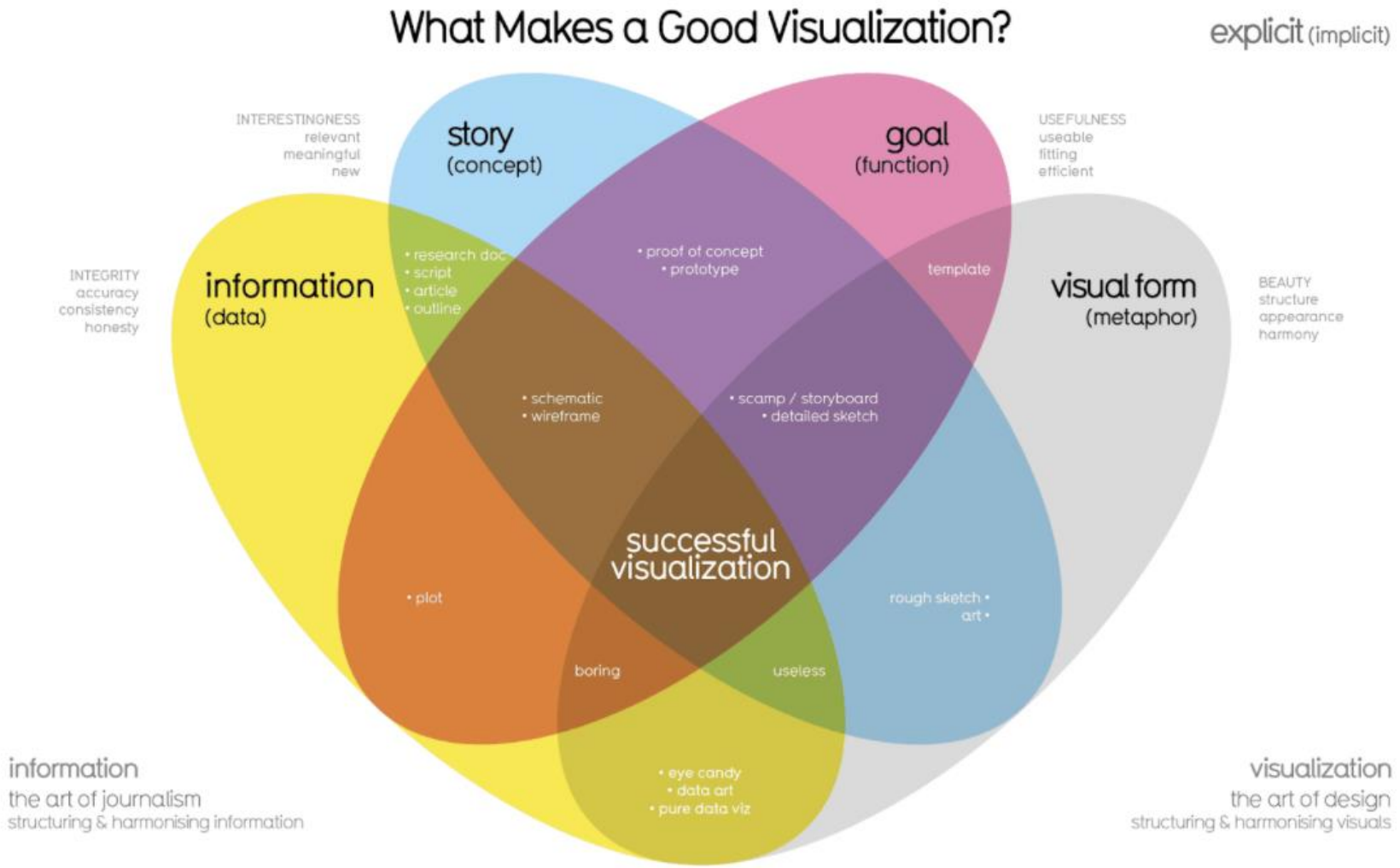
CSCI 491: Data Visualization

29- Storytelling with figures

Why the story is important?
David McCandless



What is a story?

- A story is a collection of observations, facts, or events, presented in a specific order such that they create an emotional reaction
- Our goal in telling a story should be to use facts and logical reasoning to get our audience interested and excited.
- Example: Theoretical physicist Stephen Hawking was diagnosed with motor neuron disease at age 21—one year into his PhD—and was given two years to live. Hawking did not accept this predicament and started pouring all his energy into doing science. Hawking ended up living to be 76, became one of the most influential physicists of his time, and did all of his seminal work while being severely disabled.
- I'd argue that this is a compelling story. It's also entirely fact-based and true.

Every story has a clear, identifiable arc

Opening

Challenge

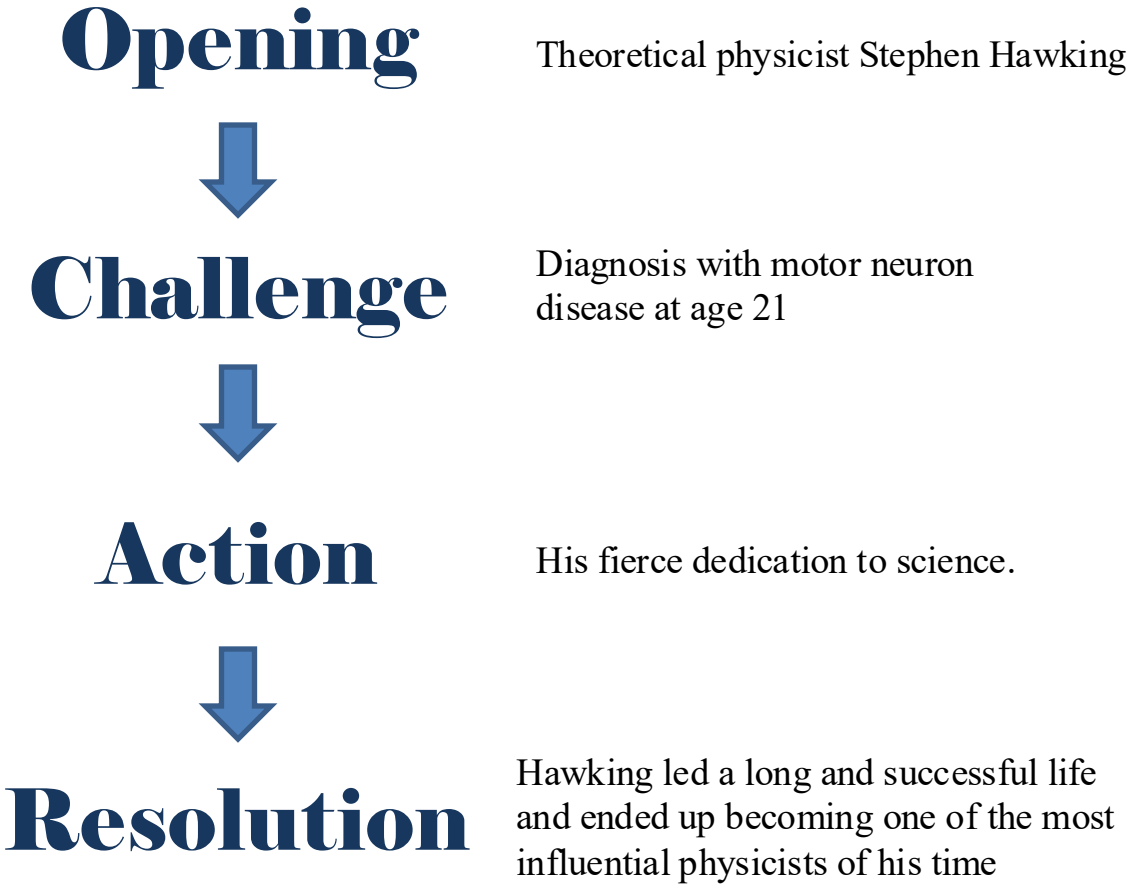
Action

Resolution

Every story has a clear, identifiable arc

Challenge and resolution are the two most important parts

Every story has a clear, identifiable arc



Other story telling formats

Lead

Development

Resolution

Commonly used in newspaper articles

Other story telling formats

Better for action movies than for scientific reports!

Writing a scientific paper: The Intro (Schimel, J. 2011)

Three paragraphs:

- Paragraph 1: What is the broad research area? (Opening)
- Paragraph 2: What specifically do we not know? (Challenge)
- Paragraph 3: What was done, what was found? (Action/Resolution)

Writing a scientific paper: The Results section (Schimel, J. 2011)

Repeat the following structure for each experiment/analysis/figure:

- What do we want to know? (Challenge)
- What did we do? (Action)
- What did we observe? (Results from the action)
- Don't interpret the findings, just report them

Writing a scientific paper: The Discussion section (Schimel, J. 2011)

First paragraph, repeat everything said so far:

What do we want to know?

What did we do?

What did we see?

Subsequent paragraphs, elaborate on these issues:

How can we interpret our findings?

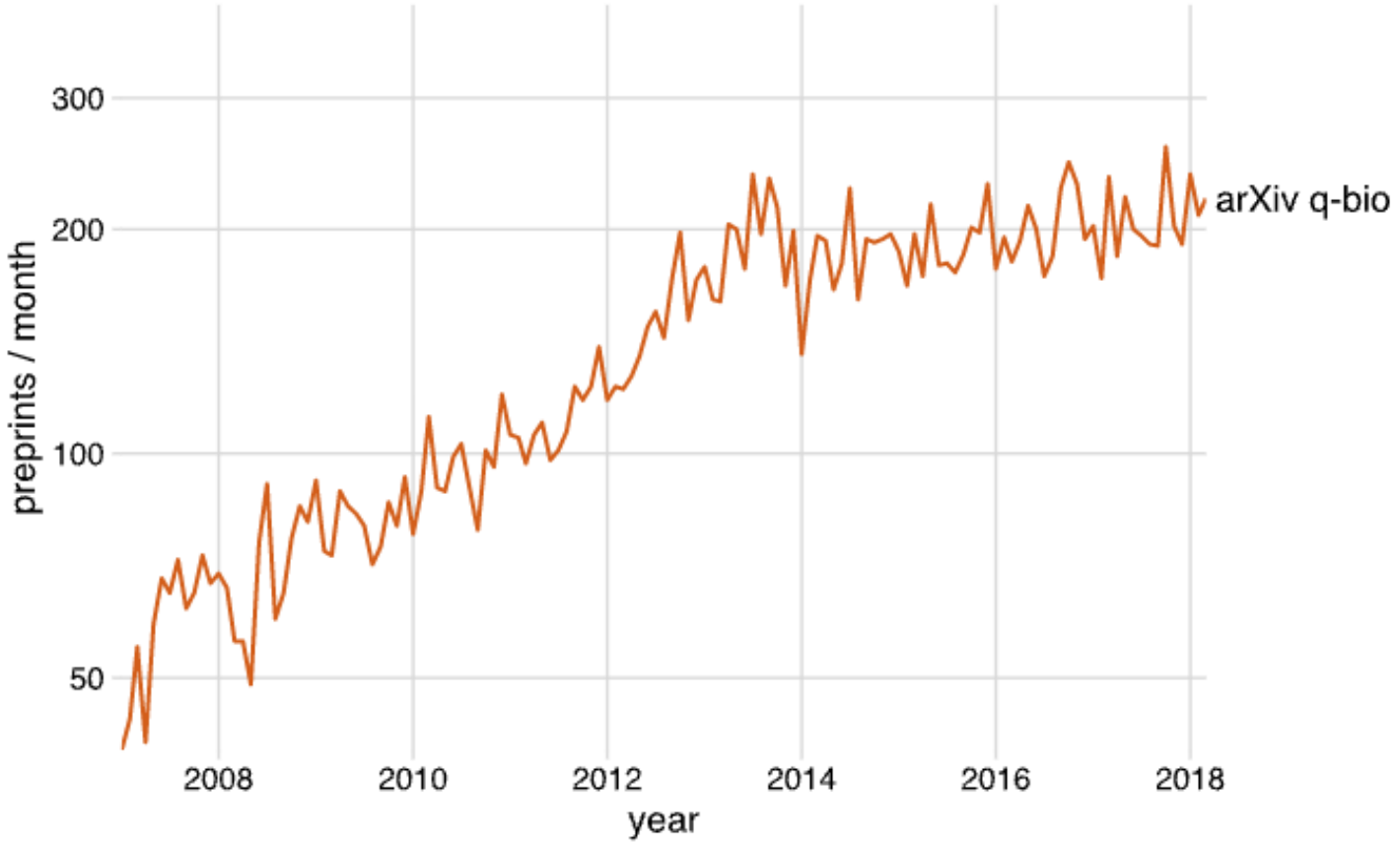
How do our findings relate to other works in the field?

What are weaknesses/drawbacks of our work?

Telling a story with figures

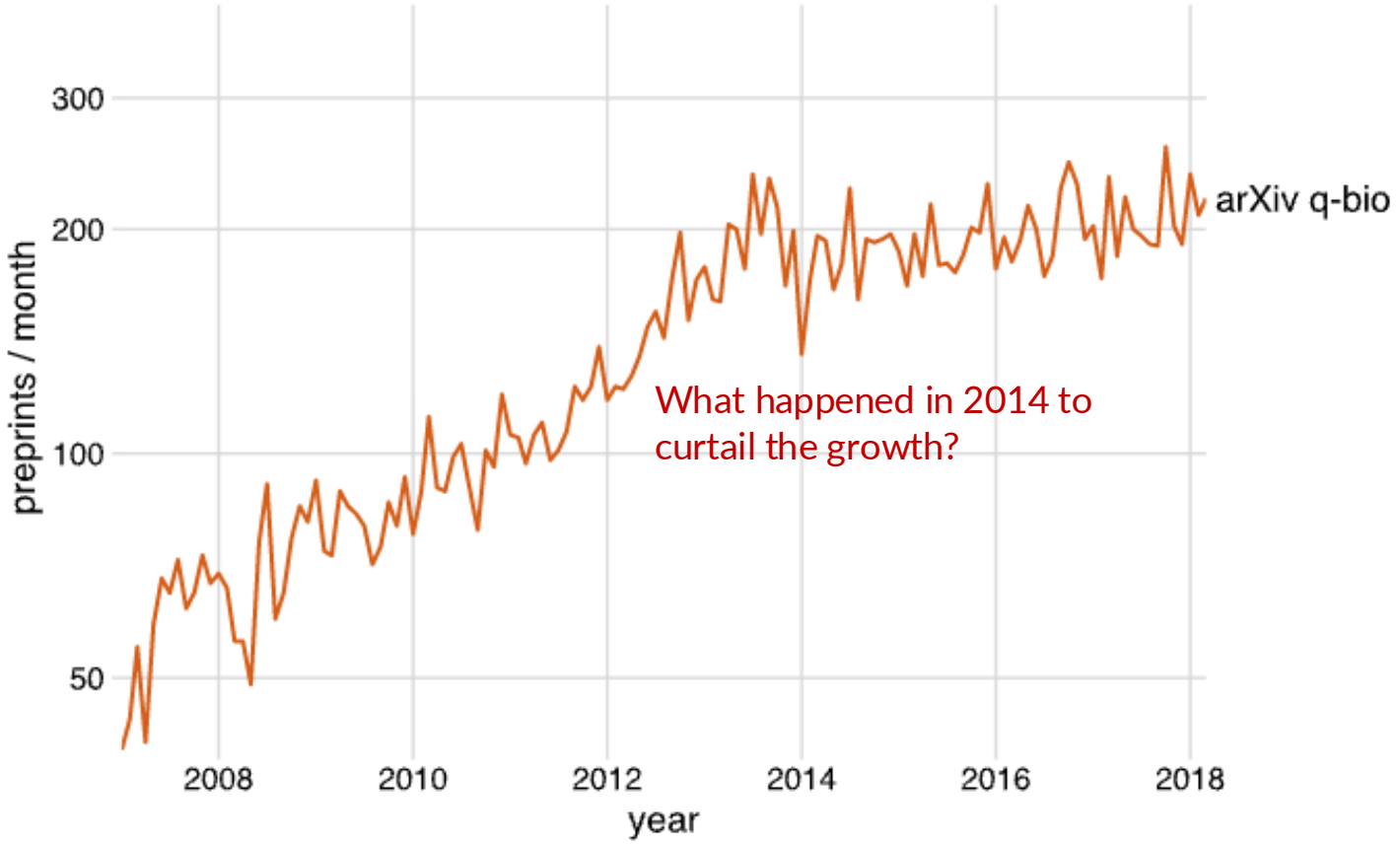
- A visualization may illustrate the opening, the challenge, the action, or the resolution, but it is unlikely to convey all these parts of the story at once.
- To tell a complete story, we will usually need multiple visualizations.
- For example, when giving a presentation, we may first show some background or motivational material, then a figure that creates a challenge, and eventually some other figure that provides the resolution.
- Likewise, in a research paper, we may present a sequence of figures that jointly create a convincing story arc.
- It is, however, also possible to condense an entire story arc into a single figure. Such a figure must contain a challenge and a resolution at the same time, and it is comparable to a story arc that starts with a lead.

Example: Preprints in biology



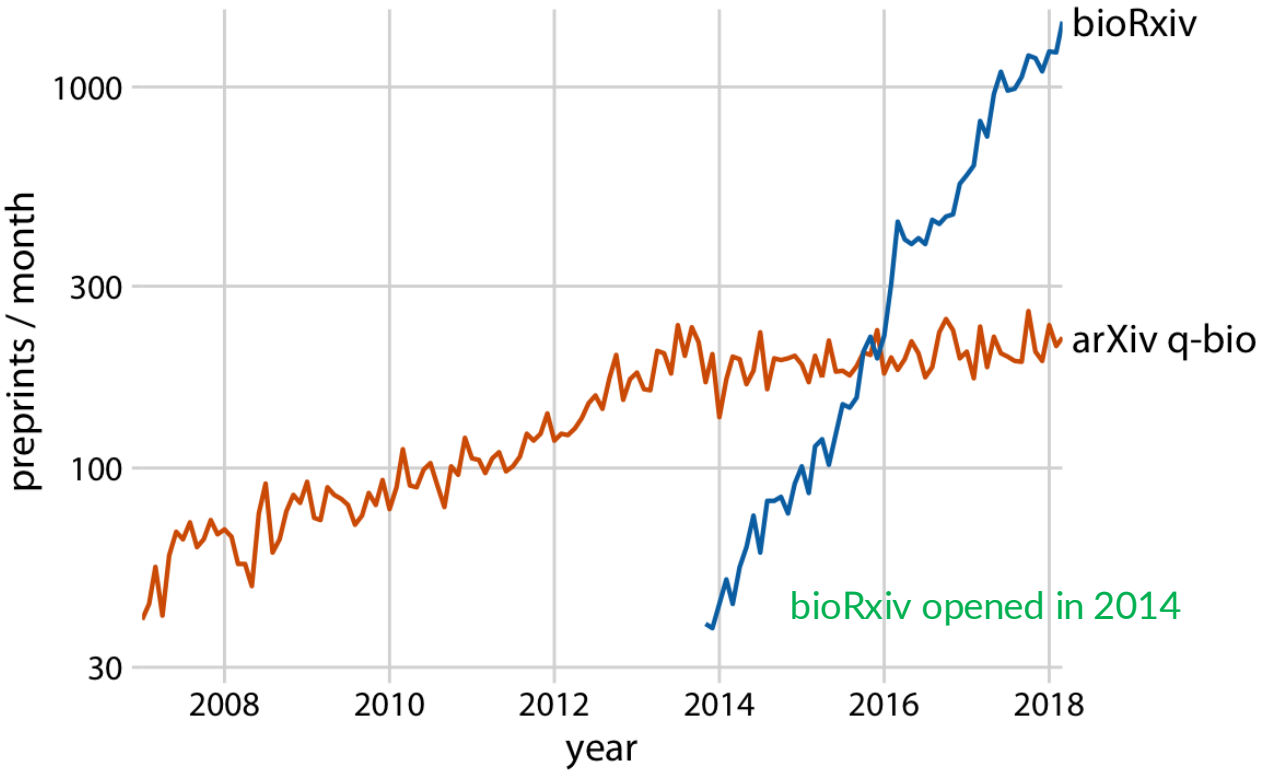
Opening

Example: Preprints in biology



Challenge

Example: Preprints in biology



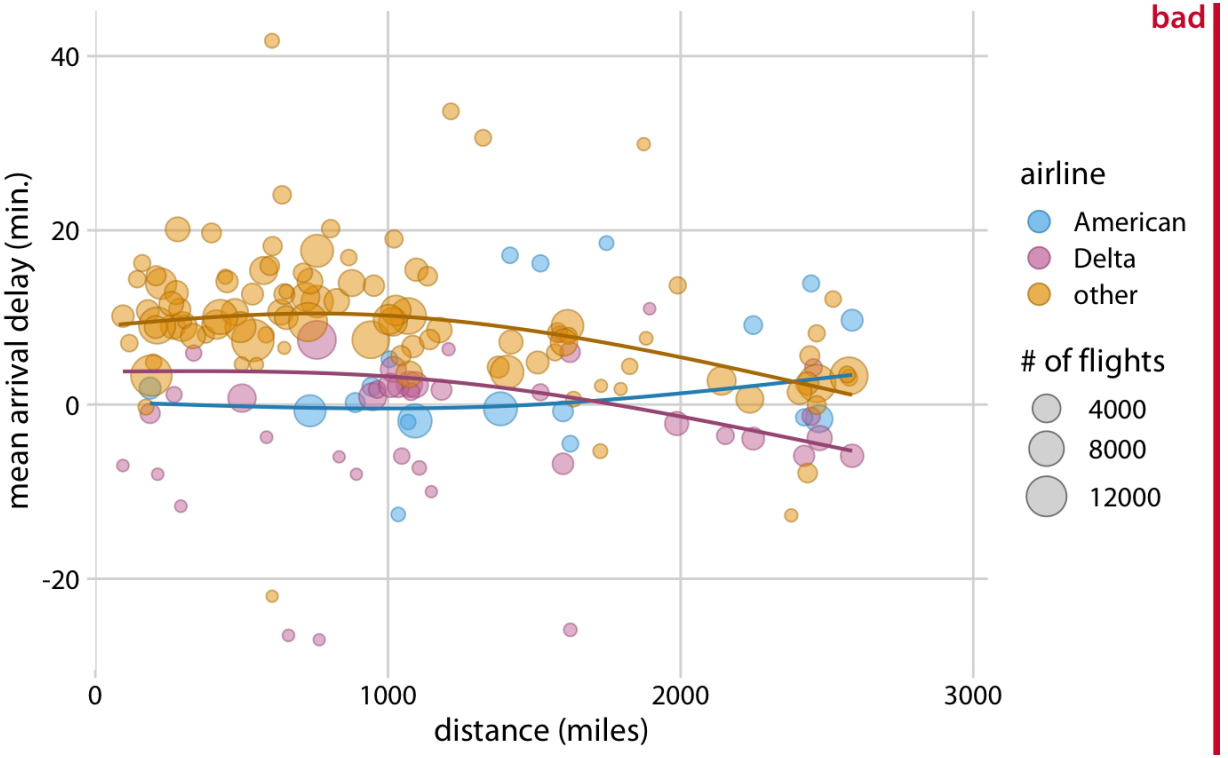
Resolution

Keep in mind

- Every figure needs a clear purpose within the story arc
- A complete arc will usually require at least two figures

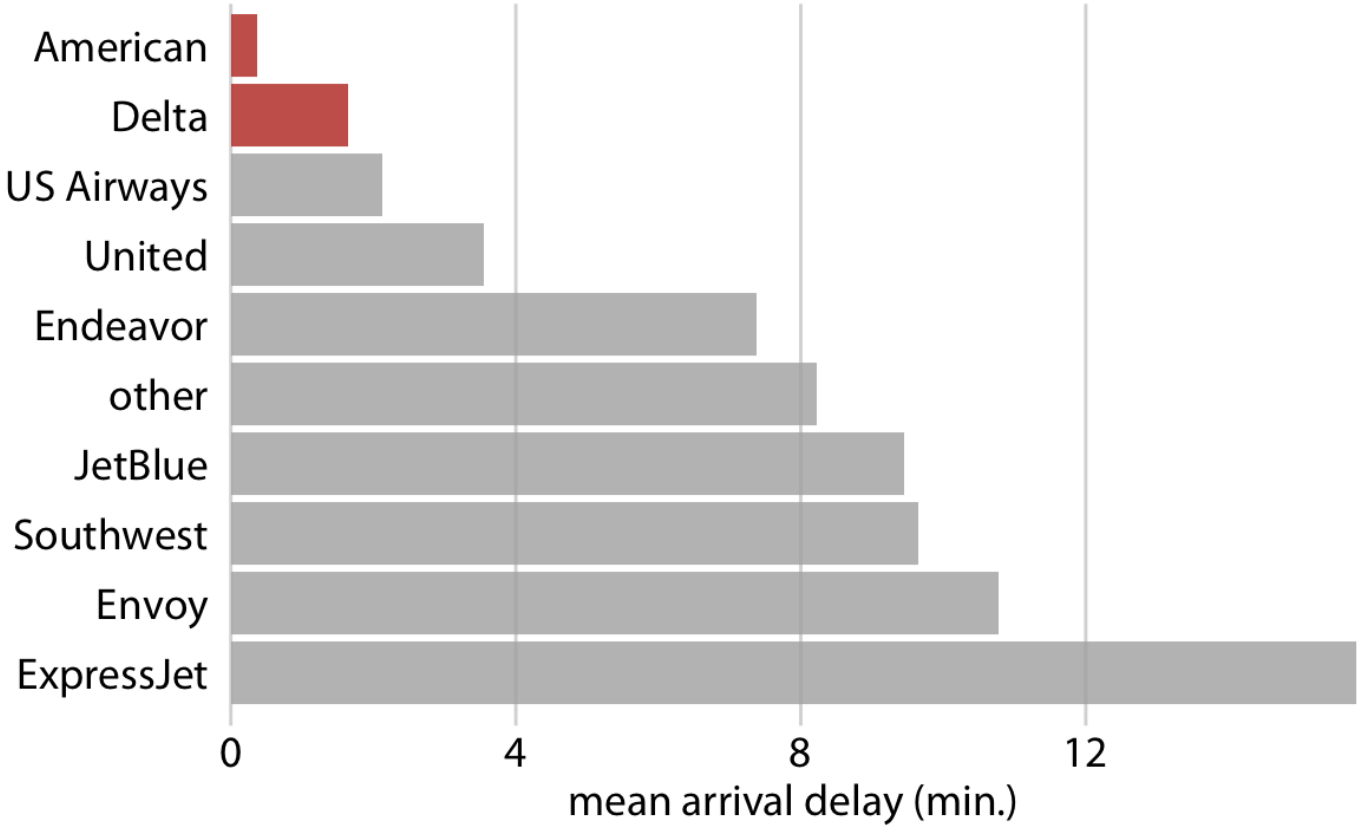
Prepare figures that make a clear point

- Never assume your audience can rapidly process complex visual displays.



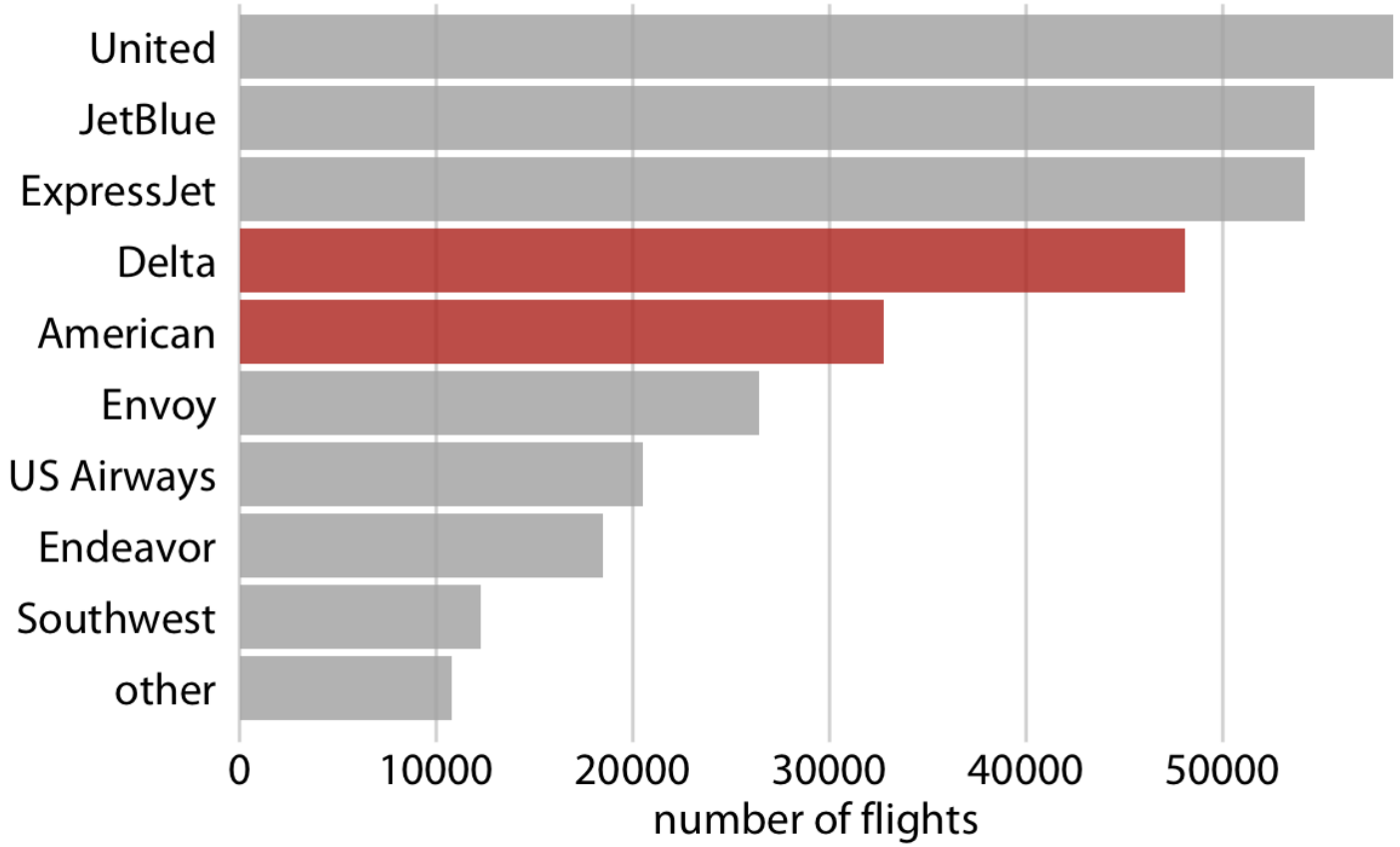
Mean arrival delay versus distance from New York City. Each point represents one destination, and the size of each point represents the number of flights from one of the three major New York City airports (Newark, JFK, or LaGuardia) to that destination in 2013.

Prepare figures that make a clear point



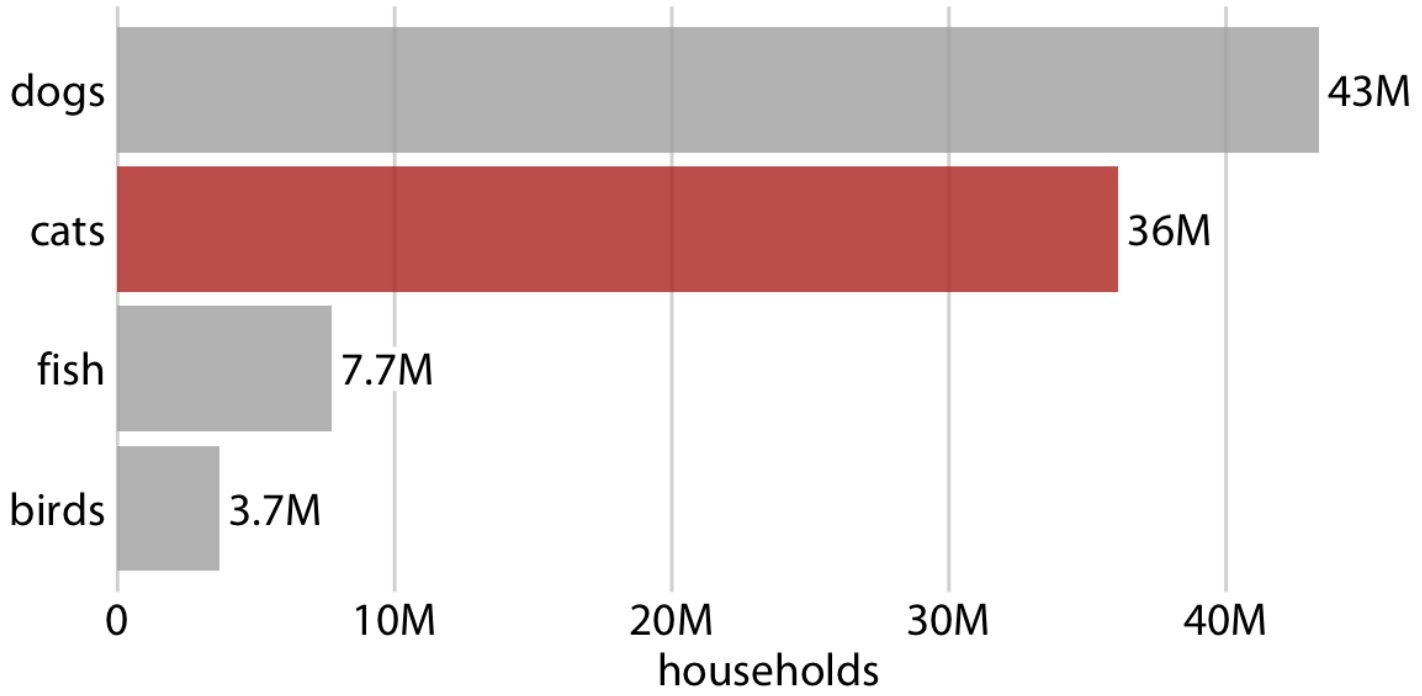
Mean arrival delay for flights out of the New York City area in 2013, by airline.

Prepare figures that make a clear point



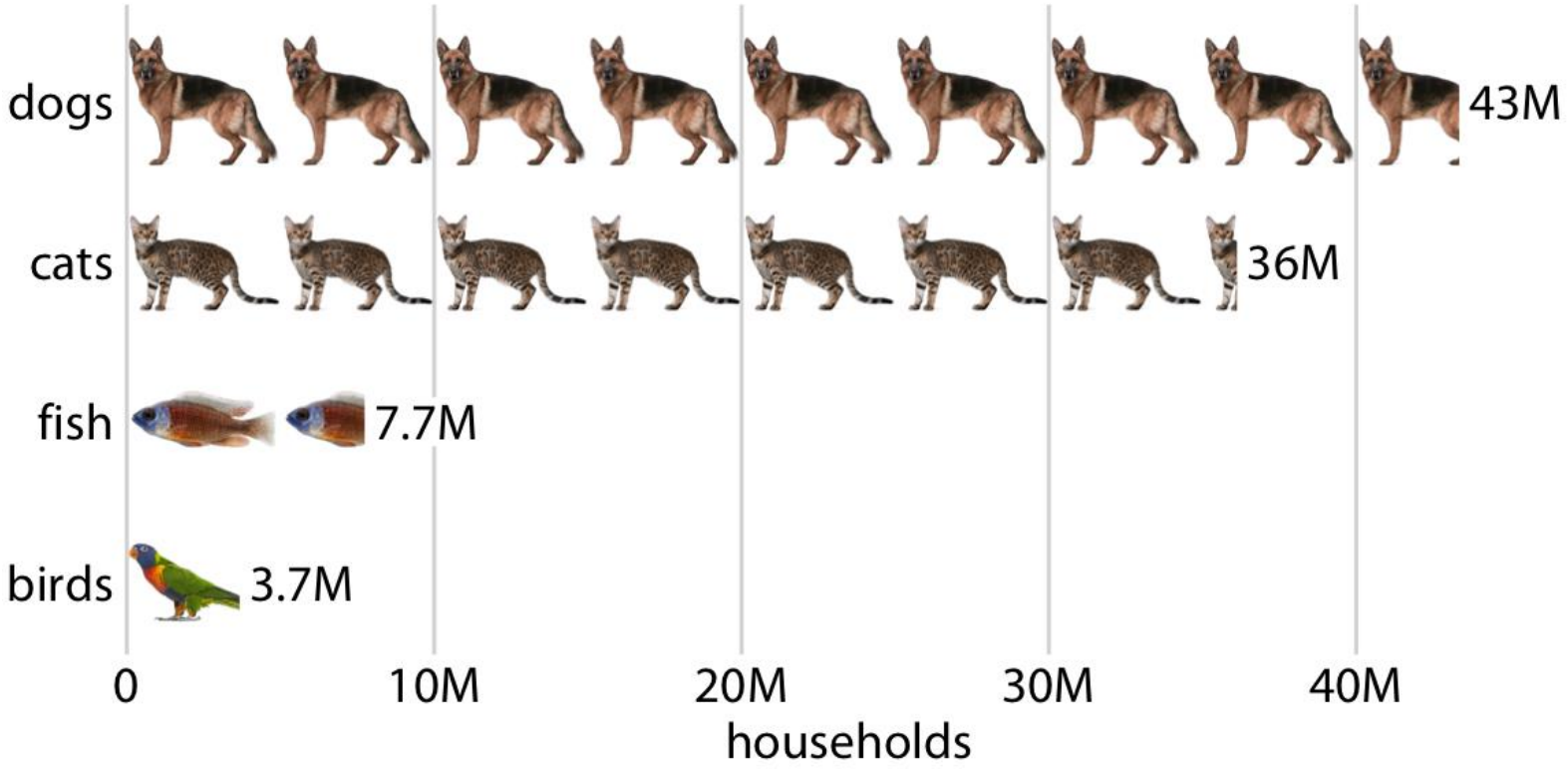
Number of flights out of the New York City area in 2013

Make your figures memorable



Number of households having one or more of the most popular pets: dogs, cats, fish, or birds.

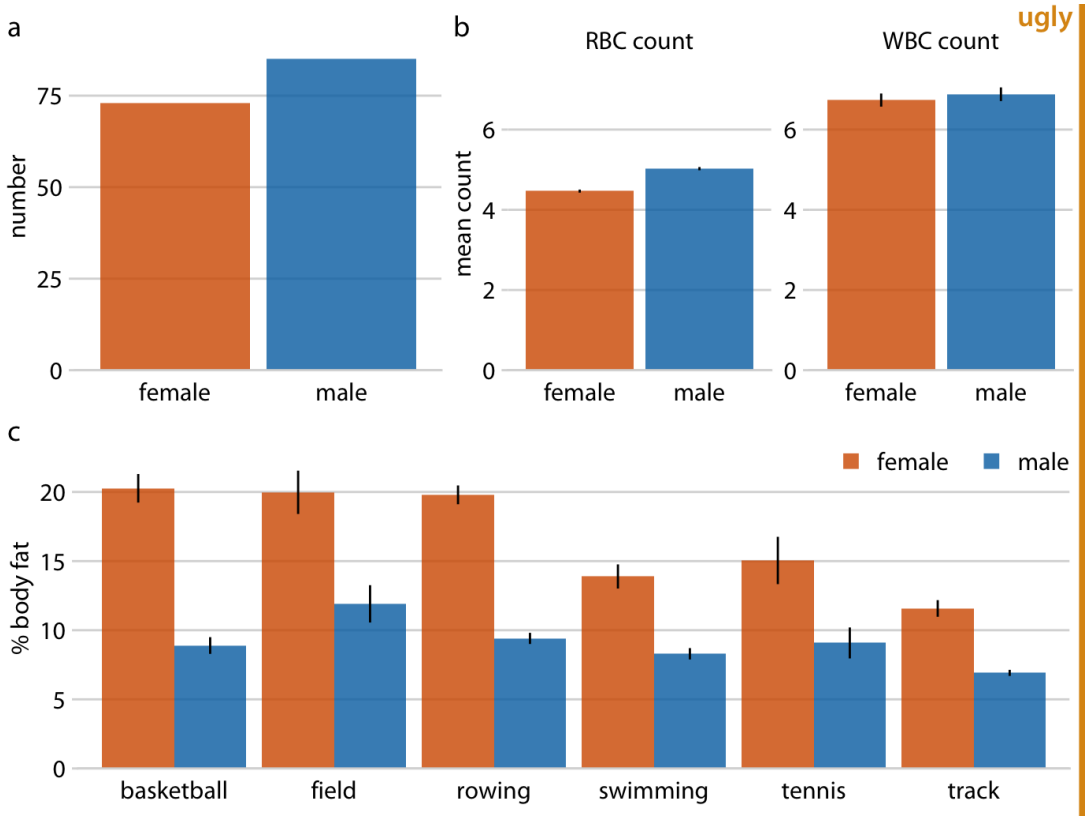
Make your figures memorable



Number of households having one or more of the most popular pets: dogs, cats, fish, or birds. Each complete animal represents 5 million households who have that kind of pet.

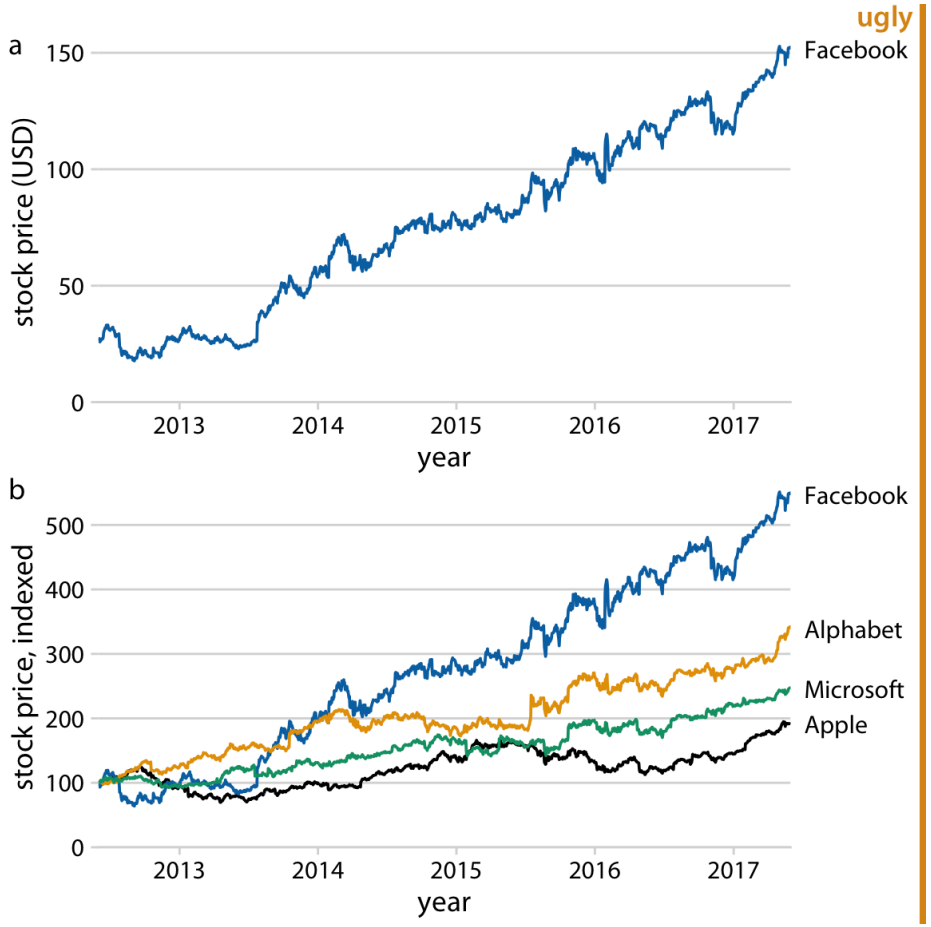
Be consistent but don't be repetitive

- When preparing a presentation or report, aim to use a different type of visualization for each distinct analysis.



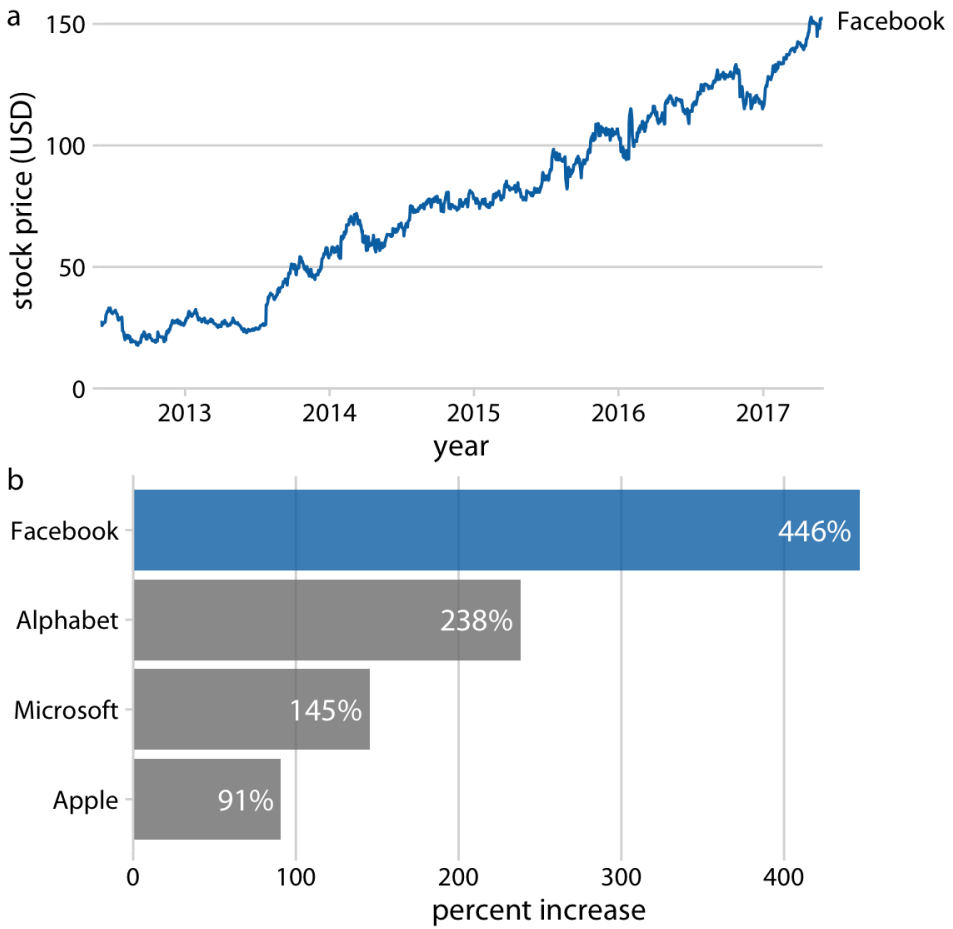
Physiology and body-composition of male and female athletes. Error bars indicate the standard error of the mean.

Be consistent but don't be repetitive



Growth of Facebook stock price over a five-year interval and comparison with other tech stocks.

Be consistent but don't be repetitive



Growth of Facebook stock price over a five-year interval and comparison with other tech stocks.