Introduction to the Grammar of Graphics

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Math 141, 1/28/22

Outline

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- Motivate intentional data visualization
- Discuss the Grammar of Graphics
- Decompose particular graphics using the GG paradigm

Section 1

Data Visualization

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- Humans are best at finding patterns in visual media.
- Graphs allow us to compare and explore relationships between variables.
- Most importantly, graphs **tell a compelling story.**

Graphs Gone Awry: The Challenger Disaster

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- After a two hour conference call, the engineer's recommendation was overruled due to lack of persuasive evidence and the launch proceeded.
- The Challenger exploded 73 seconds into launch.

The Challenger Charts

- Here is one of those charts:

The Challenger Charts

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BLOW BY HISTORY
SRM-15 WORST BLOW-BY
- 2 CASE JOINTS (80°), (110°) ARC
- MUCH WORSE VISUALLY THAN SRM-22

SRM 22 BLOW-BY
- 2 CASE JOINTS (30-40°)

SRM-13A, 15, 16A, 18, 23A 24A
- NOZZLE BLOW-BY

HISTORY OF O-RING TEMPERATURES (DEGREES-F)

MOTOR	MBT	AMB	O-RING	WIND
DM-1	68	36	47	10 MPH
DM-2	76	45	52	10 MPH
QM-3	72.5	40	48	10 MPH
QM-4	76	48	51	10 MPH
SRM-15	52	64	53	10 MPH
SRM-22	77	78	75	10 MPH
SRM-25	55	26	29 27	10 MPH 25 MPH

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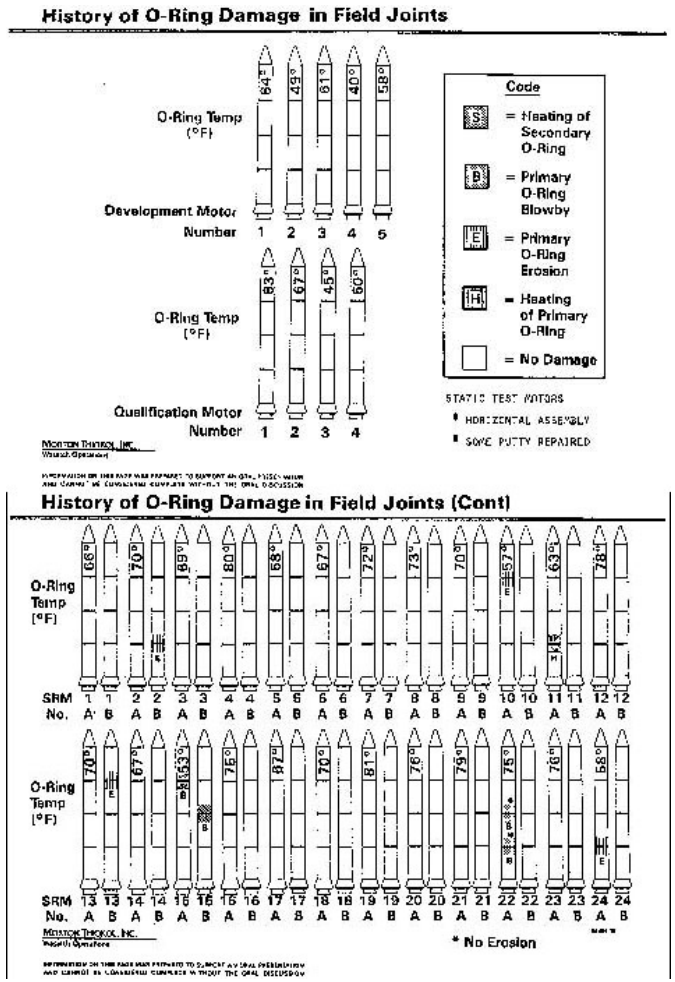

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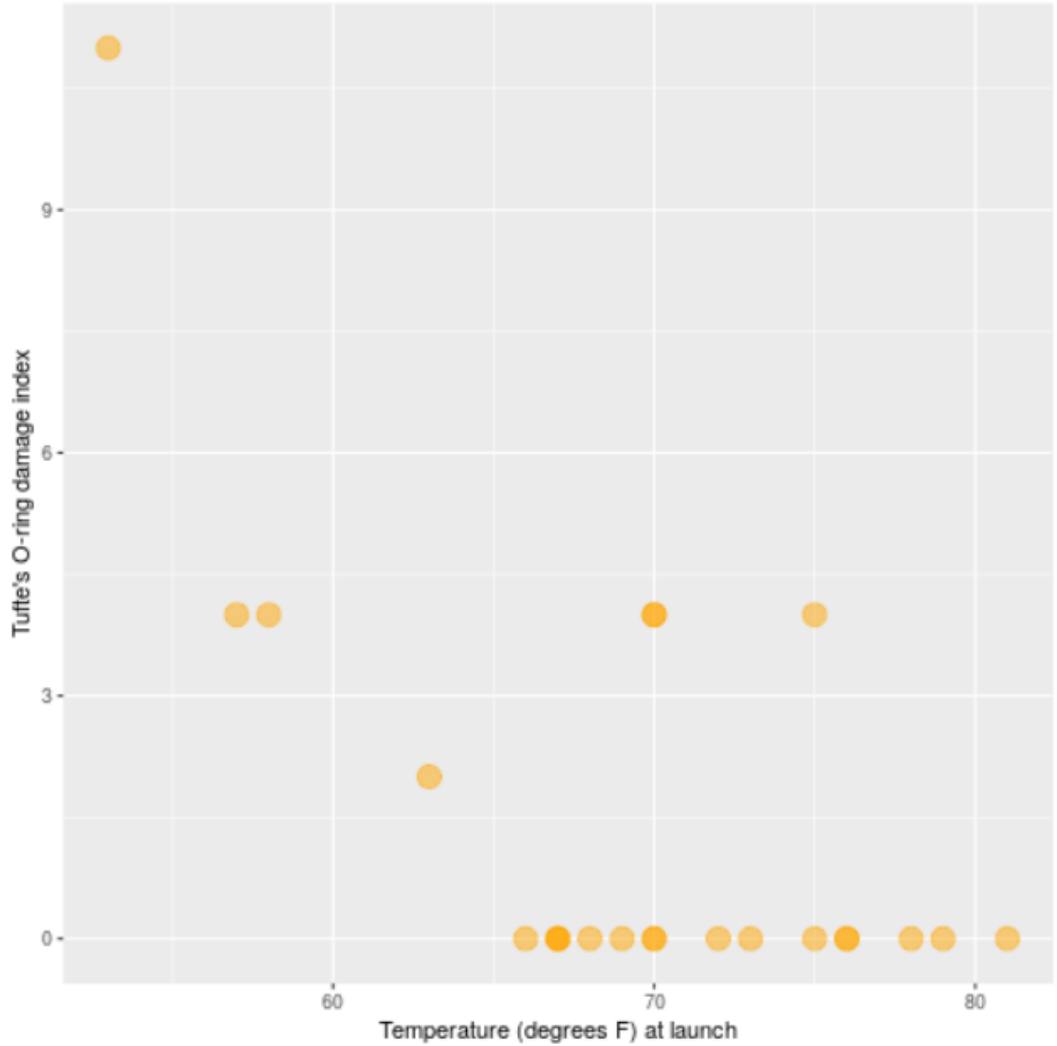

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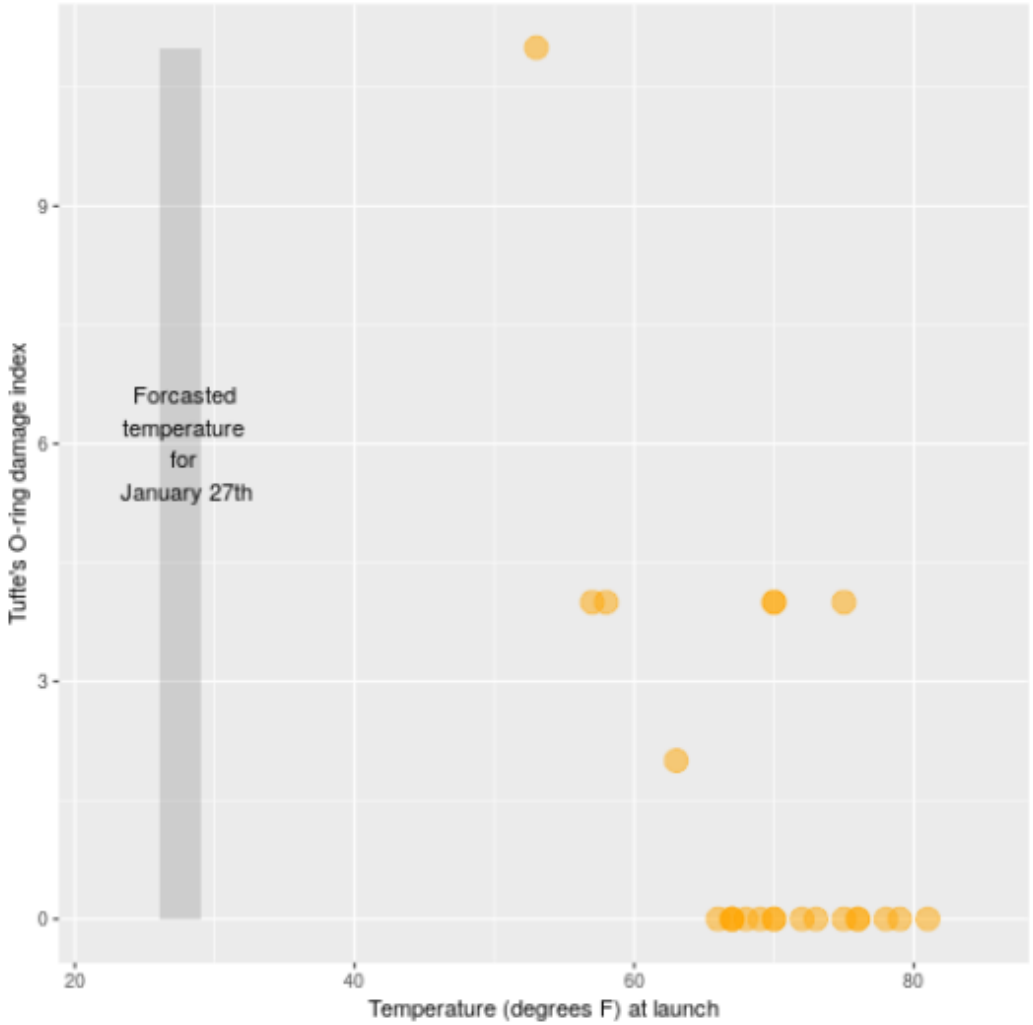

Section 2

The Grammar of Graphics

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Planet Name	x position	bar
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Planet Name	color	bar

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Planet Name	x position	bar
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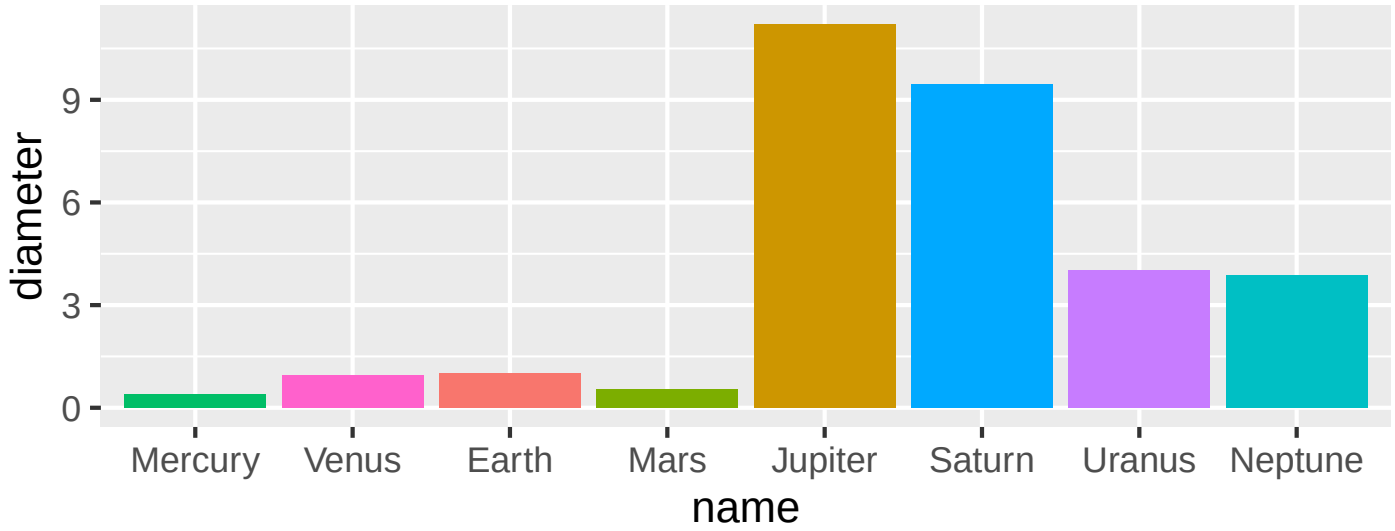
Planet Name	color	bar

```
ggplot(data = planets_df) +
  geom_bar(stat = "identity",  mapping = aes(x = name, y = diameter, fill  = name)
```



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- **guide**: a legend to help user convert visual display back to the data

Plotting the Planets

Consider the planets data frame, `planets_df`:

name	type	diameter	rotation	rings	distance
Mercury	Terrestrial planet	0.382	58.64	FALSE	0.4
Venus	Terrestrial planet	0.949	-243.02	FALSE	0.7
Earth	Terrestrial planet	1.000	1.00	FALSE	1.0
Mars	Terrestrial planet	0.532	1.03	FALSE	1.5
Jupiter	Gas giant	11.209	0.41	TRUE	5.2
Saturn	Gas giant	9.449	0.43	TRUE	9.5
Uranus	Gas giant	4.007	-0.72	TRUE	19.2
Neptune	Gas giant	3.883	0.67	TRUE	30.1

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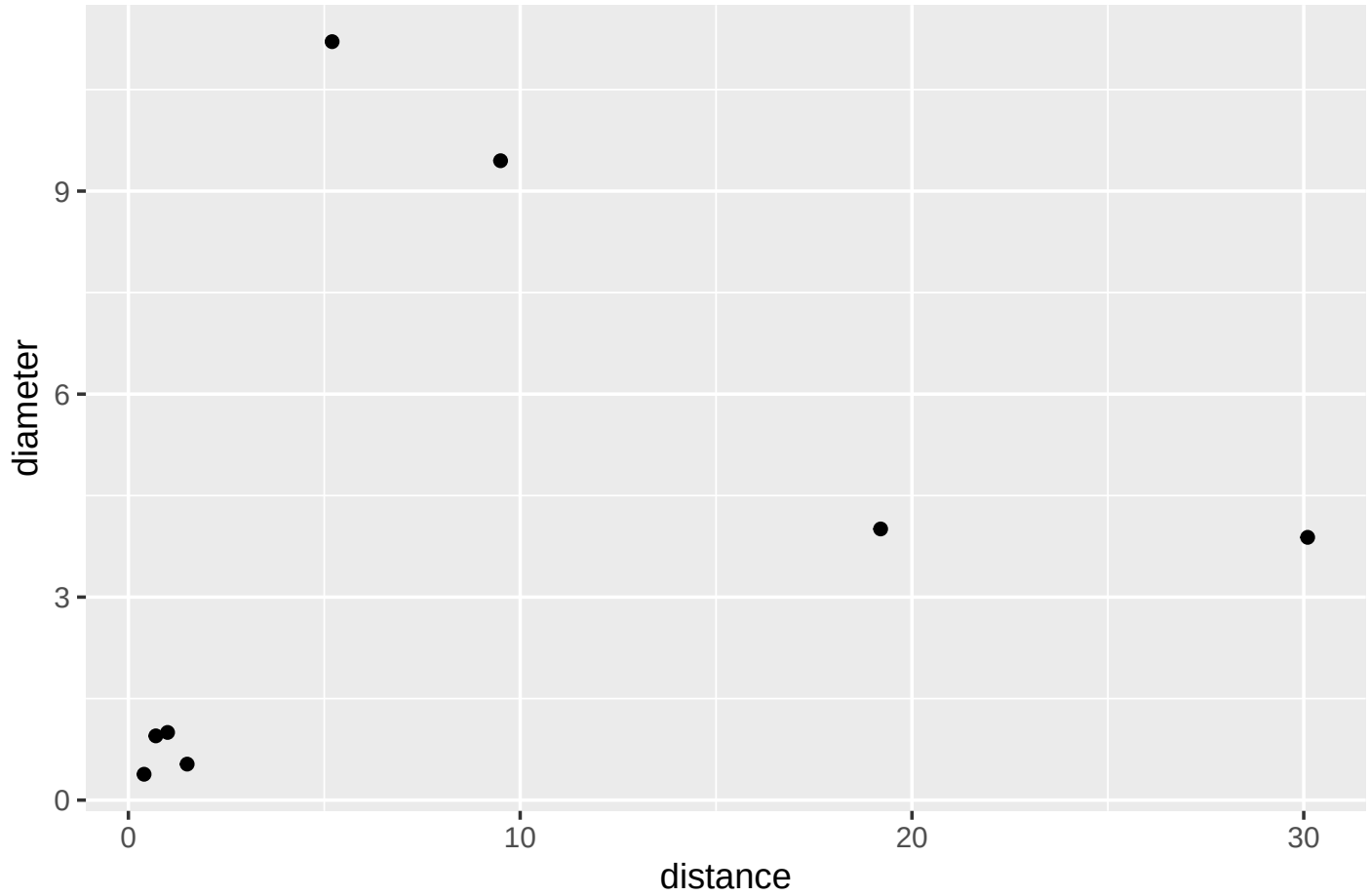
Describe how to create a plot of distance vs. diameter.

Plotting the Planets

```
ggplot(data = planets_df, mapping = aes(x = distance, y = diameter)) +
  geom_point()
```



Decomposing Graphics

Let's get some practice decomposing visualizations using the grammar of graphics. For each of images on the next slides, we'll answer the following:

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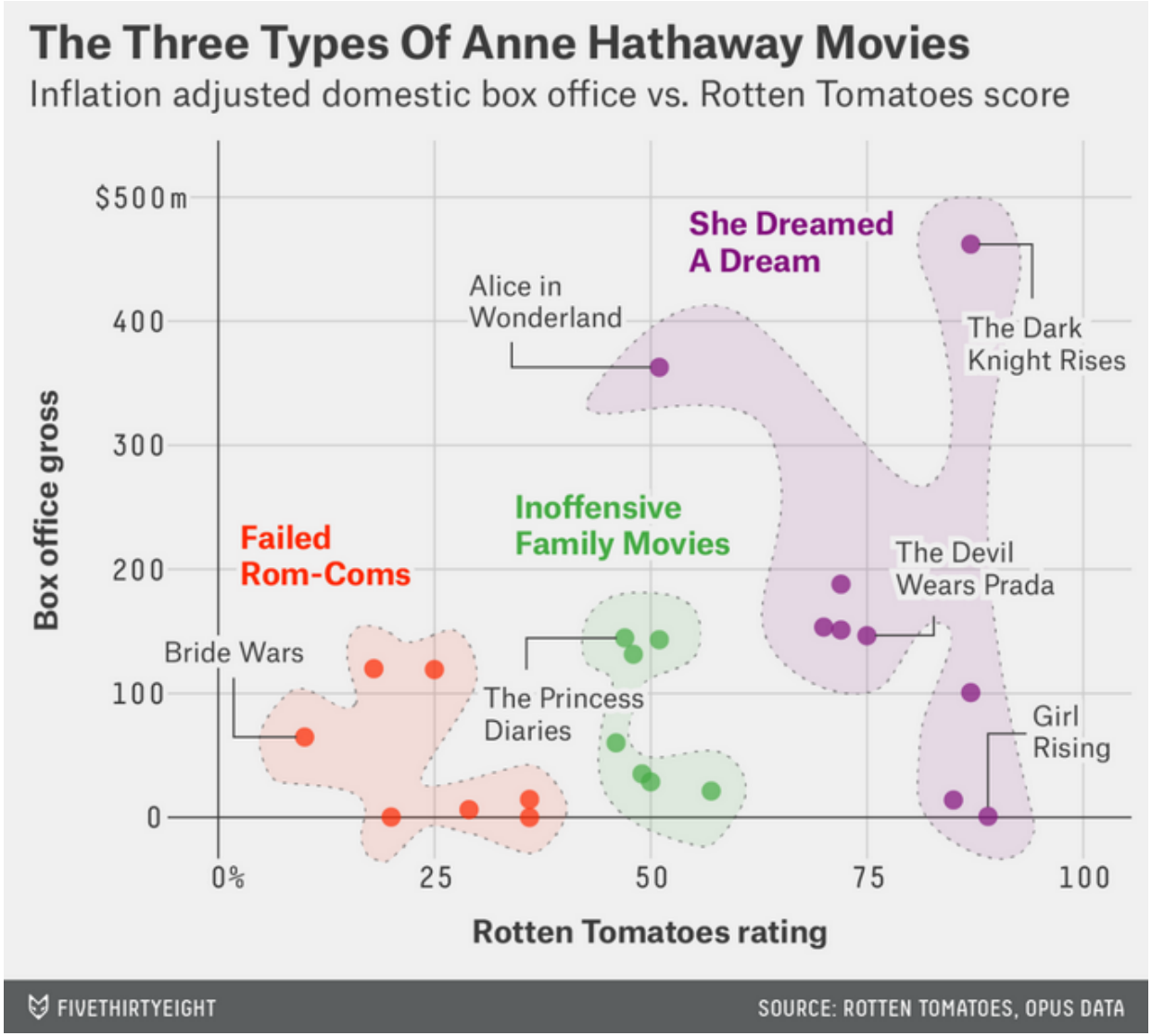
4. What are the **aesthetics** of the **geom**? Which variable sets the value of that **aesthetic**?
5. What additional context does this graphic provide?

Example 1 Graphic



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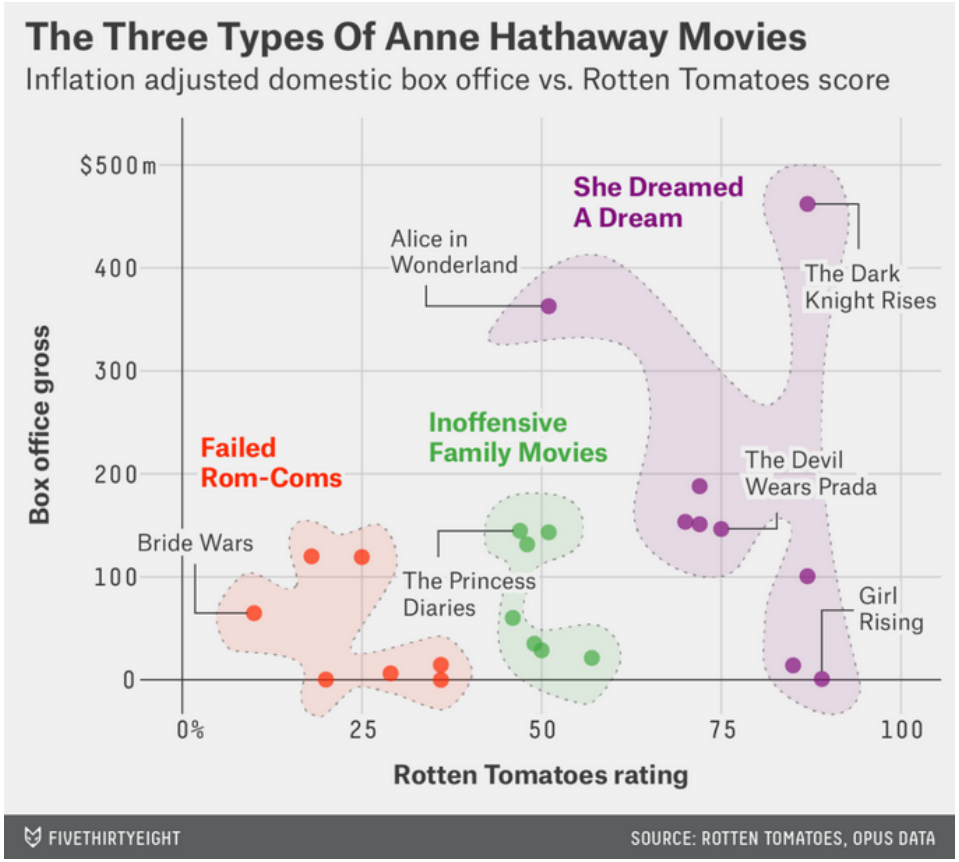
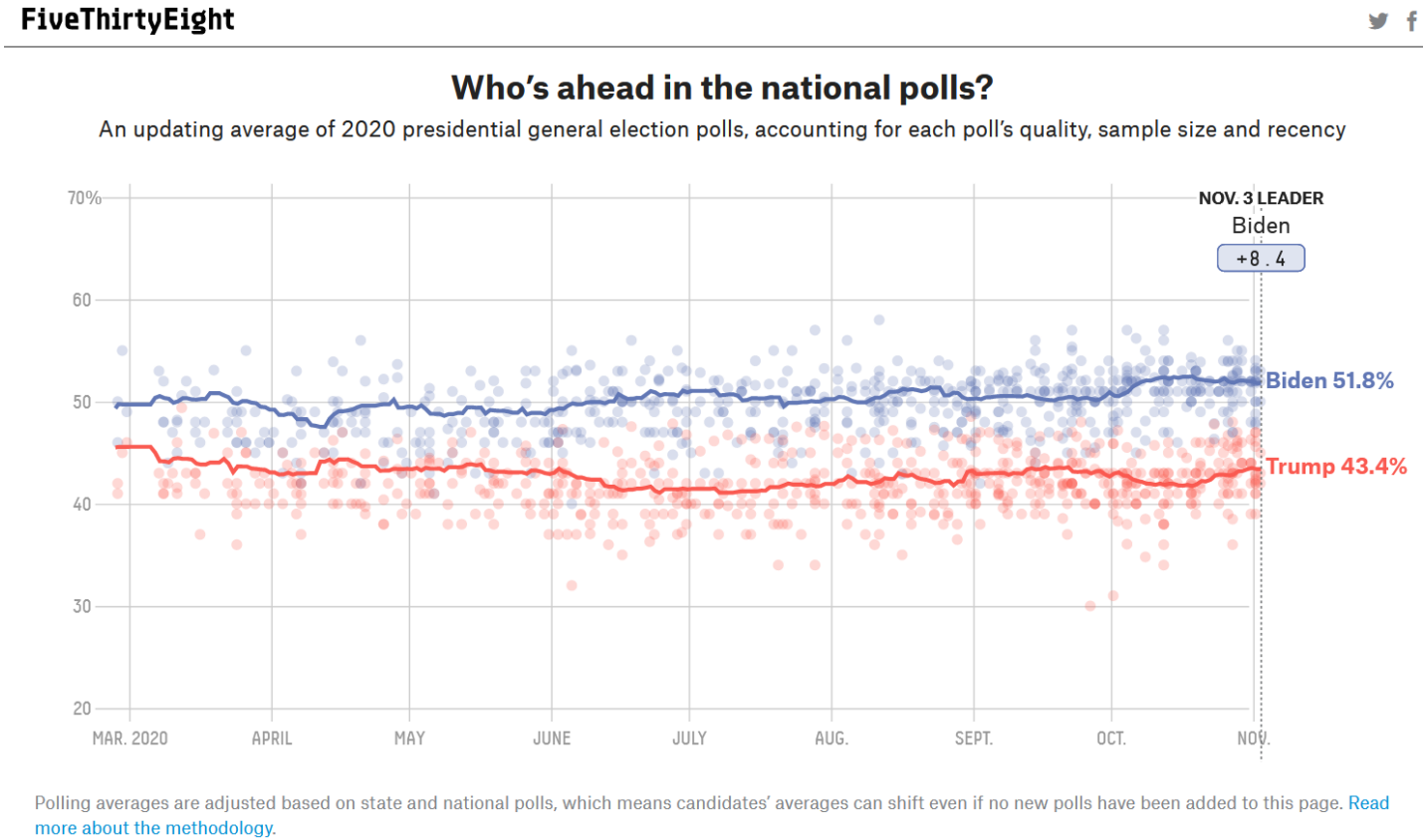


Example 2 Graphic



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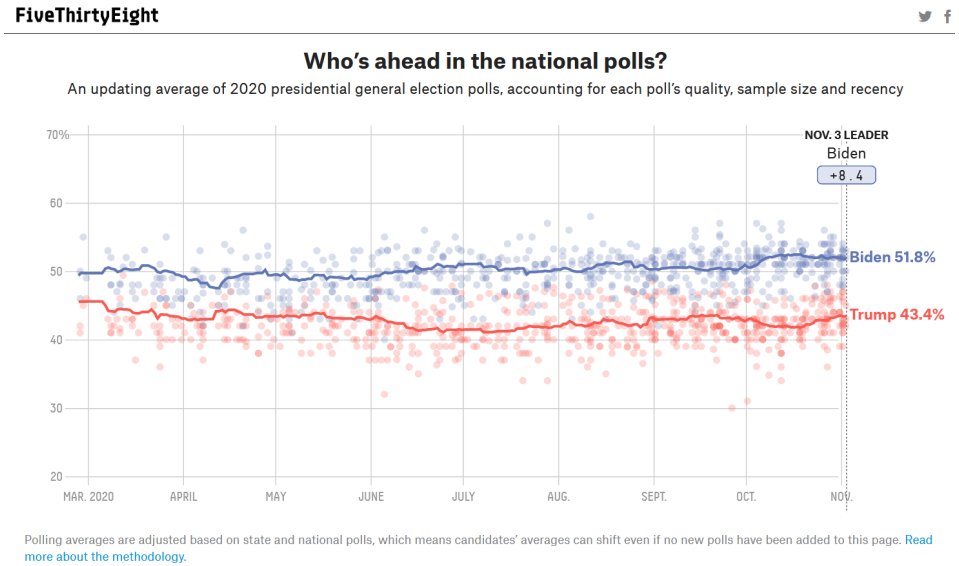
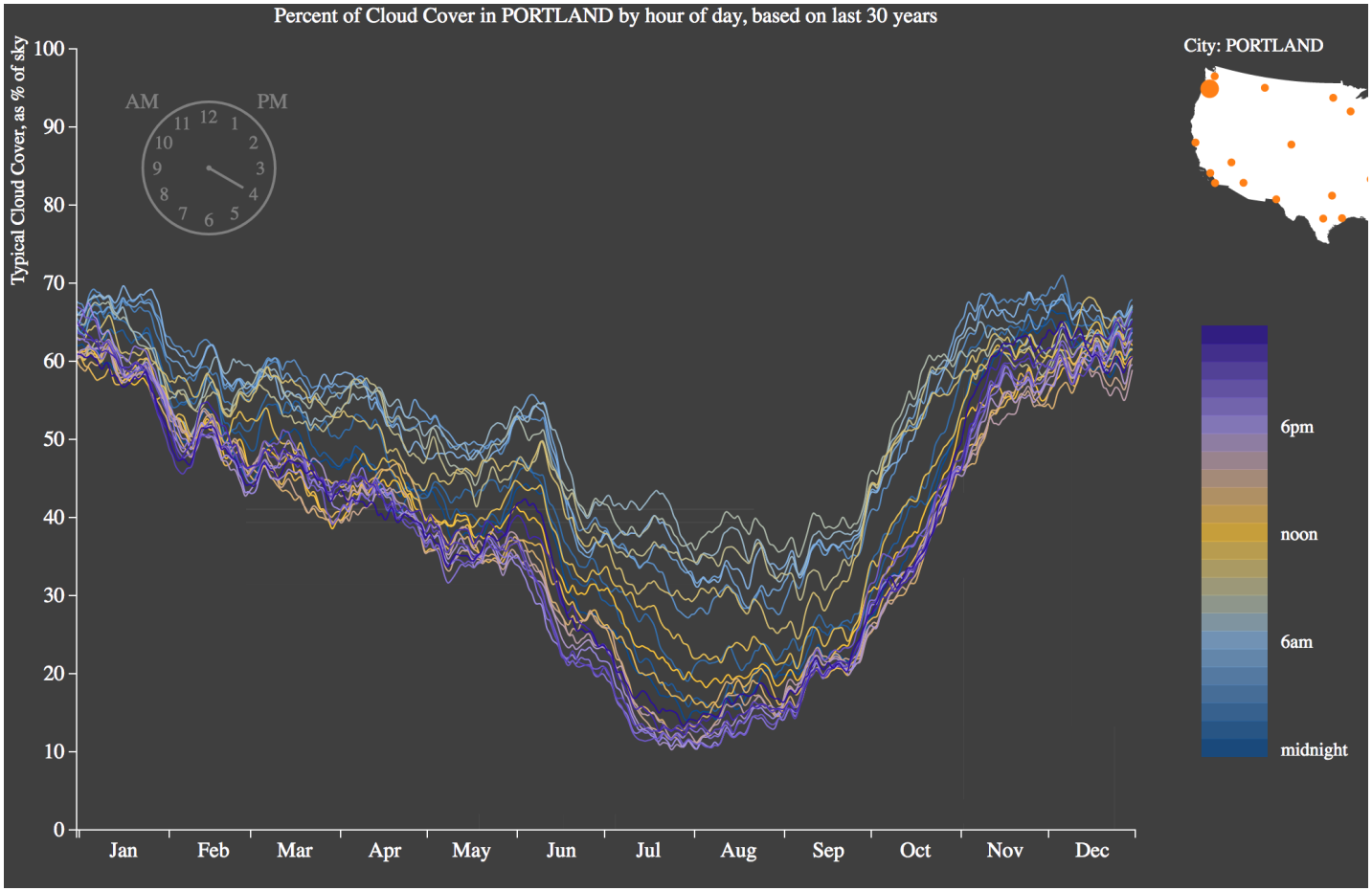


Example 3 Graphic



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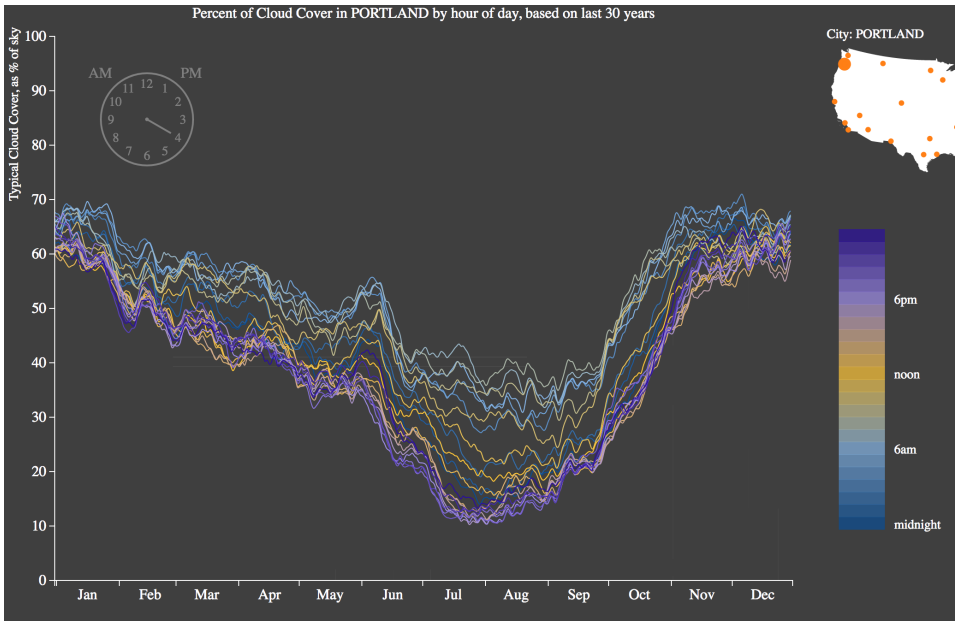

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- Minimize/eliminate extraneous elements that do not serve main purpose.