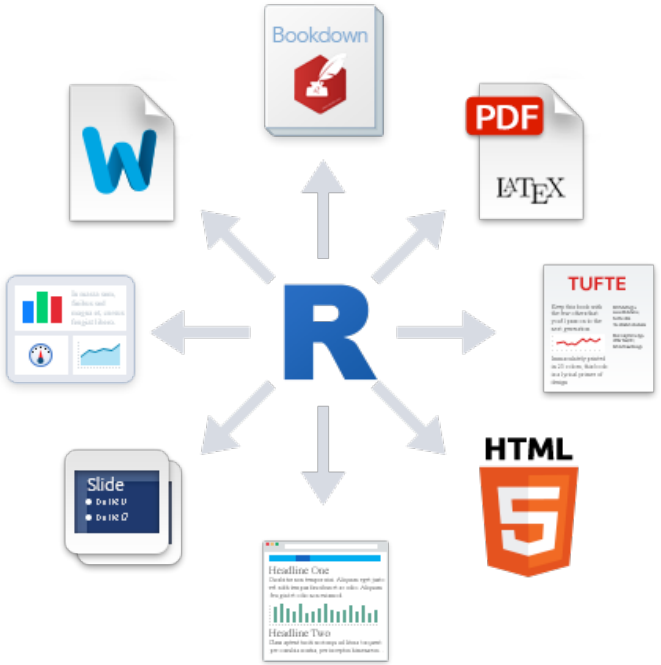
```
<body>
  <section>
    <h1>Rock Climbing Packing List</h1>
    <ul>
      <li>Climbing Shoes</li>
      <li>Harness</li>
      <li>Backpack</li>
      <li>Rope</li>
      <li>Belayer</li>
    </ul>
  </section>
</body>
```

```
# Rock Climbing Packing List

* Climbing Shoes
* Harness
* Backpack
* Rope
* Belayer
```

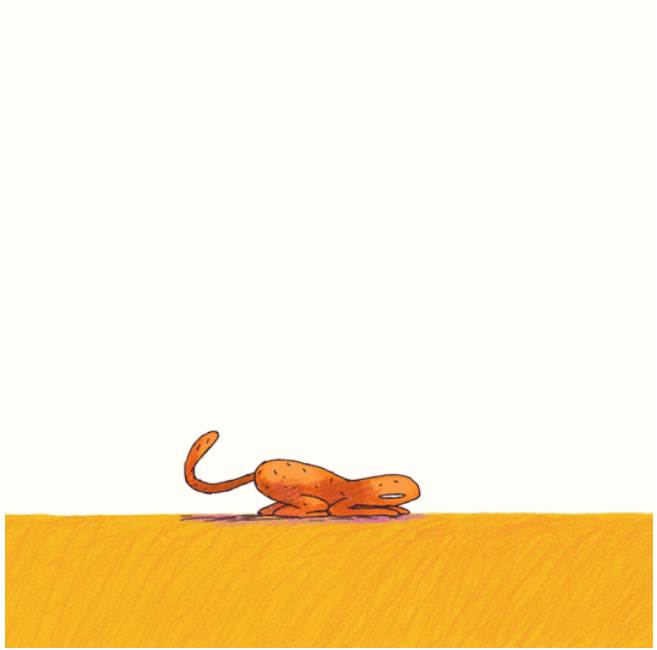
What is Rmarkdown?

- Markdown syntax to create dynamic documents, presentations and reports in Rstudio
- Renders many different types of files



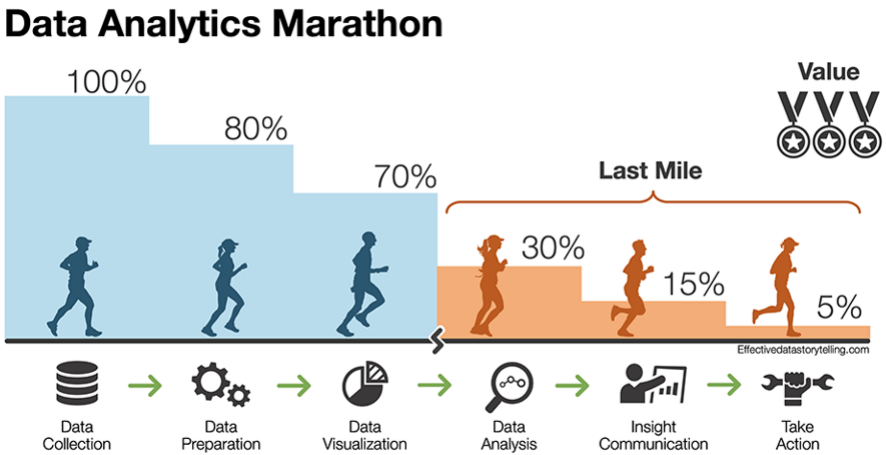
Why Rmarkdown?

- Dynamic documents
  - Filters
  - Outputs



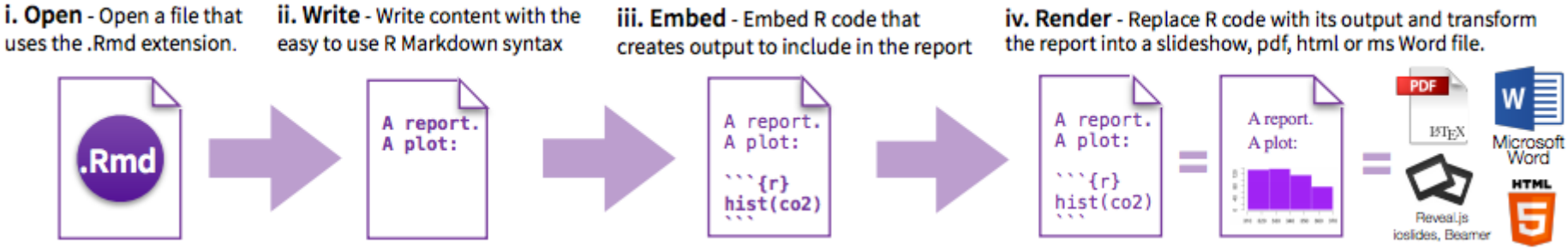
Why Rmarkdown?

- Reproducibility



Simple workflow

- Open
- Write
- Embed
- Render



Required packages

```
library("rmarkdown")
library("knitr")
library("ggplot2")
```

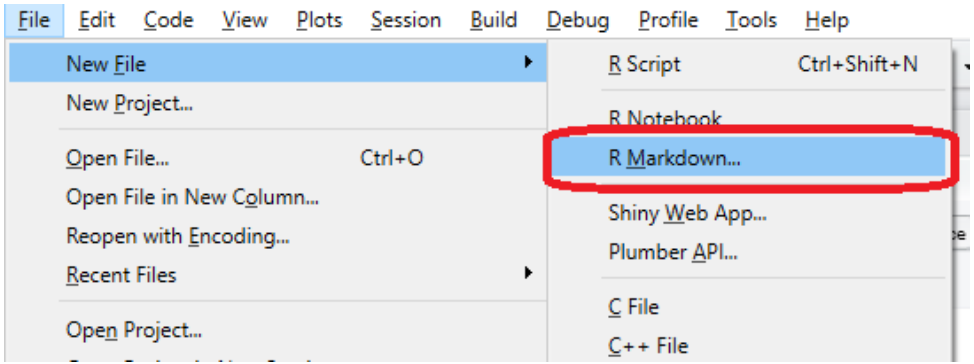
unhcrverse: unhcrdown

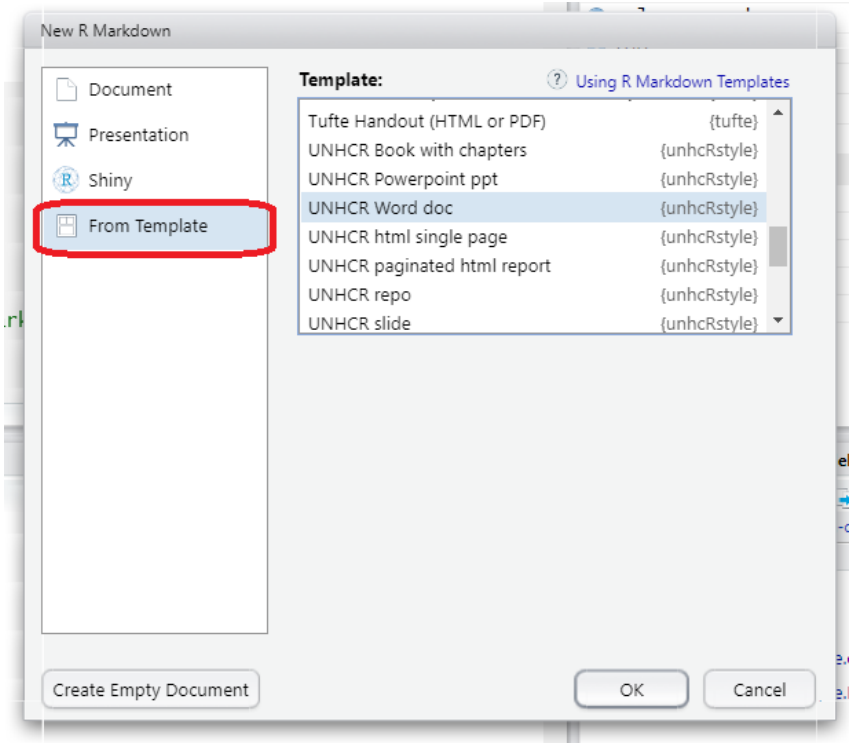
Set of templates following UNHCR Brand recommendations.

https://github.com/vidonne/unhcrdown

```
install.packages("remotes")
library(remotes)
remotes::install_github("vidonne/unhcrdown")
```

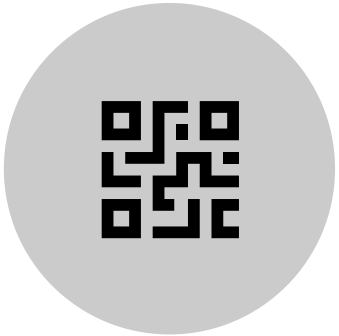
Using unhcrdown





How to read an Rmarkdown file?

METADATA



CODE

TEXT

Metadata

- YAML
  - Yet Another Markup Language >> YAML Ain’t Markup Language
  - Syntax for hierarchical data structures that is commonly used for configuration files
  - Requires specific formatting to render (e.g. colons after fields, avoid adding extra spaces etc.)
  - Identifies backticks or lists information as strings

```
---
title: "UNHCR Branded Rmarkdown"
author: First Last Name
date: "15 December, 2021"
output: unhcrdown::paged_report
---
```

Metadata: Date

- Backstick r
- Specific formats

```
---
author: "Pan-Africa DIMA Units"
date: "`r format(Sys.Date(),  '%d %B %Y')`"
output:
  unhcrdown::docx_simple
---
```

Code	Meaning	Code	Meaning
%a	Abbreviated weekday	%A	Full weekday
%b	Abbreviated month	%B	Full month
%c	Locale-specific date and time	%d	Decimal date
%H	Decimal hours (24 hour)	%I	Decimal hours (12 hour)
%j	Decimal day of the year	%m	Decimal month
%M	Decimal minute	%p	Locale-specific AM/PM
%S	Decimal second	%U	Decimal week of the year (starting on Sunday)
%w	Decimal Weekday (0=Sunday)	%W	Decimal week of the year (starting on Monday)
%x	Locale-specific Date	%X	Locale-specific Time
%y	2-digit year	%Y	4-digit year
%z	Offset from GMT	%Z	Time zone (character)

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Text: Markdown basics

```
Plain text

End a line with two spaces
to start a new paragraph.

*italics* and **bold**

`verbatim code`

sub/superscript^2^~2~

~~strikethrough~~
```

Plain text

End a line with two spaces
to start a new paragraph.

italics and **bold**

`verbatim code`

sub/superscript^2$_2$

~~strikethrough~~

```
# Header1  {#anchor}

## Header 2  {#css_id}

### Header 3  {.css_class}

#### Header 4

##### Header 5

###### Header 6
```

Header1

Header 2

Header 3

Header 4

```
<http://www.rstudio.com>

[link](www.rstudio.com)

Jump to [Header 1](#anchor)

image:

![Caption](smallorb.png)

* unordered list
    + sub-item 1
    + sub-item 2
        - sub-sub-item 1

* item 2

    Continued (indent 4 spaces)
```

http://www.rstudio.com

link

Jump to Header 1

image:

Caption

- unordered list
    - sub-item 1
    - sub-item 2
        - sub-sub-item 1
- item 2

  Continued (indent 4 spaces)

```
1. ordered list
2. item 2
        i) sub-item 1
          A.  sub-sub-item 1
```

1. ordered list
2. item 2
    i. sub-item 1
        A. sub-sub-item 1

1. A list whose numbering

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Codes

Inline codes

- In the written part of the document
- Great to automate update

```
# Methodology

This report analyzes data on UNHCR's population of concern in the year **`r asr_year`**.
```

Code chunks

- Lines of code to render plots, tables, calculate summary statistics, load packages etc.

```
```{r, echo=FALSE, message=FALSE, warning=FALSE, results = 'hide'}
library(ggplot2)
library(unhcrthemes)
library(scales)

column_graph <- ggplot(asr_top5, aes(asylum_name, total_sum)) +
  geom_col(fill = unhcr_pal(n = 1, "pal_blue"))

column_graph
```
```

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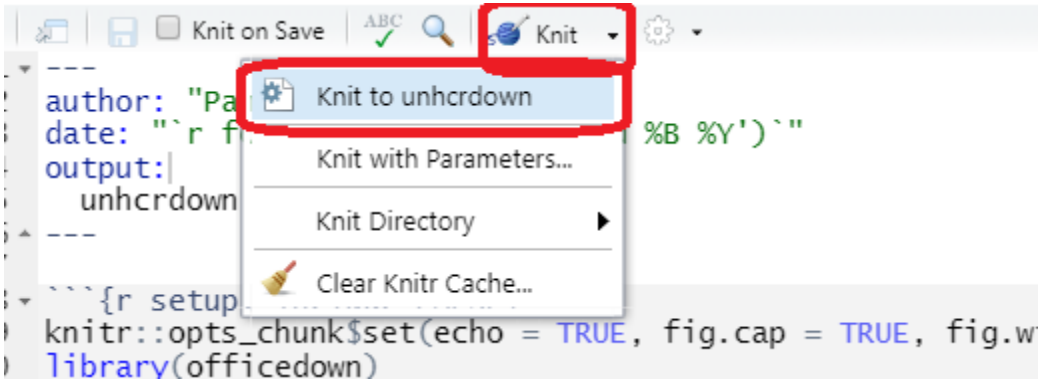
Knit

- “Knit” button (Ctrl+Shift+K): render report in chosen output



Demo

Objectives

- Identification of main elements in the Rmarkdown file
- Knit
- Explain data manipulation in first code chunk
- Filter by year = 2019 + identify inline codes

Ahmadou's cheat sheet

dplyr essentials

Main `dplyr` verbs you will learn in this training:

- `filter()`: keep rows that satisfy your conditions
- `select()`: keep or exclude some columns
- `rename()`: rename columns
- `mutate()`: add a new column
- `summarize()`: get summary statistics
- `group_by()`: data manipulation operations by group

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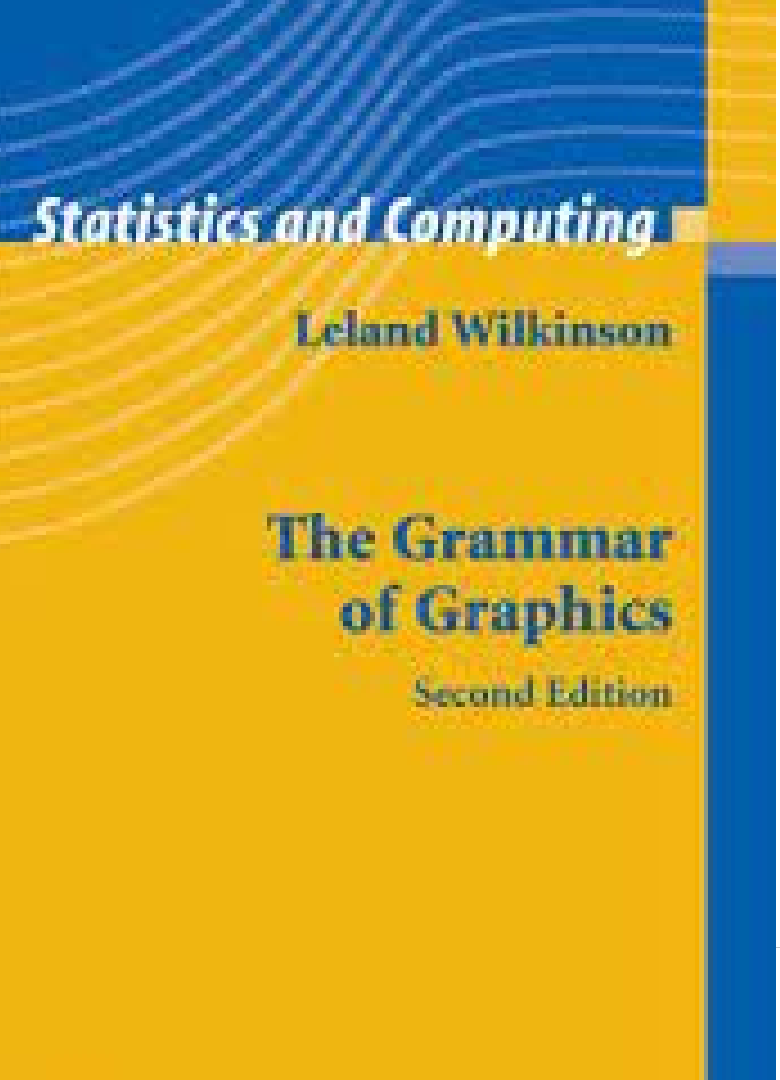
Good practices in Rmarkdown

- Data manipulation

Quiz

Data visualization in R (ggplot2)

Illustration by Allison Horst



ggplot2: grammar of graphics

The quick brown fox jumps over the lazy dog.

Article Adjective Adjective Noun Verb Preposition

- Graphics = distinct layers of grammatical elements.
- Meaningful plots through aesthetic mappings.

demo

Basic syntac

- Data
- Mapping (aesthetics)
- Geometric representation (geom)


```
ggplot(data, aes(x,  y)) + geom_*()
```

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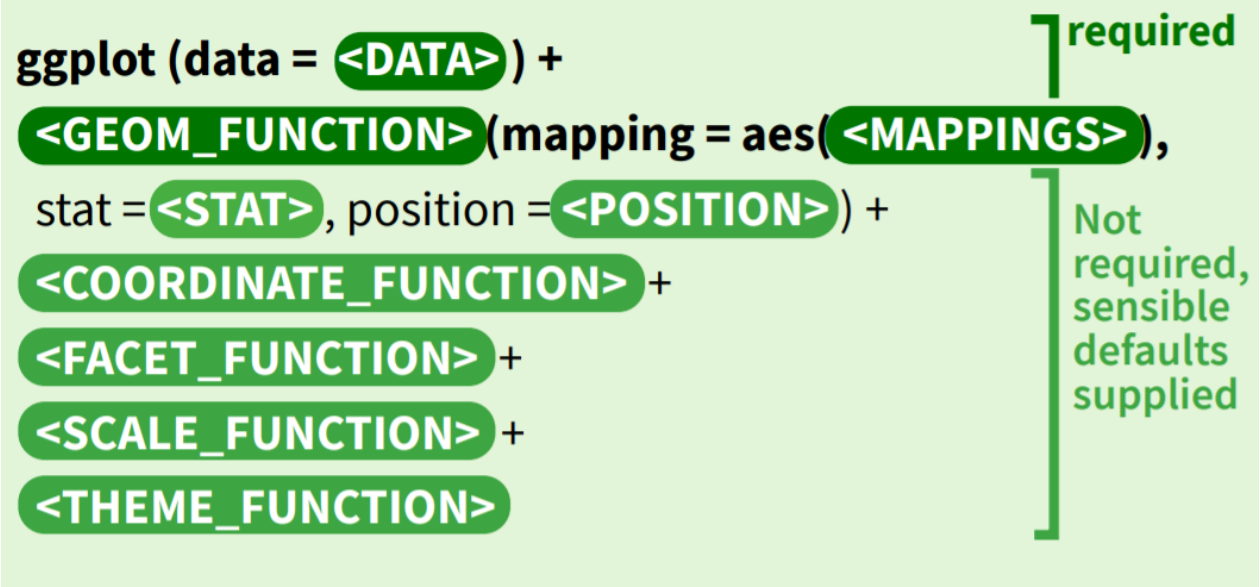
demo

Intermediary syntax

- Statistics
- Facet
- Coordinates
- Labels
- Theme



Data	*{variables of interest}*				
Aesthetics	*x-axis* *y-axis*	*colour* *fill*	*size* *labels*	*alpha* *shape*	*line width* *line type*
Geometries	*point*	*line*	*histogram*	*bar*	*boxplot*
Themes	*non-data ink*				
Statistics	*binning*	*smoothing*	*descriptive*	*inferential*	
Coordinates	*cartesian*	*fixed*	*polar*	*limits*	
Facets	*columns*	*rows*			

Demo

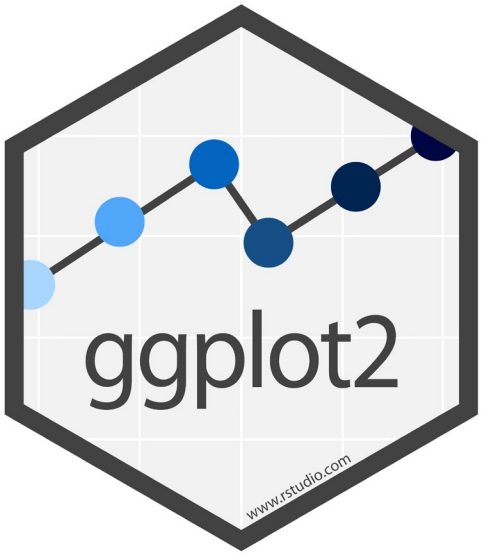
Objectives

- Show base graphics
- Basic syntax
- Analysis of changes in graphs
- Return to Rmarkdown to interpret the column chart

Quiz


BASE
R
R Studio
+
ggplot2
sjPlot
Shiny
knitr
rmarkdown
tidyr
The tidyverse
Components
haven
readr
stringr
lubridate
devtools
purrr
broom
modelr
tidyverse



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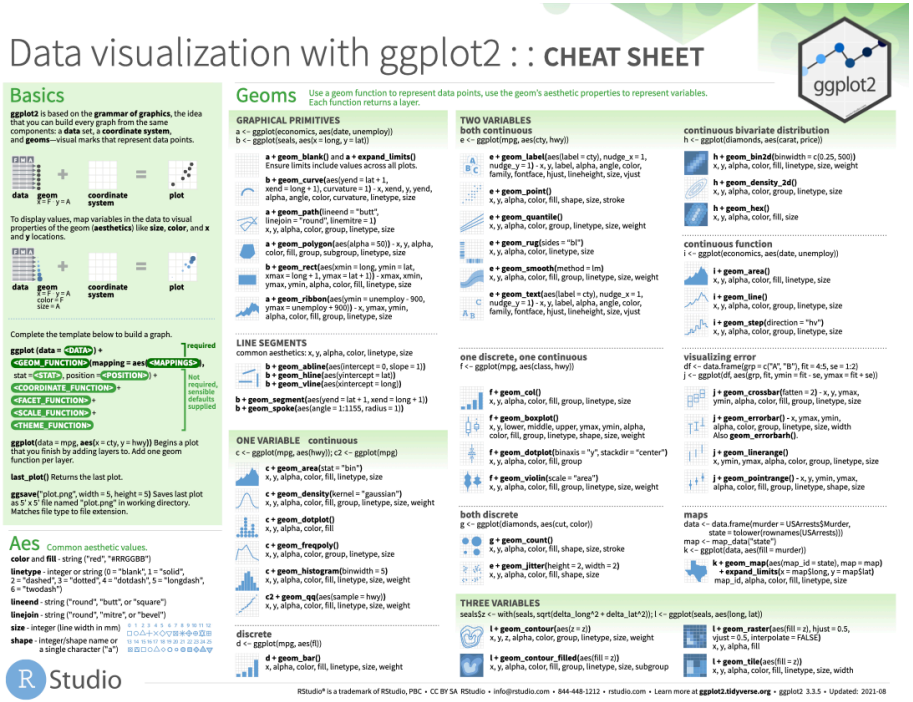
ggplot2 resources

- ggplot2 package: https://ggplot2.tidyverse.org/
- ggplot2 cheat sheet
- ggplot2 extensions: https://exts.ggplot2.tidyverse.org/
- Basics of ggplot2
- UNHCRverse: unhcrthemes



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Rmarkdown resources

- Rmarkdown website by Rstudio
- Rmarkdown Cheat Sheet
- Knitr in a Knutshell
- ++ Learn & Connect Trainings

Tomorrow

- Recap + questions
- Extra!
  - Naming conventions
  - ASR and country names
  - Secret participant
- Structuring an R community in Pan-Africa


done(function(response) {
for (var i = 0; i < response.length; i+
var layer = L.marker(
[response[i].latitude, response
// ,{icon: myIcon}
);
layer.addTo(group);
layer.bindPopup(
"<p>" + "Species: " + response[
"<p>" + "Description: " + respo
"<p>" + "Seen at: " + response[
"<p>" + "On: " + response[i].si
}
$('select').change(function() {
species = this.value;
});
url: queryURL,
method: "GET"
done(function(response) {
for (var i = 0; i < response.length; i+
var layer = L.marker(
[response[i].latitude, response
// ,{icon: myIcon}
);
layer.addTo(group);
THANK
YOU