Data Visualisation & Data Organisation in Spreadsheets

CVEN 5837 - Summer 2022

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https://cven5837-ss22.github.io/website/

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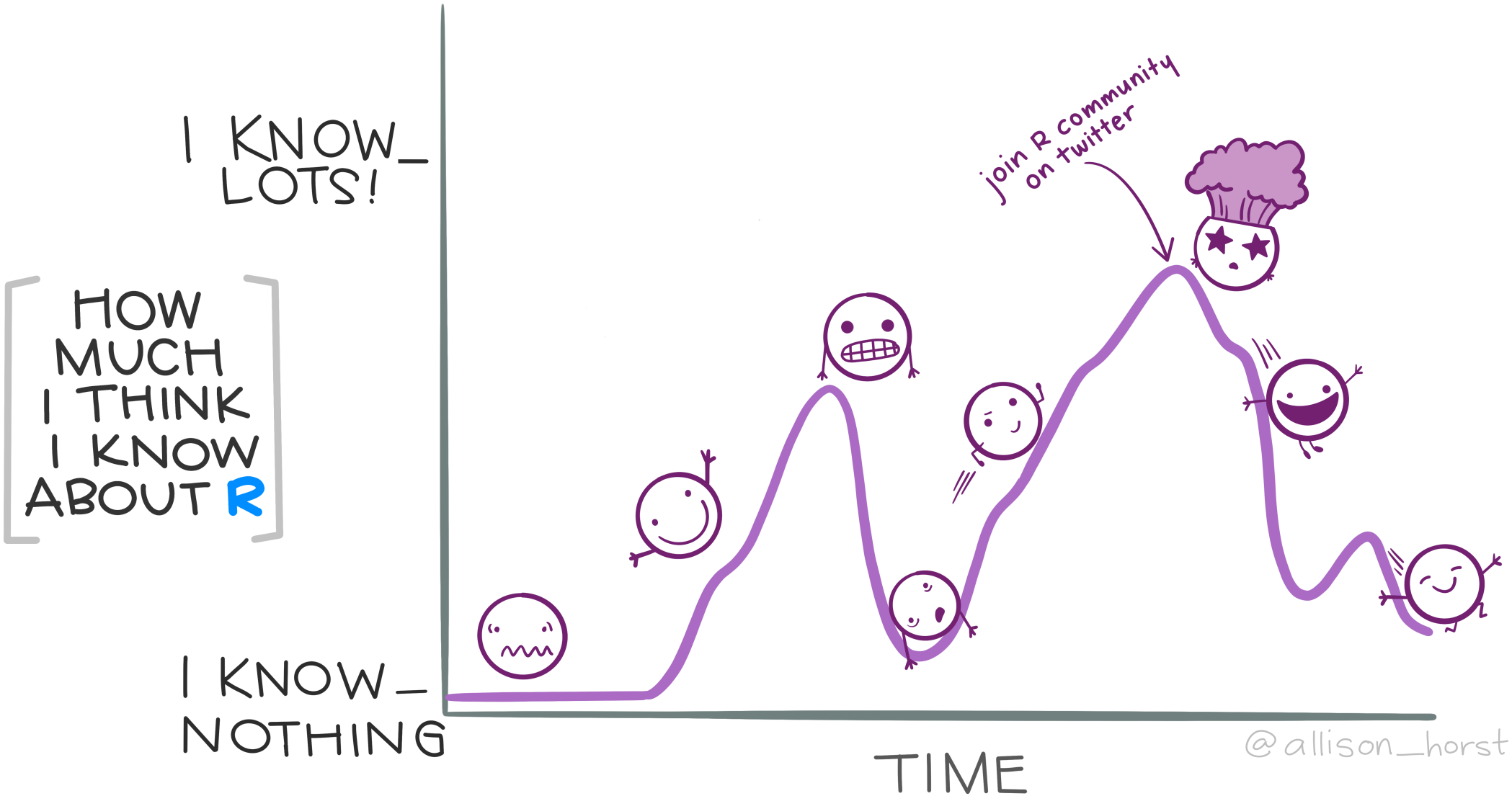

Artwork by @allison_horst

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Solving coding problems

Tipps for search engines

- Use actionable verbs that describe what you want to do
- Be specific
- Add R to the search query
- Add the name of the R package name to the search query
- Scroll through the top 5 results (don’t just pick the first)

Example: “How to remove a legend from a plot in R ggplot2”

Stack Overflow

What is it?

- The biggest support network for (coding) problems
- Can be intimidating at first
- Up-vote system

Workflow

- First, briefly read the question that was posted
- Then, read the answer marked as “correct”
- Then, read one or two more answers with high votes
- Then, check out the “Linked” posts
- Always give credit for the solution

Give credit

528

from r cookbook, where bp is your ggplot:

Remove legend for a particular aesthetic (fill):

```
bp + guides(fill="none")
```

It can also be done when specifying the scale:

```
bp + scale_fill_discrete(guide="none")
```

This removes all legends:

```
bp + theme(legend.position="none")
```

Share Edit Follow Flag

edited Dec 2, 2021 at 7:07

Andrew Morris

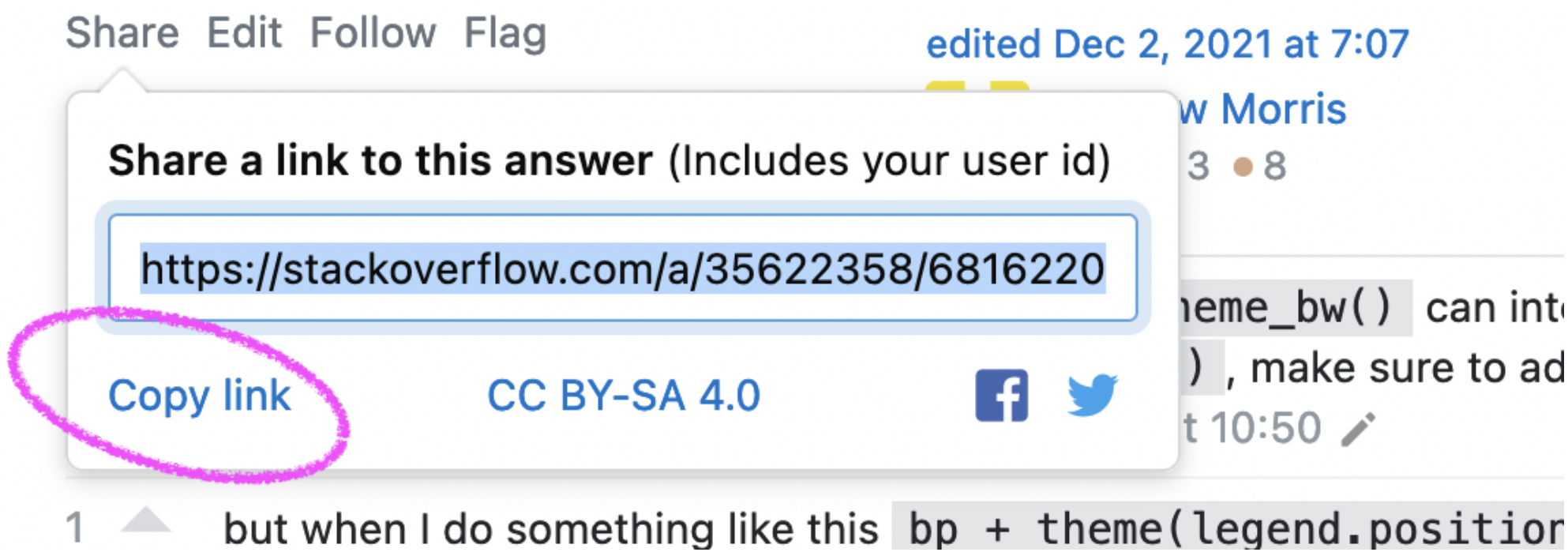
408 ● 3 ● 8

answered Feb 25, 2016 at 8:48

user3490026

5,388 ● 1 ● 9 ● 4

Give credit


Share Edit Follow Flag
edited Dec 2, 2021 at 7:07
w Morris
3 8
Share a link to this answer (Includes your user id)
https://stackoverflow.com/a/35622358/6816220
Copy link
CC BY-SA 4.0
eme_bw() can int
) , make sure to ad
t 10:50
1
but when I do something like this bp + theme(legend.positior

Give credit

```
ggplot(data = global_waste_data_kg_year,
       mapping = aes(x = income_id,
                     y = capita_kg_year,
                     color = income_id)) +
  ## Remove legend ref: https://stackoverflow.com/a/35622358/6816220
  theme(legend.position = "none")
```

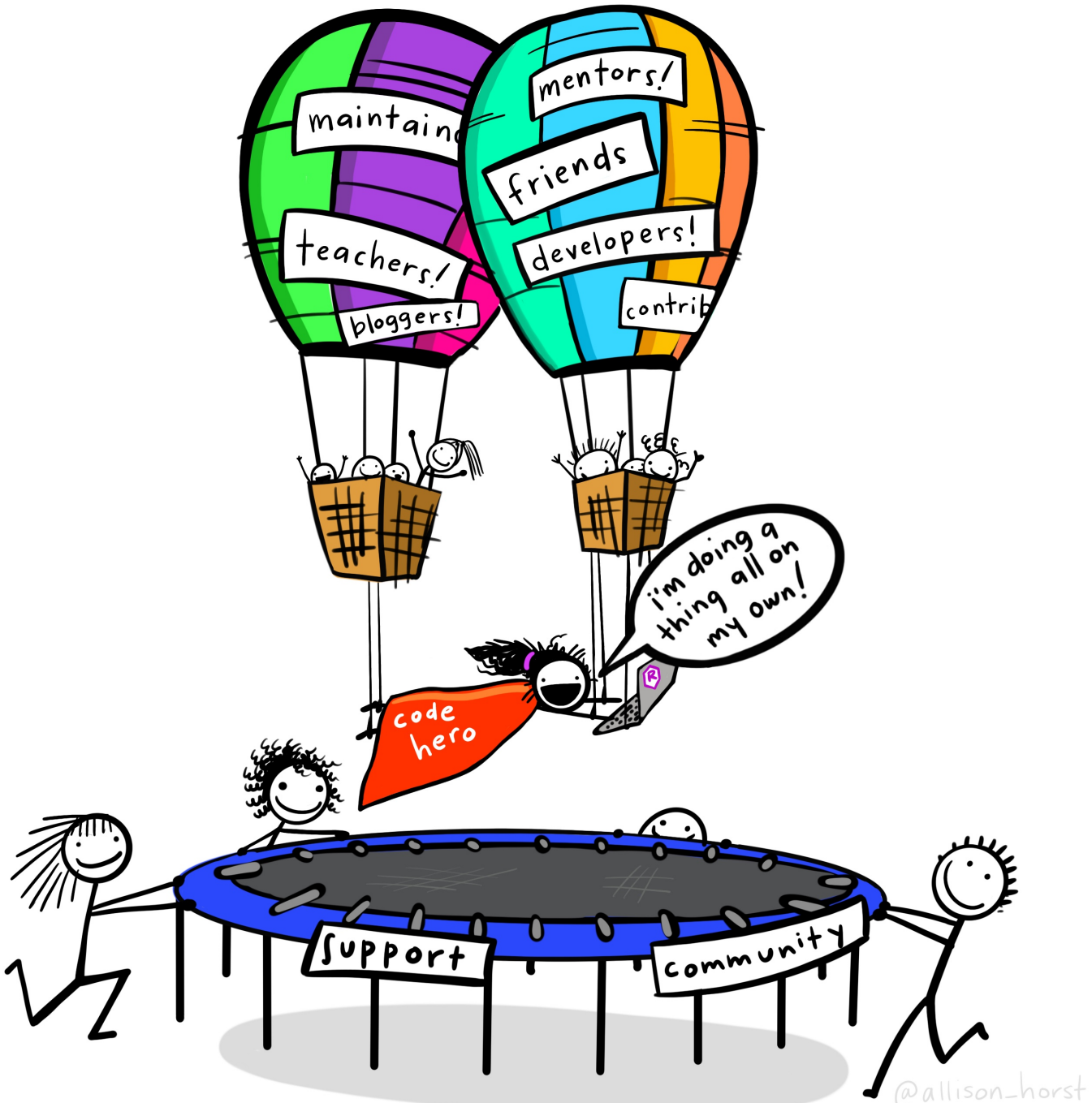
Other sources for help

- Our Google Space for the course
- RStudio Community Forum: https://community.rstudio.com/
- Documentation websites: https://dplyr.tidyverse.org/
- Twitter community: #rstats

Artwork by @allison_horst

Minimal reproducible example (reprex)

- Needed when asking questions online
- Good support information: https://www.tidyverse.org/help/#reprex



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Artwork by @allison_horst

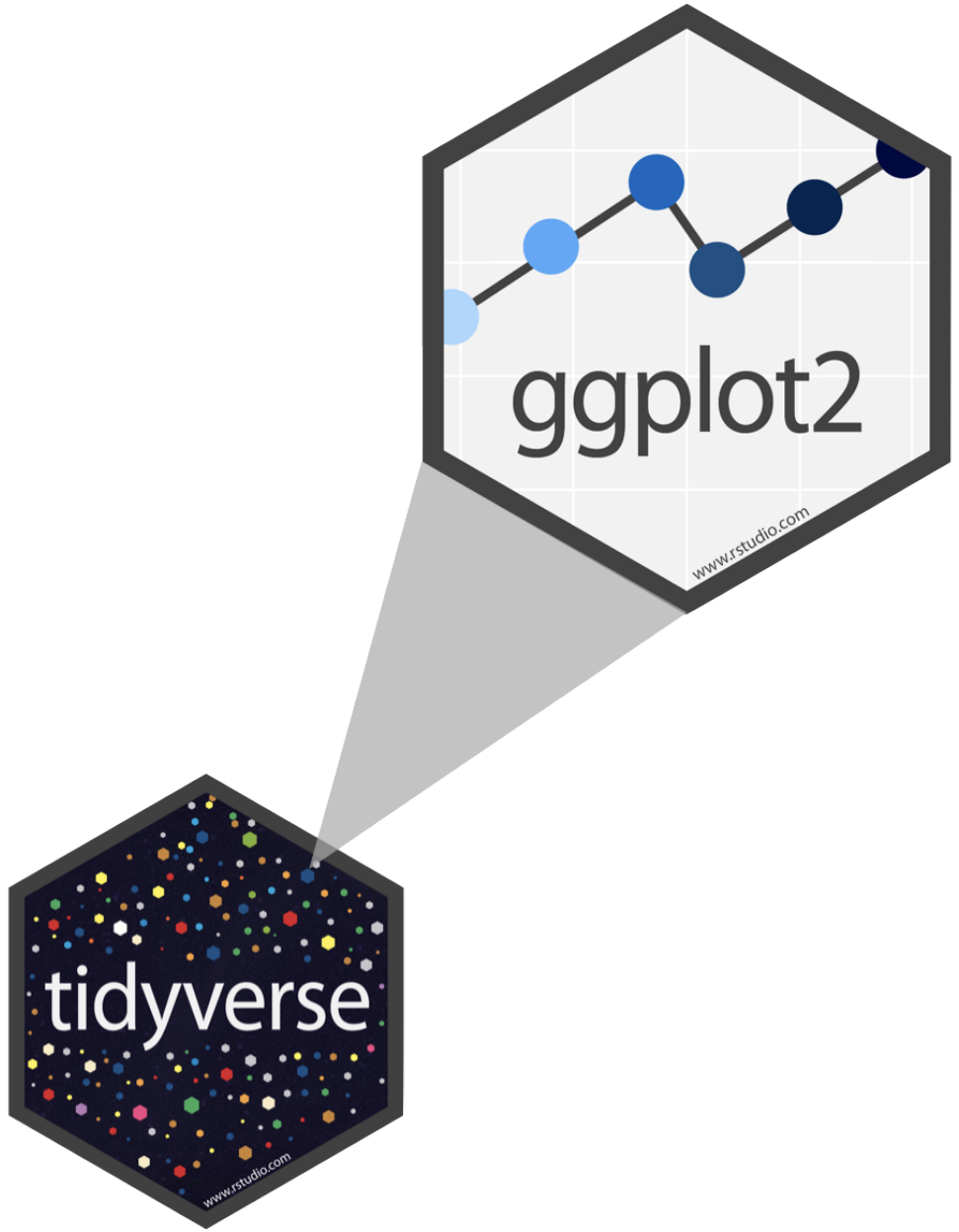
Learning Objectives (for this week)

1. Learners can describe the four main aesthetic mappings that can be used to visualise data using the ggplot2 R Package
2. Learners can control the colour scaling applied to a plot using colour as an aesthetic mapping
3. Learners can compare three different geoms and their use case
4. Learners can apply a theme to control font types and sizes within a plot
5. Learners can apply 12 principles for data organisation in spreadsheets in the layout of a collected dataset

Exploratory Data Analysis with `ggplot2`

R Package `ggplot2`

- **ggplot2** is tidyverse's data visualization package
- `gg` in `ggplot2` stands for Grammar of Graphics
- Inspired by the book **Grammar of Graphics** by Leland Wilkinson
- **Documentation:** https://ggplot2.tidyverse.org/
- **Book**: https://ggplot2-book.org



Code structure

- `ggplot()` is the main function in ggplot2
- Plots are constructed in layers
- Structure of the code for plots can be summarized as

```
ggplot(data = [dataset],
       mapping = aes(x = [x-variable],
                     y = [y-variable])) +
   geom_xxx() +
   other options
```

Code structure

```
1  ggplot()
```

Code structure

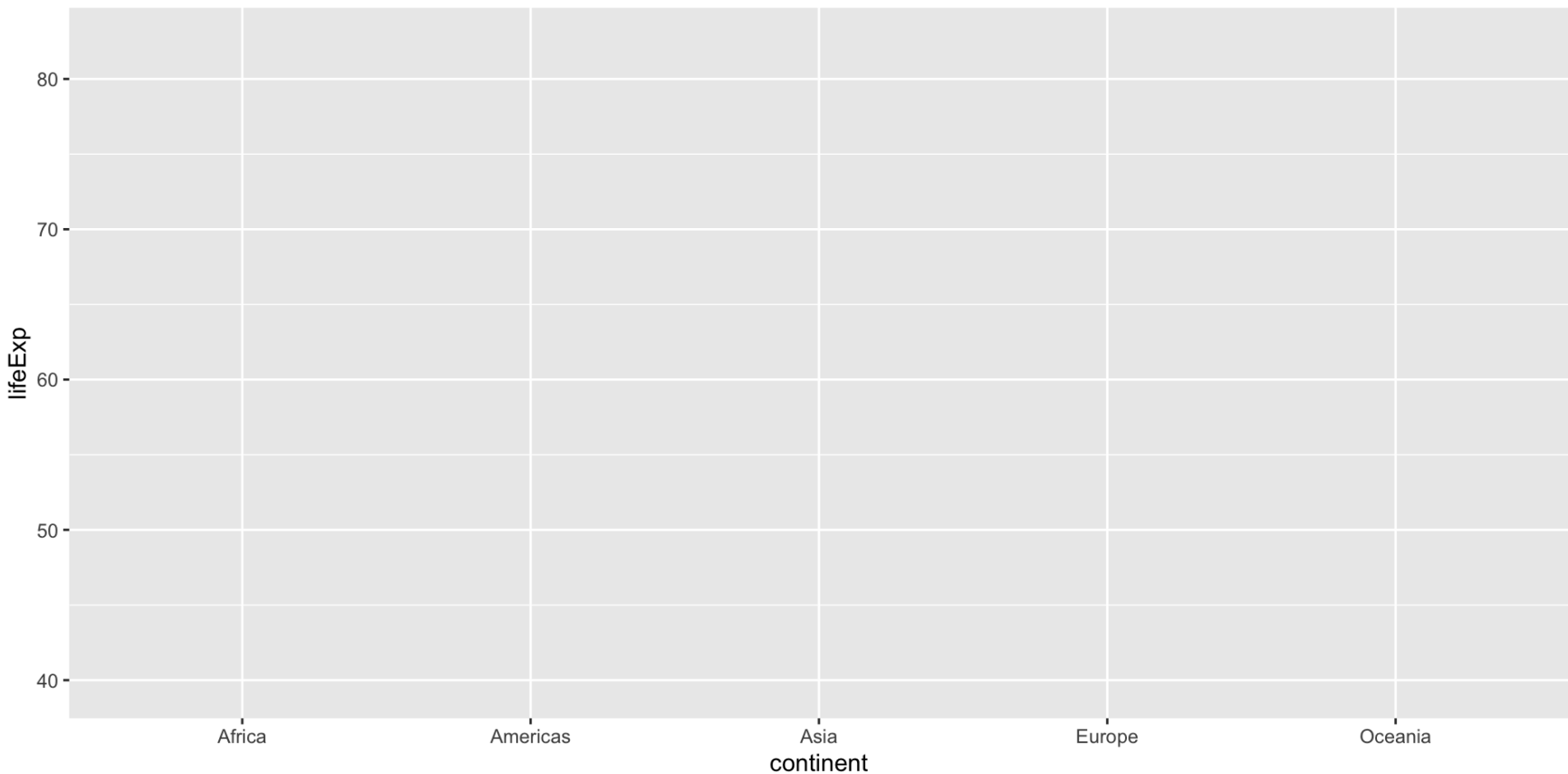
```
1  ggplot(data = gapminder_yr_2007)
```

Code structure

```
1  ggplot(data = gapminder_yr_2007,
2         mapping = aes())
```

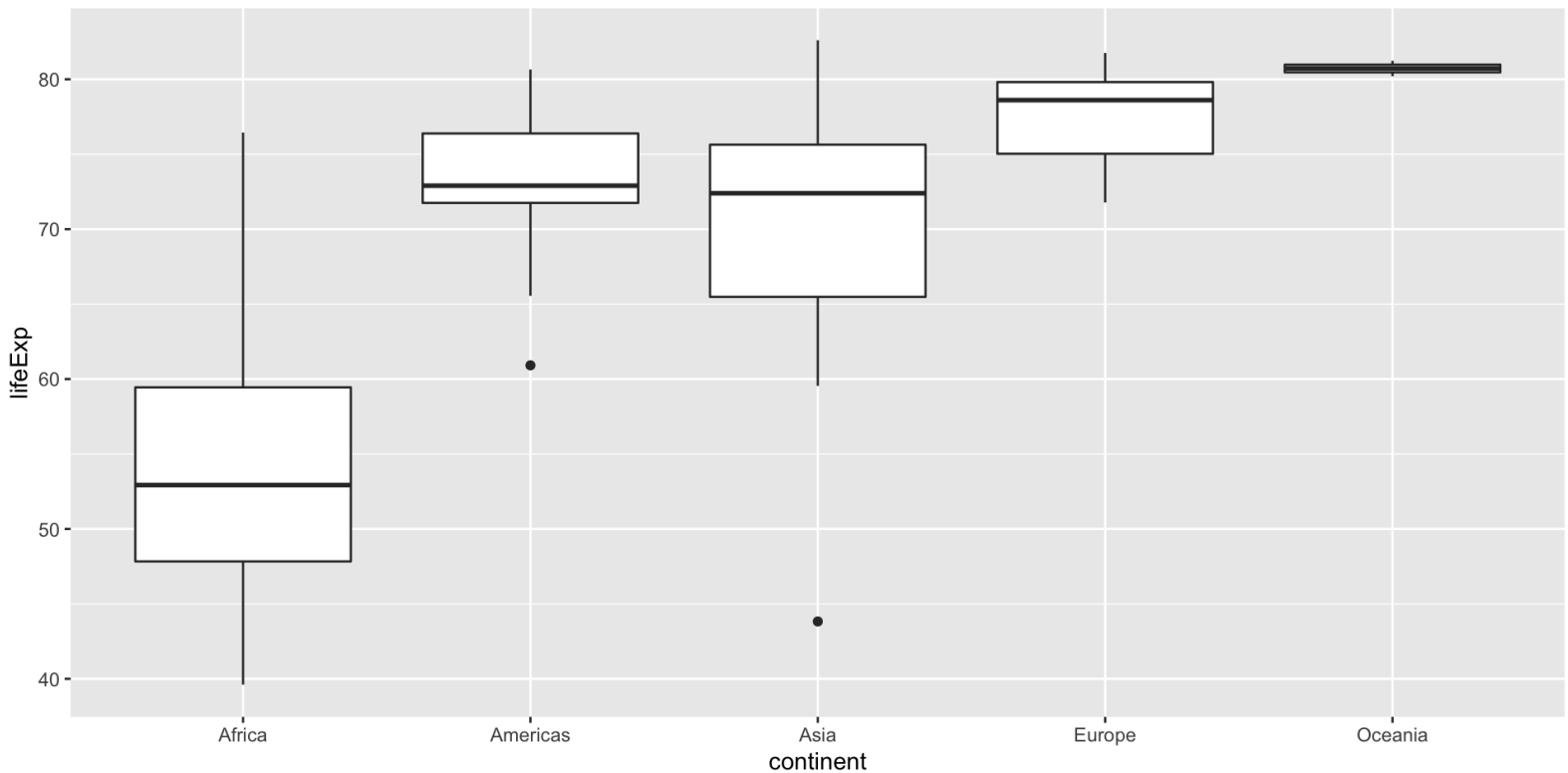
Code structure

```
1 ggplot(data = gapminder_yr_2007,
2        mapping = aes(x = continent,
3                      y = lifeExp))
```



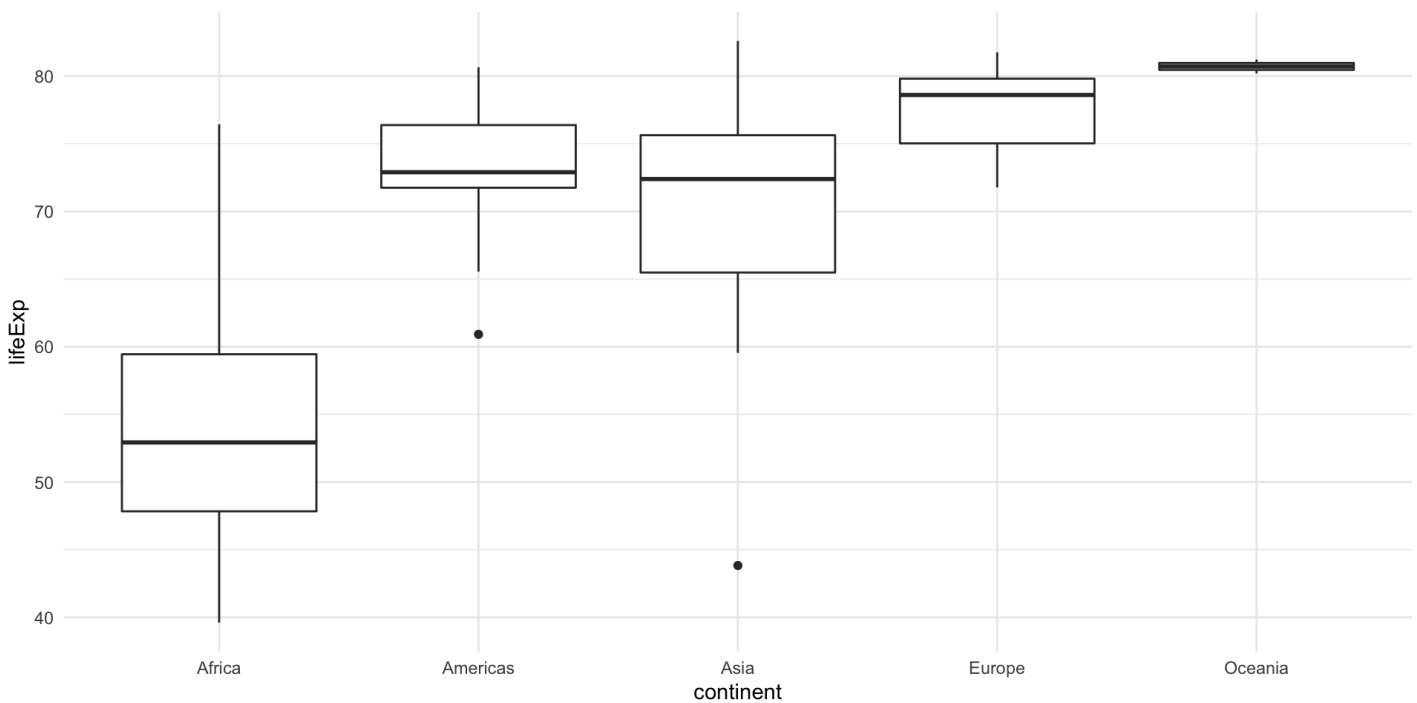
Code structure

```
1  ggplot(data = gapminder_yr_2007,
2         mapping = aes(x = continent,
3                       y = lifeExp)) +
4    geom_boxplot()
```



Code structure

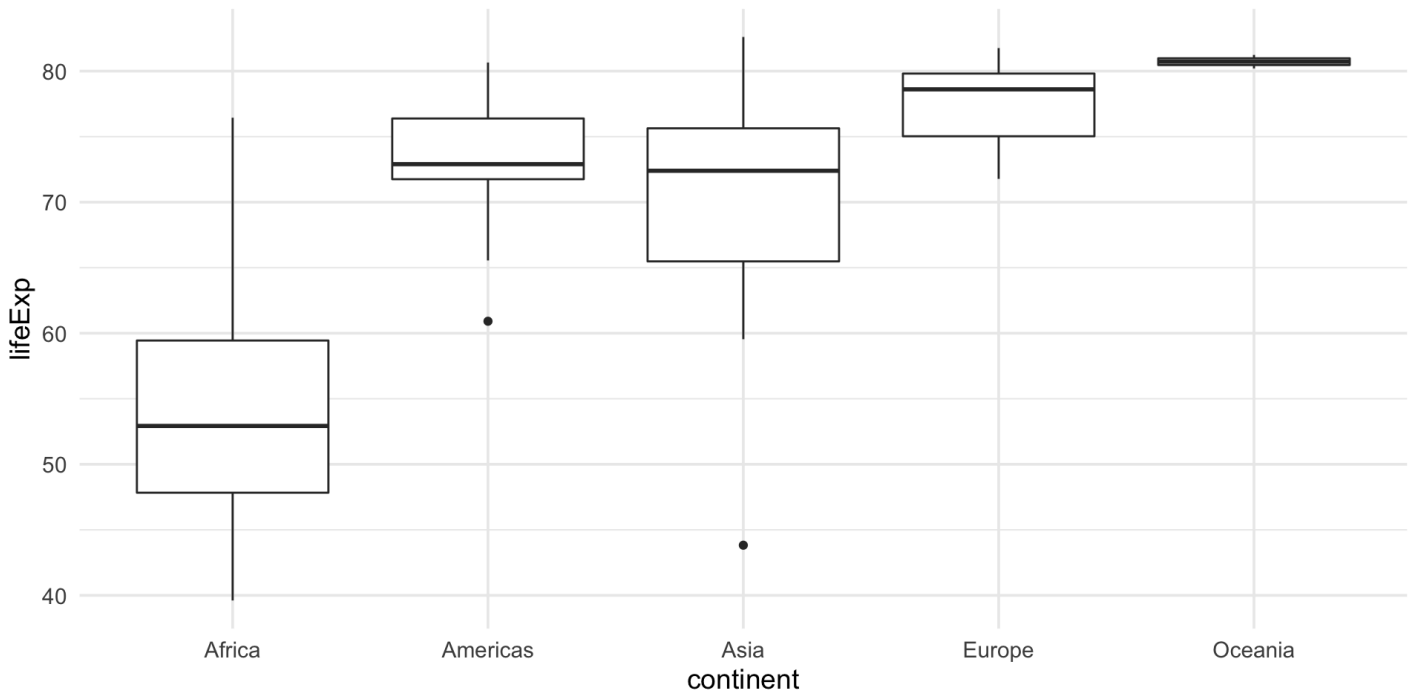
```
ggplot(data = gapminder_yr_2007,
       mapping = aes(x = continent,
                     y = lifeExp)) +
  geom_boxplot() +
  theme_minimal()
```



https://cven5837-ss22.github.io/website/

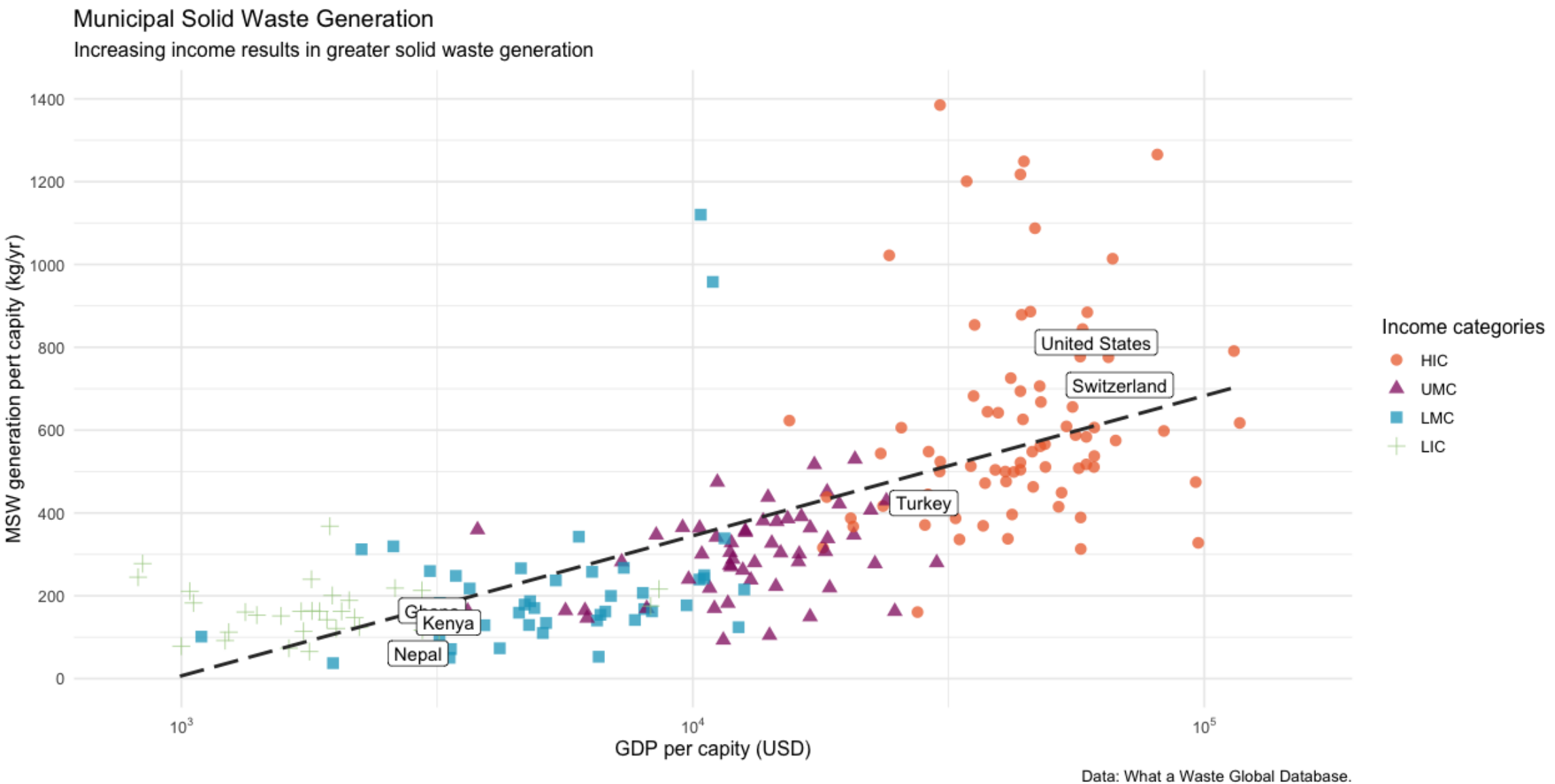
Code structure

```
ggplot(data = gapminder_yr_2007,
       mapping = aes(x = continent,
                     y = lifeExp)) +
  geom_boxplot() +
  theme_minimal(base_size = 14)
```



Live Coding Exercise: Reproduce this plot

https://cven5837-ss22.github.io/website/


Municipal Solid Waste Generation
Increasing income results in greater solid waste generation
MSW generation pert capity (kg/yr)
1400
1200
1000
800
600
400
200
0
10^3
10^4
10^5
GDP per capity (USD)
United States
Switzerland
Turkey
Kenya
Nepal
Income categories
HIC
UMC
LMC
LIC
Data: What a Waste Global Database.

live-02a-data-visualiation

1. Head over to rstudio.cloud
2. Open the workspace for the course (cven5837-ss22)
3. Open “Projects”
4. Open the “course-materials” project
5. Follow along with me

Break

10:00

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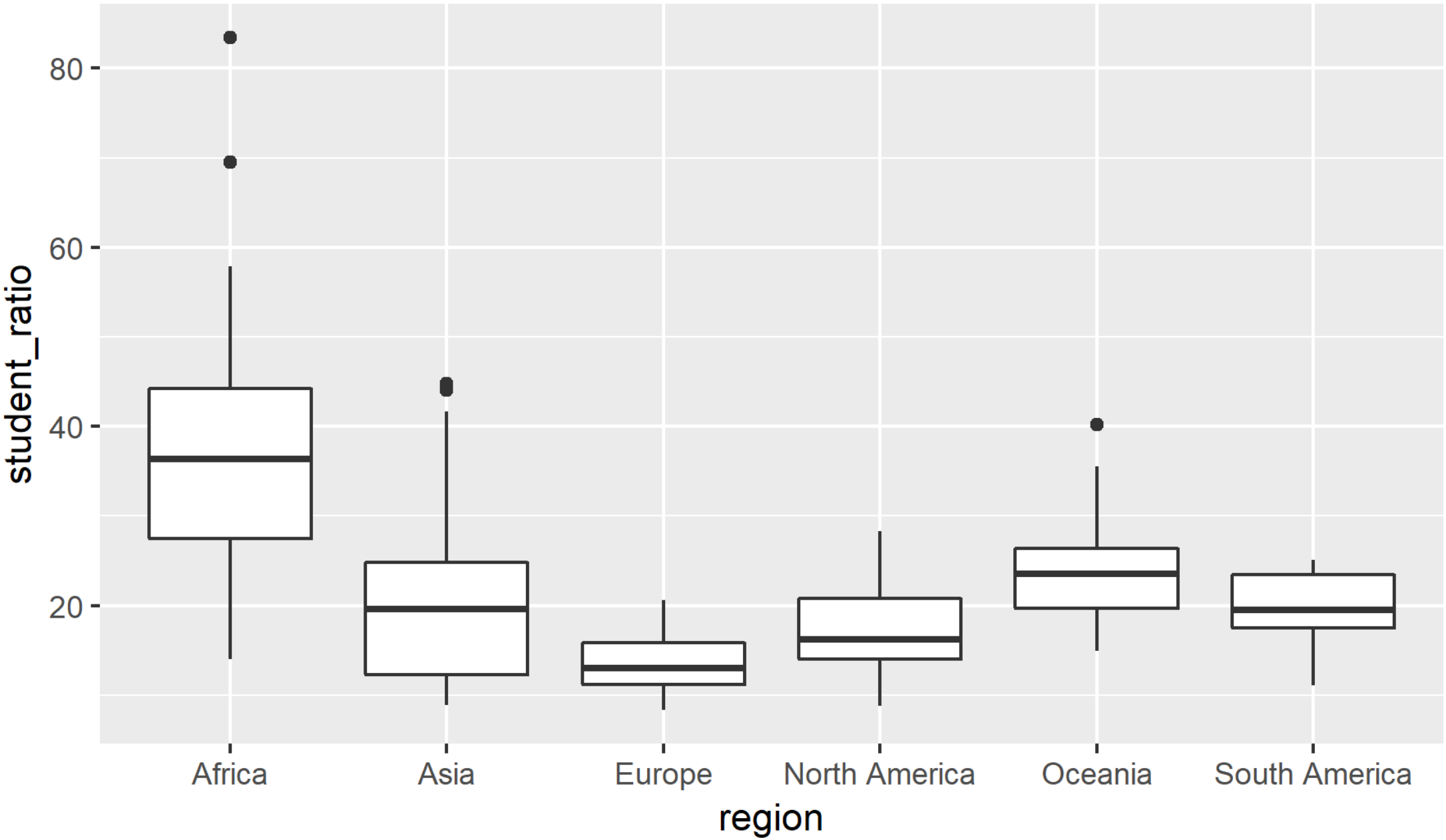
Photo by Blake Wisz

Visualising numerical data

Types of variables

The Evolution of a ggplot



Data: UNESCO Institute for Statistics
Visualization by Cédric Scherer

Tutorial: https://www.cedricscherer.com/2019/05/17/the-evolution-of-a-ggplot-ep.-1/

data-to-viz.com

https://cven5837-ss22.github.io/website/

Data Collection Tools

Data Collection Tools

- Questionnaires for survey based data
- Spreadsheets for manual experimental/observational data
- Sensors for automated near real-time data

Survey tools

Commonly used in the Global Engineering and Development sector

- KOBO Toolbox
- mWater
- OpenDataKit

Data Organisation in Spreadsheets

Listen

Article

Data Organization in Spreadsheets

Karl W. Broman & Kara H. Woo

Pages 2-10 | Received 01 Jun 2017, Accepted author version posted online: 29 Sep 2017, Published online:24 Apr 2018

Download citation https://doi.org/10.1080/00031305.2017.1375989 Check for updates

Jorunal: The American Statistician, Screenshot taken on 2022-03-23

Data Organisation in Spreadsheets

Read the paper (it's part of your homework), but you can also:

- Go through the annotated slides: https://kbroman.org/Talk_DataOrg/dataorg_notes.pdf
- Watch Karl Broman give the talk (02:36 to 45:00): https://youtu.be/t74E0a90gkA?t=156
- Read the content on a website: https://kbroman.org/dataorg/

But, especially apply it to your data

https://cven5837-ss22.github.io/website/

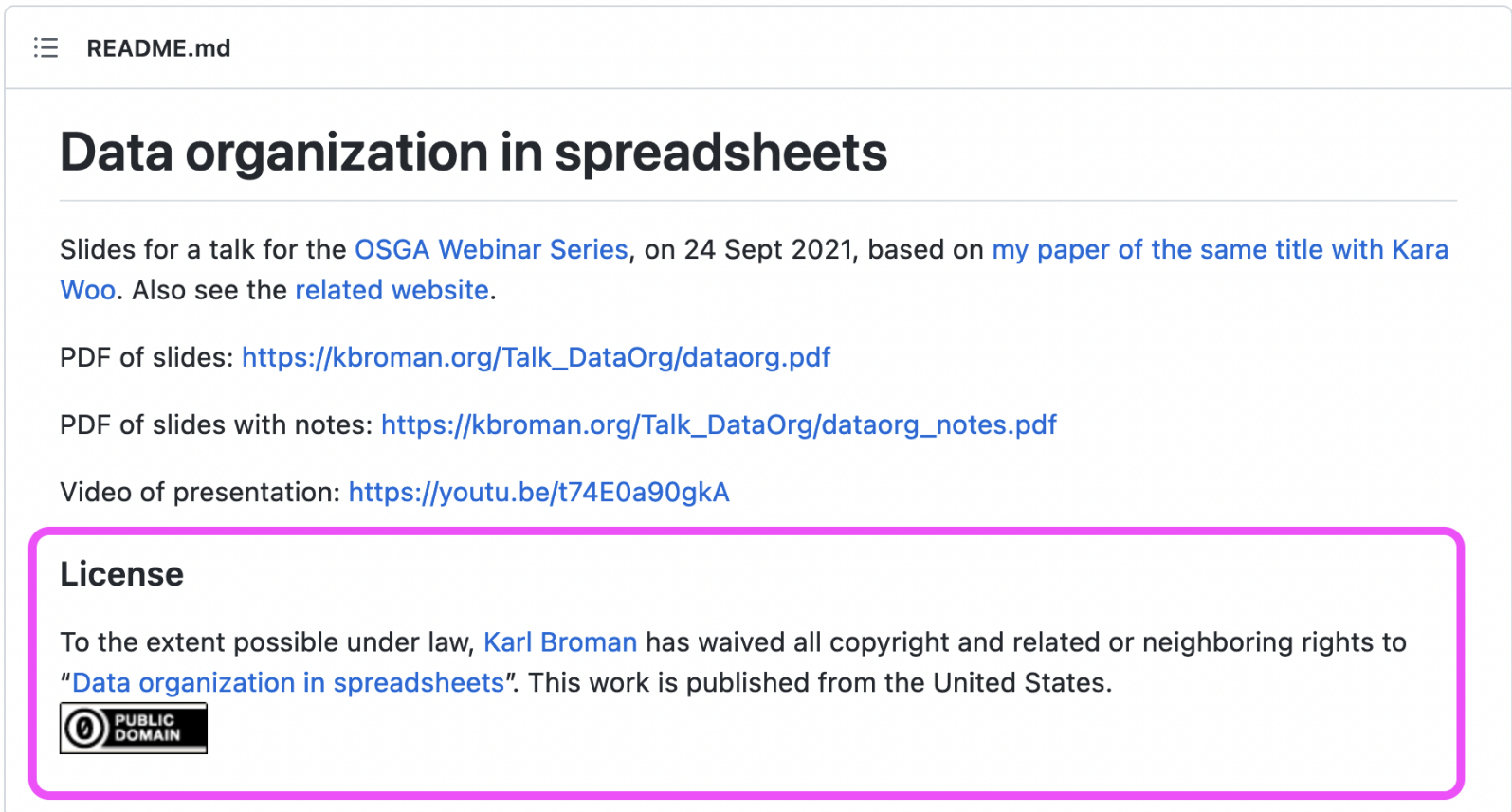
via GIPHY

Why?

Because it will make your life easier!

Jorunal: The American Statistician, [Screenshot taken on 2022-07-11]

License? CC0 (!)



README.md

Data organization in spreadsheets

Slides for a talk for the OSGA Webinar Series, on 24 Sept 2021, based on my paper of the same title with Kara Woo. Also see the related website.

PDF of slides: https://kbroman.org/Talk_DataOrg/dataorg.pdf

PDF of slides with notes: https://kbroman.org/Talk_DataOrg/dataorg_notes.pdf

Video of presentation: https://youtu.be/t74E0a90gkA

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PUBLIC DOMAIN

(https://github.com/kbroman/Talk_DataOrg) .footnote[Screenshot taken on 2022-03-23]

Karl Broman, GitHub repo broman/Talk_DataOrg, Screenshot taken on 2022-03-23

Pair Programming Exercise

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Pair Programming Exercises

- Two learners work together in a break out session
- One person (the driver) shares the screen and does the typing
- The other person (the navigator) offers comments and suggestions
- Roles get switched

hw-02a-data-visualiation

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3. Open “Projects”
4. Open the “course-materials” project

Homework week 2

https://cven5837-ss22.github.io/website/

Bring your own data

- Generate data doing a short survey or observational study
- Find a data online that interests you
- Use a dataset that you already have available

Homework due dates

- All material on course website
- Homework assignment due: Friday, 15th July
- Learning reflection due: Monday, 18th July

Thanks! 

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Slides created via revealjs and Quarto: https://quarto.org/docs/presentations/revealjs/ Access slides as PDF on GitHub