



Mastering Data Visualisation Design

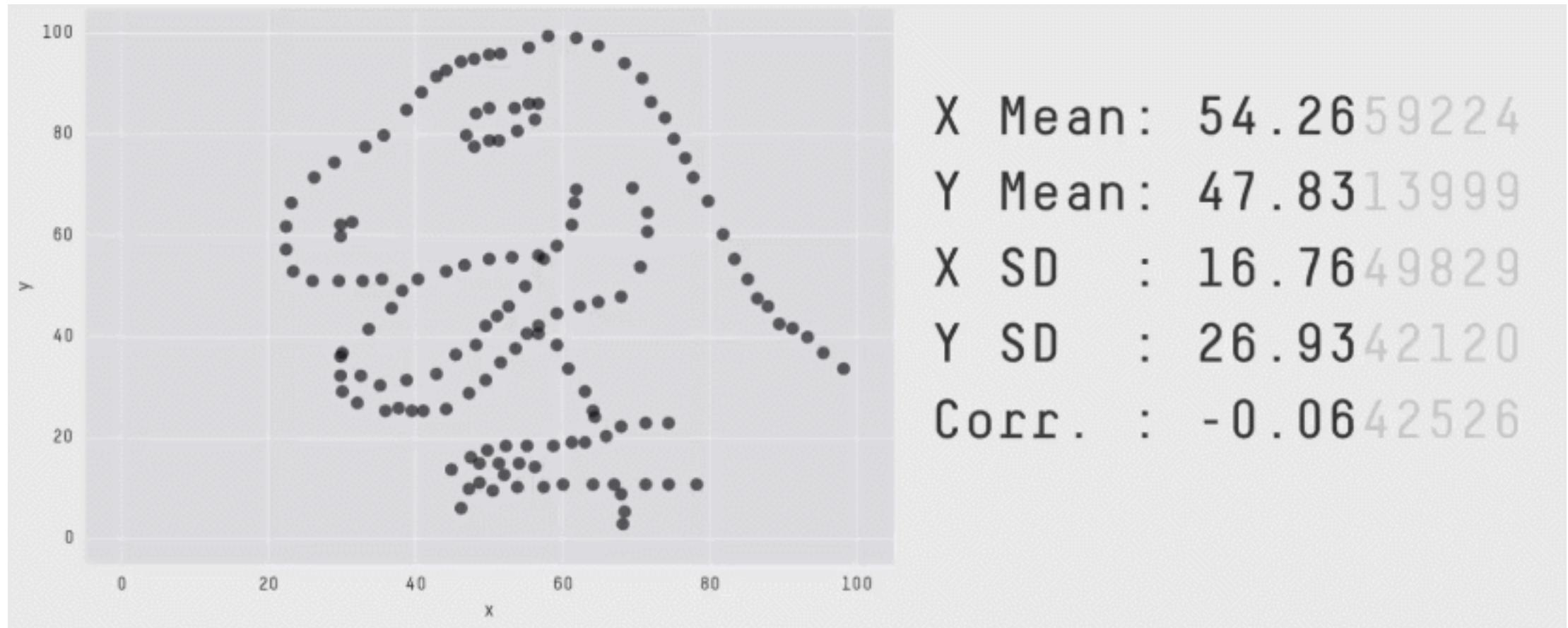
SIH Masterclass

Giorgia Mori

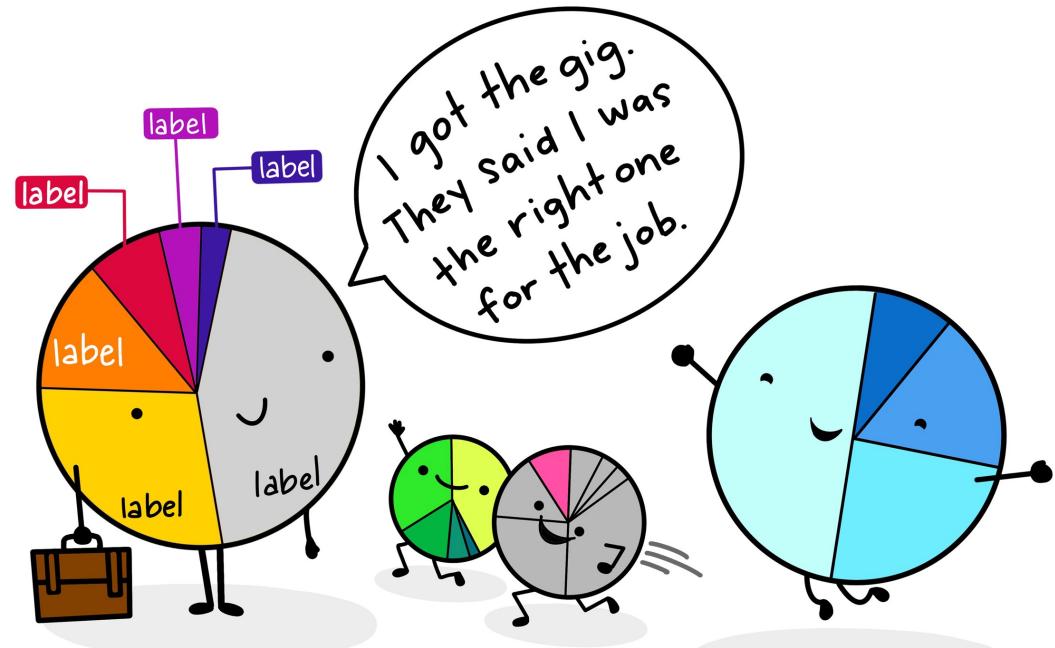
Data Science Trainer

Sydney Informatics Hub (SIH)

The importance of Data Visualisation



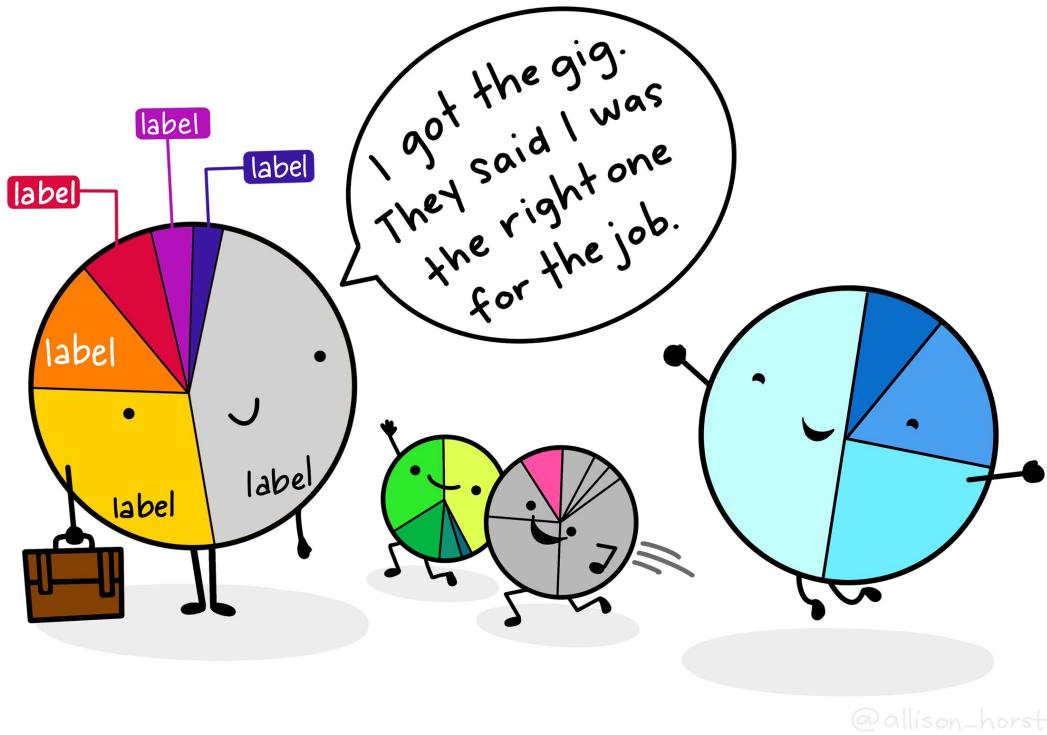
Overview



@allison_horst

- Why you want to use data visuals;
- Which graph to use for your message;
- How to adjust your visuals for your audience.

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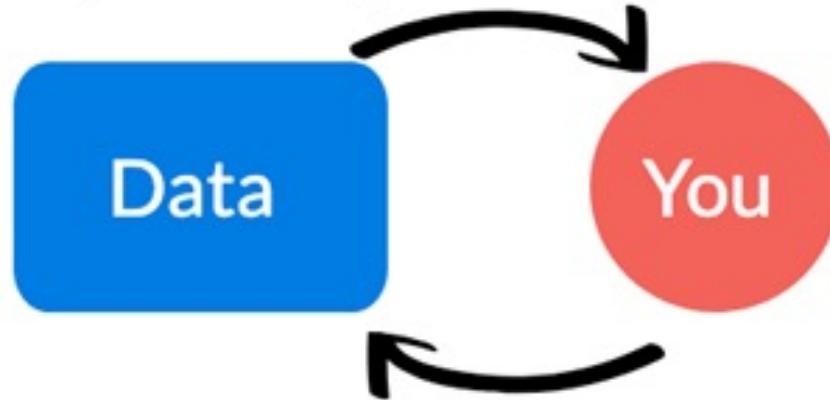


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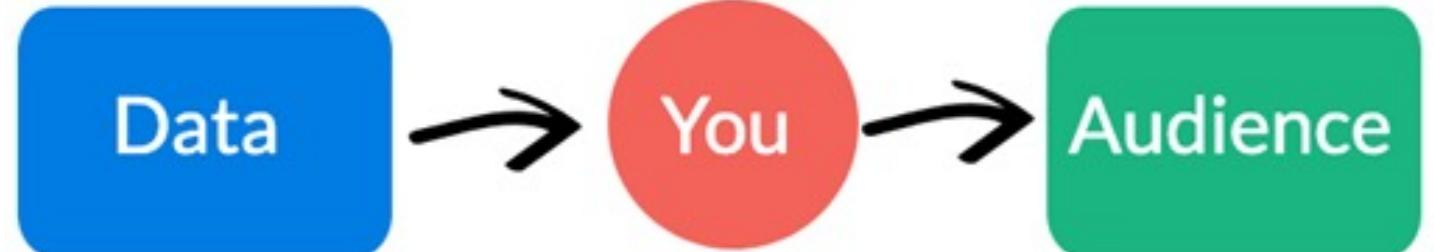
@allison_horst

Why you want to use data visuals

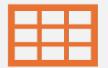
Exploratory Data Visualisation



Explanatory Data Visualisation



Tools for visualisation



Excel or Google Sheets



Software like Prism or SPSS



BI tools like Tableau or PowerBI

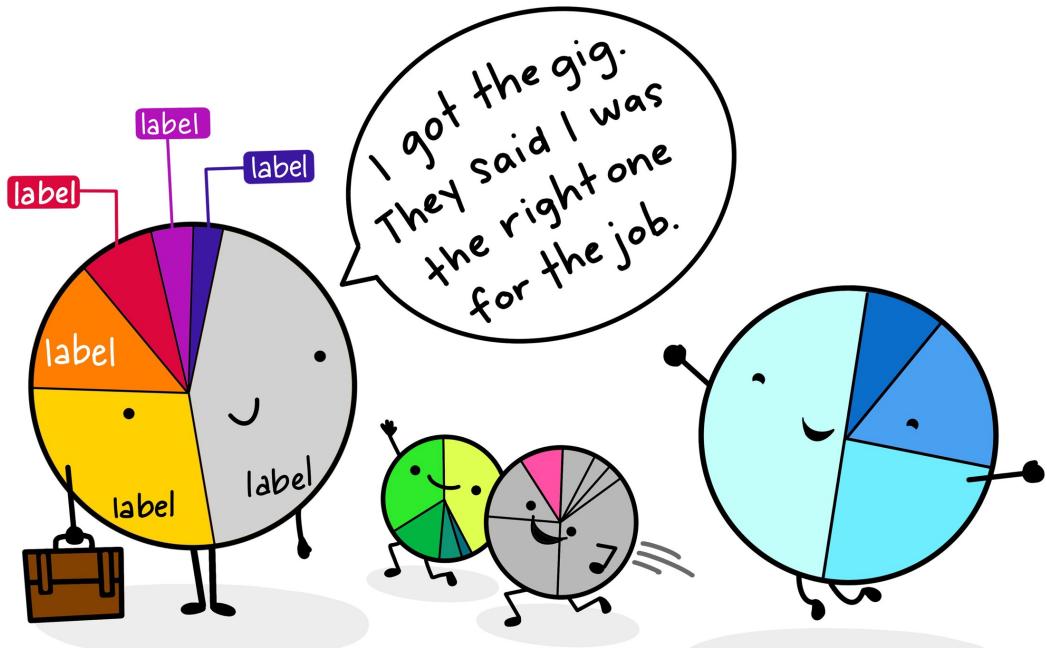


Libraries in Python or R



Drawing/editing in Adobe Photoshop or Illustrator

Overview

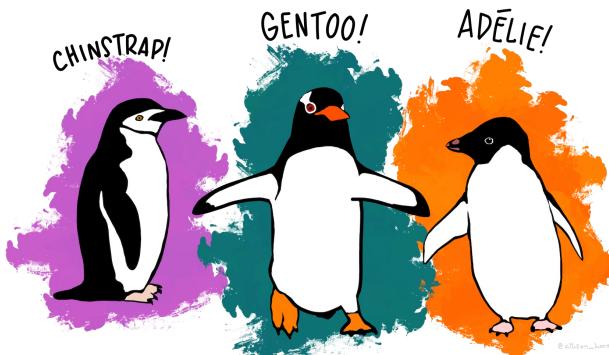


- Why you want to use data visuals;
- **Which graph to use for your message;**
- How to adjust your visuals for your audience.

What type and size of data are you working with?



	species	island	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g	sex	year
66	Adelie	Biscoe	41.6	18.0	192	3950	male	2008
67	Adelie	Biscoe	35.5	16.2	195	3350	female	2008
68	Adelie	Biscoe	41.1	19.1	188	4100	male	2008
69	Adelie	Torgersen	35.9	16.6	190	3050	female	2008
70	Adelie	Torgersen	41.8	19.4	198	4450	male	2008
71	Adelie	Torgersen	33.5	19.0	190	3600	female	2008



Artwork by @allison_horst

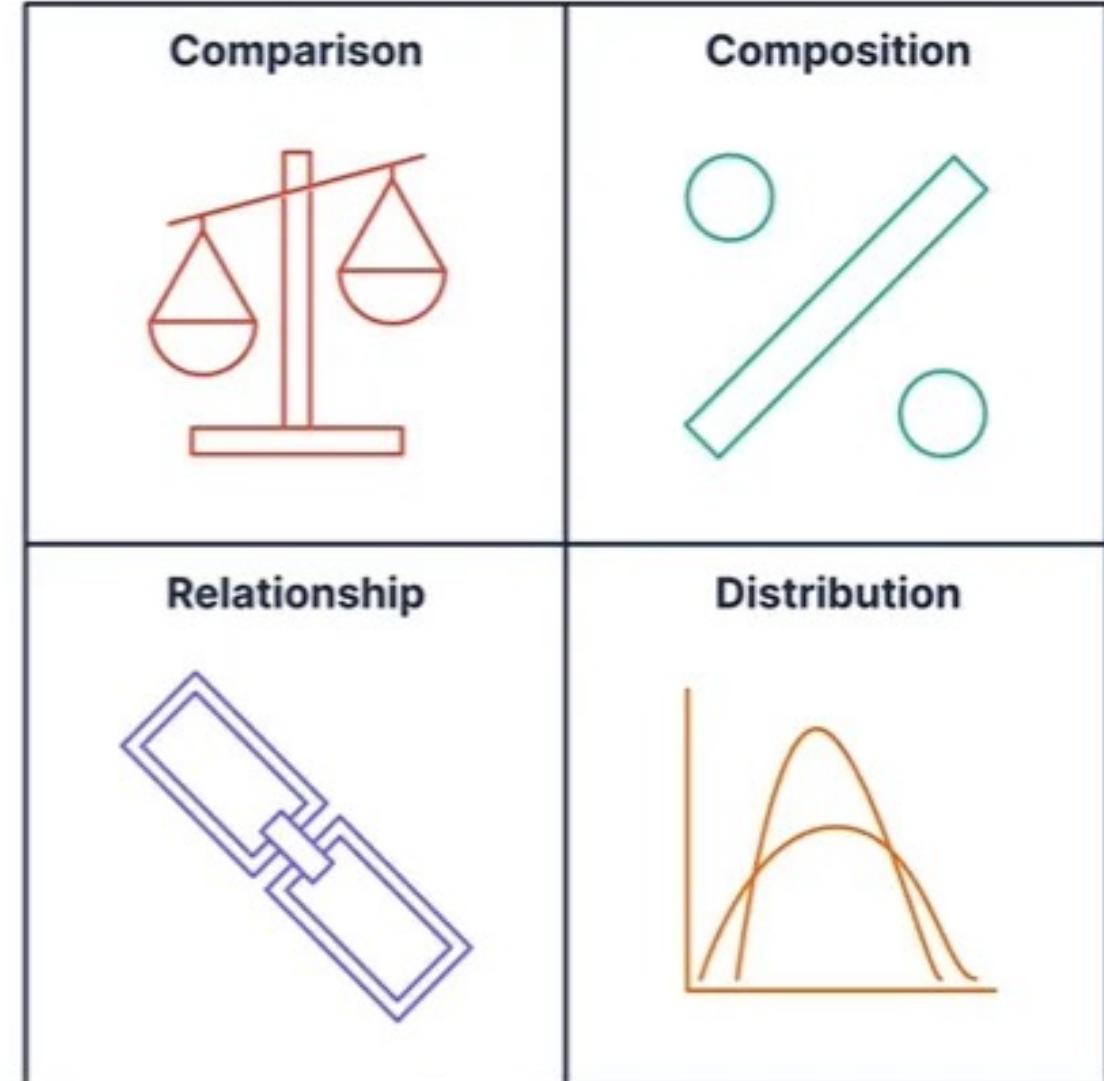
Quantitative: numerical

Ordinal: non-numerical data

that has a natural order

Categorical: nominal

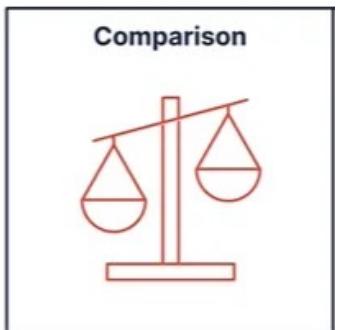
Selecting the Right Graph for Your Message



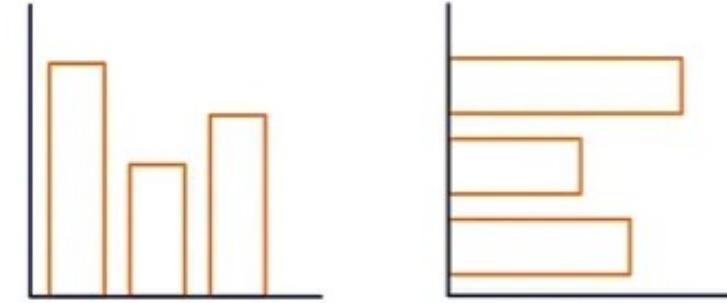


Comparison

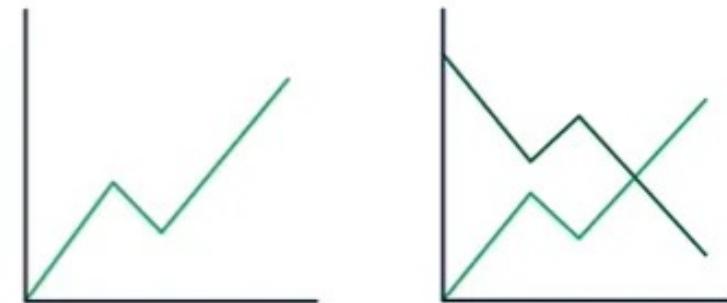
How are the elements similar or different?



Bar charts



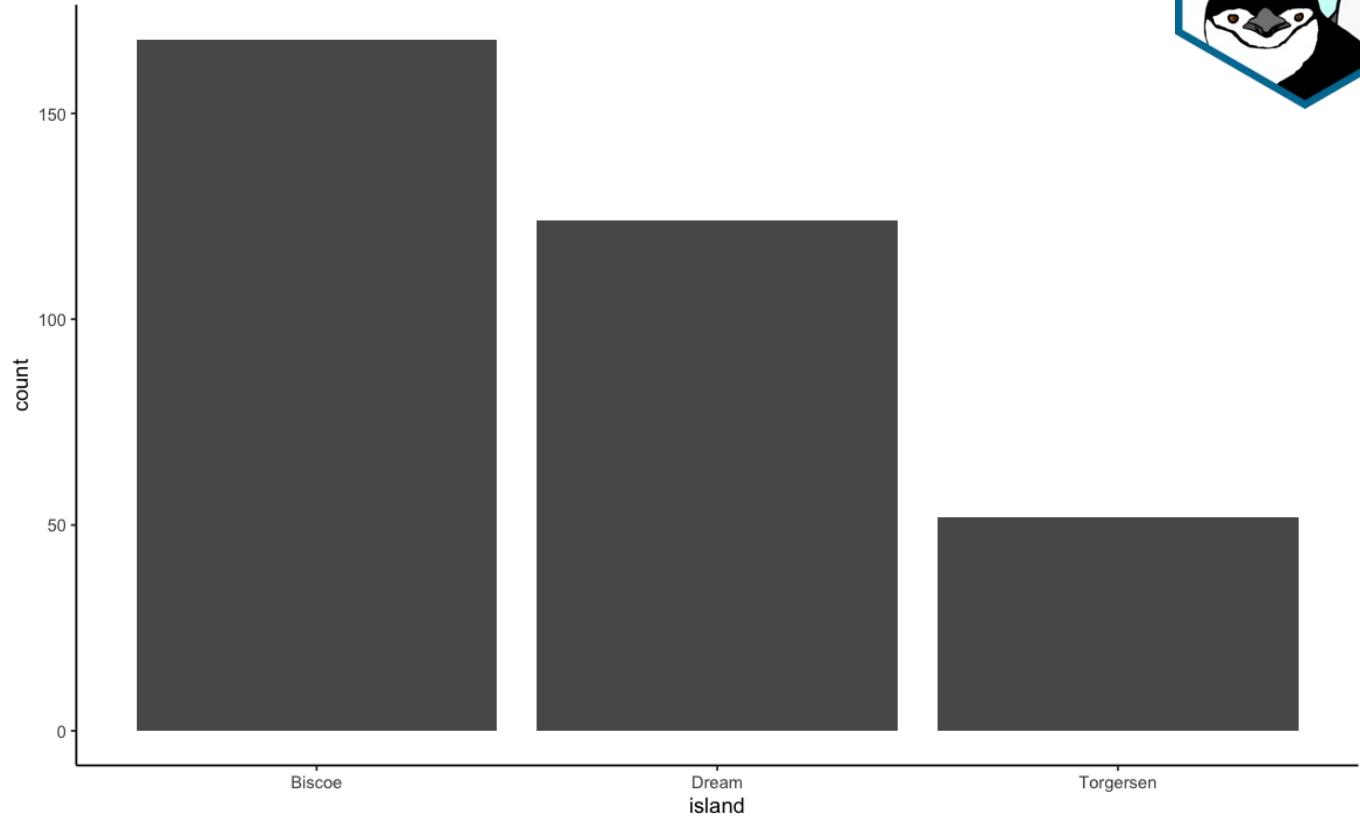
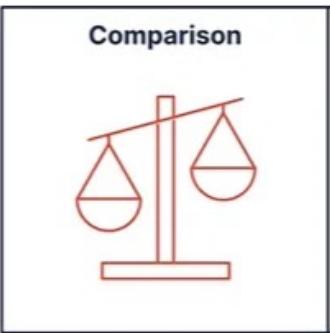
Line charts





Comparison

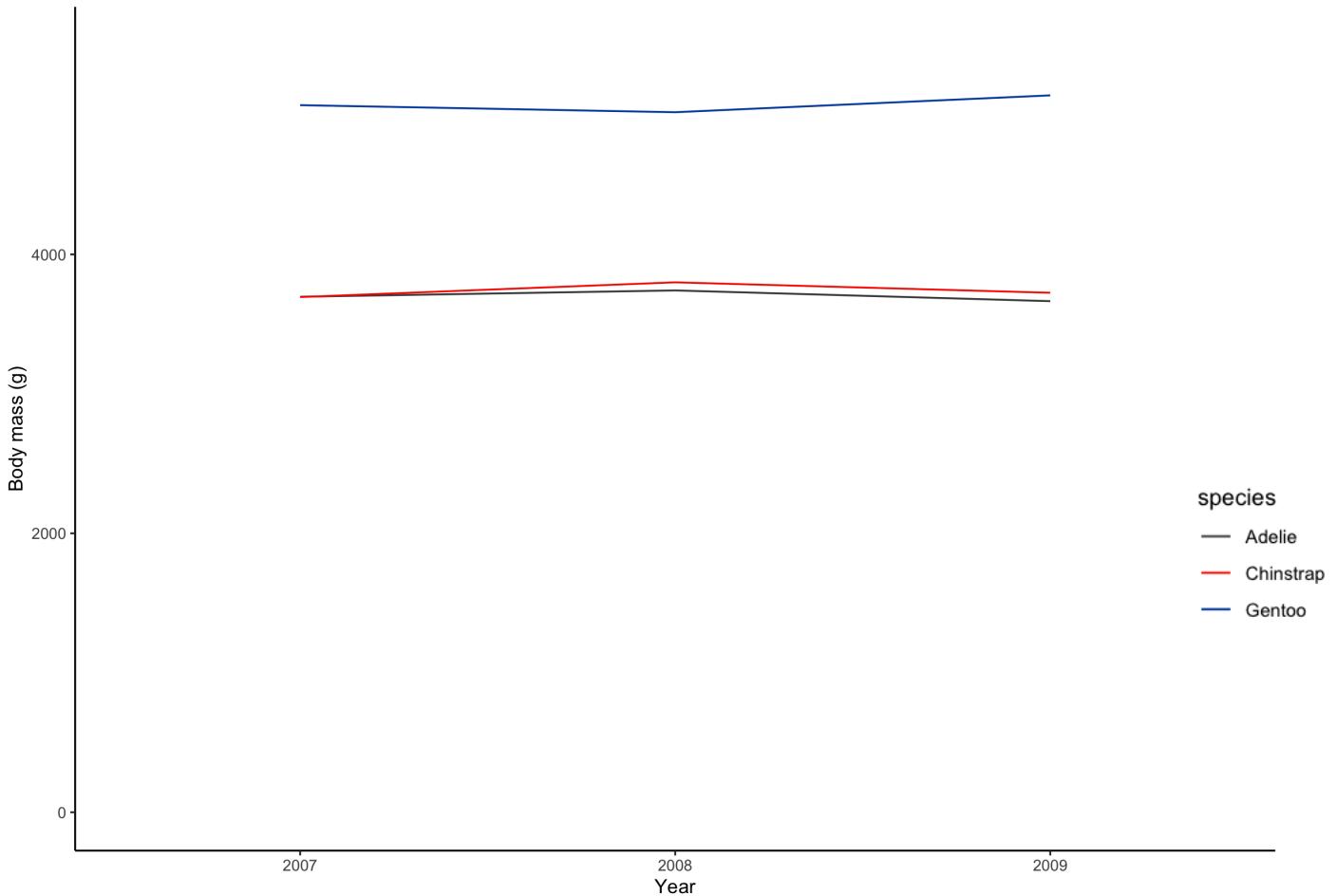
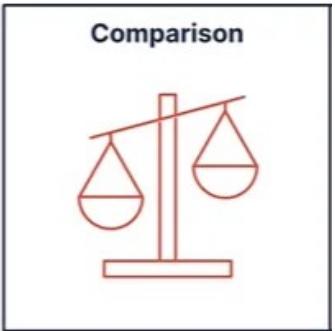
How are the elements similar or different?





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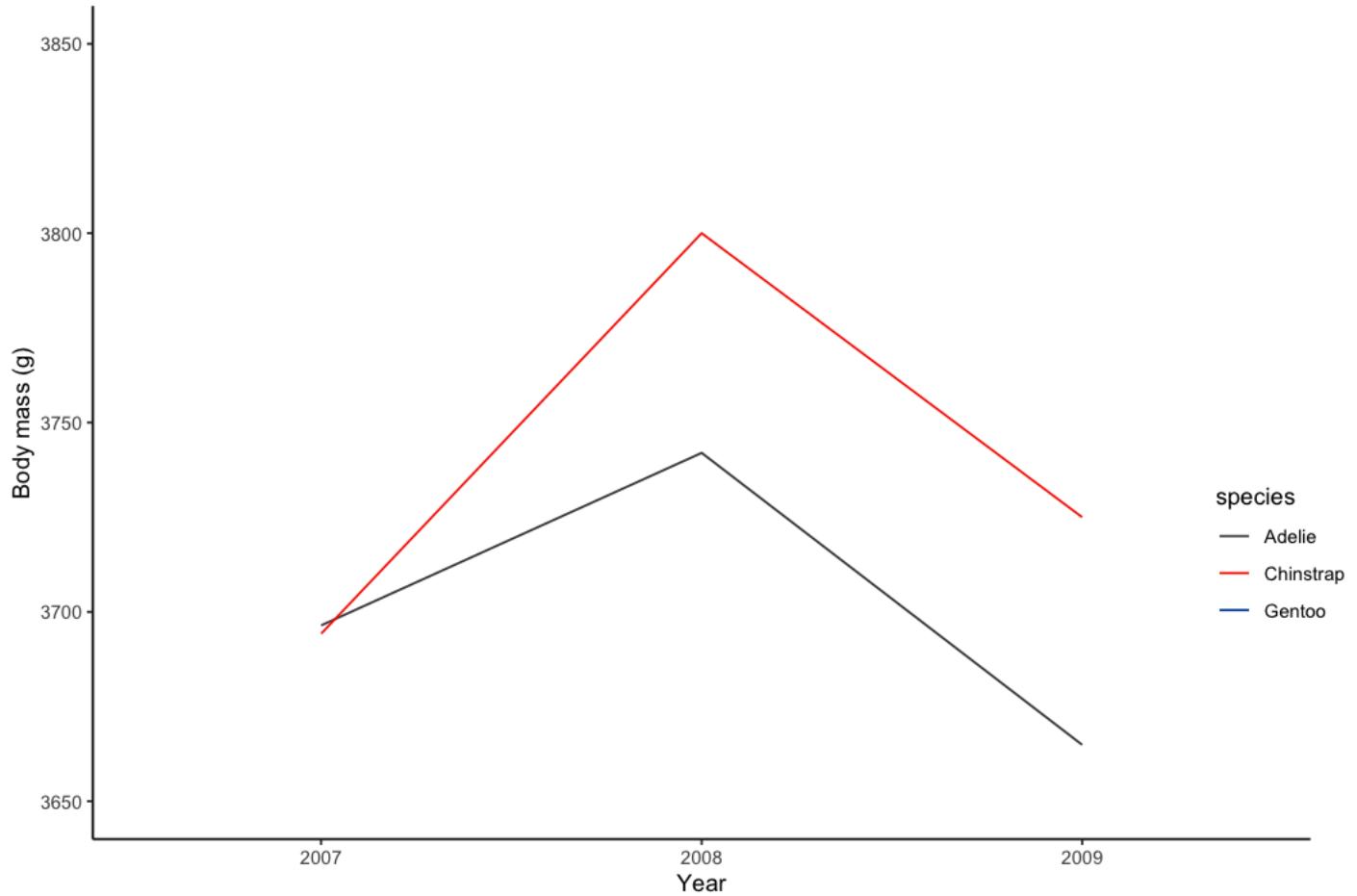
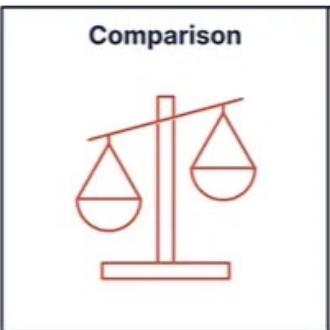
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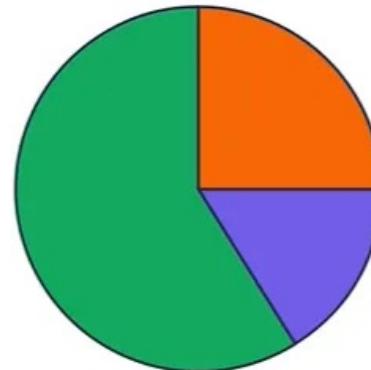
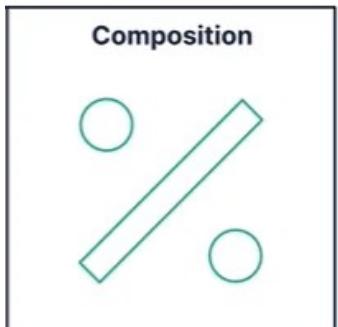
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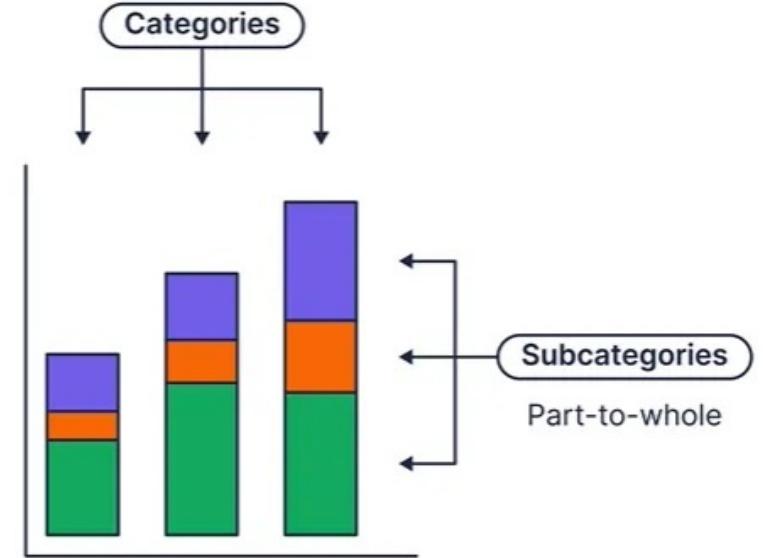


Composition

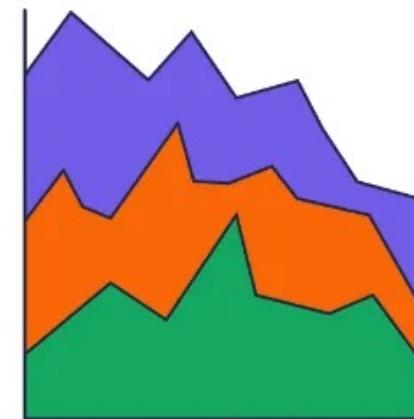
*What parts
make up the
whole*



Pie chart



Stacked bar chart



Time

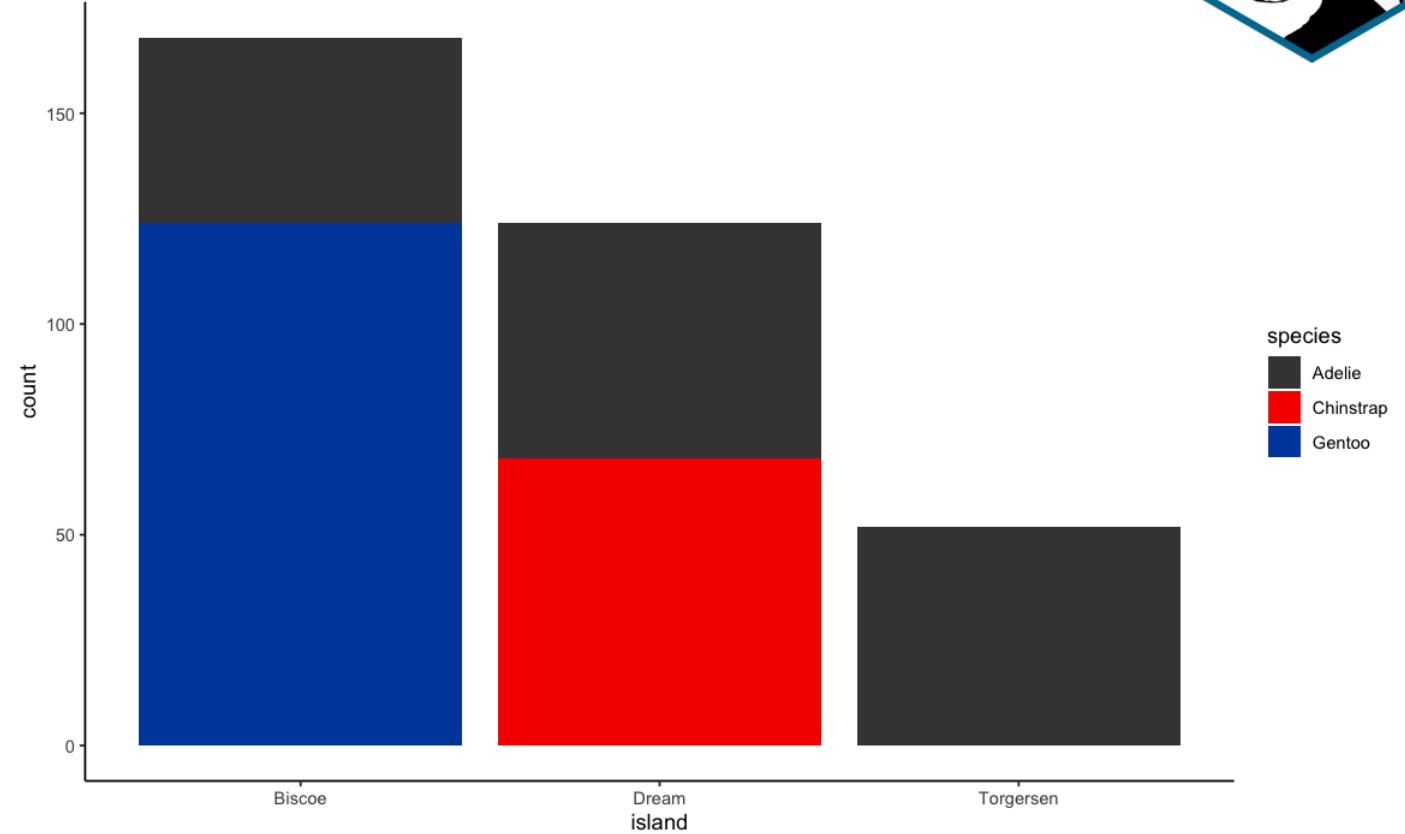
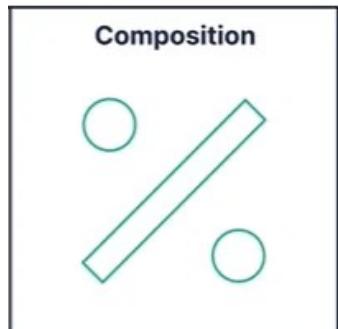
Stacked area chart





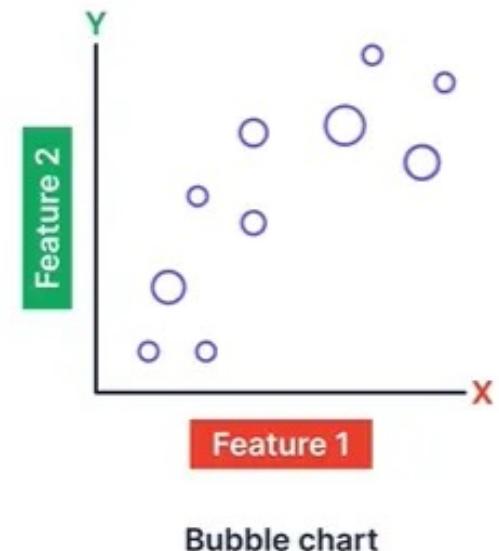
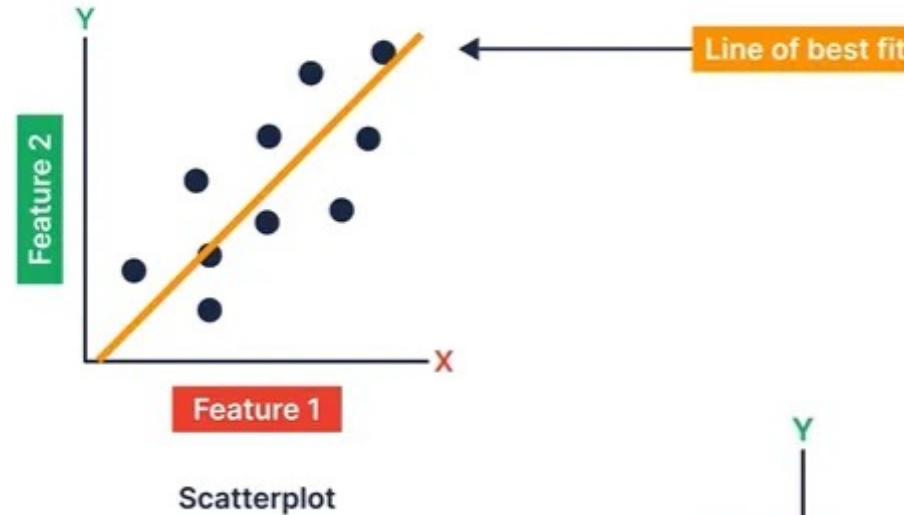
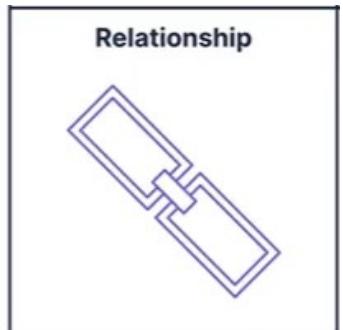
Composition

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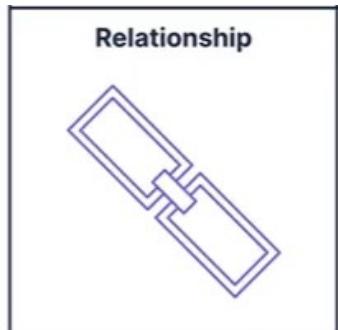
Relationship

*uncover
relationships
between
variables*

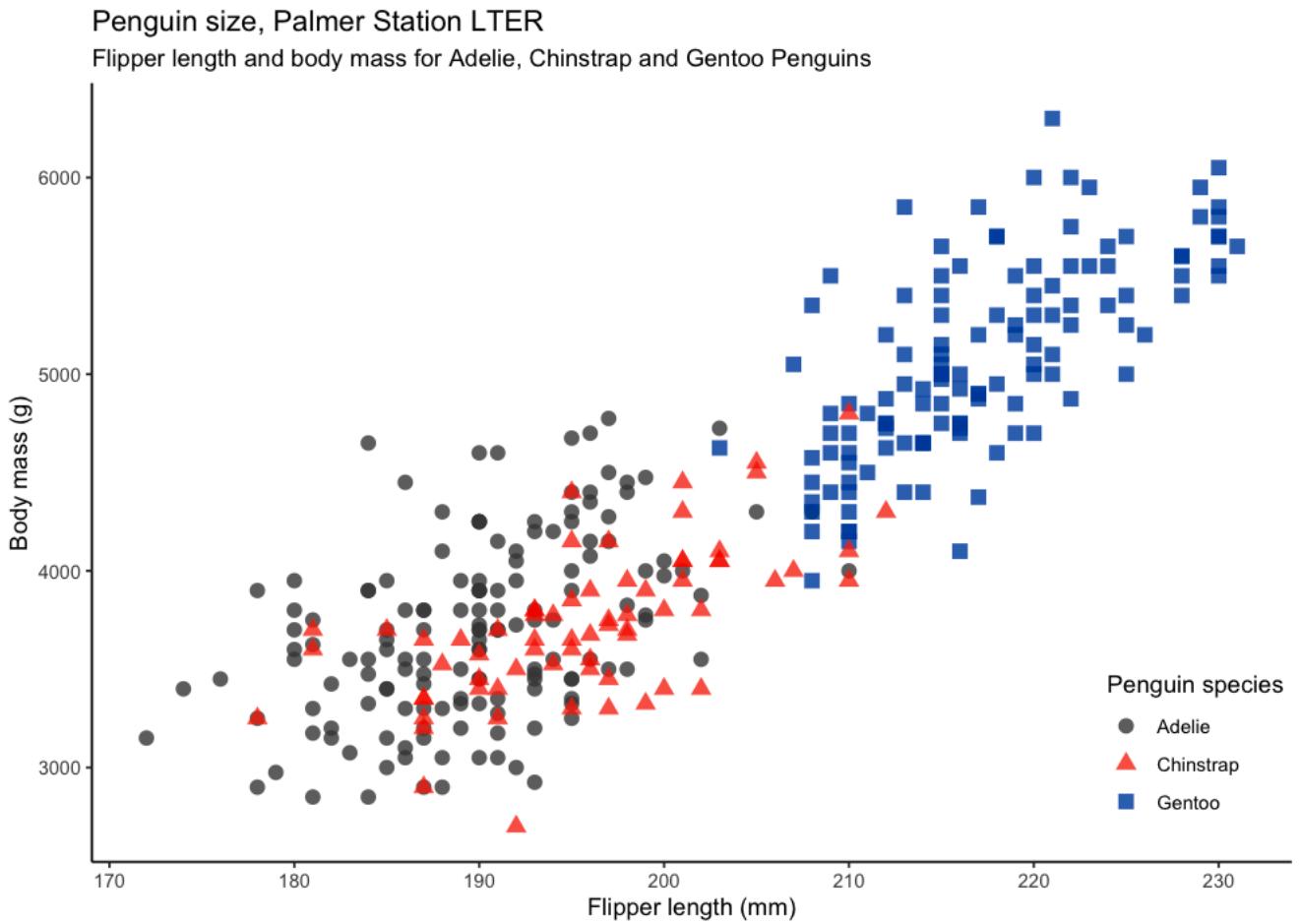
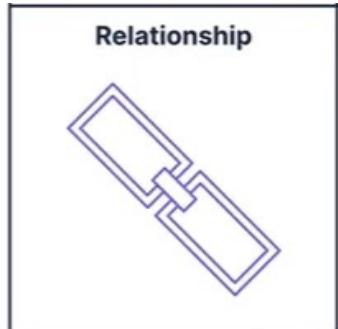


Relationship

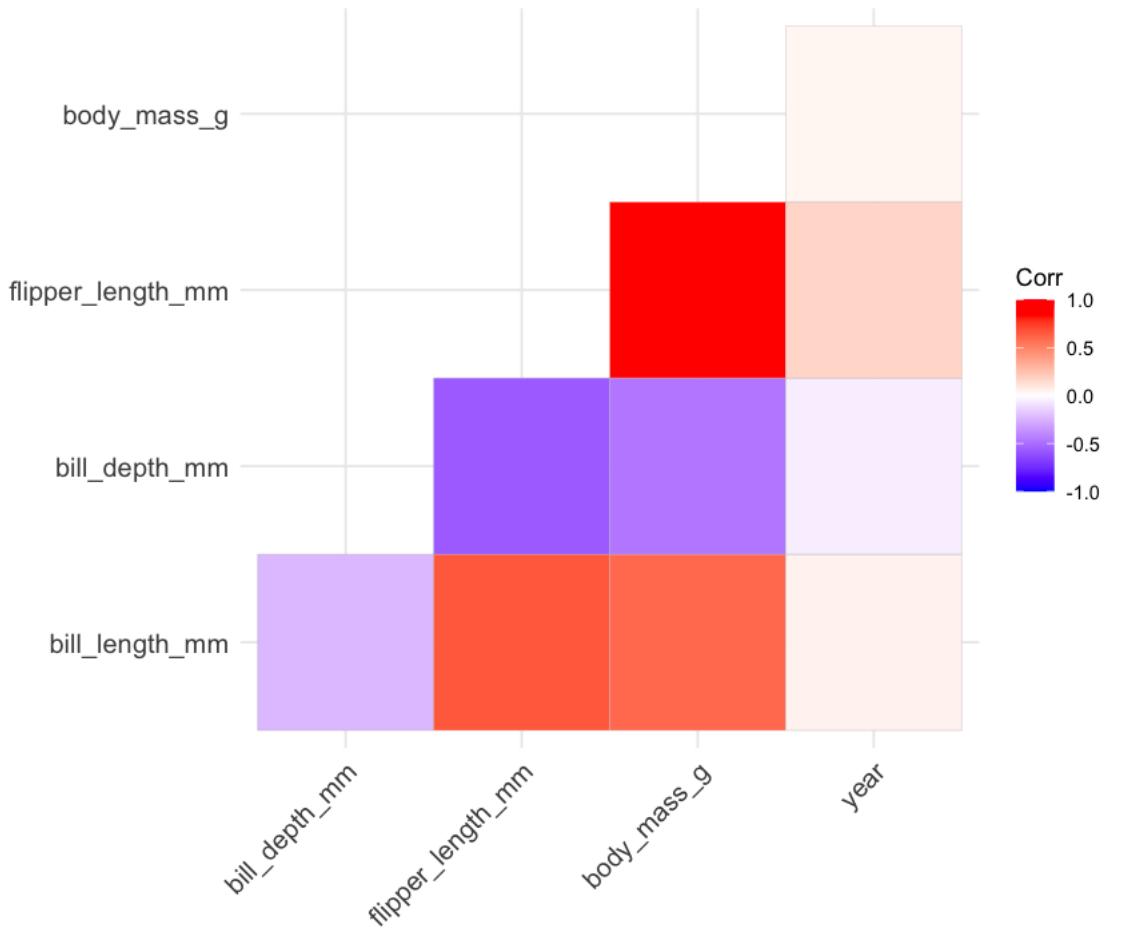
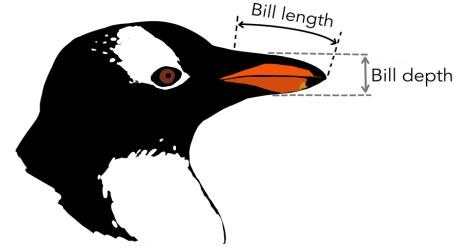
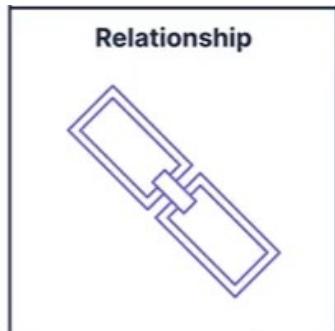
*uncover
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Relationship *uncover* relationships between variables

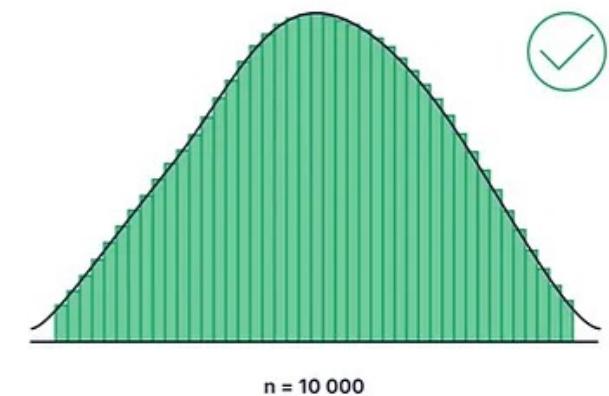
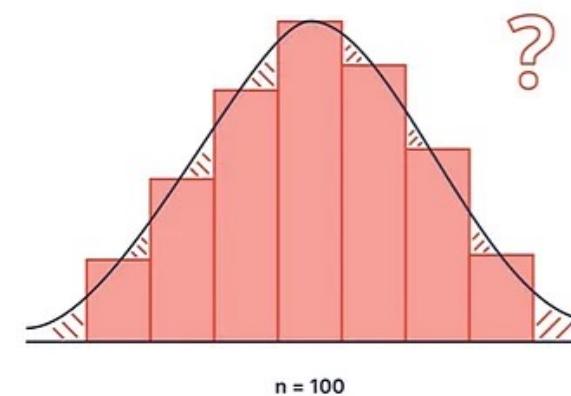
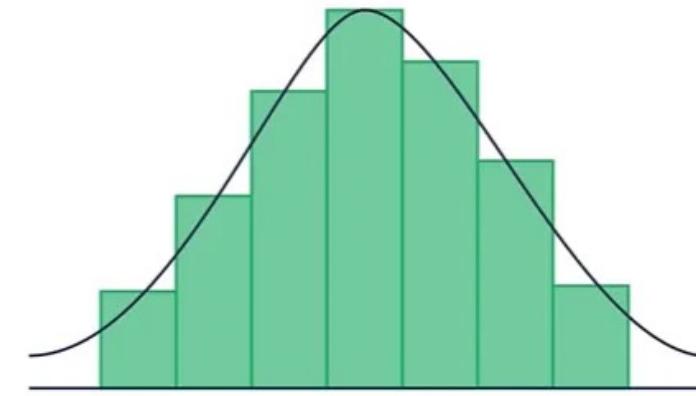
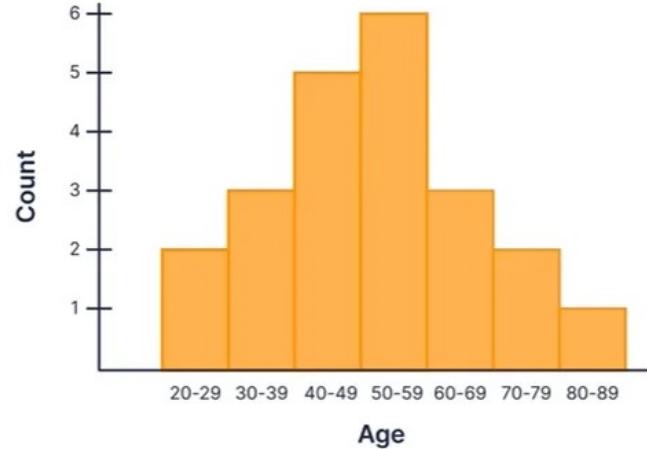
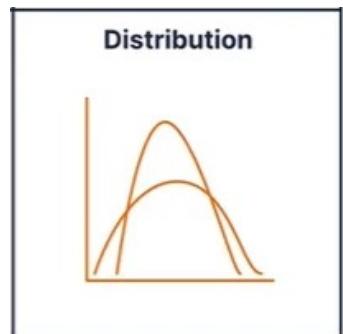


Relationship *uncover* relationships between variables



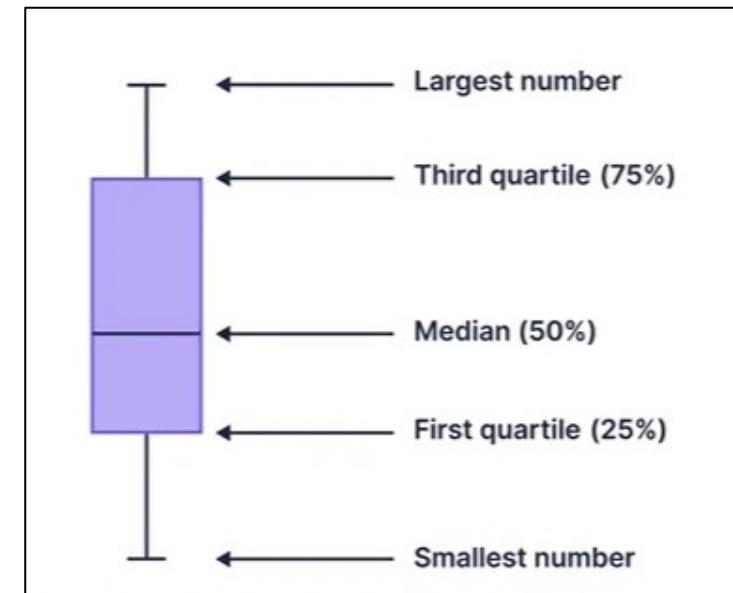
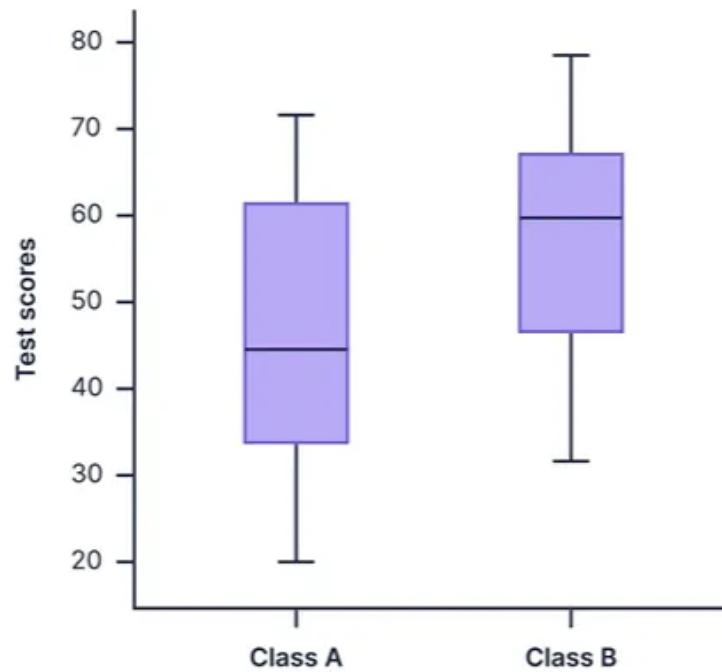
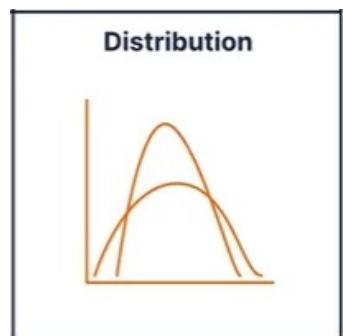
Distribution

analyze how values cluster and identify outliers



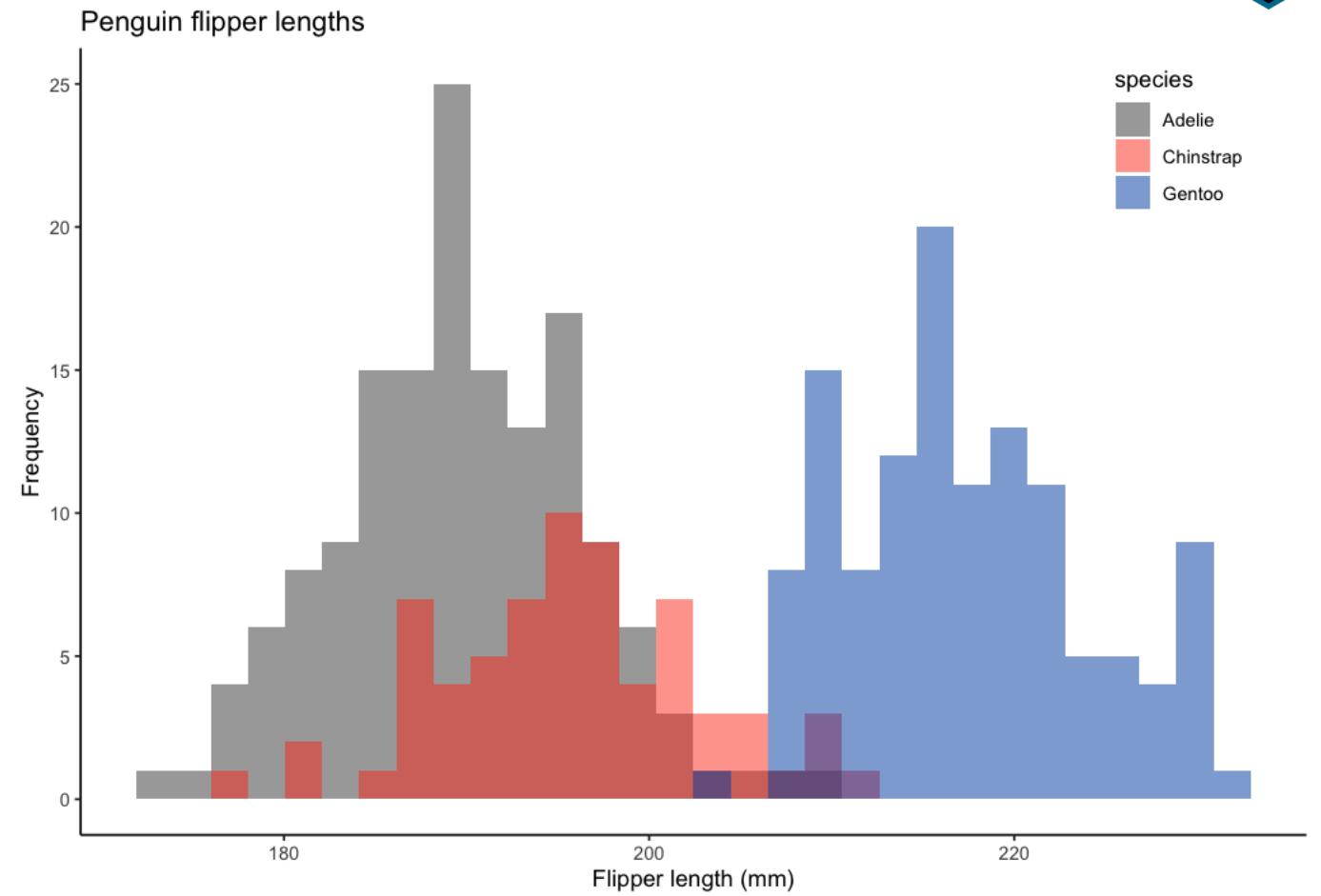
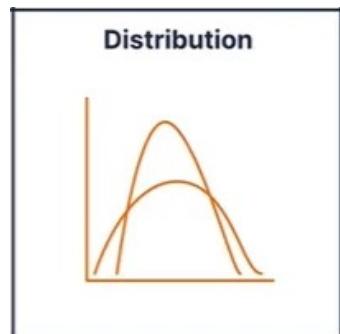
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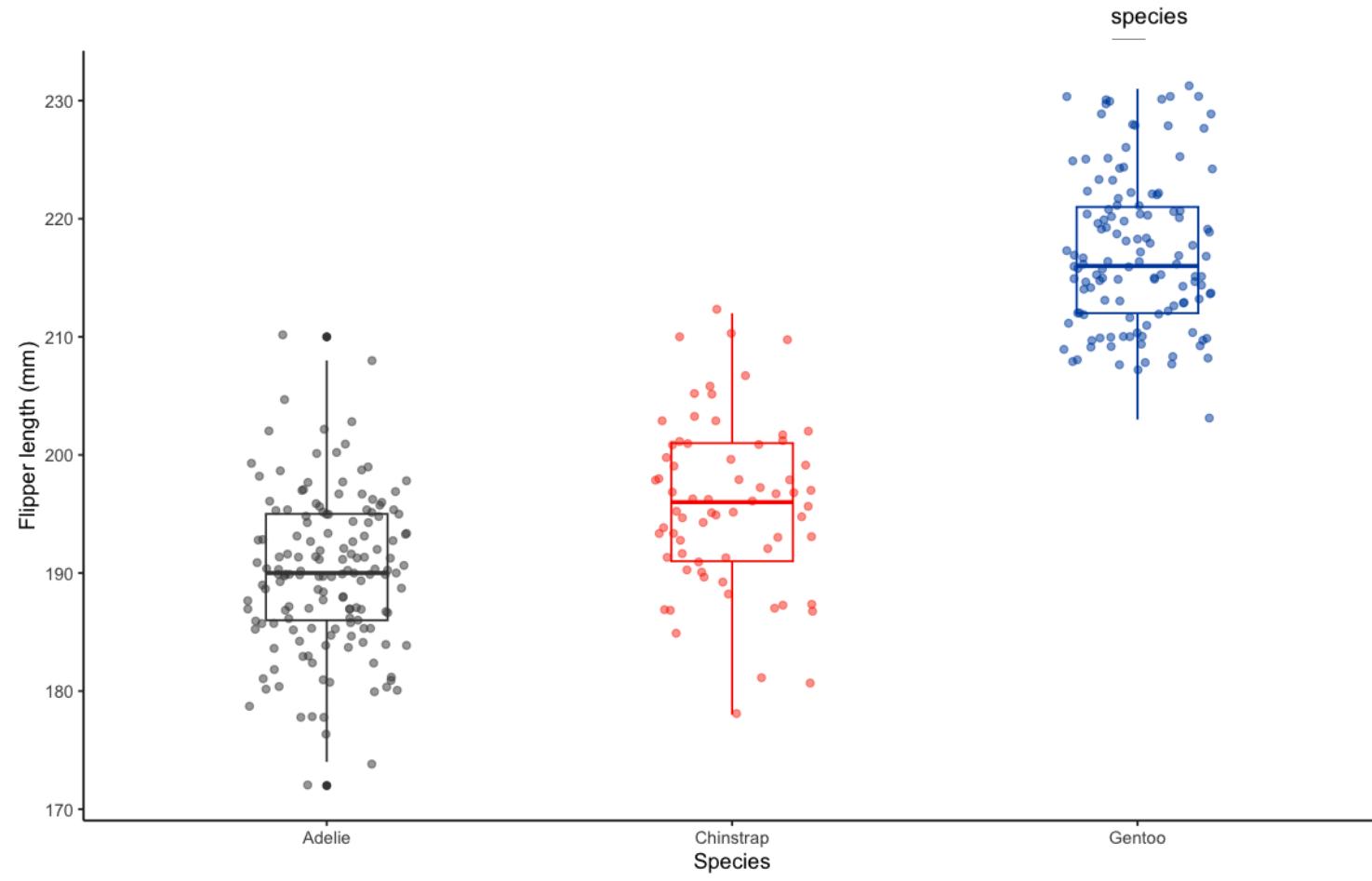
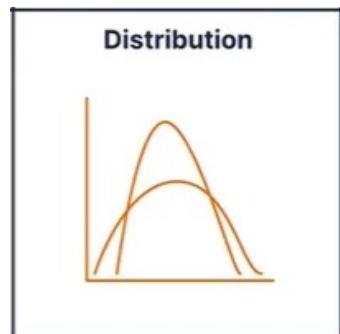


Distribution *analyze how values cluster and identify outliers*





Distribution *analyze how values cluster and identify outliers*





from Data to Viz

EXPLORE STORY ALL CAVEATS POSTER ABOUT CONTACT

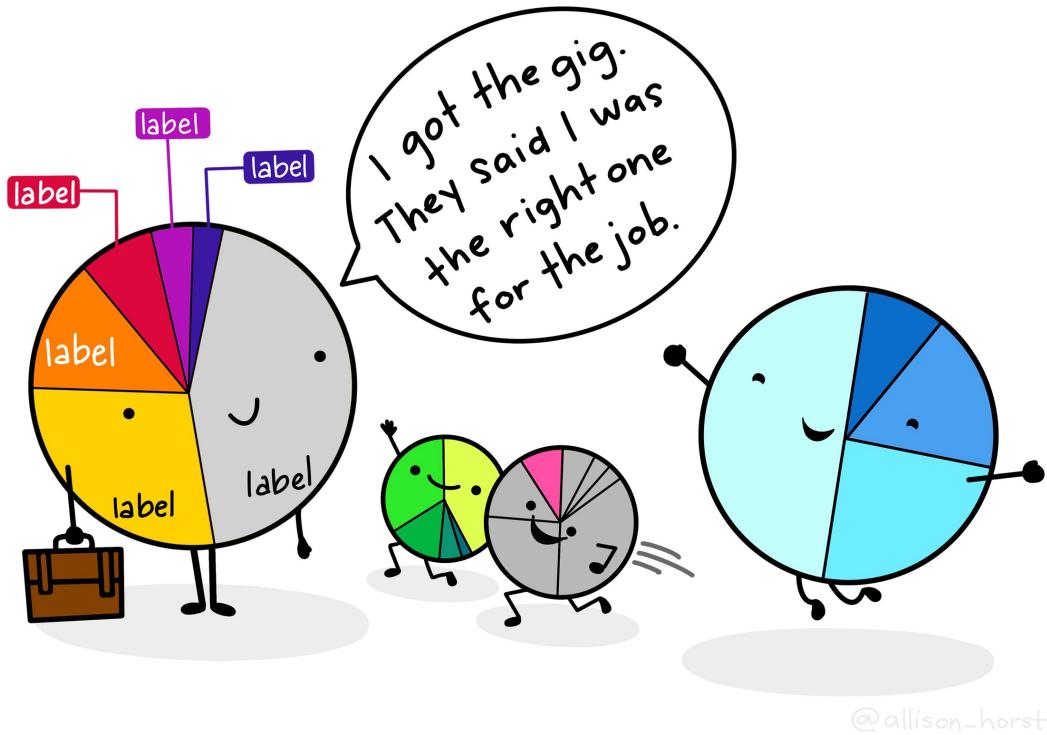


from Data to Viz

From Data to Viz leads you to the most appropriate graph for your data. It links to the code to build it and lists common caveats you should avoid.

EXPLORE

Overview

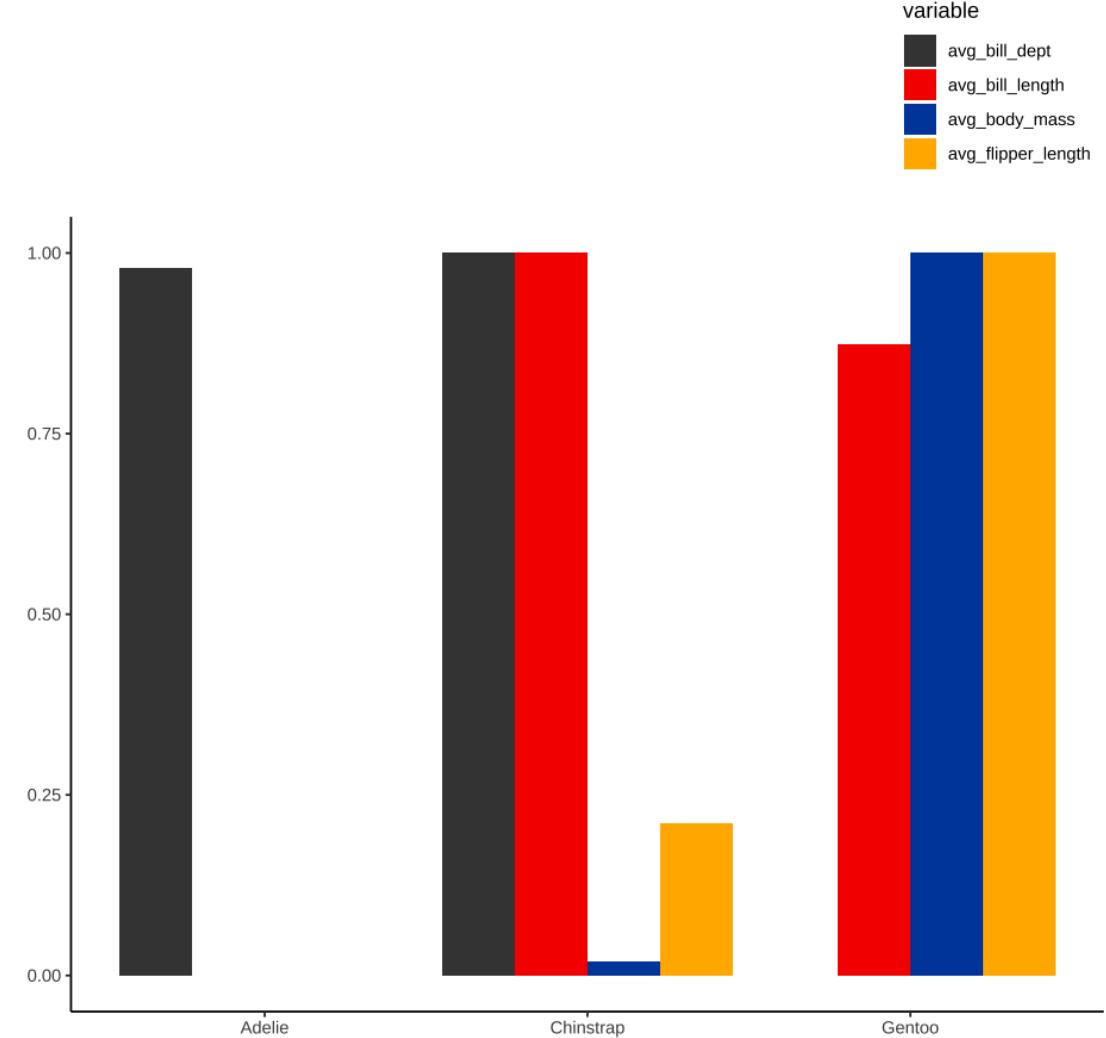
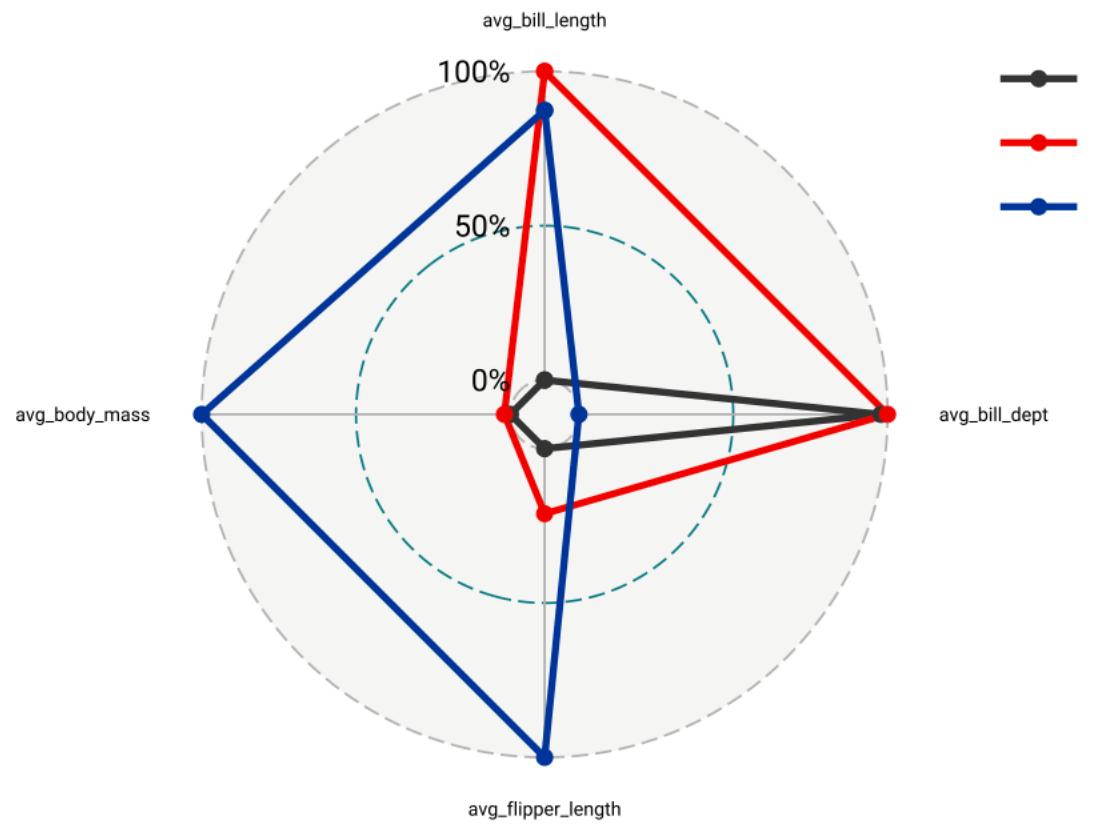


- Why you want to use data visuals;
- Which graph to use for your message;
- **How to adjust your visuals for your audience.**

Who is your audience?

- How familiar they are with the subject matter of your data;
- How much context they already have vs what you should supply;
- Their familiarity with various methods of data visualisation.





Which one is **Bouba**, and which one is **Kiki**?

(“Sound Symbolism” - Wolfgang Köhler 1929)

BOUBA HUHU LAULAU

DUBULU CUMULU

MALUBA CAUCAU DAUDAU

LUMUBU NOBOMO

KIKI NIBITI KIJINI

ZIMITI HINITI

NIKIMI HELIKI TAKETI

BEMELE CHITIKI

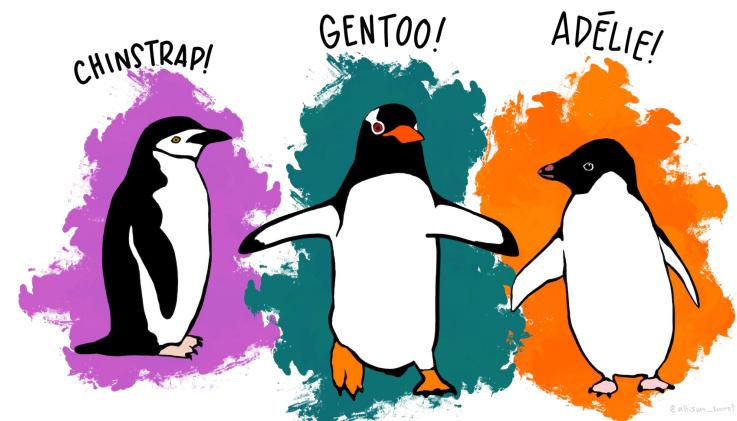
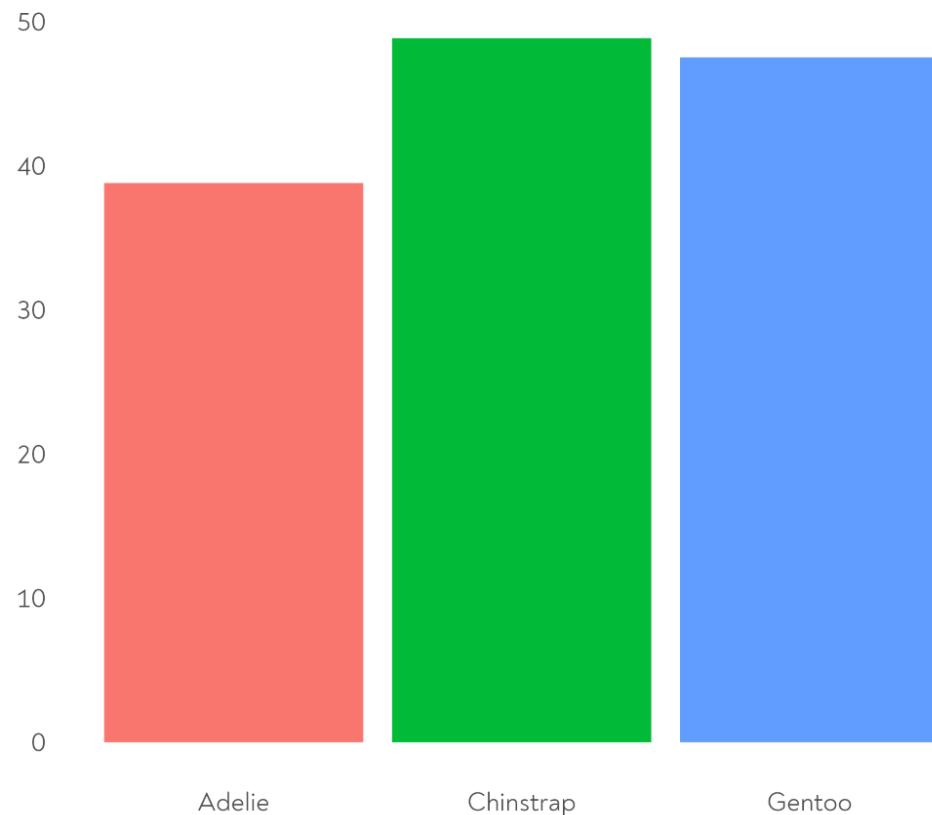


PENGUIN



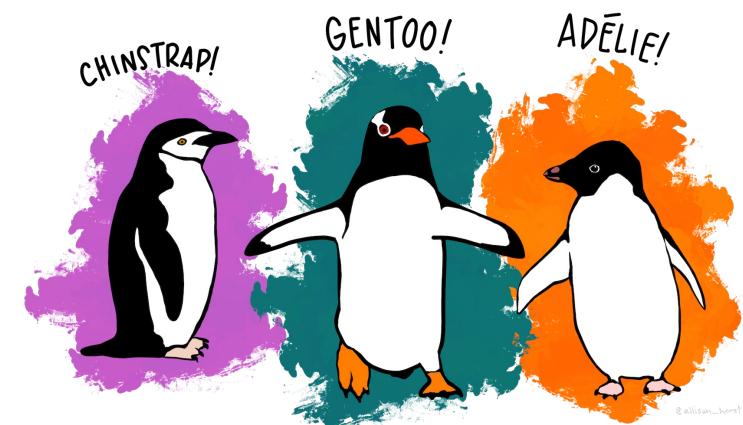
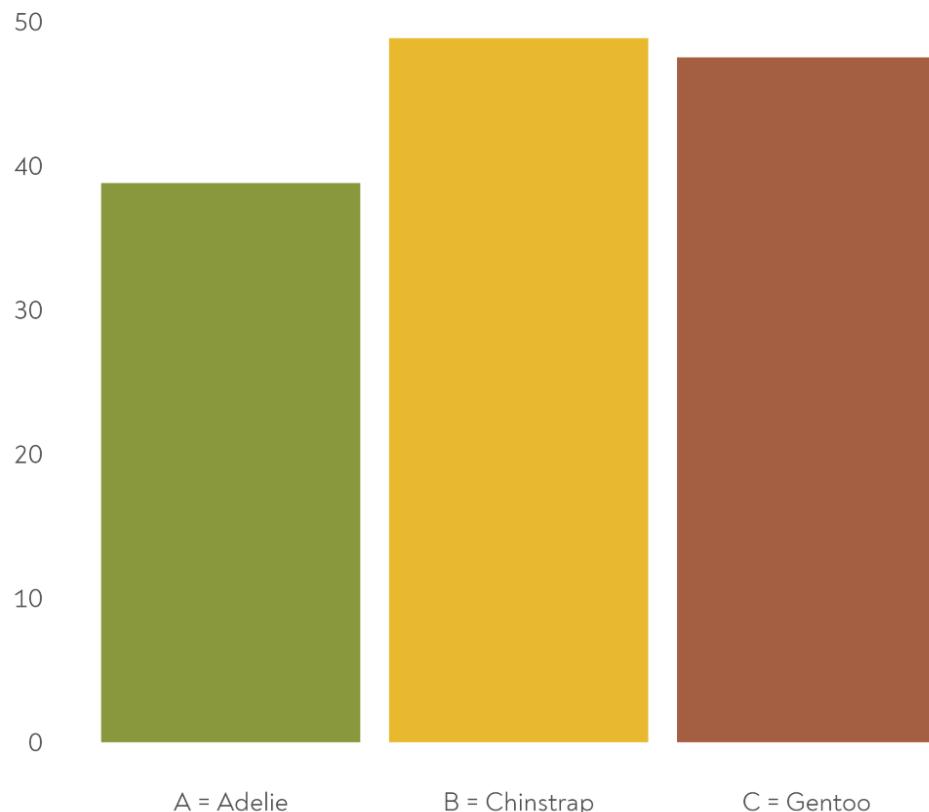
The penguins had a baking competition to see **which species could make the best banana bread**. Each species was given bananas of a different level of ripeness (**ripe, under ripe, over ripe**).

The taller the bar, the yummier the cake!

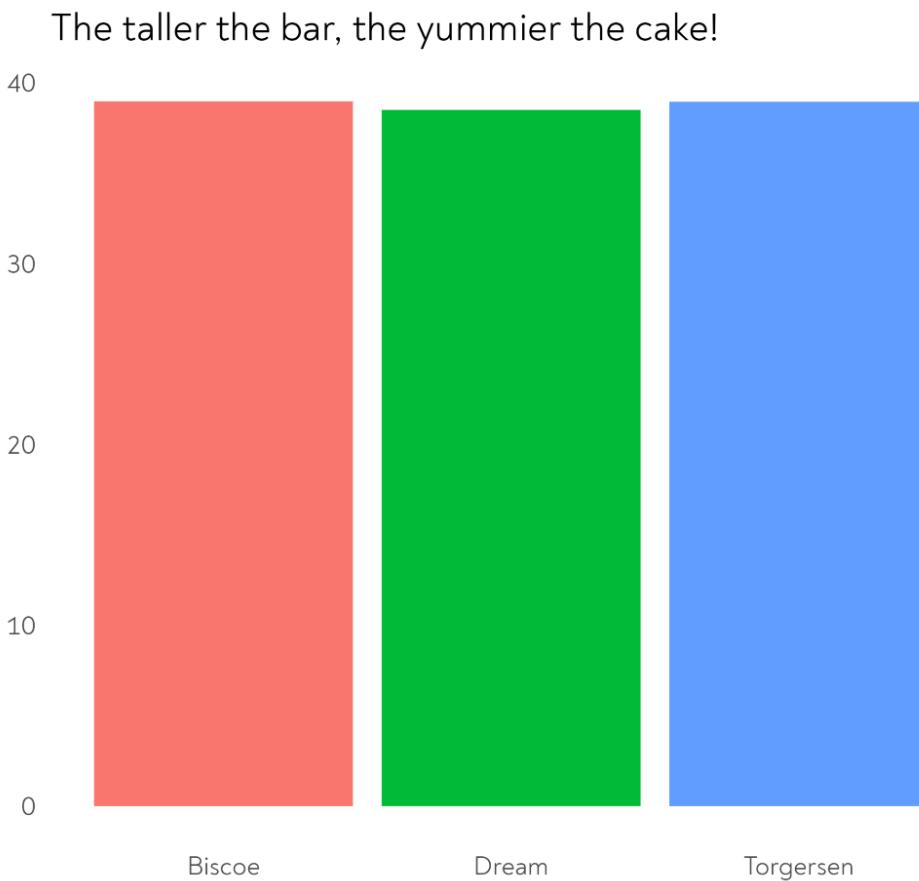


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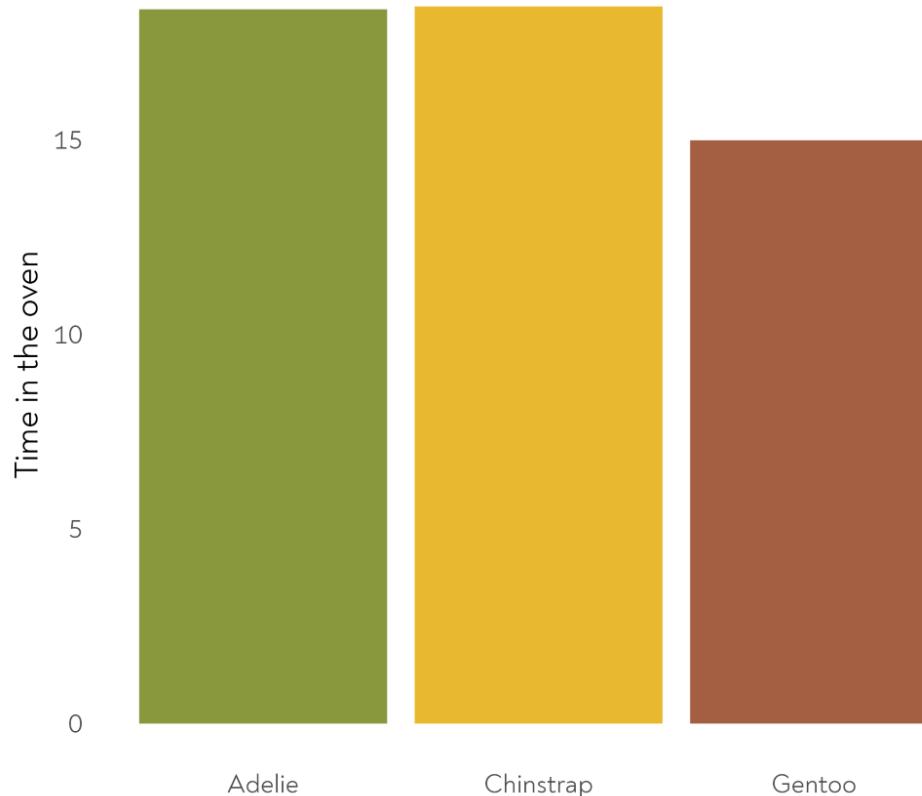
The Adelie penguins decided to experiment with **different quantities of banana in their mix.**
Each island chose a different quantity.



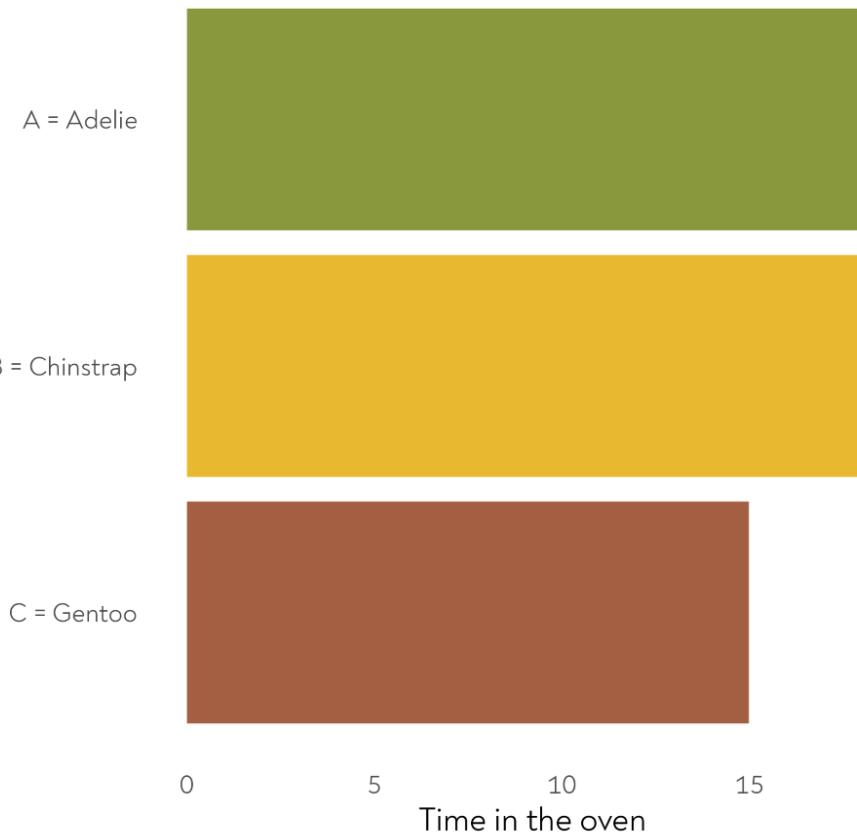
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The penguins also **baked their cakes** for different amounts of time.
Here are the *mean durations per species*.



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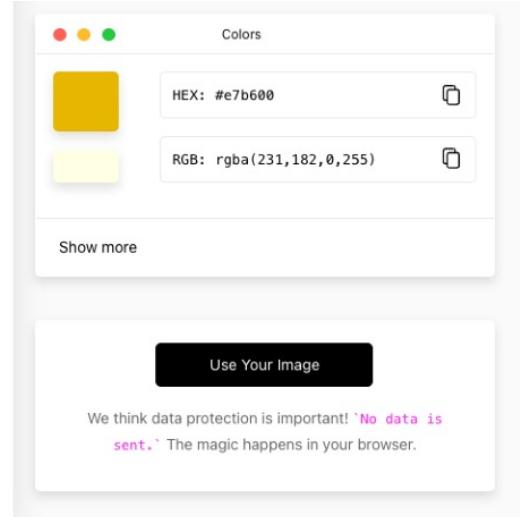
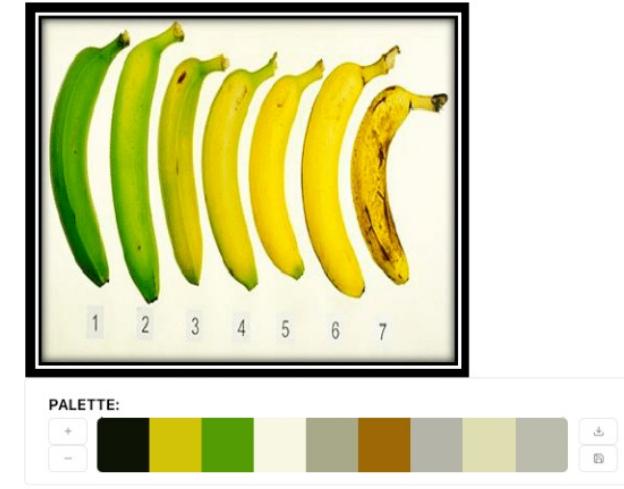


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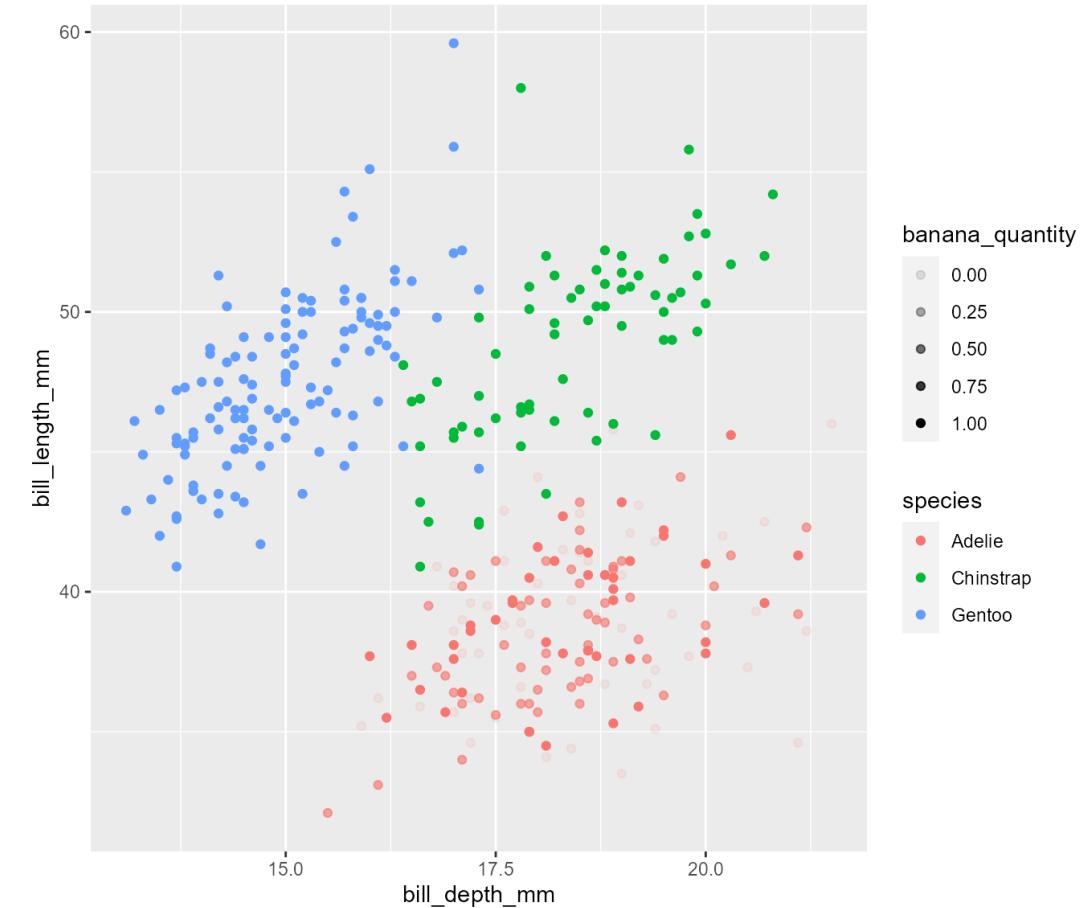
Make it easy for your audience to remember what is what

- Use your brand guidelines;
 - <https://github.com/Sydney-Informatics-Hub/usydColours>
- Use a photo you like + something like imagecolorpicker.com;
- Take inspiration from photos/other dataviz/art you like;
- Google images and “[whatever you like] palette”
- Or... start from the colour wheel and read around how best to use it:
 - paletton.com;
 - <https://cararthompson.shinyapps.io/monochromeR/>



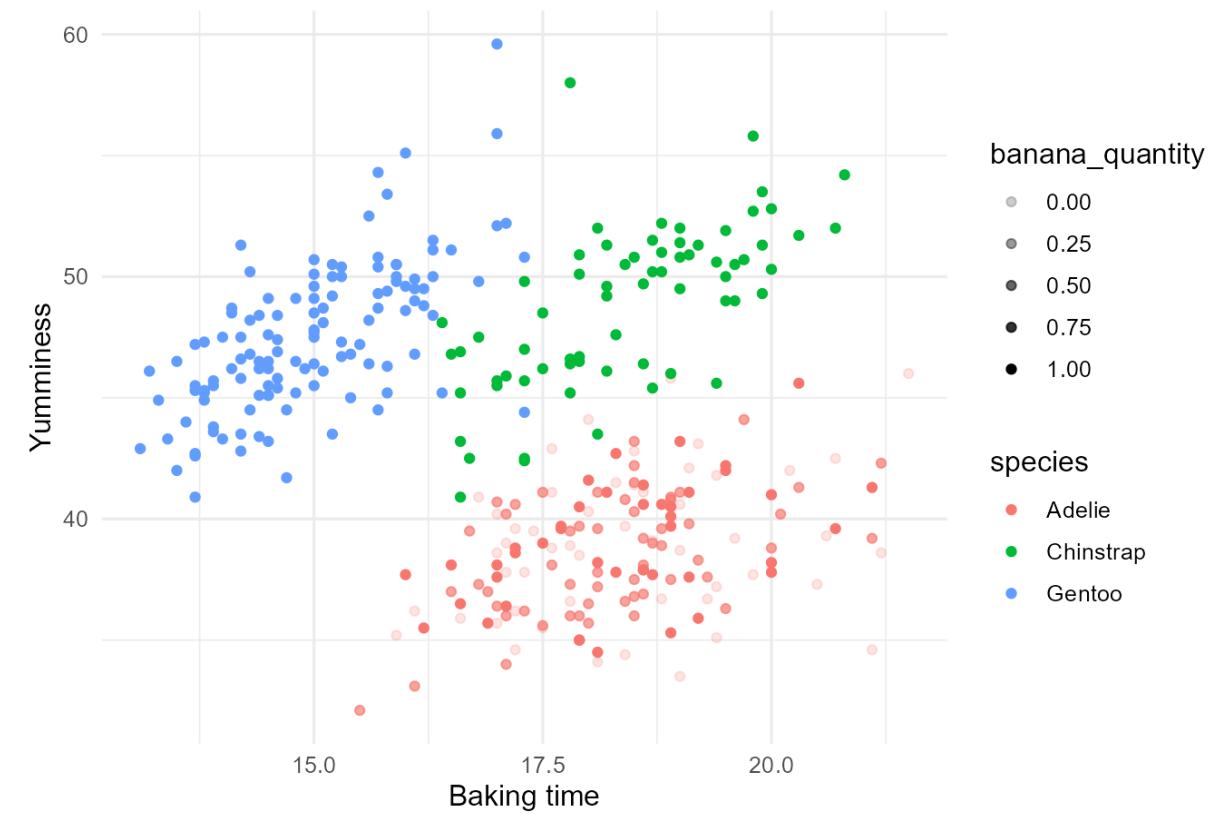
How to adjust your visuals for your audience

1. **Reduce noise;**
2. Give context to your colors;
3. Add colour to text to help orient readers;
4. Use colours & fonts to add text hierarchy;
5. Reduce unnecessary eye movement;
6. Highlight important data points;
7. Give everything some space to breathe.



How to adjust your visuals for your audience

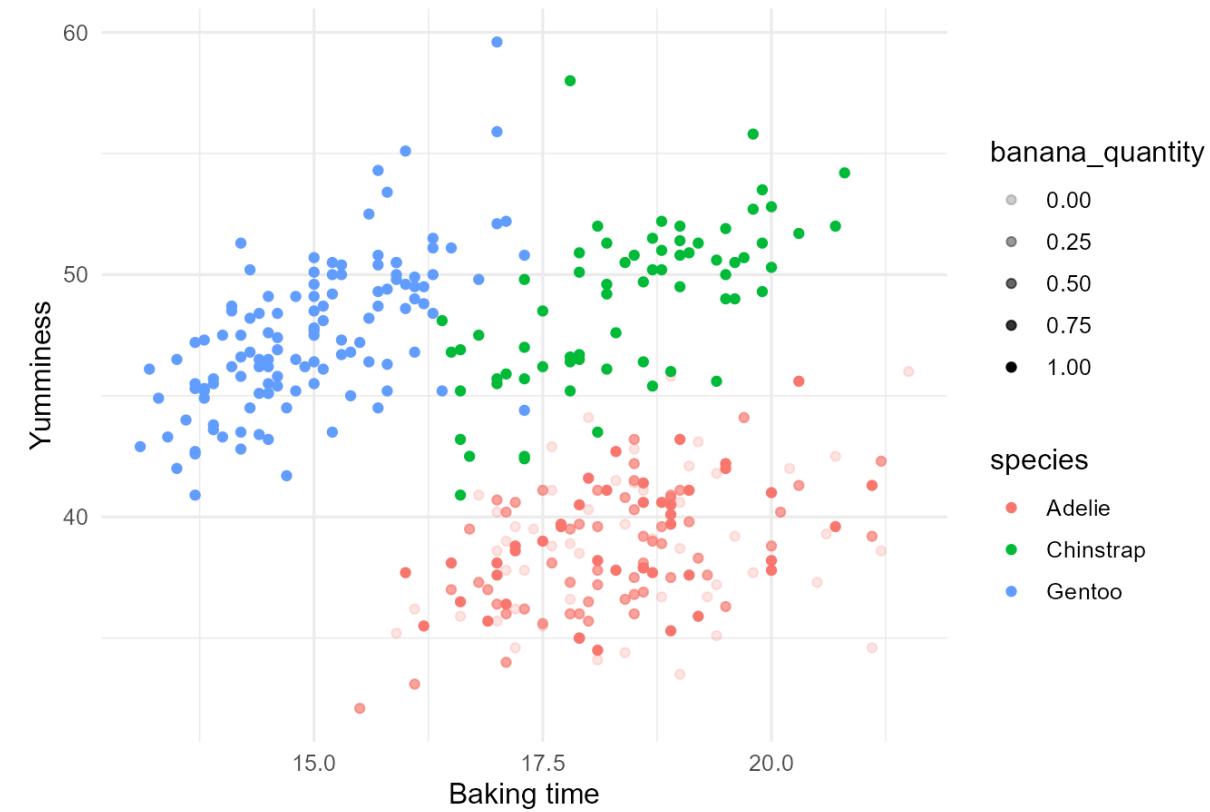
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Data from {palmerpenguins}; misused for illustration purposes.

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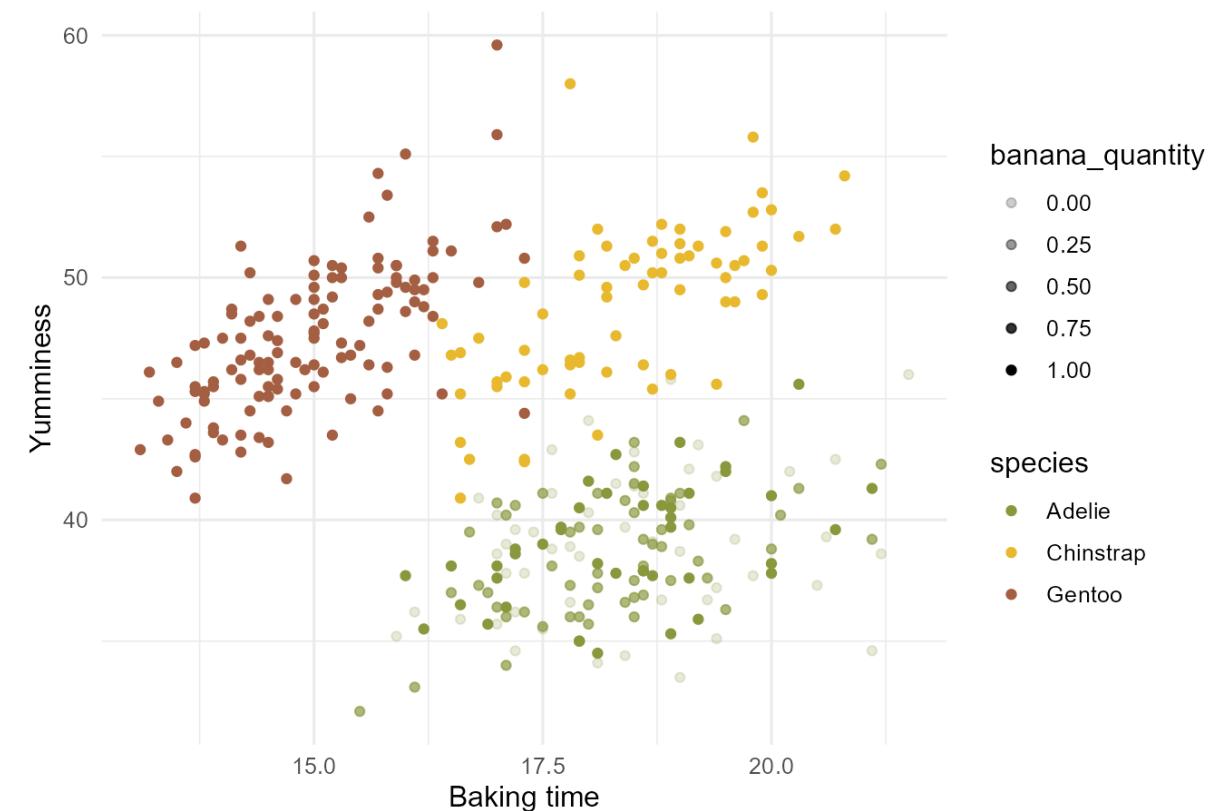
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Banana loaf tastes best when baked with ripe or over-ripe bananas
The Palmer Penguins carried out an experiment using bananas of different ripeness.
The Adelie penguins were given unripe bananas, Gentoos were given over-ripe bananas
and Chinstraps were given yellow bananas.
Each penguin was left to choose their own cooking time.

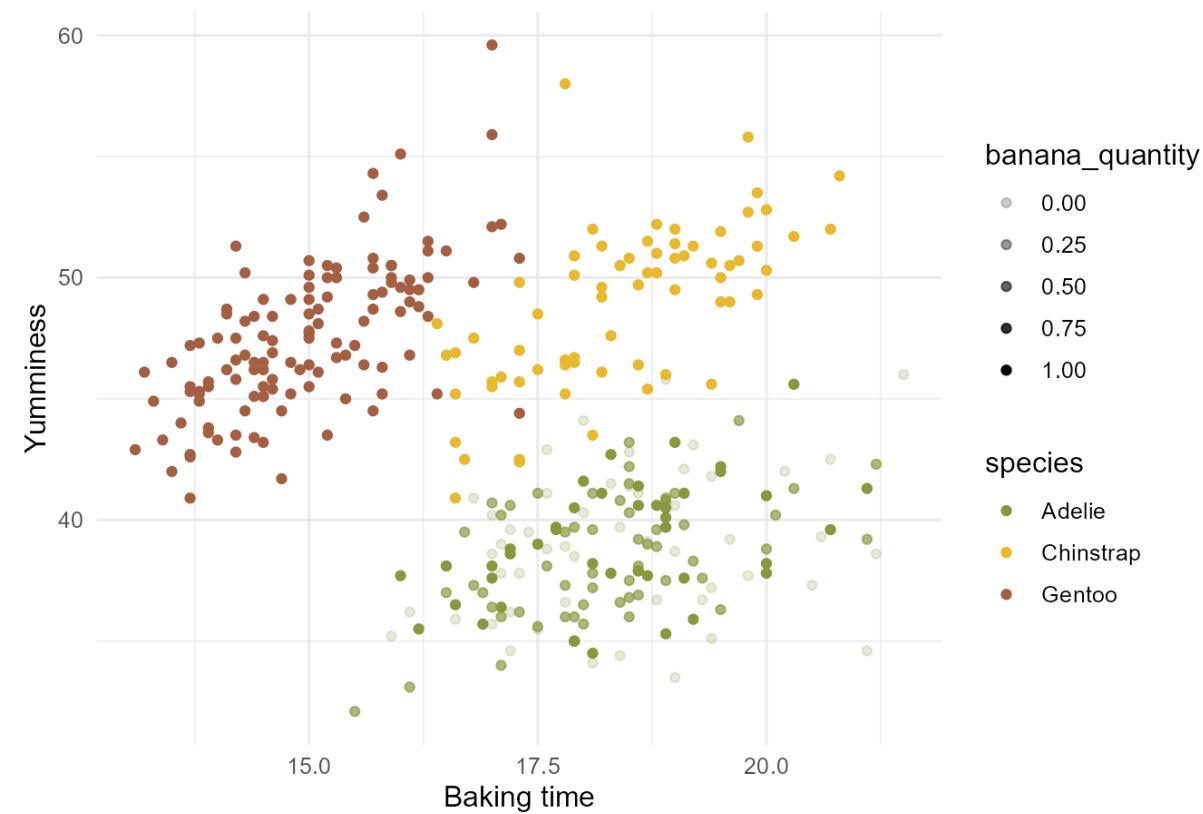


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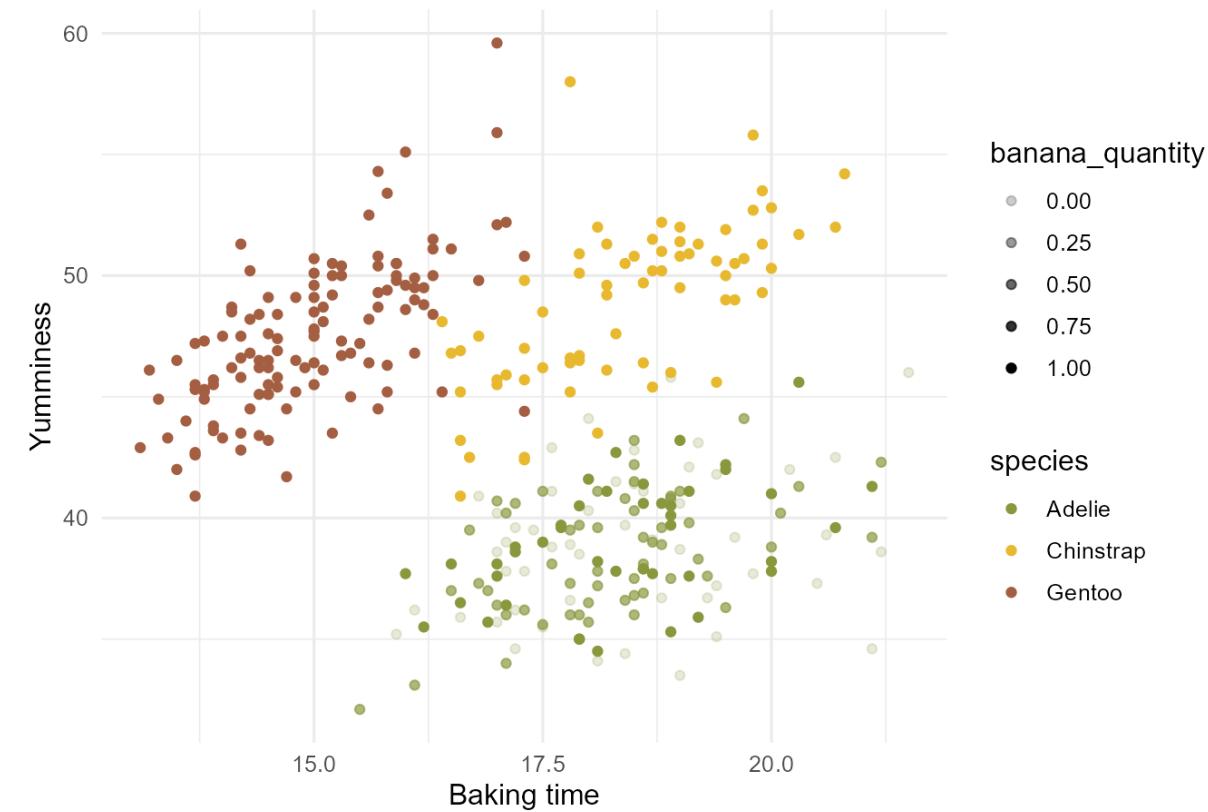


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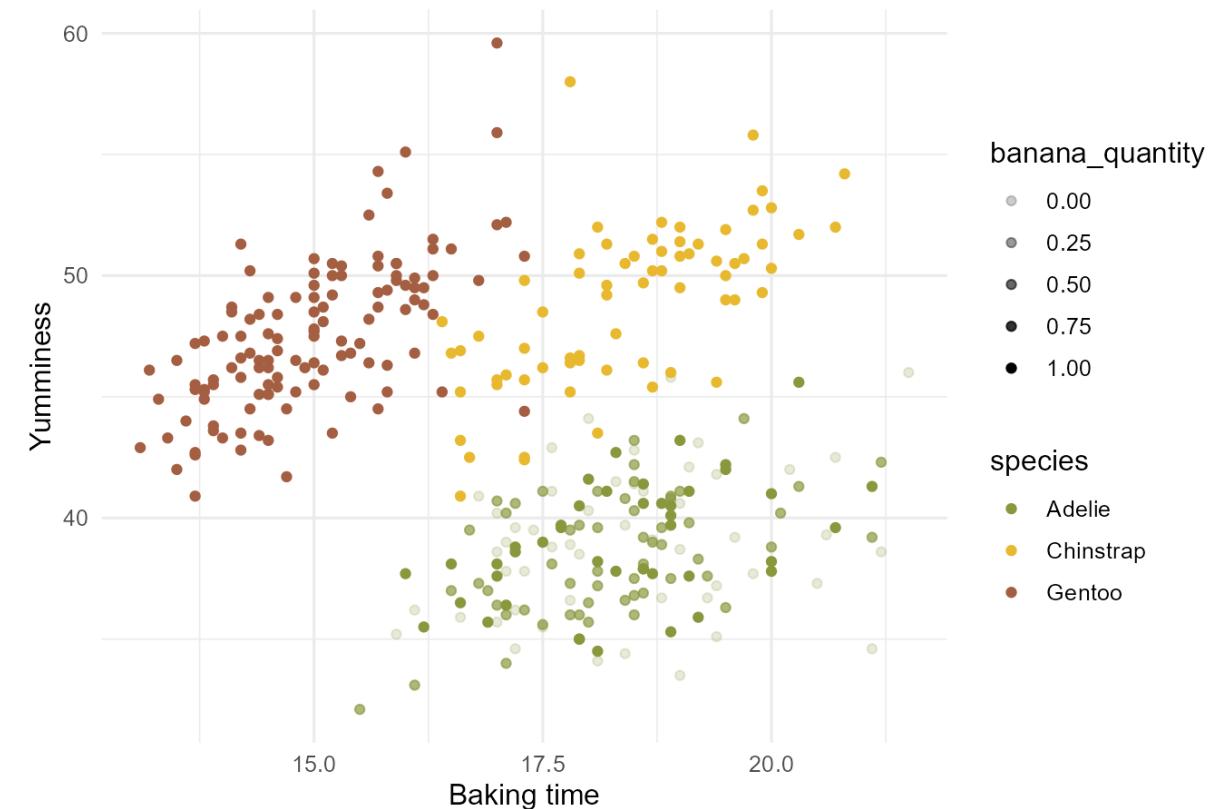


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YOU WILL READ THIS FIRST.

At some point you may come back to read this line or maybe not.

And then you will read this line next.

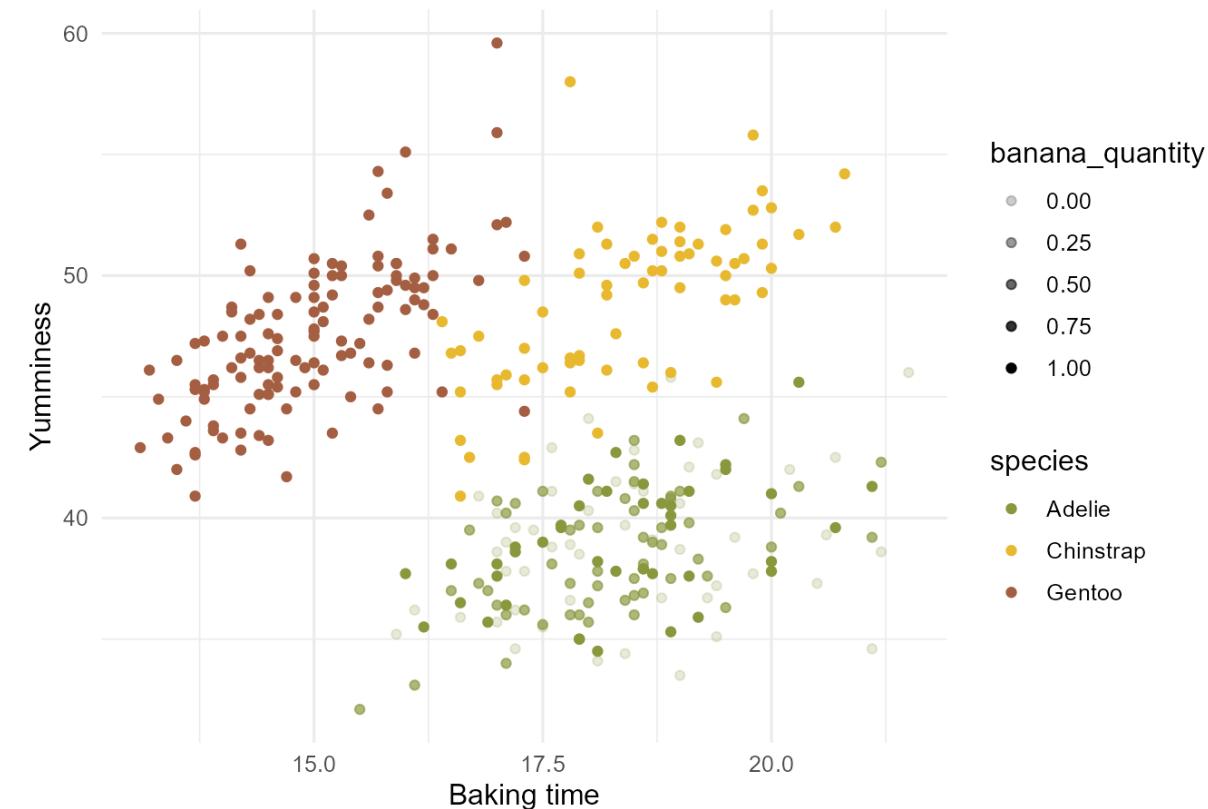
You will go back to read this body copy if you want to know more. It takes the most effort to read because it has a lot of text in a small font in a light weight with tight line spacing. Many people will skip paragraphs like this unless if they aren't engaged right away. This is why it's important to draw attention to your message using visual hierarchy.

**You'll probably
read this before
the paragraph.**

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Banana loaf tastes best when baked with **ripe** or **over-ripe** bananas
The Palmer Penguins carried out an experiment using bananas of different ripeness.
The Adelie penguins were given unripe bananas, Gentoos were given over-ripe
bananas and Chinstraps were given yellow bananas.
Each penguin was left to choose their own cooking time.



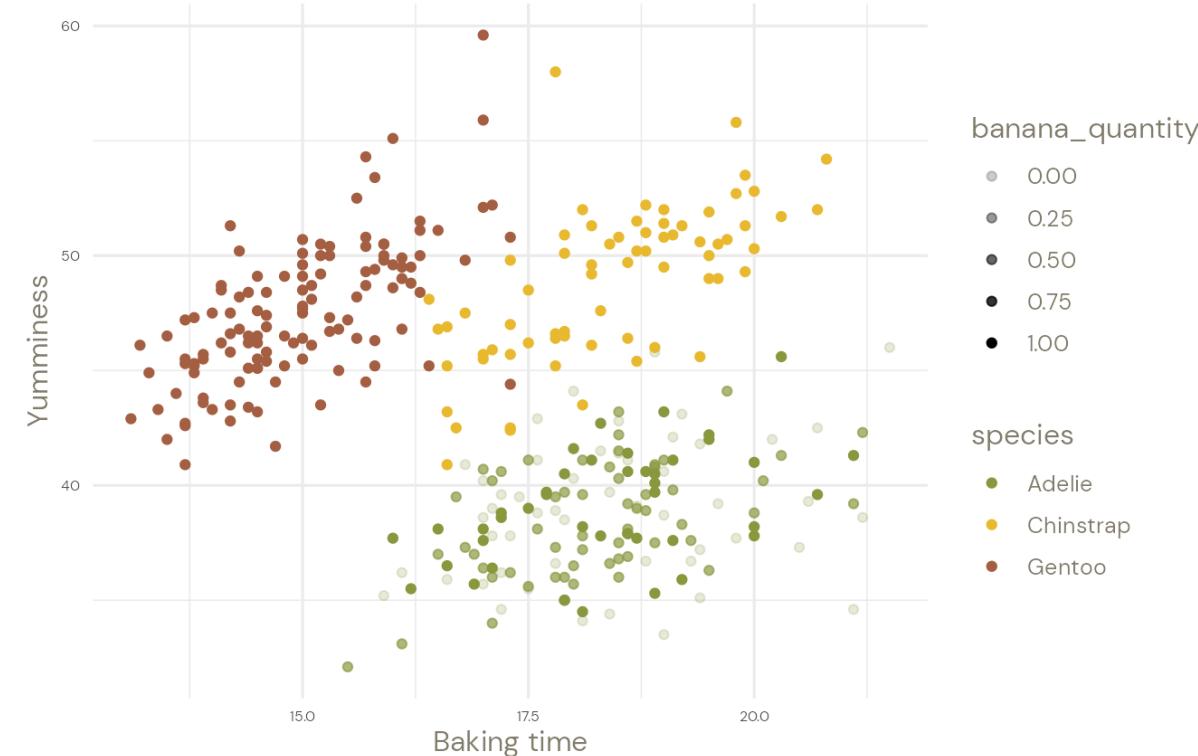
Data from {palmerpenguins}; misused for illustration purposes.

How to adjust your visuals for your audience

1. Reduce noise;
2. Give context to your colors;
3. Add colour to text to help orient readers;
- 4. Use colours & fonts to add text hierarchy;**
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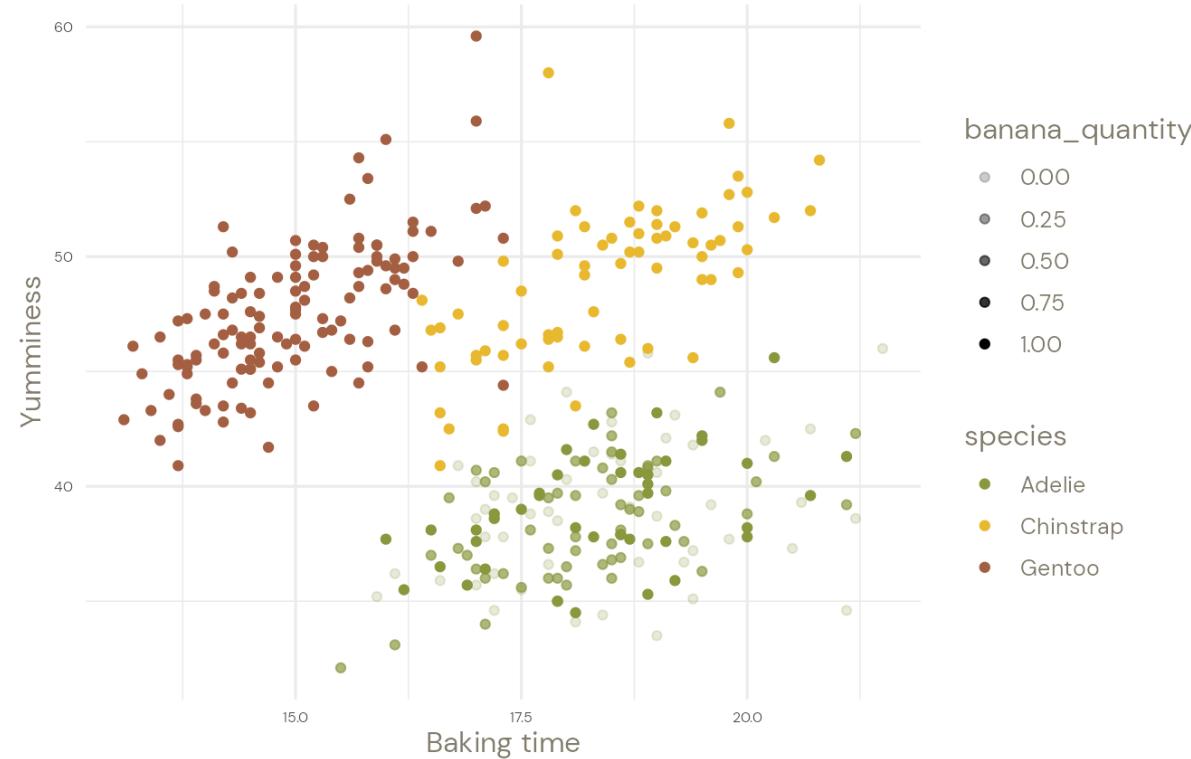
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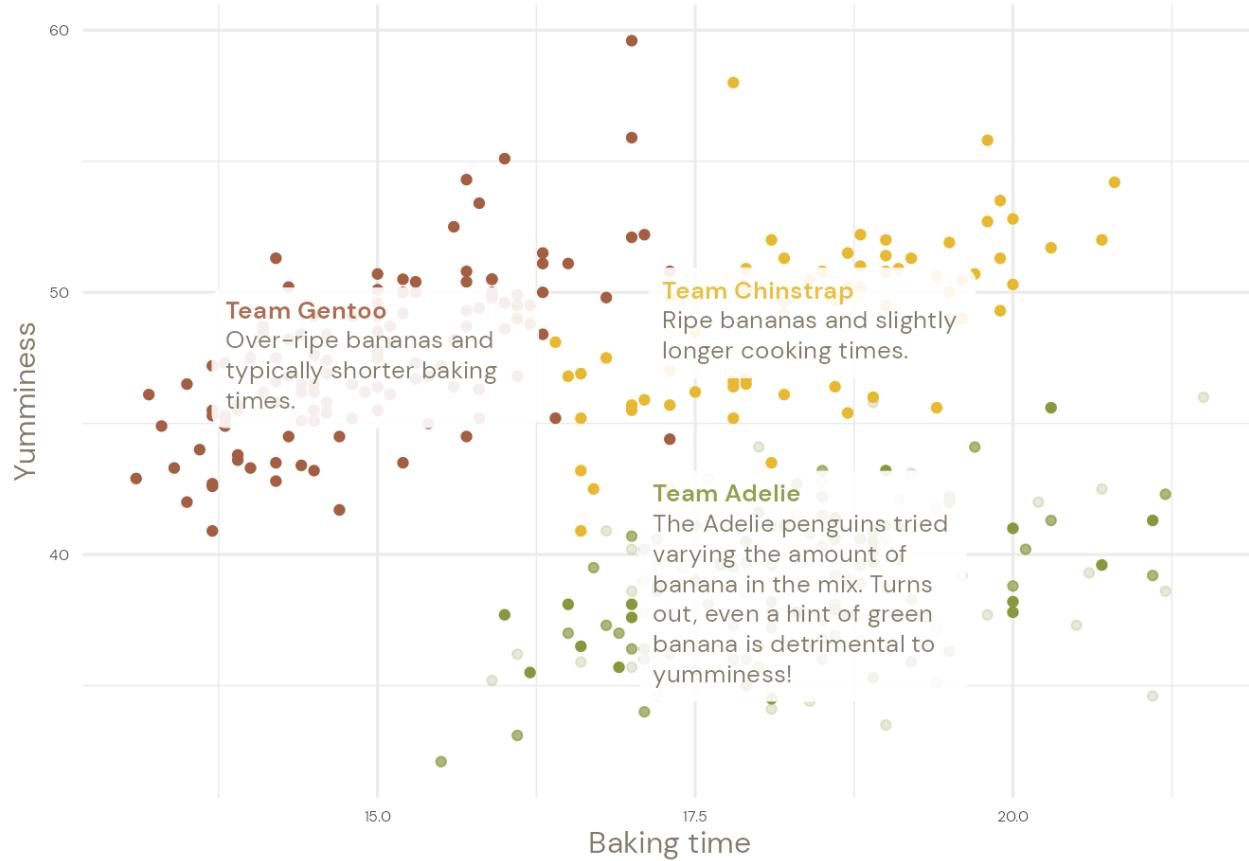
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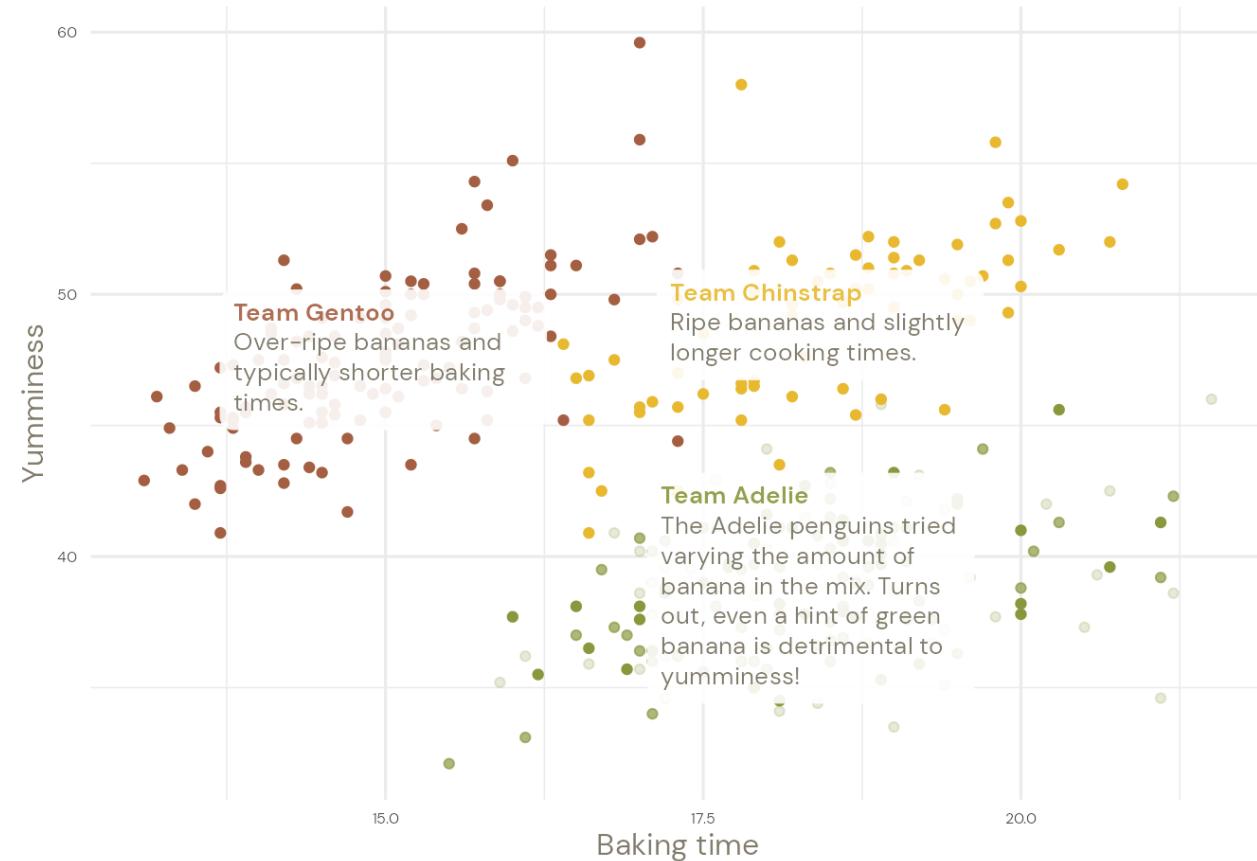
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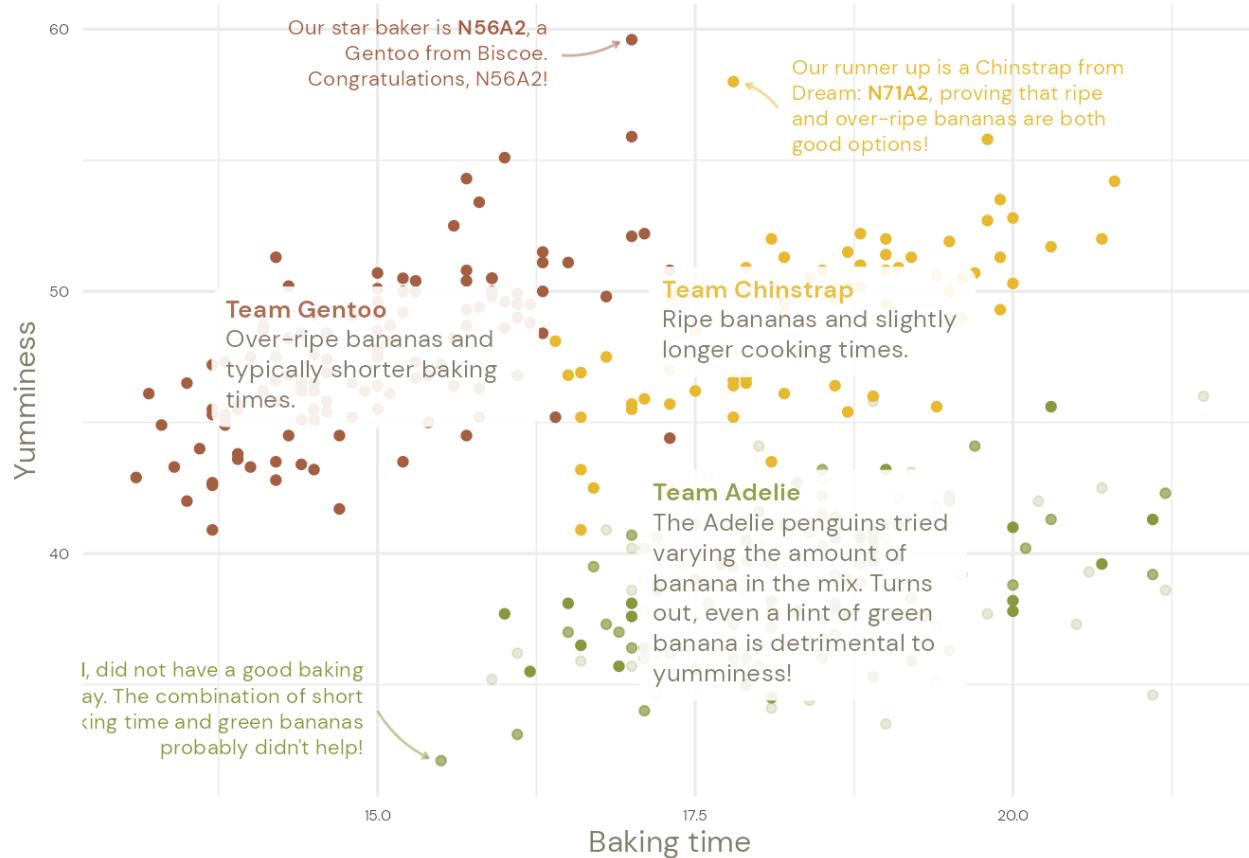
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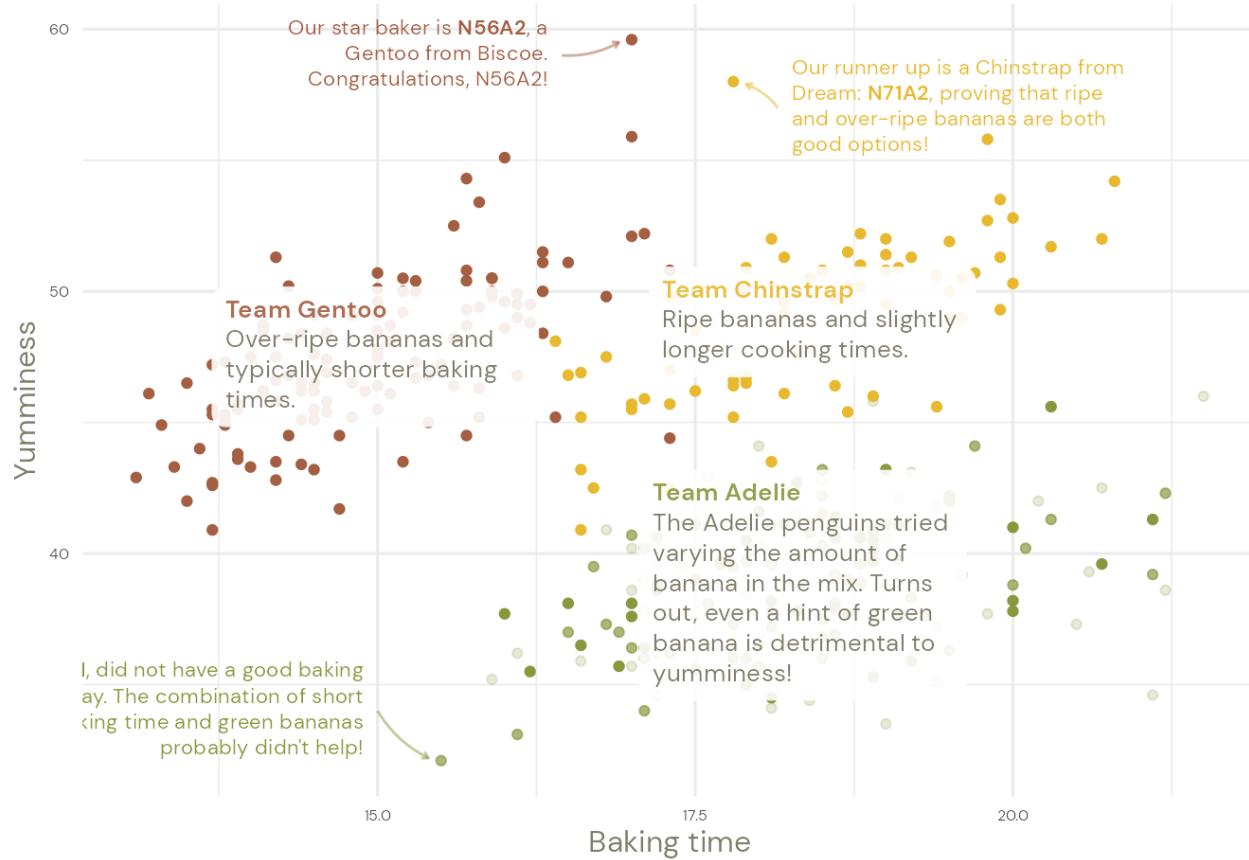
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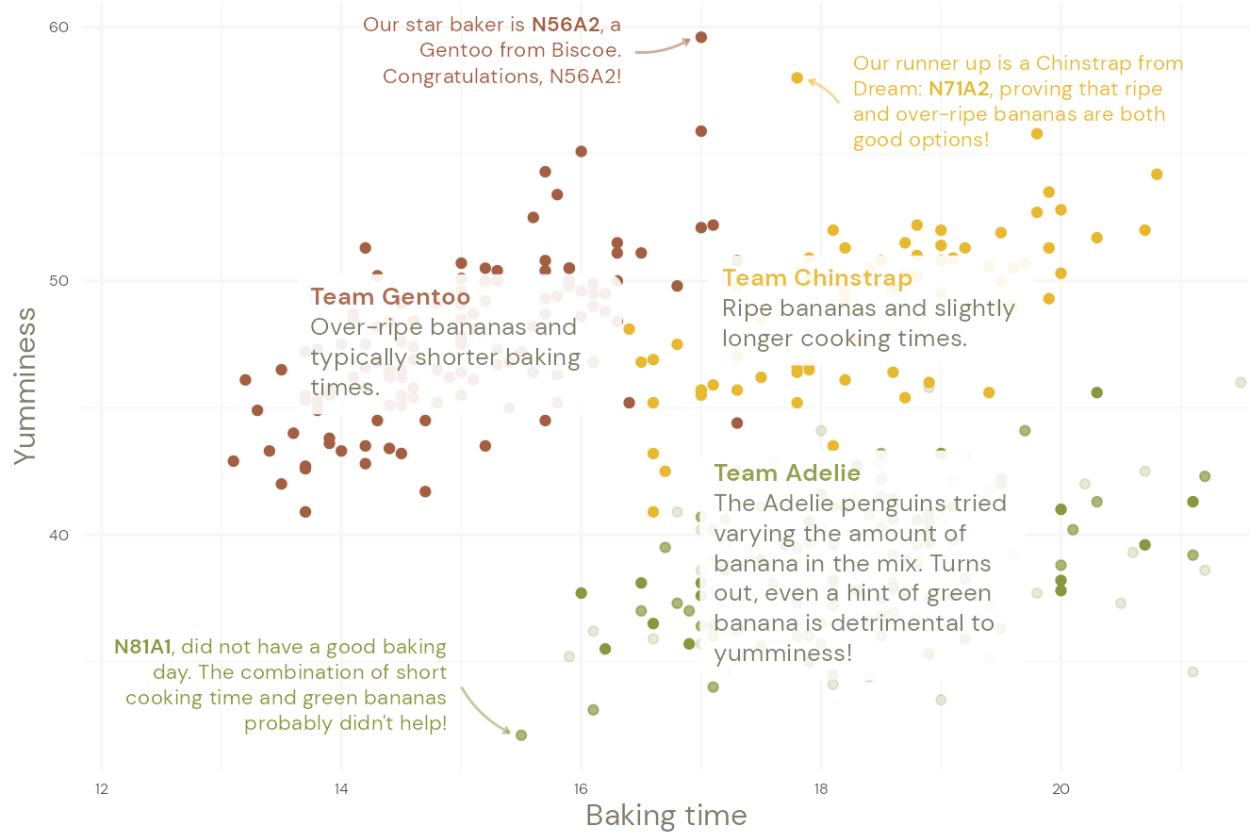
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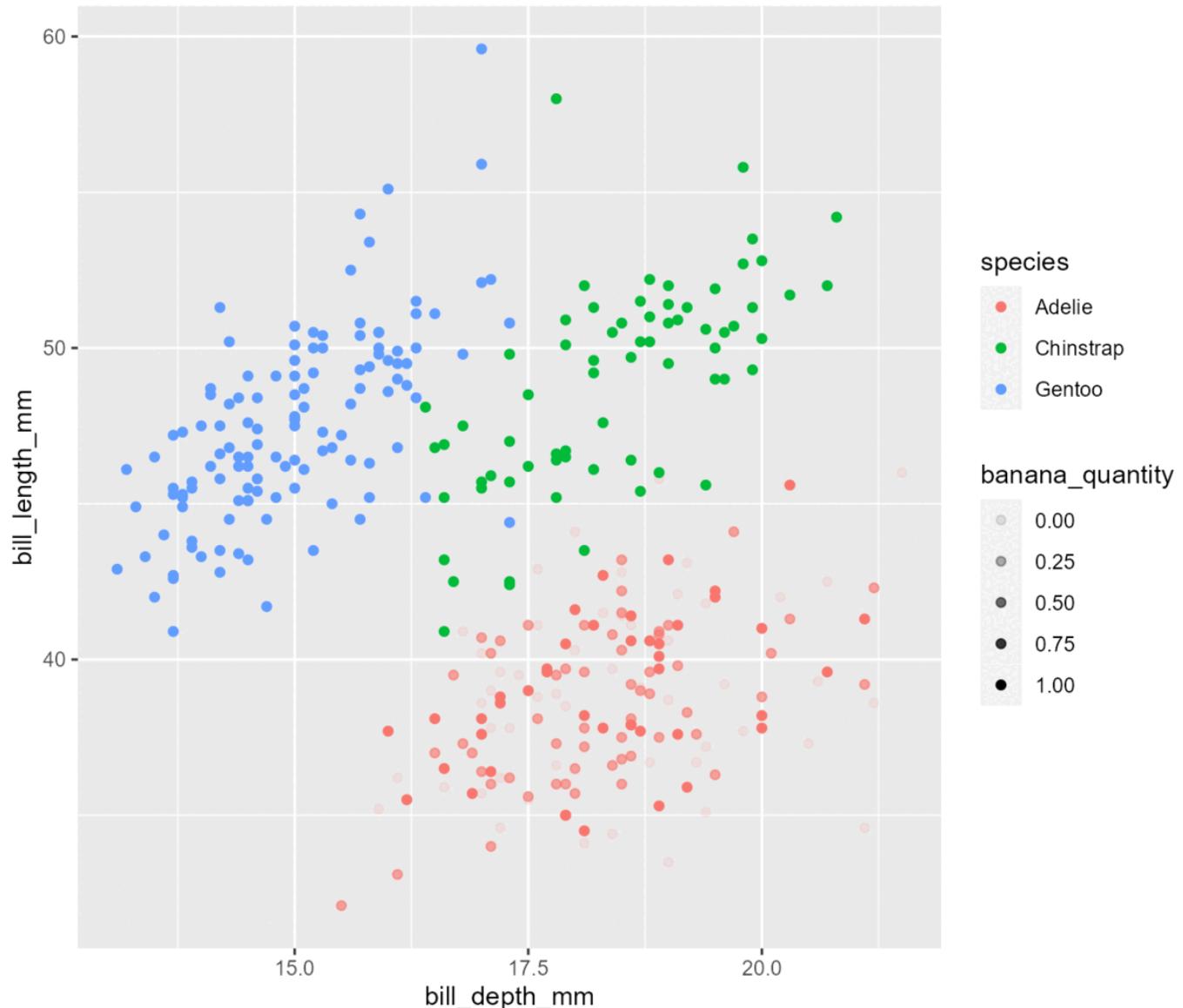
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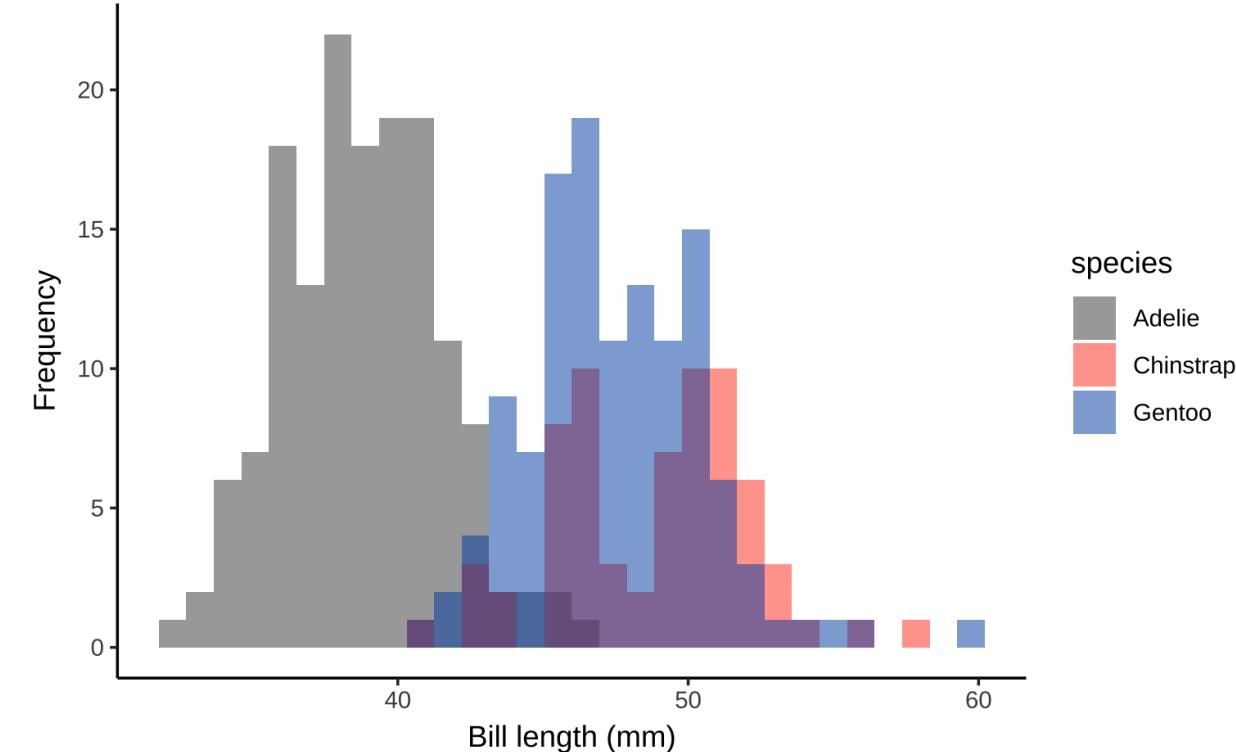
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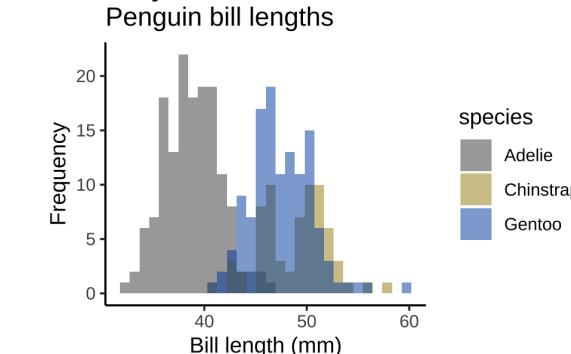


Accessibility

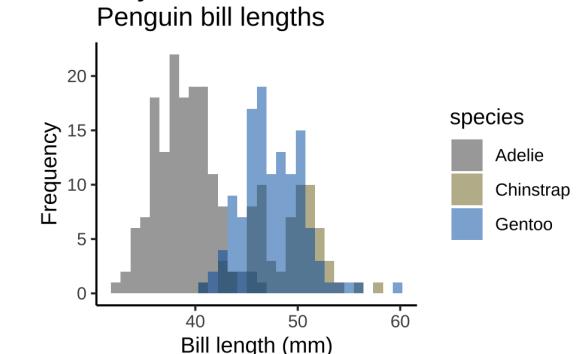
Penguin bill lengths



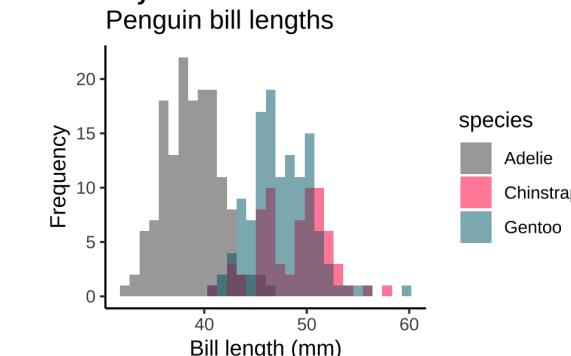
Deutanomaly



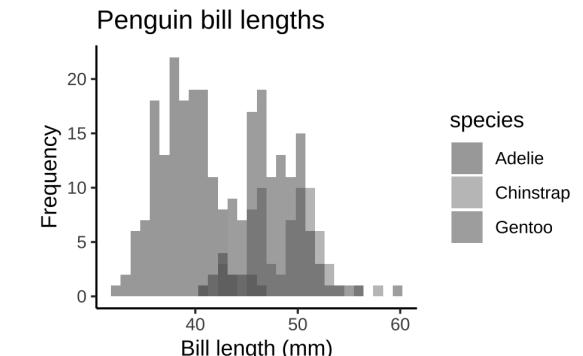
Protanomaly



Tritanomaly

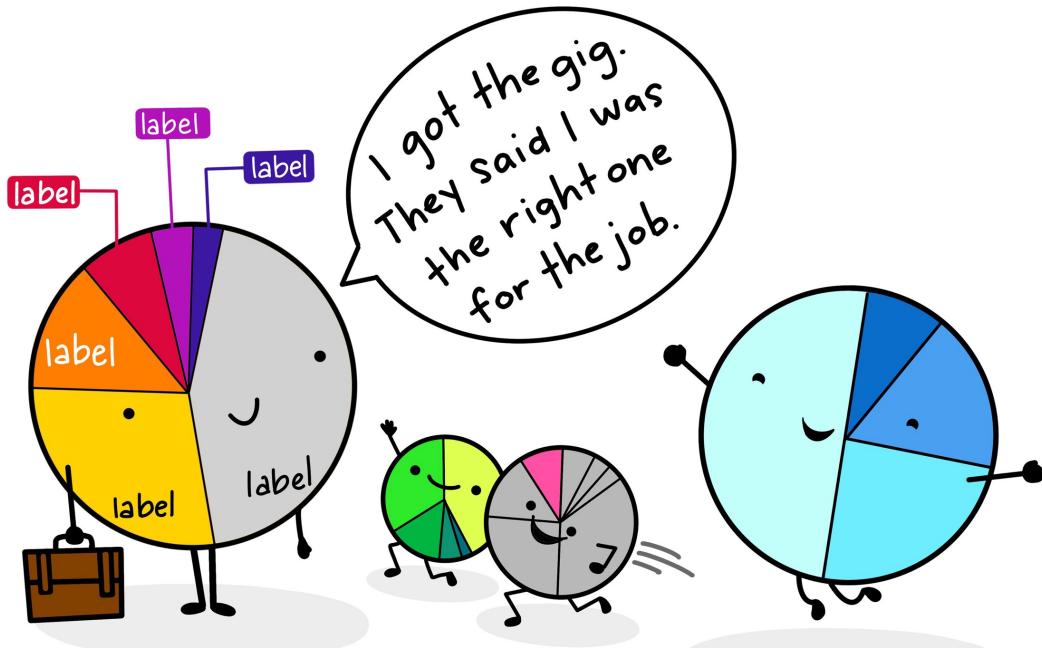


Desaturated



[remotes::install_github\("clauswilke/colorblindr"\)](#)

Overview



@allison_horst

- Why you want to use data visuals;
- Which graph to use for your message;
- How to adjust your visuals for your audience;
- **BONUS! Visuals for infographics**

Data Visualization vs Infographic

How do they overlap and where do they differ?



Data visualization is a type of visual that helps us see and understand data, ideally in ways that lead us to have quick insights and "aha"s.

Common examples are maps, timelines, bar charts, line graphs, and pie charts.



Data visualization can be a meaningful part of an infographic, which with the additional storytelling can make the data visualization more actionable.



Infographic (informational graphic) is a highly visual design product that includes information, and that ideally tells a story of some kind.

They can be short or long, and often include a variety of elements such as narratives, illustrations, icons, photos, and data visualizations.

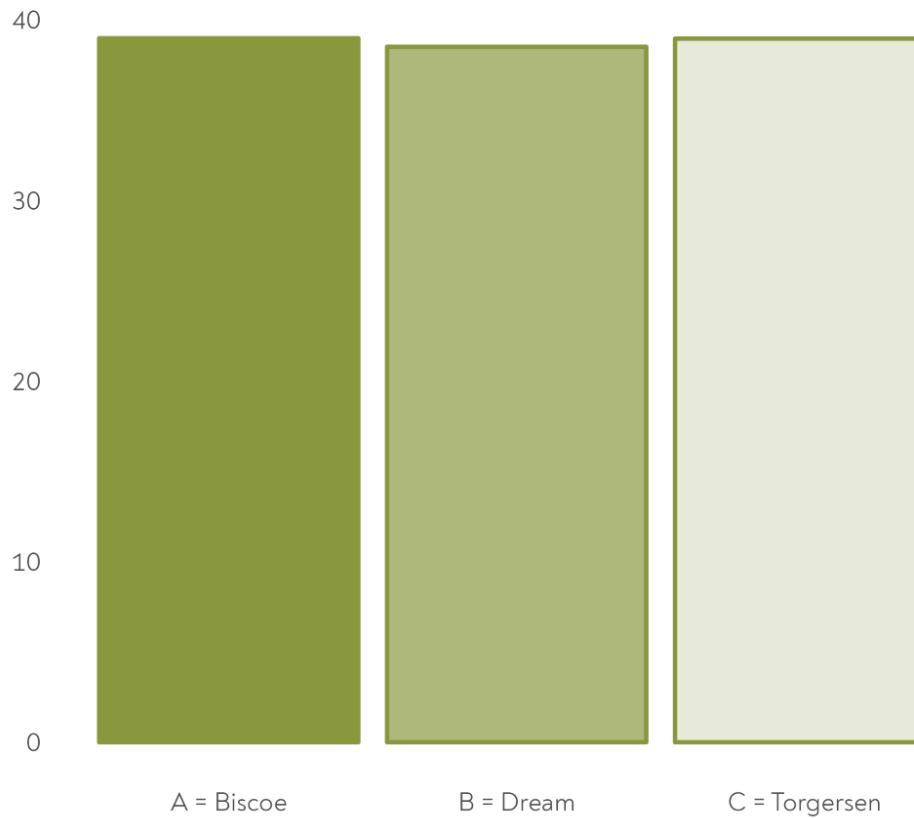
As data becomes more and more a part of how we understand our world and our work in it, data visualization and infographics are becoming more commonly used words that refer to how we learn about and share this data with others.

Tips & Tricks

Special effects

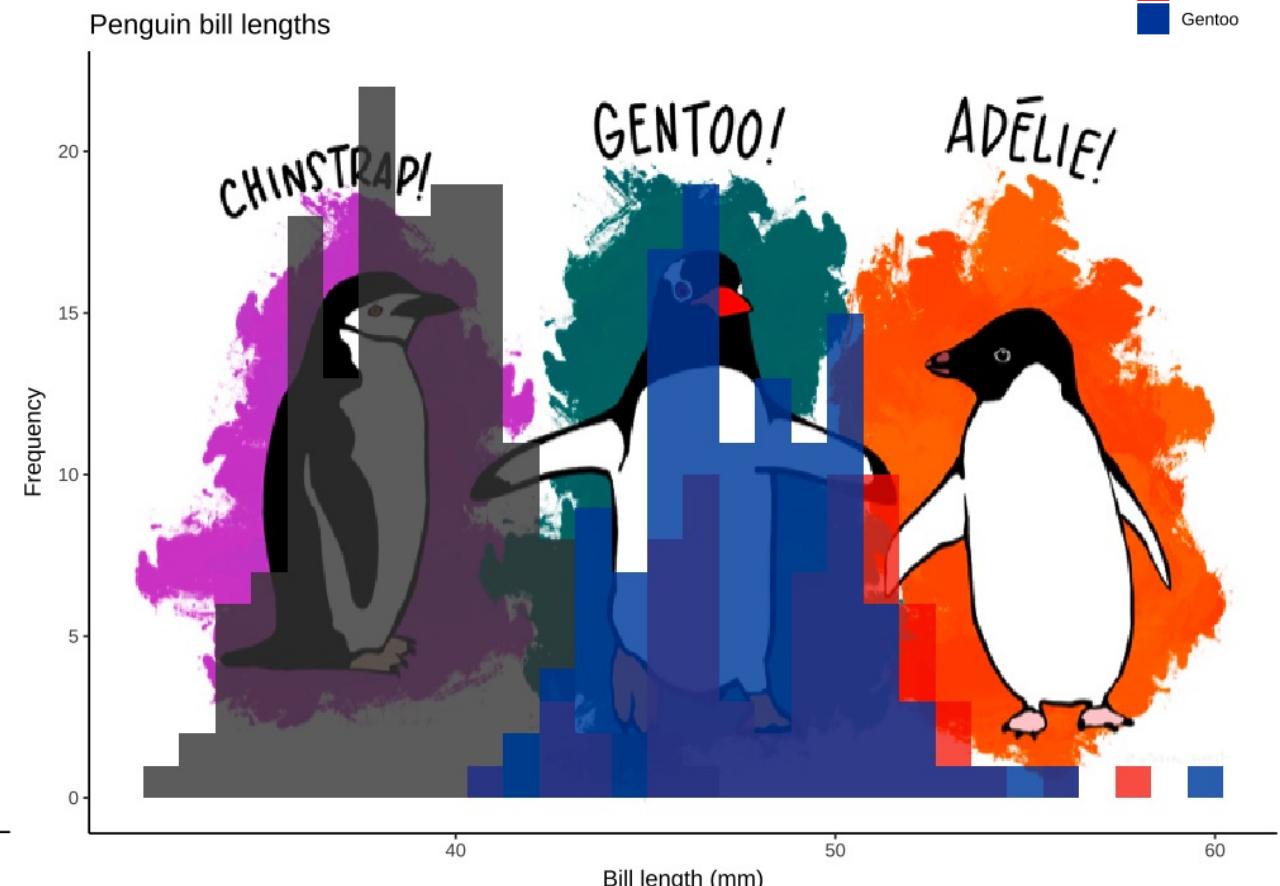
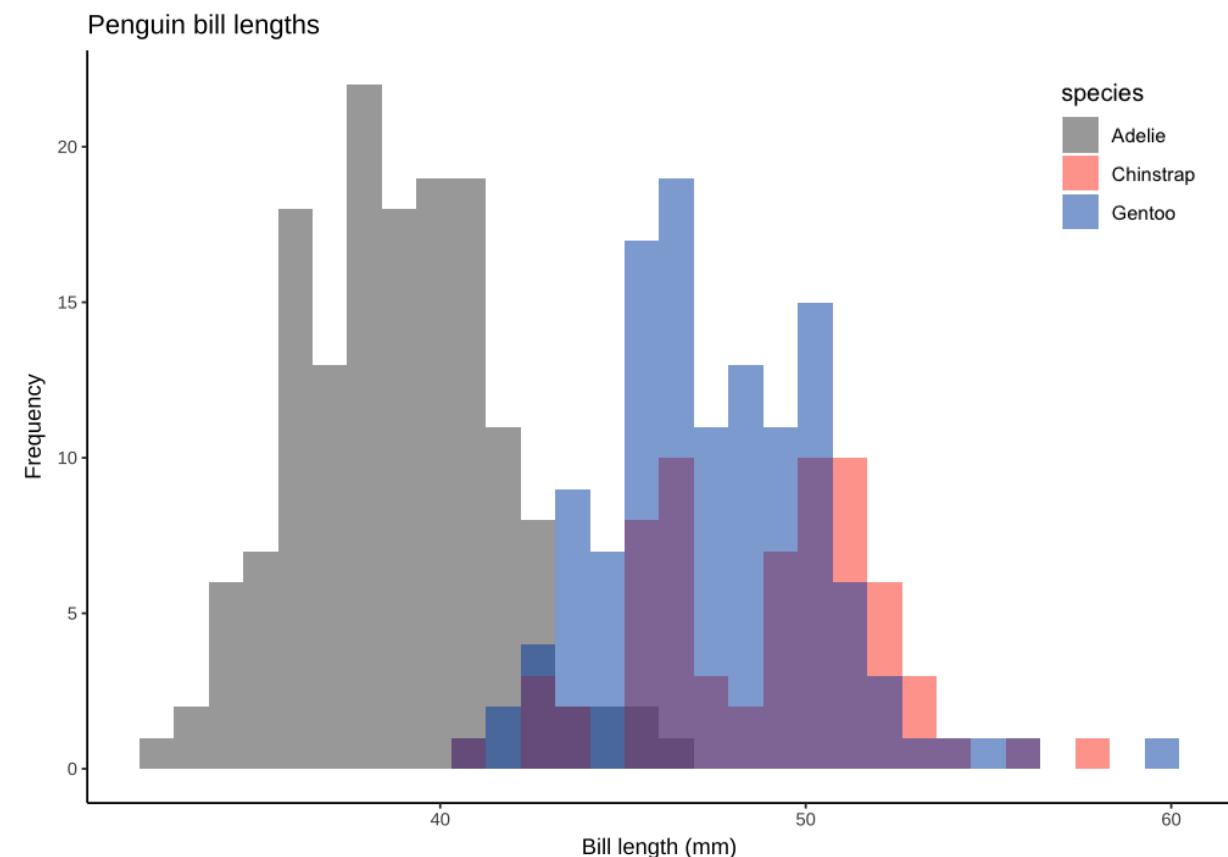
Gradients

The taller the bar, the yummier the cake!



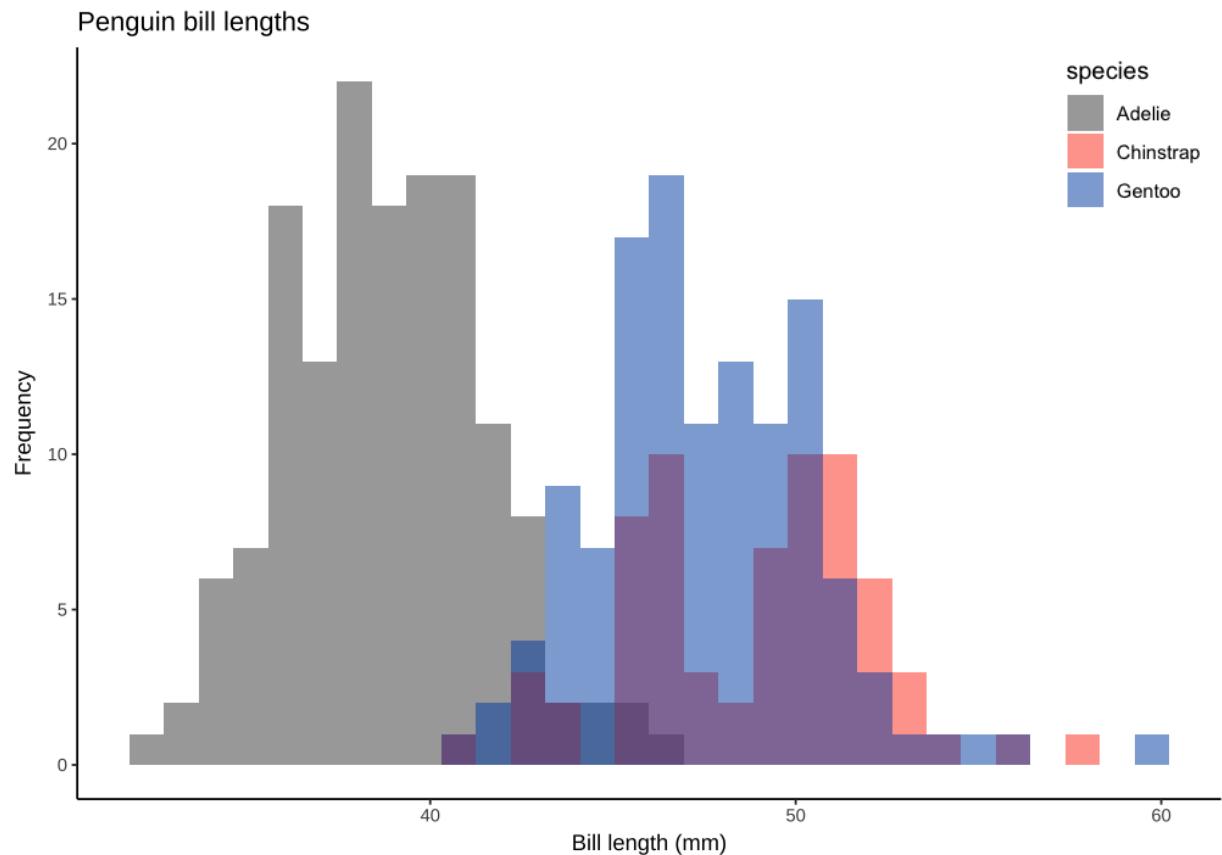
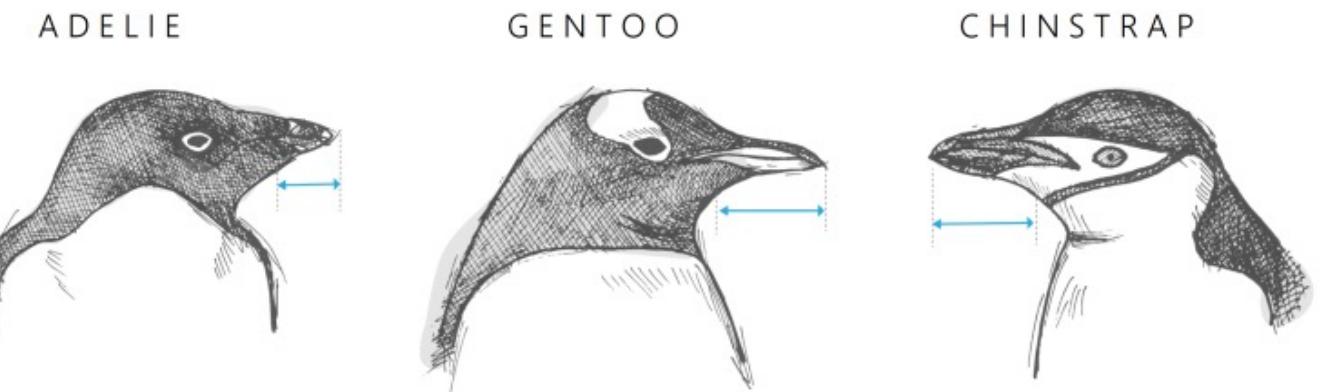
Tips & Tricks *Special effects*

Photos



Tips & Tricks

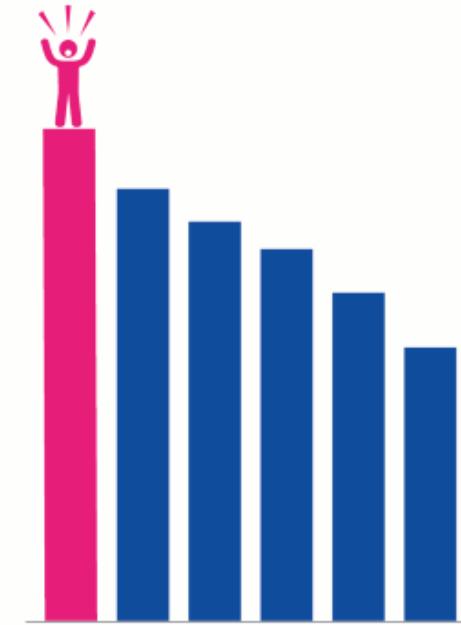
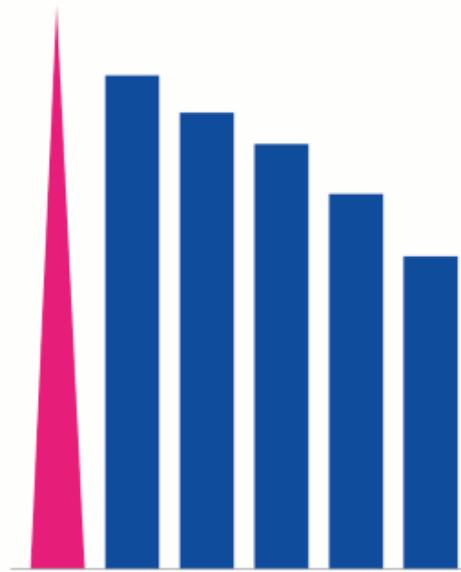
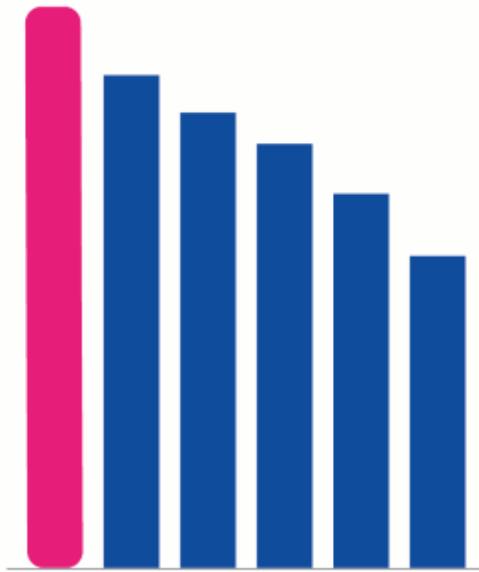
Special effects



Tips & Tricks

Special effects

Structural modifications



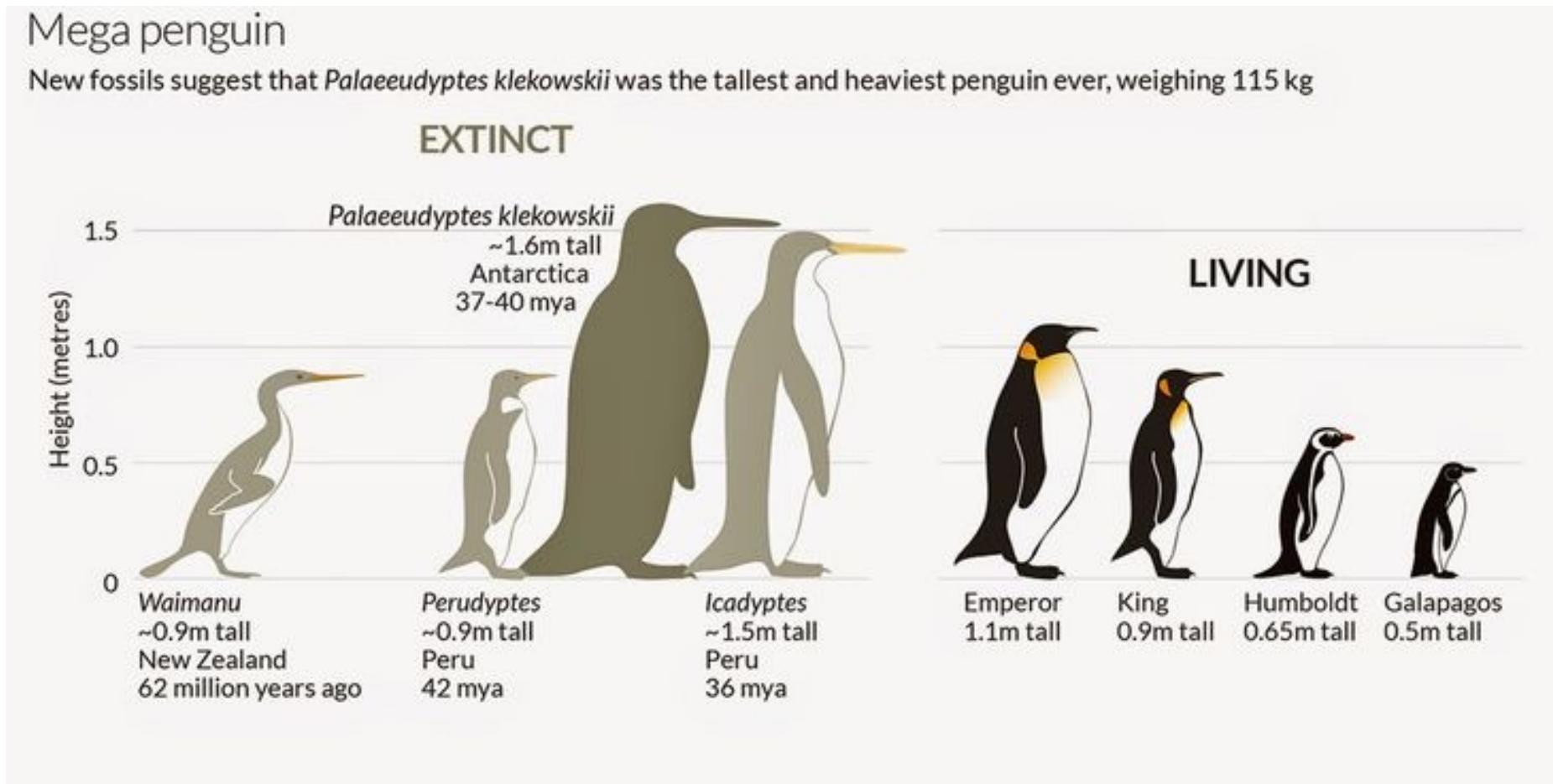
Tips & Tricks

Special effects

Structural modifications

Mega penguin

New fossils suggest that *Palaeudyptes klekowskii* was the tallest and heaviest penguin ever, weighing 115 kg



Decorating (well) is difficult!



**Stick to one
solid colour**



**Add colours only
when motivated
by the story you
are telling**



**Use colour
consistently**



**Stick to solid
fill colors**



**Play with
decorations
only when the
visual effect is
immediately
understandable
as a visual
metaphor**

References and resources

Use of colors:

- Thompson, Cara. 2023. "Level Up Your Plots: Using Colour, Annotations, Text Hierarchy and Other Tricks to Make Your Data Story Stand Out." October 3, 2023. <https://www.cararthompson.com/talks/nhsr2023-level-up-workshop>
- "Level Up Your Plots: Enhance the Story Telling Capabilities of Your Datavisualisations." 2022. September 29, 2022. https://www.cararthompson.com/talks/hdsi_rug.
- <https://colourcontrast.cc/>

Which plot to use for which dataset:

- <https://medium.com/@abdallahashraf90x/how-to-choose-the-right-visualization-for-your-data-data-analysis-c49b1469a583>
- Stephen Few. "Eenie, Meenie, Minie, Mow: Selecting the Right Graph for Your Message", *Perceptual Edge*, September 18, 2004.

Visual Design:

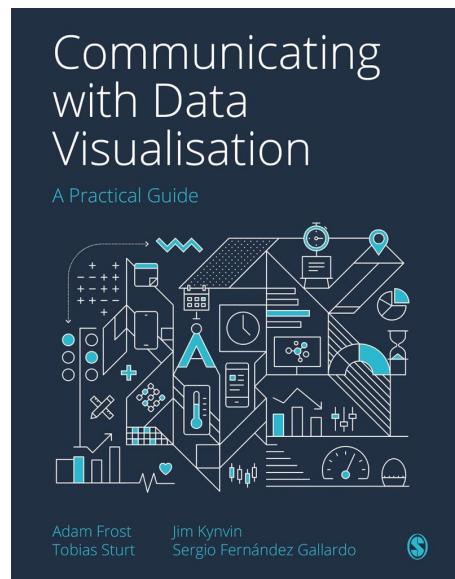
- William S. Cleveland & Robert McGill (1984) *Graphical Perception: Theory, Experimentation, and Application to the Development of Graphical Methods*, *Journal of the American Statistical Association*, 79:387, 531-554, DOI: 10.1080/01621459.1984.10478080

Which fonts to use for your charts and tables:

- <https://blog.datawrapper.de/fonts-for-data-visualization/>

Datasaurus methods:

- <https://www.research.autodesk.com/publications/same-stats-different-graphs/>



Keep learning with us!



Your Feedback is important

✉️ sih.training@sydney.edu.au

