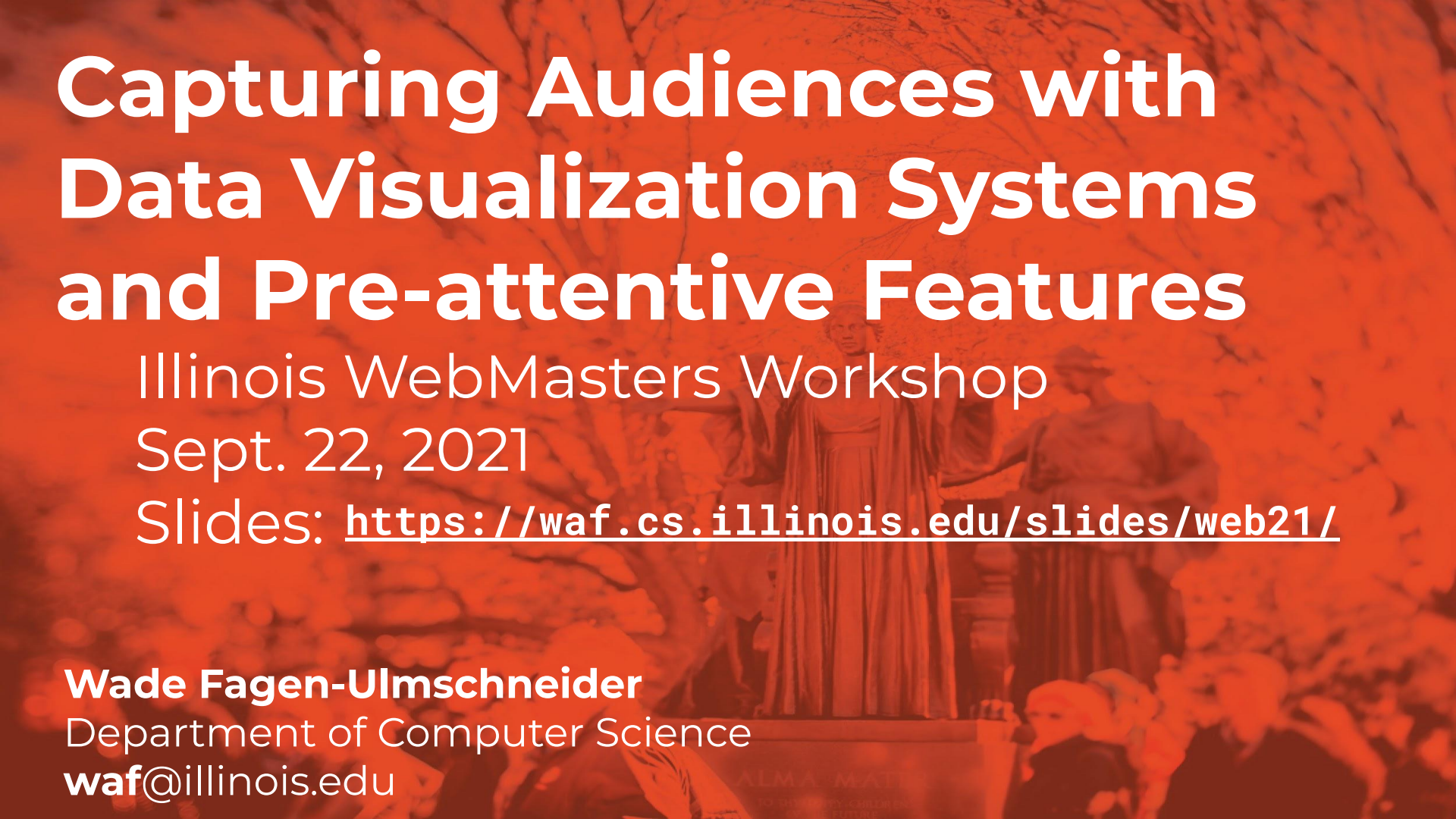
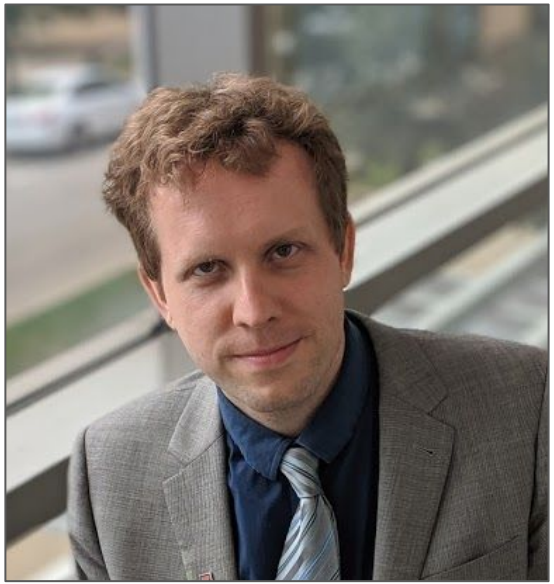


Capturing Audiences with Data Visualization Systems and Pre-attentive Features

Illinois WebMasters Workshop
Sept. 22, 2021
Slides: https://waf.cs.illinois.edu/slides/web21/

Wade Fagen-Ulmschneider
Department of Computer Science
waf@illinois.edu

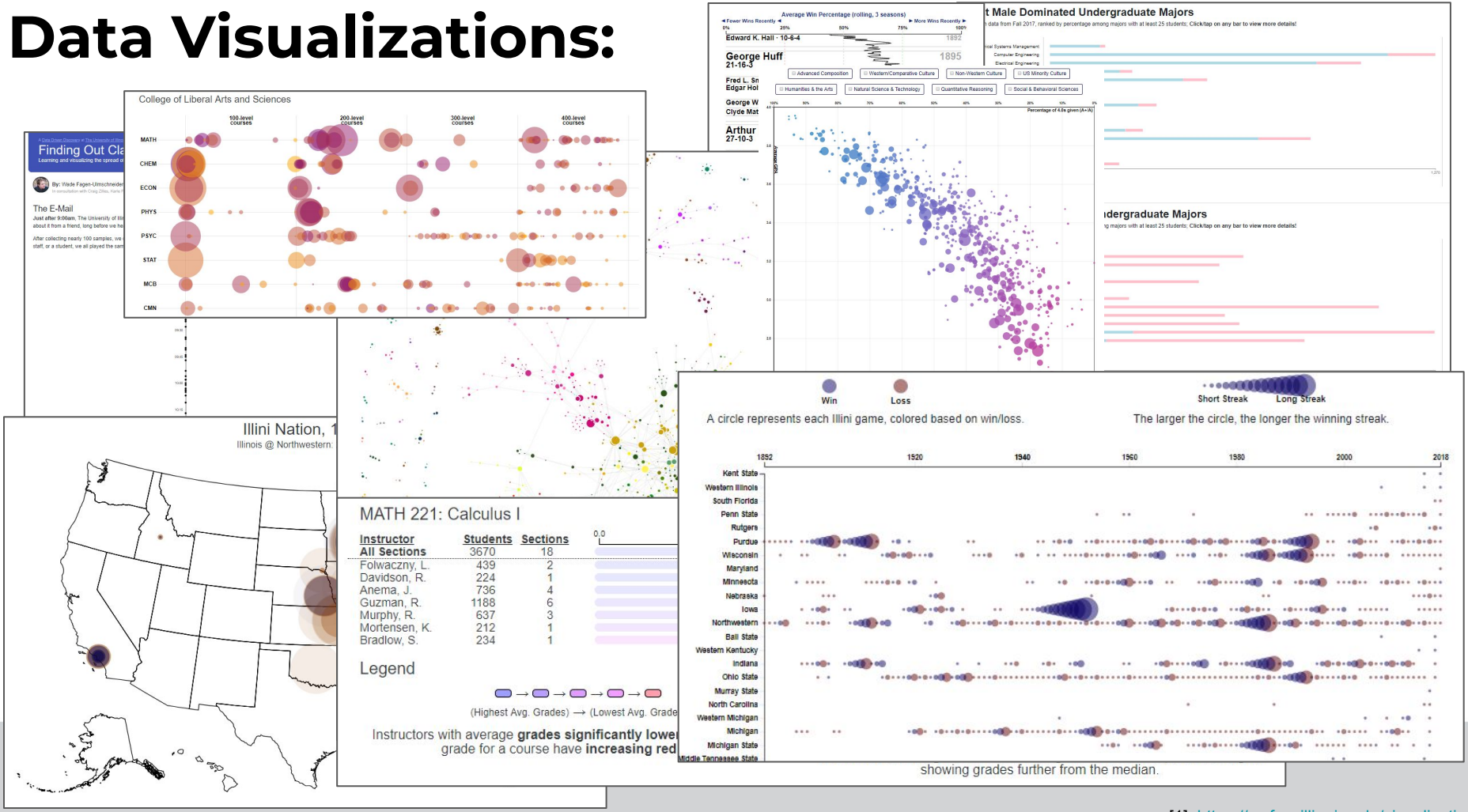
Quick Introduction:



Wade Fagen-Ulmschneider (waf)
Teaching Associate Prof. of Computer Science
Grainger College of Engineering
profwade

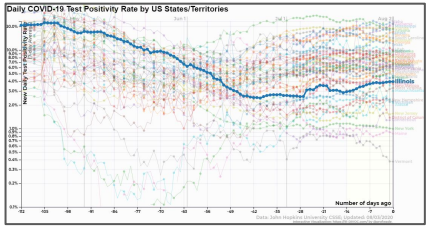

CISCO
Google
Morgan Stanley
+PhD

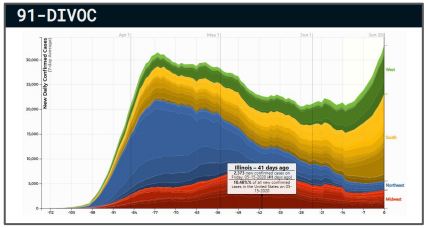
Data Visualizations:

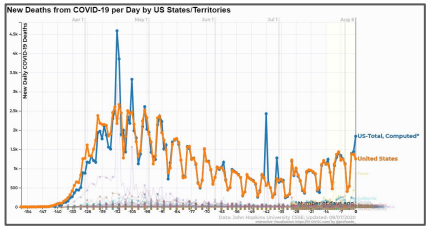


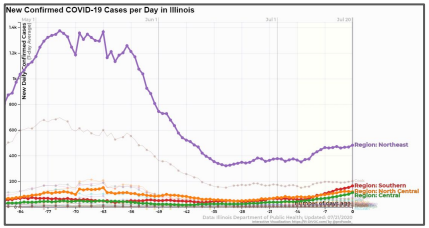
[1]: https://waf.cs.illinois.edu/visualizations/

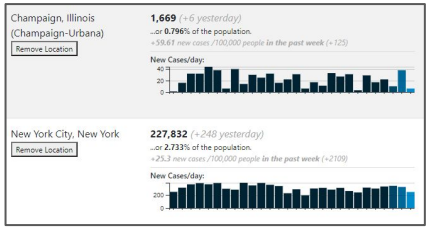
91-DIVOC Project

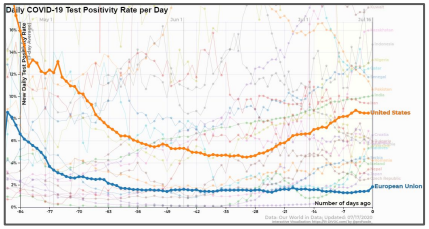










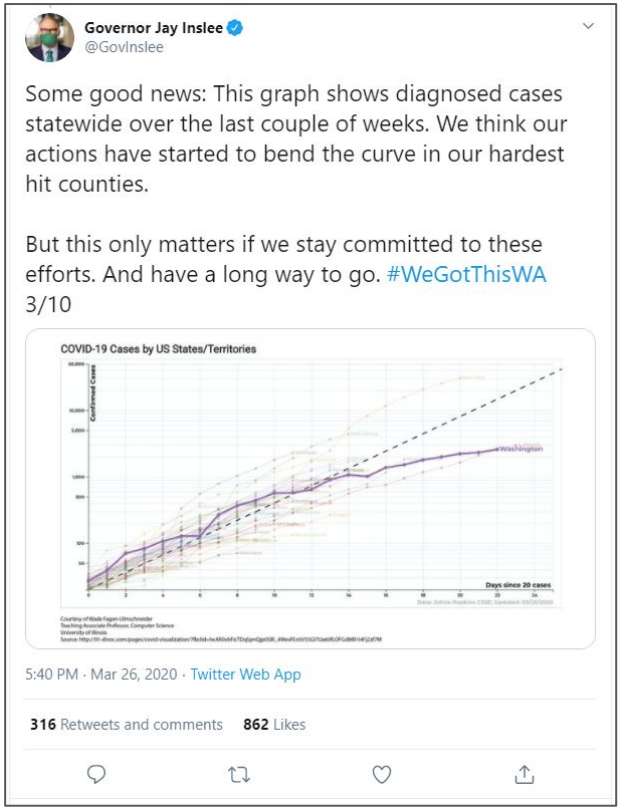


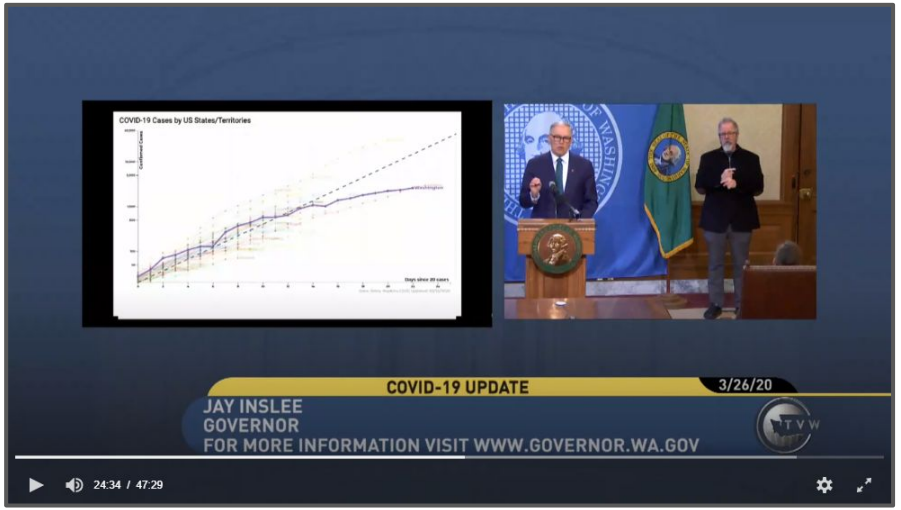
★ Technically detailed, **data-forward interactive visualizations** of COVID-19 data.

★ Similar to “Our World In Data” (**Oxford**) and “Johns Hopkins COVID-19 Tracker” (**JHU**).

★ Used by **governors**, **public health officials**, and **millions of others**.

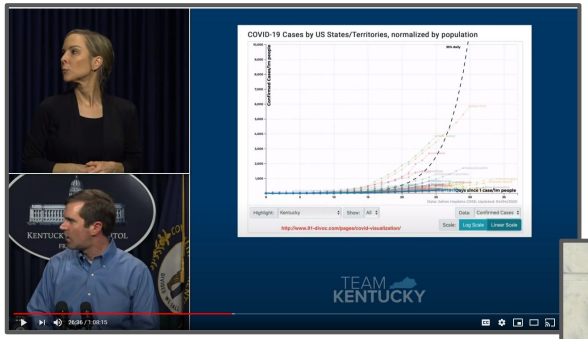
[2]: https://91-divoc.com/



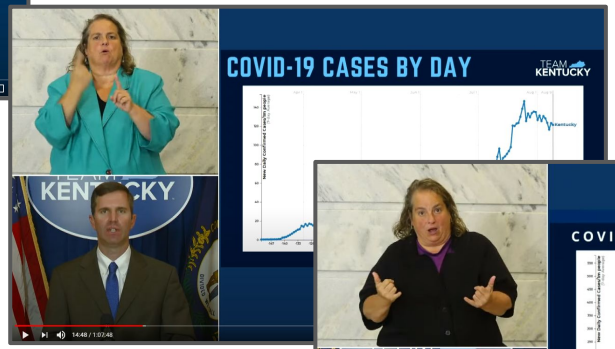


Washington State Gov. Inslee, March 26, 2020

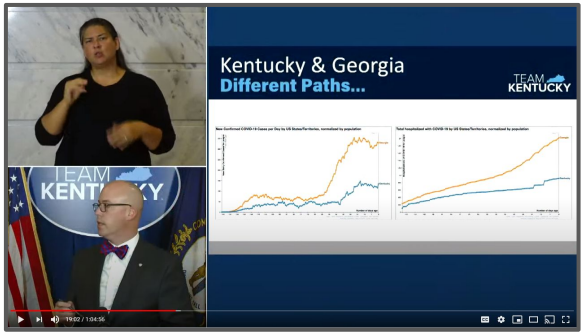
[3]: https://waf.cs.illinois.edu/impact/



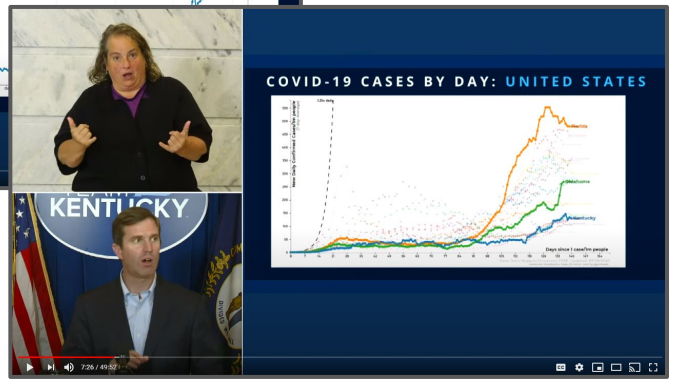
Kentucky State Gov. Beshear
April 5, 2020



August 10, 2020



Kentucky Dir. of Public Health, Dr. Steven Slack (August 13, 2020)



July 29, 2020

[3]: https://waf.cs.illinois.edu/impact/

POPULAR MECHANICS

⇒ *"The Easiest Way to Make Sense of Essential Data"*

THE VERGE

⇒ *"The Best Graphs and Data for Tracking the Coronavirus Pandemic"*

Vox

GIZMODO

CBS THIS MORNING

SLATE

SALON

THE VERGE

The Washington Post

AAAS Science

[3]: https://waf.cs.illinois.edu/impact/

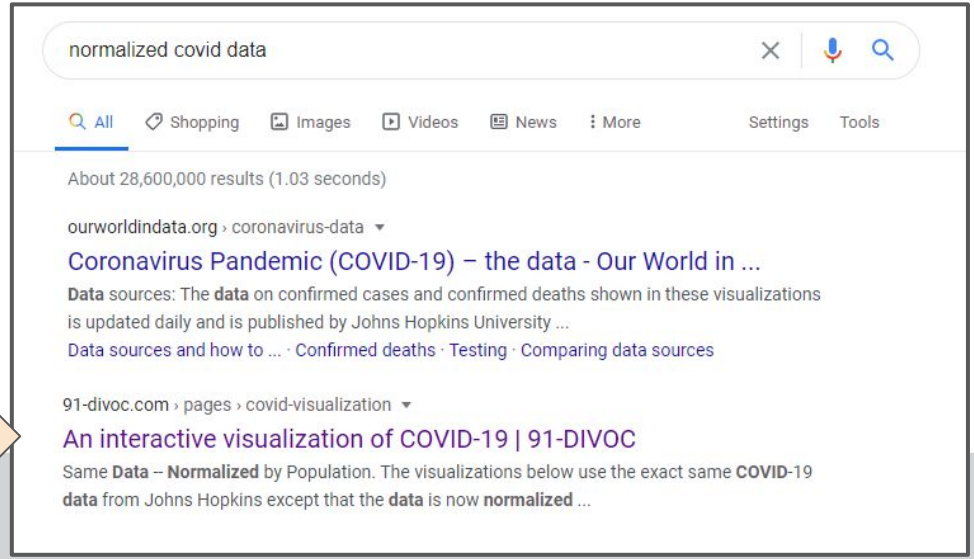
Over 100 Journalists:

- August 11, 2020; Kentucky Department of Public Health (Dr. Steven Slack) uses 91-DIVOC as part of Kentucky's COVID-19 press conference on August 11. Dr. Slack has also used 91-DIVOC as part of Kentucky's COVID-19 press conference on August 3, as part of KYDPH update video for July 7, and as part of Kentucky's COVID-19 press conference on June 30.
- Vox (German Lopez), August 11, 2020; *America's uniquely bad Covid-19 epidemic, explained in 18 maps and charts* uses Fagen-Ulmschneider's 91-DIVOC visualization as part of a piece on COVID-19.
- August 10, 2020; Kentucky Governor Andy Beshear uses 91-DIVOC as part of Kentucky's COVID-19 press conference on August 10. Governor Beshear also used 91-DIVOC as part of Kentucky's COVID-19 press conference on July 29 and Kentucky's COVID-19 press conference on April 5.
- University of Illinois (Prof. Sergei Maslov), August 6, 2020; *COVID-19 Briefing Series: Data Modeling* uses Fagen-Ulmschneider's 91-DIVOC visualization as part of a video briefing on COVID-19 for the University of Illinois campus.
- ABC Newspaper, July 28, 2020; Spain's third largest newspaper, ABC, uses Fagen-Ulmschneider's visualizations in the Spanish articles *España no aplana la curva: registra la peor evolución de contagios en Europa en los últimos dos meses* and *Las seis noticias que debes conocer hoy, martes 28 de julio*.
- Diário de Notícias (Susete Henriques), July 28, 2020; One of Portugal's largest newspapers, Diário de Notícias, uses Fagen-Ulmschneider's visualizations in the Portuguese article *Covid-19 ganha nova força em Espanha e atira país para cauda da Europa*.
- Wisconsin Public Radio (Shawn Johnson), July 27, 2020; *As Other States Mandate Masks, Wisconsin's Path Remains Unclear* uses Fagen-Ulmschneider's 91-DIVOC visualization as part of a piece on COVID-19.
- Forbes (Marshall Shepherd), July 17, 2020; *Scientists Have Been Right About The Coronavirus. Why Are People Still Not Listening?* uses Fagen-Ulmschneider's 91-DIVOC visualization as part of an article on COVID-19.
- Idaho Falls' Post Register (Douglas Whatmore); *We need to do more to contain pandemic* references Fagen-Ulmschneider's 91-DIVOC visualization as part of an article on COVID-19.
- ABC15 Arizona (Katie Raml and Garrett Archer), July 17, 2020; *Inside Arizona's Coronavirus Numbers: July 17* uses Fagen-Ulmschneider's 91-DIVOC visualization as part of video coverage on COVID-19.
- healthline (Heather Grey), July 10, 2020; *Here's What to Know About the COVID-19 Mortality Rate as Cases Climb* uses Fagen-Ulmschneider's 91-DIVOC visualization as part of a piece on COVID-19.
- SLATE (Ben Mathis-Lilley) June 25, 2020; *White House Official: Americans Will "Just Have to Live With" Massive Coronavirus Surge* uses Fagen-Ulmschneider's 91-DIVOC visualization as part of a piece on COVID-19.
- CBS This Morning (Manuel Bojorquez), June 16, 2020; *Manuel Bojorquez's (CBS) segment on the coronavirus* includes a video interview with Fagen-Ulmschneider regarding COVID-19 data.
- SLATE (Ben Mathis-Lilley), June 15, 2020; *"Texas and Florida, Please Put Masks On or We'll Never Get Out of This"* uses Fagen-Ulmschneider's 91-DIVOC visualization as part of a piece on COVID-19.
- Research Park (University of Illinois), June 6, 2020; *"Data Science User Group Discusses Data Visualization and 91-DIVOC"* covers Fagen-Ulmschneider's invited talk to the Champaign-Urbana Data Science User Group (DSUG).
- SFGate, June 1, 2020; *"The summer fight against the coronavirus will be a local one"* uses Fagen-Ulmschneider's 91-DIVOC visualization as part of a piece on COVID-19.
- FAIR: Fairness & Accuracy In Reporting (Jim Naureckas), May 29, 2020; *"Newsweek Fails to Note That White House Reopening Guidelines Make Absolutely No Sense"* utilizes Fagen-Ulmschneider's 91-DIVOC visualization. Also featured in FAIR pieces on April 11, April 14, April 29, April 30, May 1 and May 16, May 27.
- Popular Mechanics (Esther Landhuis), May 28, 2020; *"These Data Science Wizards Tell Us What's Really Happening With Coronavirus"* quotes Fagen-Ulmschneider; covers 91-DIVOC as "the easiest way to make sense of essential data".
- Walter Bradley Center for Natural and Artificial Intelligence's Mind Matters (Heather Zeiger), May 26, 2020; *"Making Sense of the Numbers Behind COVID-19"* uses Fagen-Ulmschneider's 91-DIVOC visualization as part of a piece on COVID-19.
- The News-Gazette (Jeff D'Alessio), May 20, 2020; *"UI honors top teachers with Campus Awards for Excellence, Part 1"* quotes Fagen-Ulmschneider in their coverage of the "Campus Awards for Excellence in Instruction" at The University of Illinois.
- University of Texas at Dallas, May 19, 2020; *"UTD CS Alumni Creates a Viral COVID-19 Visualization that Promotes Honest, Accessible, Transparent Access to Case Data"* quotes Fagen-Ulmschneider; covers 91-DIVOC.
- Salon (Jim Naureckas), May 16, 2020; *"Are we really hitting a pandemic "peak" — or is this a media mirage?"* uses Fagen-Ulmschneider's 91-DIVOC visualization as part of a piece on COVID-19.
- Washington Post (Paige Winfield Cunningham), May 13, 2020; *"The Health 202: Most states lifting coronavirus lockdowns haven't met federal guidelines for reopening"* uses Fagen-Ulmschneider's 91-DIVOC visualization as part of a piece on COVID-19.
- Geospatial World, April 13, 2020; *"91-DIVOC Interactive Visualization of COVID-19"* writes about Fagen-Ulmschneider's 91-DIVOC visualization.
- EMS1 (Catherine R. Counts), April 9, 2020; *"8 types of data: Telling the story of COVID-19"* writes about Fagen-Ulmschneider's 91-DIVOC visualization.
- VICE (Mordechai Rorvig), April 7, 2020; *"How to Read the Coronavirus Graphs"* writes about Fagen-Ulmschneider's 91-DIVOC visualization.
- The State Journal, April 6, 2020; *"Beshear indicates that he might close churches that keep holding services"* uses Fagen-Ulmschneider's 91-DIVOC visualization as part of a piece on COVID-19.
- Murray State's NPR Station WKMS, April 5, 2020; *Beshear Confirms 38 New Cases & 5 Deaths From COVID-19* covers Gov. Beshear's use of 91-DIVOC as part of Kentucky's COVID-19 press conference.
- Wave3 News (Louisville, KY; Brian Planalp), April 5, 2020; *"Covington company to provide state with thousands of COVID-19 tests per day "* uses Fagen-Ulmschneider's 91-DIVOC visualization as part of a piece on COVID-19.
- IT News Africa (Luis Monzon), April 3, 2020; *"The 3 Best Ways to Track the Coronavirus Pandemic"* writes about Fagen-Ulmschneider's 91-DIVOC visualization.
- The Verge (Adi Robertson), April 2, 2020; *"The Best Graphs and Data for Tracking the Coronavirus Pandemic"* lists Fagen-Ulmschneider's 91-DIVOC as one of the five "most helpful public resources" for tracking COVID-19.
- March 26, 2020; Governor Jay Inslee of Washington State used 91-DIVOC as part of Washington's COVID-19 press conferences on March 26. Gov. Inslee and also *"tweeted about it later"*.
- Gizmodo (Beth Skwarecki), March 26, 2020; *"Esta gráfica con los casos de covid-19 por países es buena para tu información, pero no para tu ansiedad"* writes about Fagen-Ulmschneider's 91-DIVOC visualization for a Spanish-language audience.
- SER (David Justo), March 26, 2020; *"La gráfica que muestra la evolución del coronavirus en todo el planeta en tiempo real"* writes about Fagen-Ulmschneider's 91-DIVOC visualization for a Spanish-language audience.
- LifeHacker (Beth Skwarecki), March 25, 2020; *"Here's A New COVID-19 Data Site To Obsessively Refresh"* writes about Fagen-Ulmschneider's 91-DIVOC visualization.
- Poets & Quants, March 18, 2020; *"Gies Alumnus Rises Above Competition In Data-Visualization Contest"* covers the "Racial Demographics at UIUC over 50 years" visualization that Fagen-Ulmschneider advised at The University of Illinois.
- Seeking Alpha, July 25, 2020; *Weekly High Frequency Indicators: No Weekly Change As Emergency Unemployment Benefits End* cites Fagen-Ulmschneider's 91-DIVOC project as a COVID-19 resource.
- USA Today (John Bacon, Elinor Aspegren, and Lorenzo Reyes), July 13, 2020; *Coronavirus updates: LA and San Diego school districts will start fall classes online only; California orders statewide closures* cites Fagen-Ulmschneider's 91-DIVOC project as a COVID-19 resource.
- WBRC News (Birmingham, AL; Joshua Gauntt), July 1, 2020; *What COVID-19 trends are doctors focusing on?* cites Fagen-Ulmschneider's 91-DIVOC project as a resource used by medical professionals.
- Psychology Today (Emily Deans), June 18, 2020; *"Good Information on COVID19"* cites Fagen-Ulmschneider's 91-DIVOC project among the "best websites" for COVID-19.
- Society of Professional Journalists' Journalists Toolbox (Mike Reilley), June 17, 2020; *"Coronavirus and COVID-19 Data and Research"* cites Fagen-Ulmschneider's 91-DIVOC project as a COVID-19 resource.
- The Berkeley Daily Planet (Kelly Hammargren), June 13, 2020; *"Cover Your Face: The Covid-19 Pandemic Isn't Over"* cites Fagen-Ulmschneider's 91-DIVOC project as a COVID-19 resource.
- American Press Institute/The Poynter Institute (Harrison Mantas and Susan Benkelman), May 21, 2020; *"Factually: Perceiving the curve"* cites Fagen-Ulmschneider's 91-DIVOC project as a COVID-19 resource.
- Science (Jeffrey M. Zacks and Steven L. Franconeri), May 12, 2020; *"Reading the pandemic data"* cites Fagen-Ulmschneider's 91-DIVOC project as a unique view of COVID-19 data.
- Vox (Joss Fong, et al), April 28, 2020; Video: *"How coronavirus charts can mislead us"* cites Fagen-Ulmschneider's 91-DIVOC project as a COVID-19 resource.
- The Verge (Russell Brandom), April 28, 2020; *"More than 1 million people in the US have tested positive for COVID-19"* uses Fagen-Ulmschneider's 91-DIVOC project as an image reference.
- Skagit Valley Herald (Charles Hall), April 1, 2020; *"Hospital CEO: Leaders making tough decisions"* cites Fagen-Ulmschneider's 91-DIVOC project as a COVID-19 resource.
- University of Maryland, Baltimore County, 2020; *"COVID-19 Visualization Tools"* cites Fagen-Ulmschneider's 91-DIVOC project as a COVID-19 resource.
- International Science Council, 2020; *"Data Visualisation / Tracking Tools"* cites Fagen-Ulmschneider's 91-DIVOC project as a COVID-19 resource.
- Journal of the American Medical Informatics Association (Benjamin Wissel, et al), 2020; *"An interactive online dashboard for tracking COVID-19 in U.S. counties, cities, and states in real time"* cites Fagen-Ulmschneider's 91-DIVOC project.
- Global Partnership for Sustainable Development Data, 2020; *"COVID-19 Data Resources"* cites Fagen-Ulmschneider's 91-DIVOC project as a COVID-19 resource.
- COVIDVIS Research Group at UC-Berkeley, 2020; *"Visualizing the Impact of SARS-CoV-2 Intervention Strategies"* cites Fagen-Ulmschneider's 91-DIVOC project and uses some of 91-DIVOC's open-source code.
- KMUZ 100.7 (Portland, OR), 2020; *"Learn about the data"* cites Fagen-Ulmschneider's 91-DIVOC project as a COVID-19 resource.
- ArcGIS Online, 2020; *"Explore the COVID-19 Curve"* cites Fagen-Ulmschneider's 91-DIVOC project.

[3]: https://waf.cs.illinois.edu/impact/

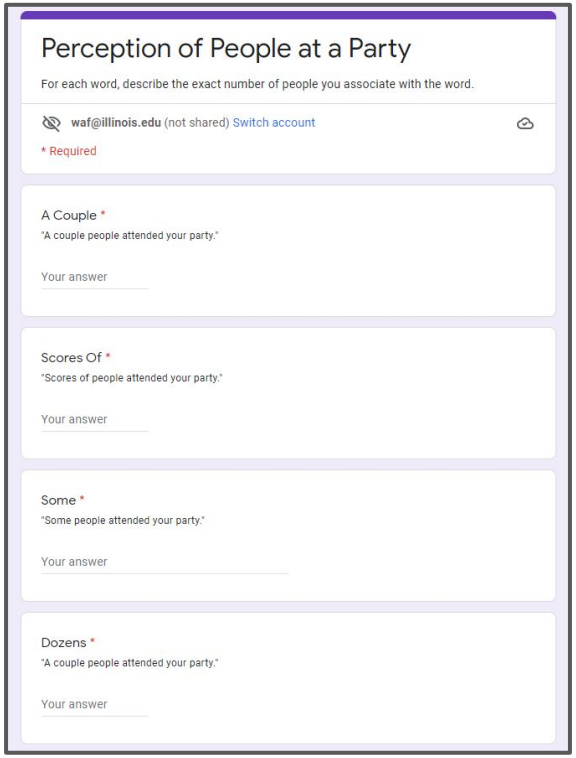
Strong Google Rankings of 91-DIVOC

- ★ **COVID Normalized by Population**, average search position of **1.5**
- ★ **Normalized COVID Data**, average search position of **2.2**
- ★ **COVID Visualization**, average search result location of **4.0**



Source: Google Search Console

Perception of Party Sizes



Perception of People at a Party

For each word, describe the exact number of people you associate with the word.

waf@illinois.edu (not shared) Switch account

* Required

A Couple *

"A couple people attended your party."

Your answer

Scores Of *

"Scores of people attended your party."

Your answer

Some *

"Some people attended your party."

Your answer

Dozens *

"A couple people attended your party."

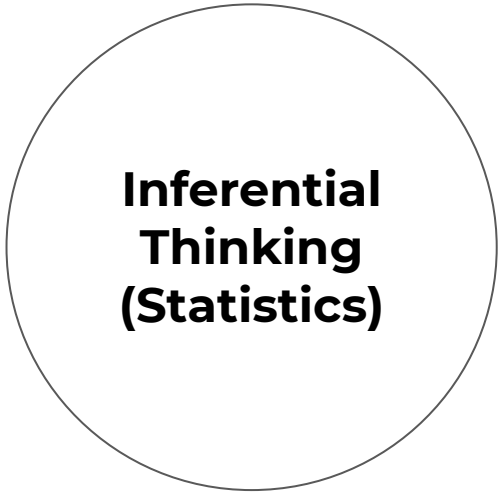
Your answer

https://forms.gle/mbxh6u1k8KZhn5BC8

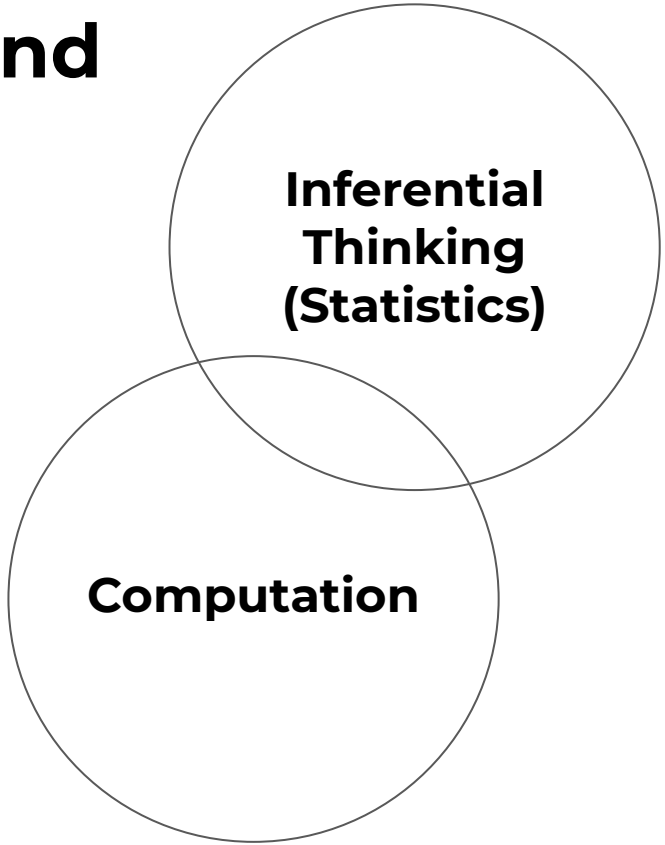
(Linked in chat)

Data Science Background

Background



Background



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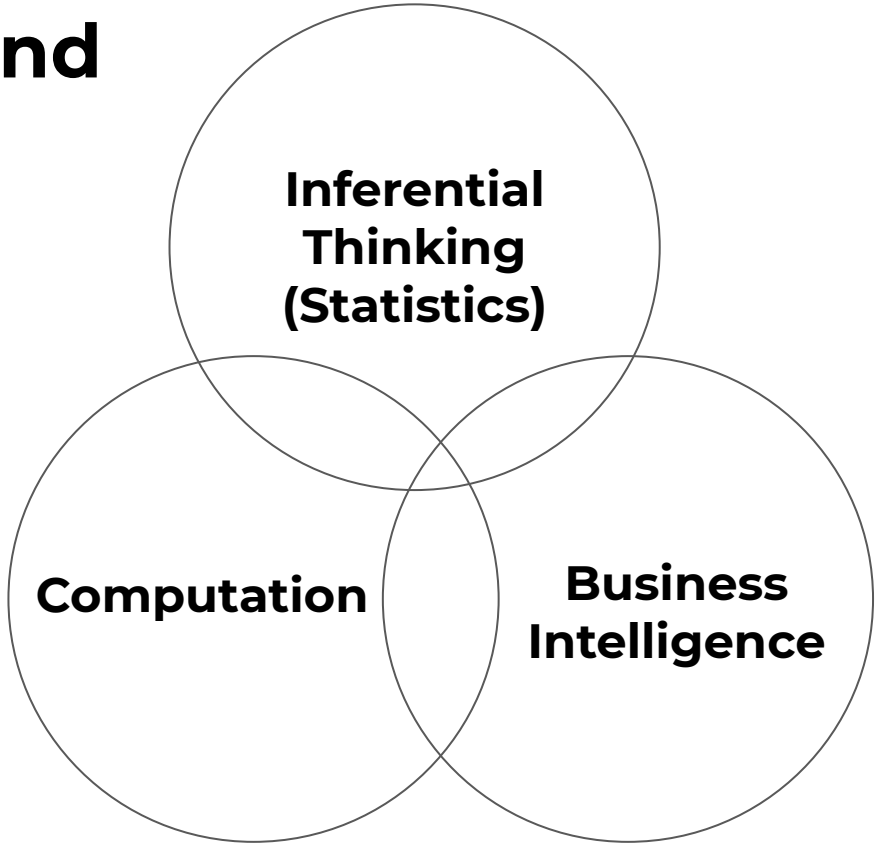
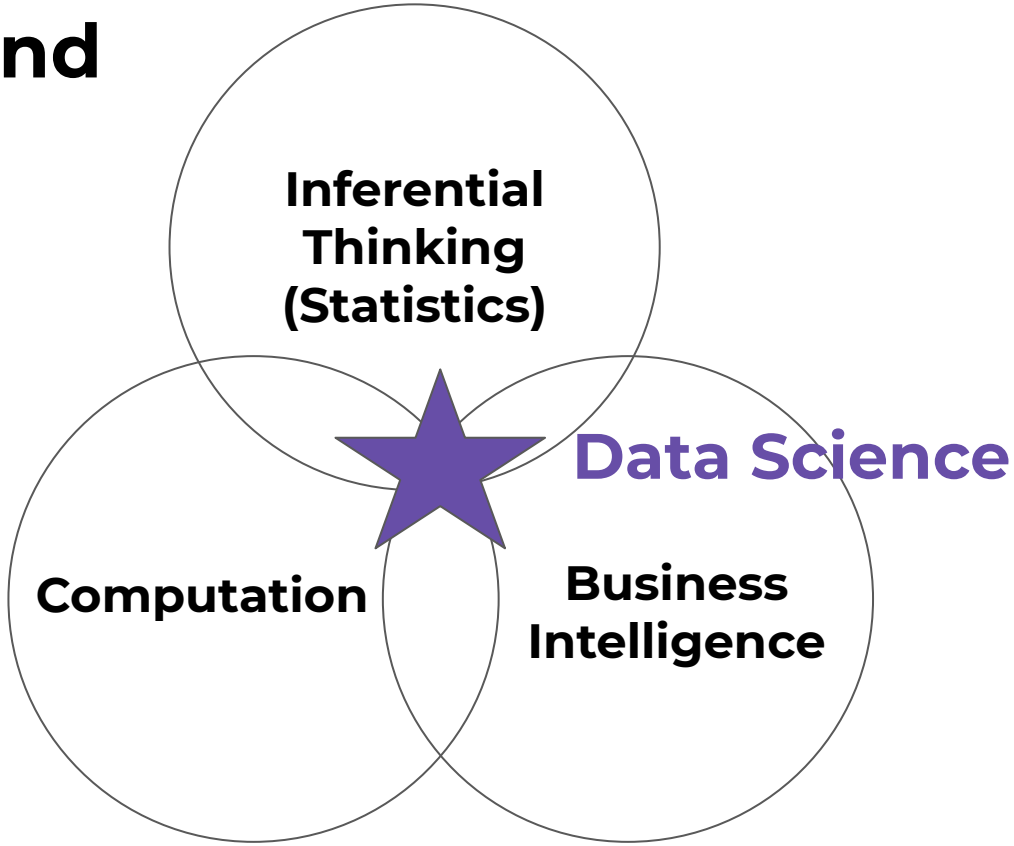

Inferential Thinking (Statistics)
Computation
Business Intelligence

Background


Inferential Thinking (Statistics)
Data Science
Computation
Business Intelligence

Data Science Overview

Data Science is Amazing

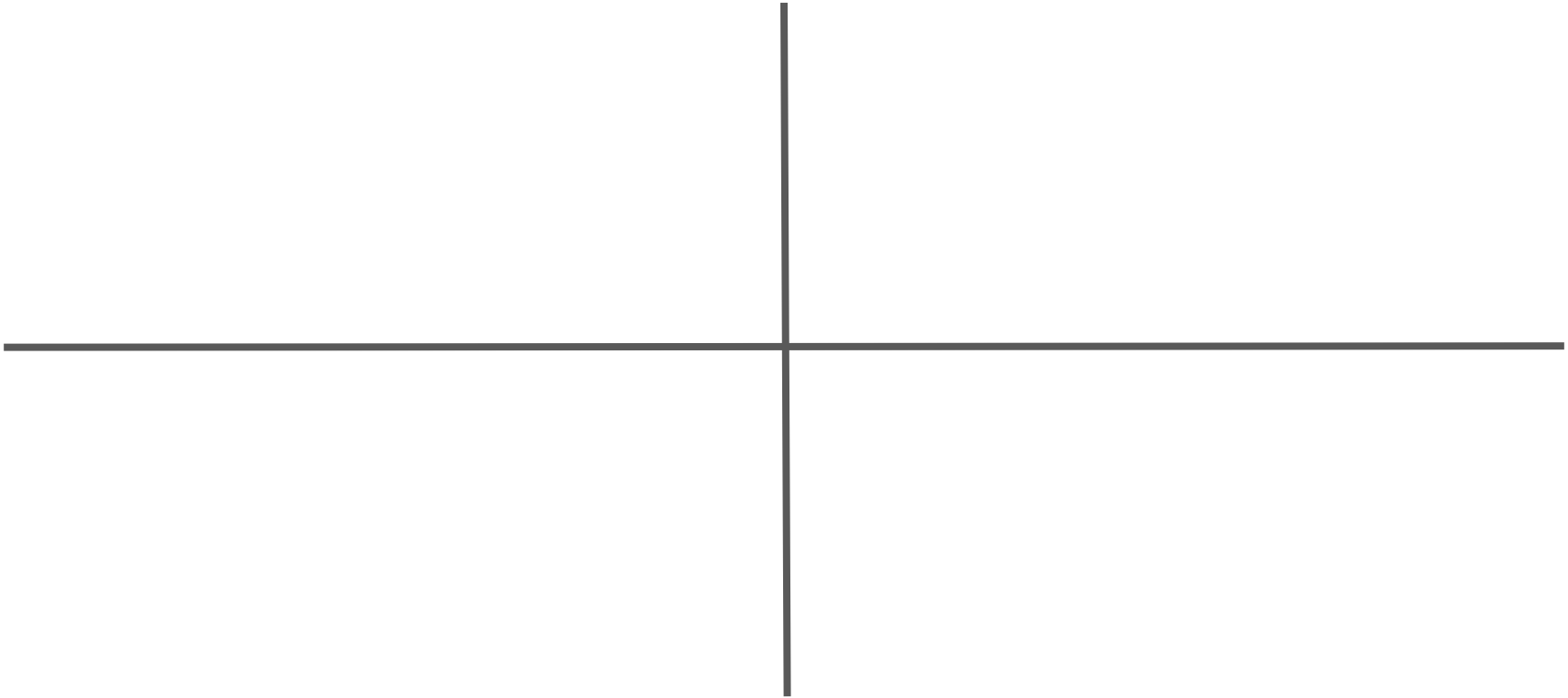
$$\sum_{i=1}^{n}\sum_{j=1}^{m} x_i + y_j$$

$$\iiint_R f(x,y,z)\, dV$$

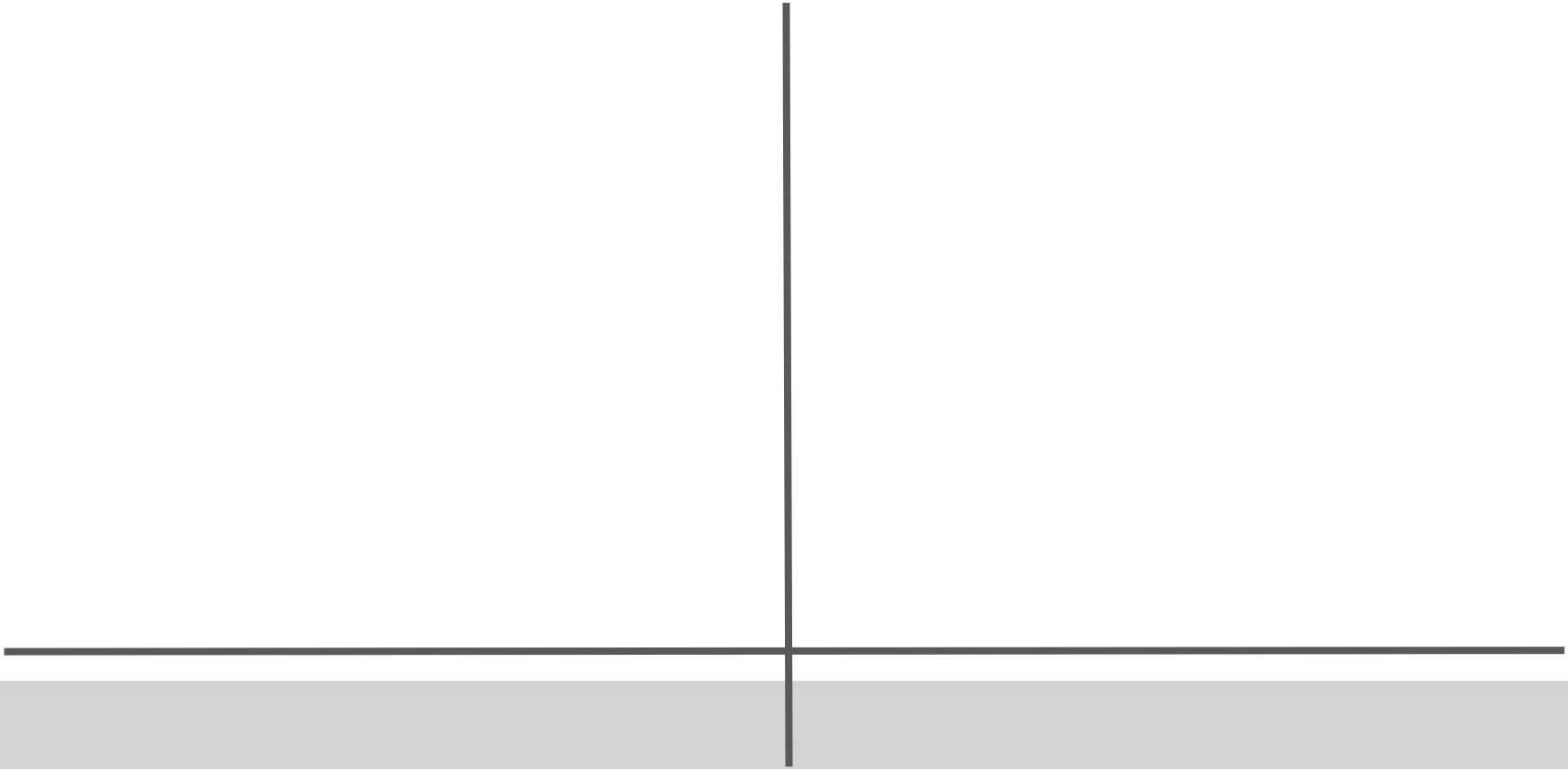
Data Science is ~~amazing~~

only as amazing as the story it tells!

Data Visualization Quadrant



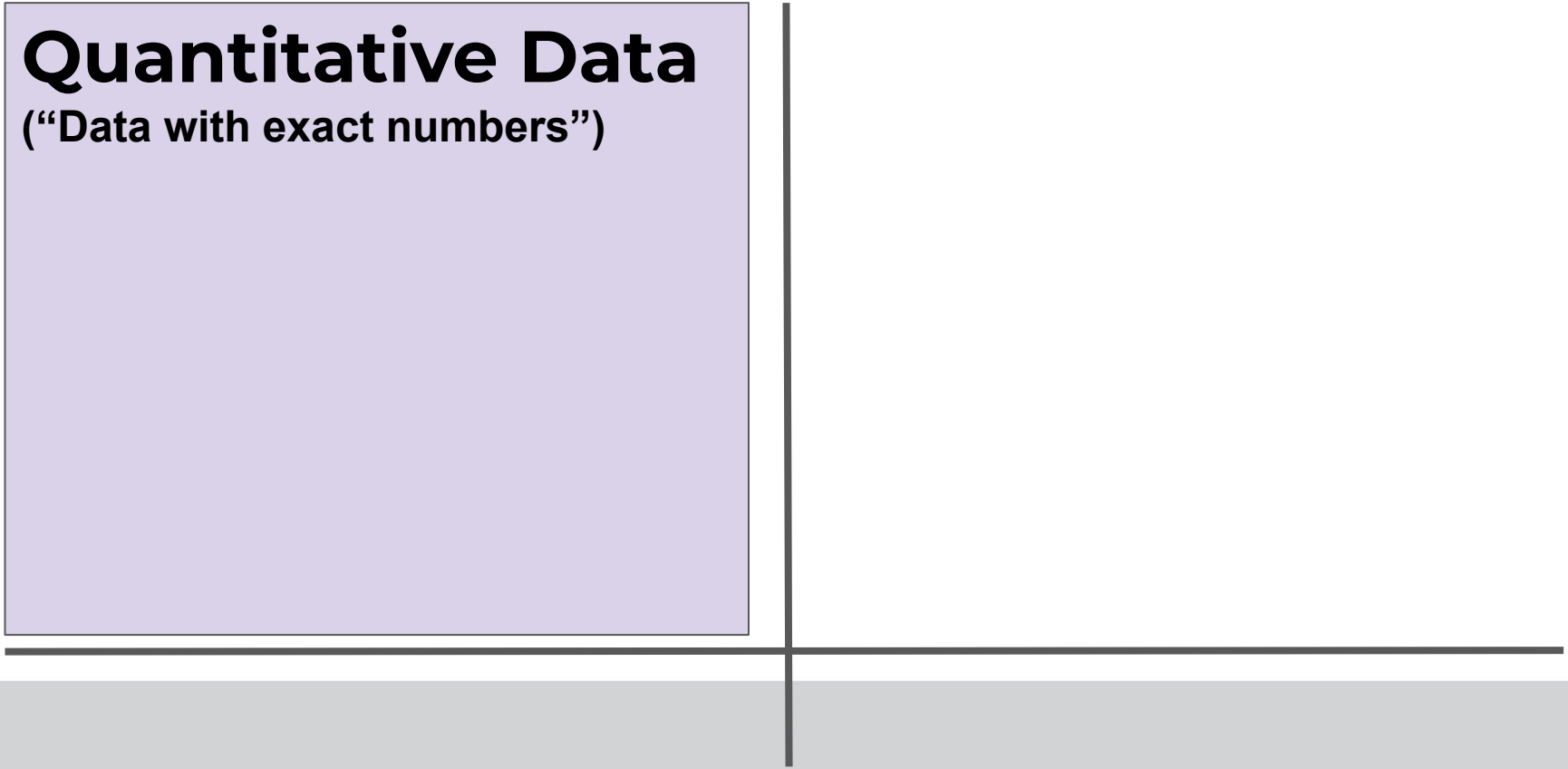
Two Categories of Data



Two Categories of Data

Quantitative Data

(“Data with exact numbers”)



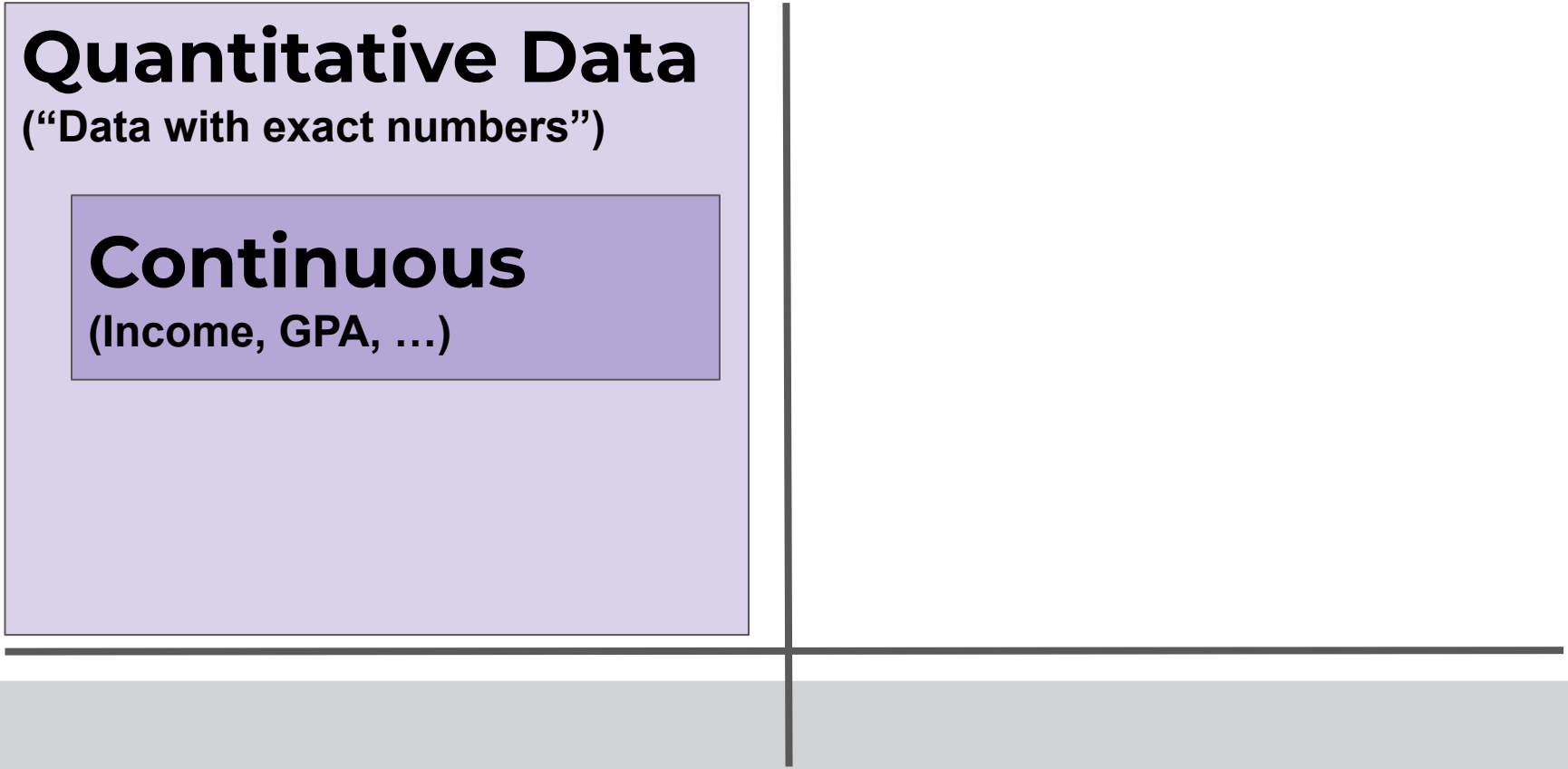
Two Categories of Data

Quantitative Data

("Data with exact numbers")

Continuous

(Income, GPA, …)



Two Categories of Data

Quantitative Data

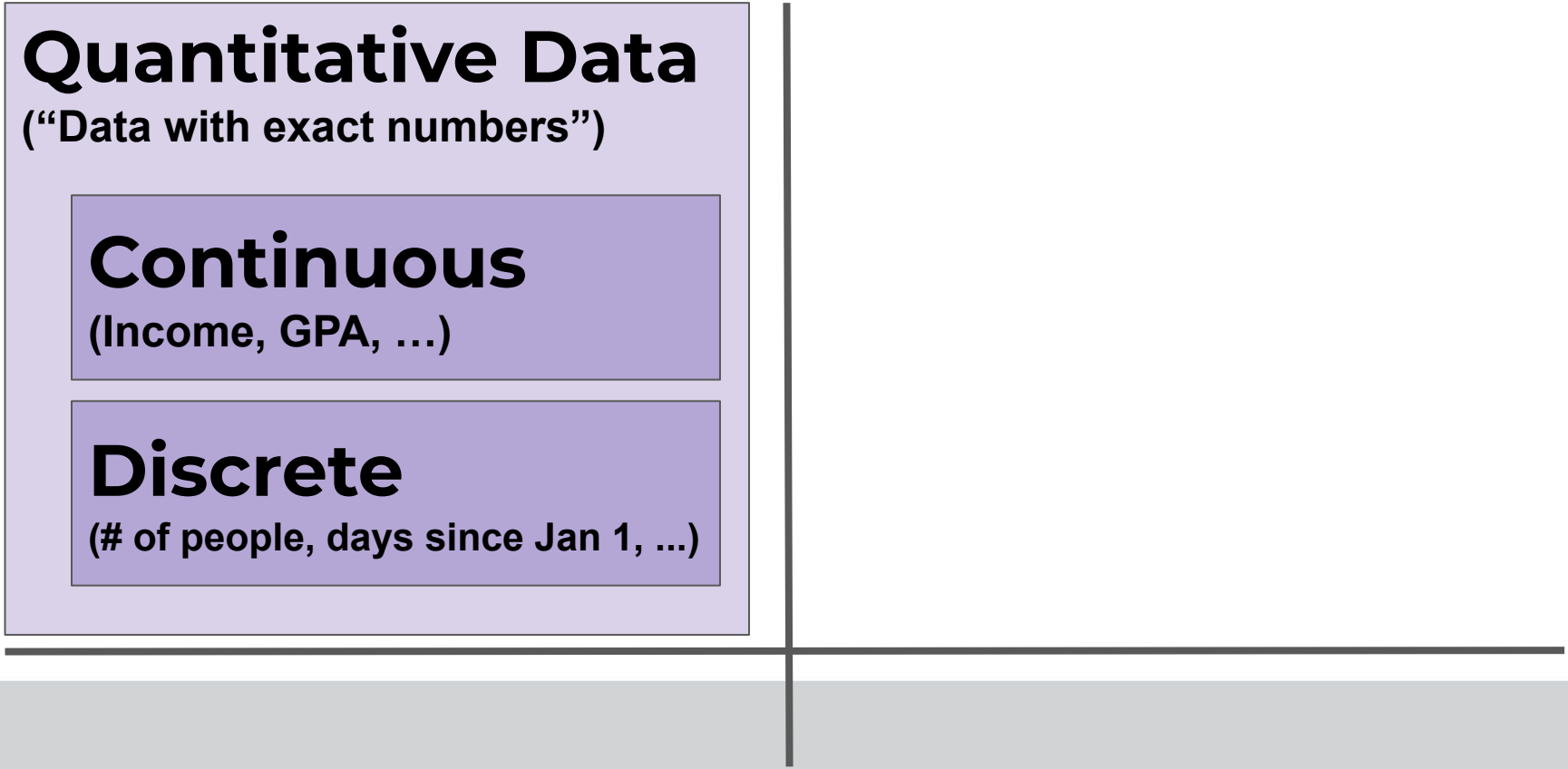
("Data with exact numbers")

Continuous

(Income, GPA, …)

Discrete

(# of people, days since Jan 1, ...)



Two Categories of Data

Quantitative Data

("Data with exact numbers")

Continuous

(Income, GPA, …)

Discrete

(# of people, days since Jan 1, ...)

Categorical Data

("Data which can be bucketed")

Two Categories of Data

Quantitative Data

("Data with exact numbers")

Continuous

(Income, GPA, …)

Discrete

(# of people, days since Jan 1, ...)

Categorical Data

("Data which can be bucketed")

Nominal

(gender, state of birth, ...)

Two Categories of Data

Quantitative Data

("Data with exact numbers")

Continuous

(Income, GPA, …)

Discrete

(# of people, days since Jan 1, ...)

Categorical Data

("Data which can be bucketed")

Nominal

(gender, state of birth, ...)

Ordered

(age range, difficulty, ...)

Two Encodings of Data

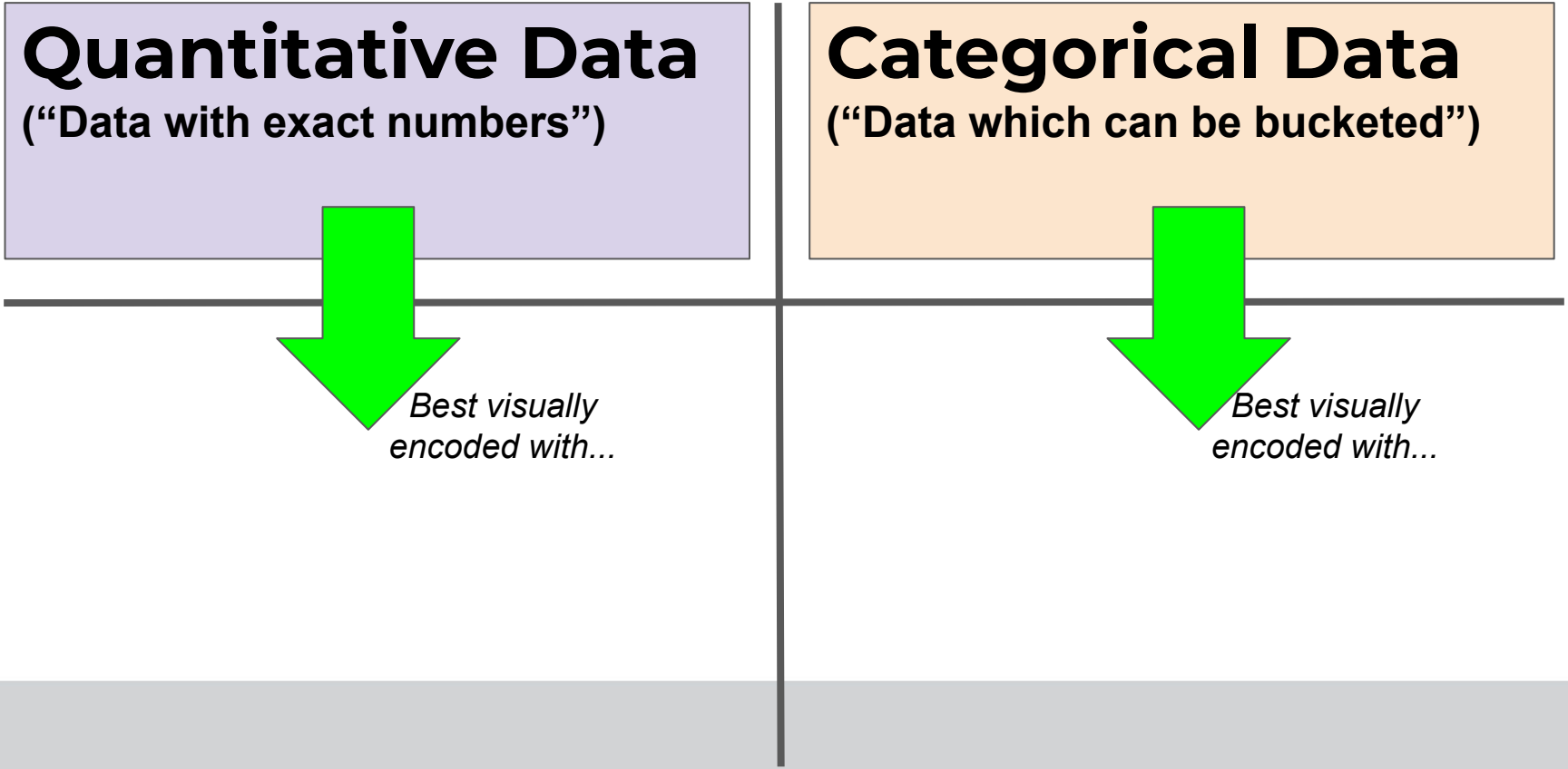
Quantitative Data

(“Data with exact numbers”)

Categorical Data

(“Data which can be bucketed”)

Two Encodings of Data



Two Encodings of Data

Quantitative Data

("Data with exact numbers")

Categorical Data

("Data which can be bucketed")

Planar Encoding

("x,y position of data")

- Great for quantitative data
- Good for high-feature count

Two Encodings of Data

Quantitative Data

("Data with exact numbers")

Categorical Data

("Data which can be bucketed")

Planar Encoding

("x,y position of data")

- Great for quantitative data
- Good for high-feature count

Retinal Encoding

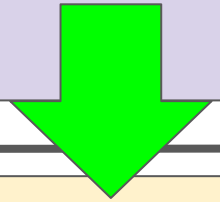
(Visual impact of data)

- Great for categorical data
- Six majors retinal encodings

Two Encodings of Data

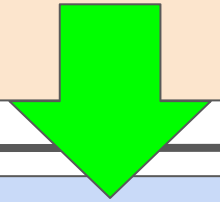
Quantitative Data

("Data with exact numbers")



Categorical Data

("Data which can be bucketed")



Planar Encoding

("x,y position of data")

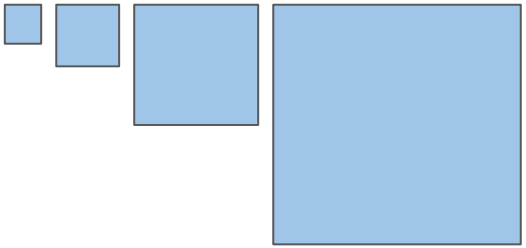
- Great for quantitative data
- Good for high-feature count

Retinal Encoding

(Visual impact of data)

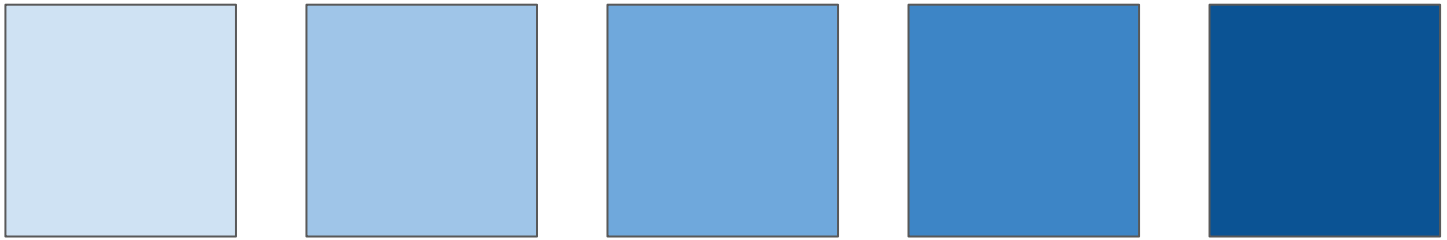
- Great for categorical data
- Six majors retinal encodings

Size



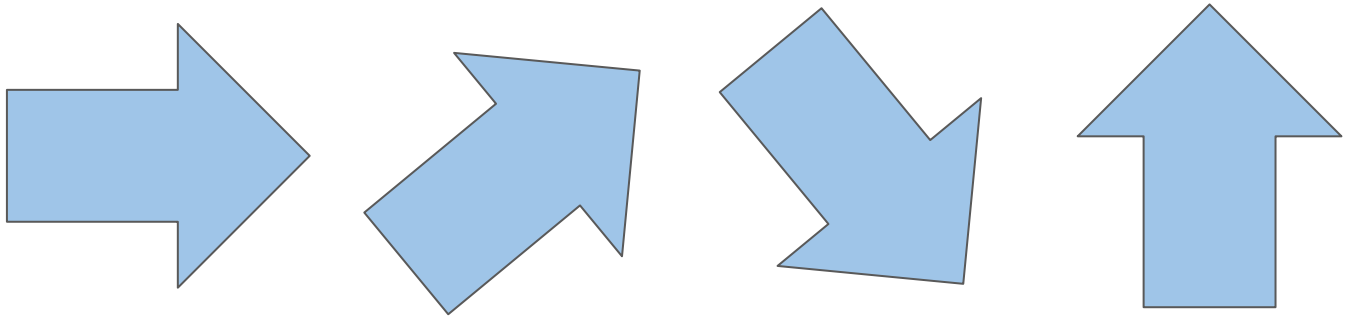
Size is a type visual, retinal encoding

Color Saturation



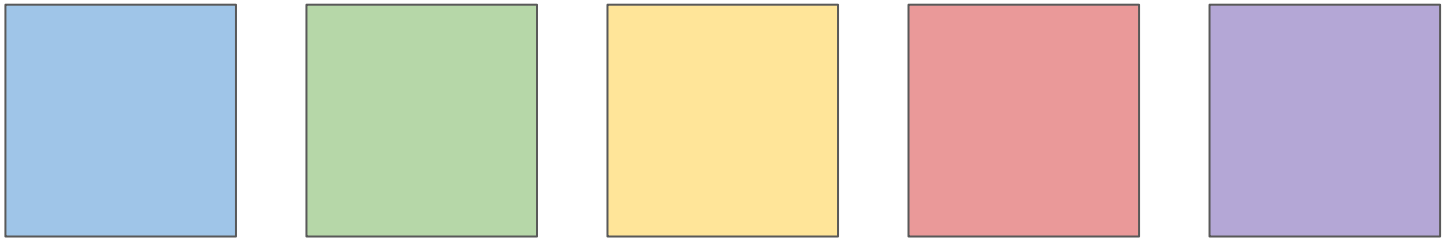
Color saturation is a type visual, retinal encoding

Orientation



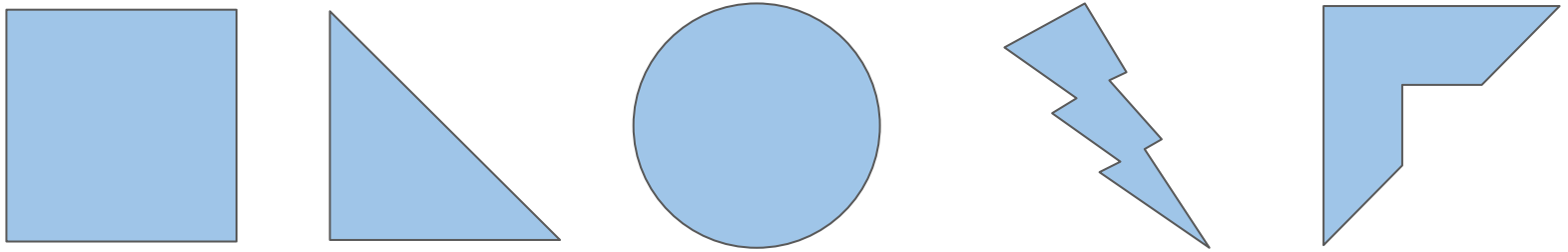
Orientation is a type visual, retinal encoding

Color Hue



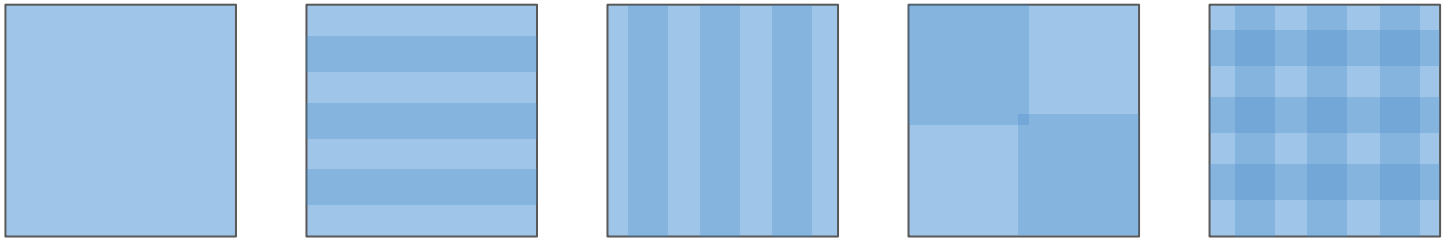
Color hue is a type visual, retinal encoding

Shape



Shape is a type visual, retinal encoding

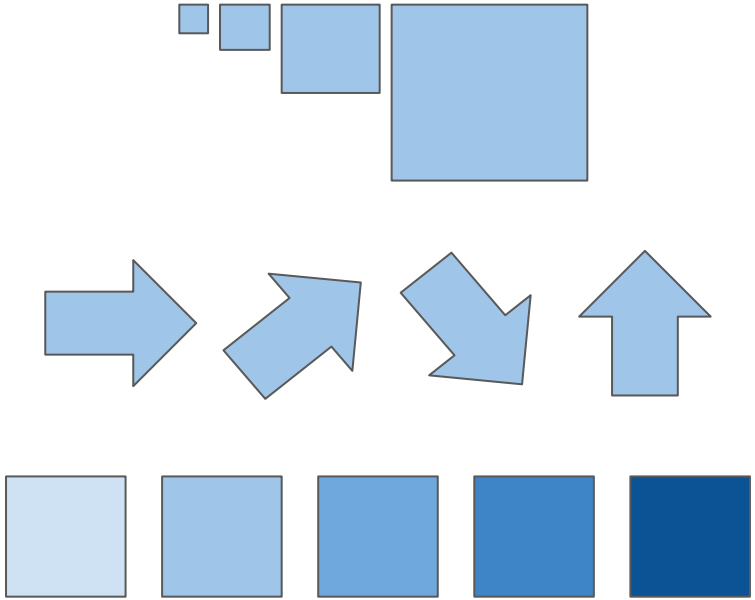
Texture



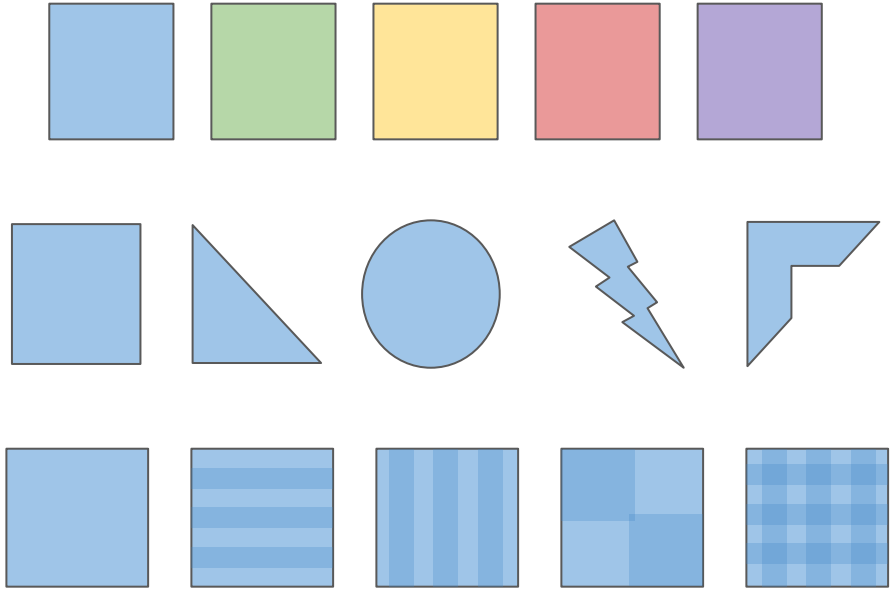
Texture is a type visual, retinal encoding

Retinal Encoding

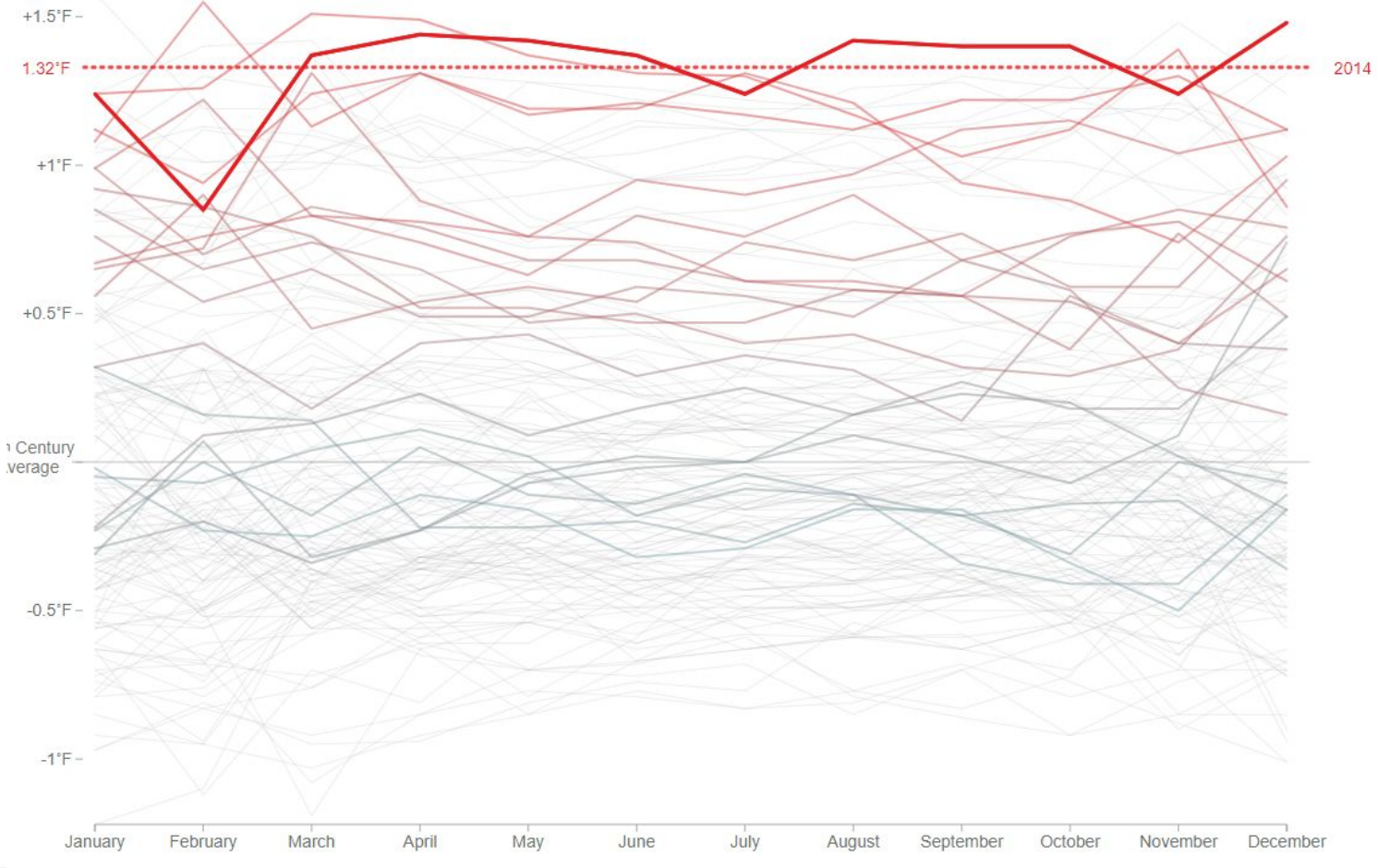
Works well for **Ordered Data**



Works well for **Nominal Data**



One Second Challenge:



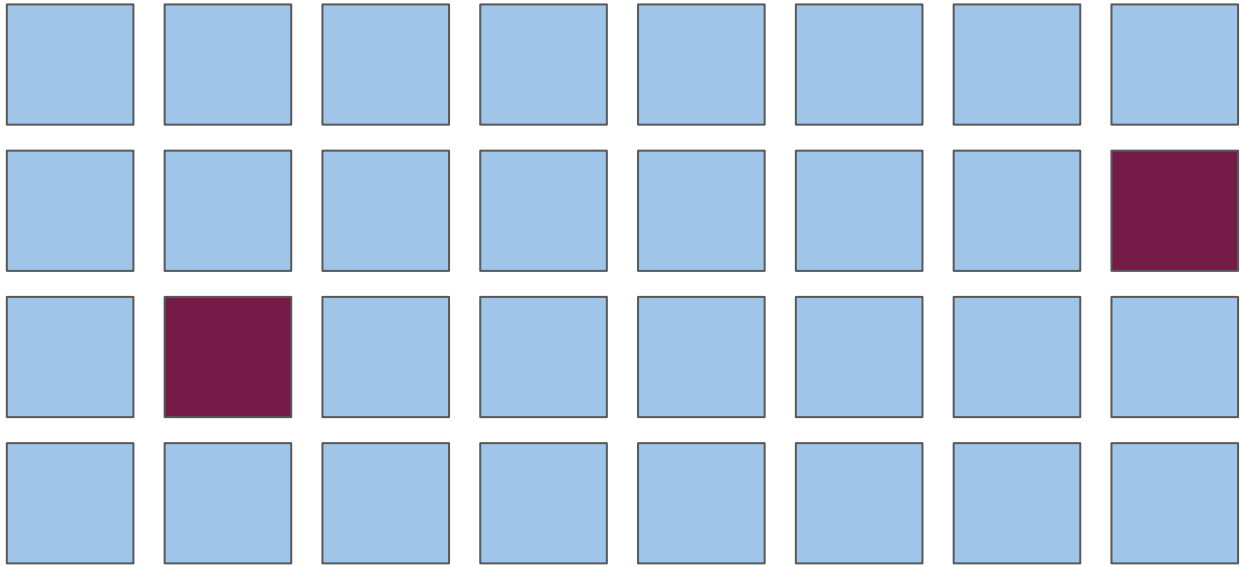
Bloomberg News (Jan. 2015)
http://www.bloomberg.com/graphics/2014-hottest-year-on-record/

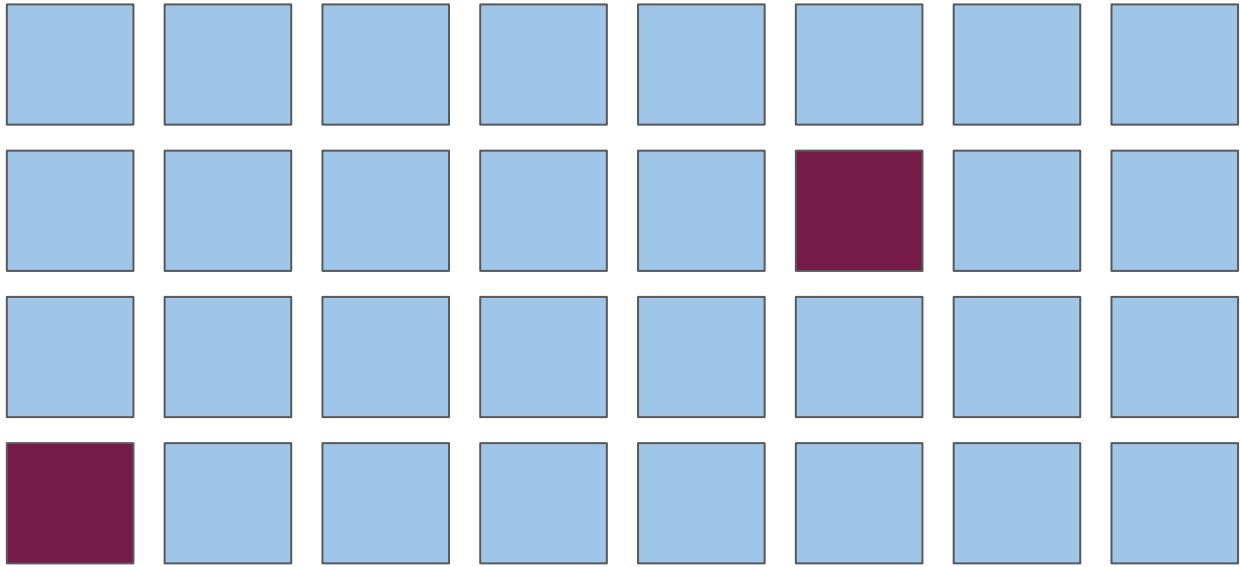
Pre-attentive Processing

What was seen in the first 250ms of viewing the visualization?

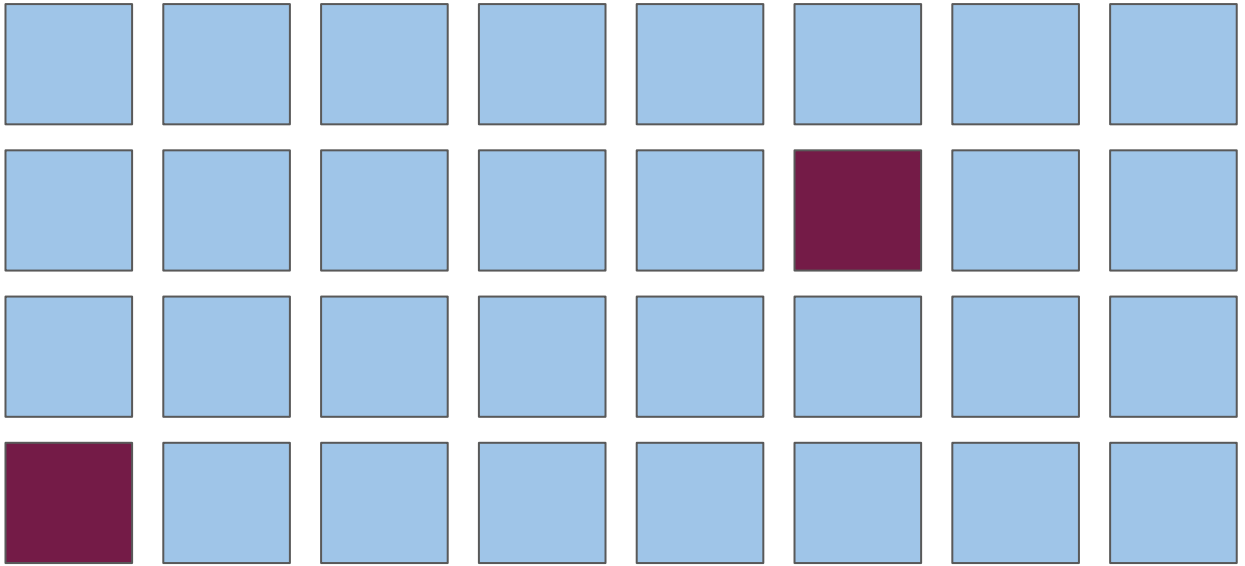
Make sure the full orange border is visible!

Pre-attentive Processing #1



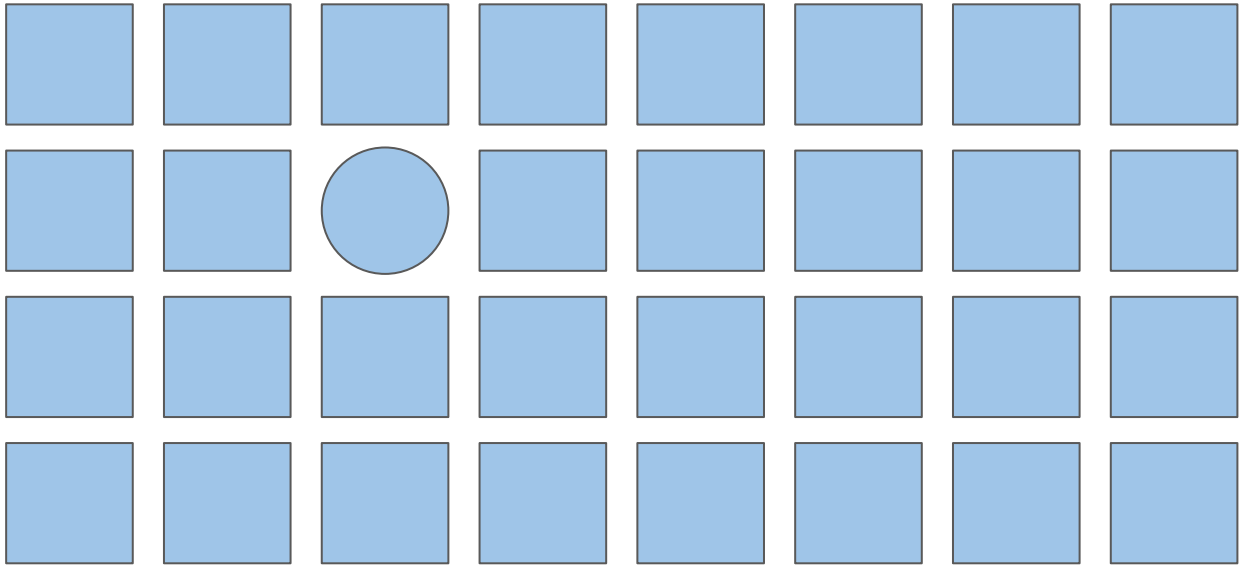


Color

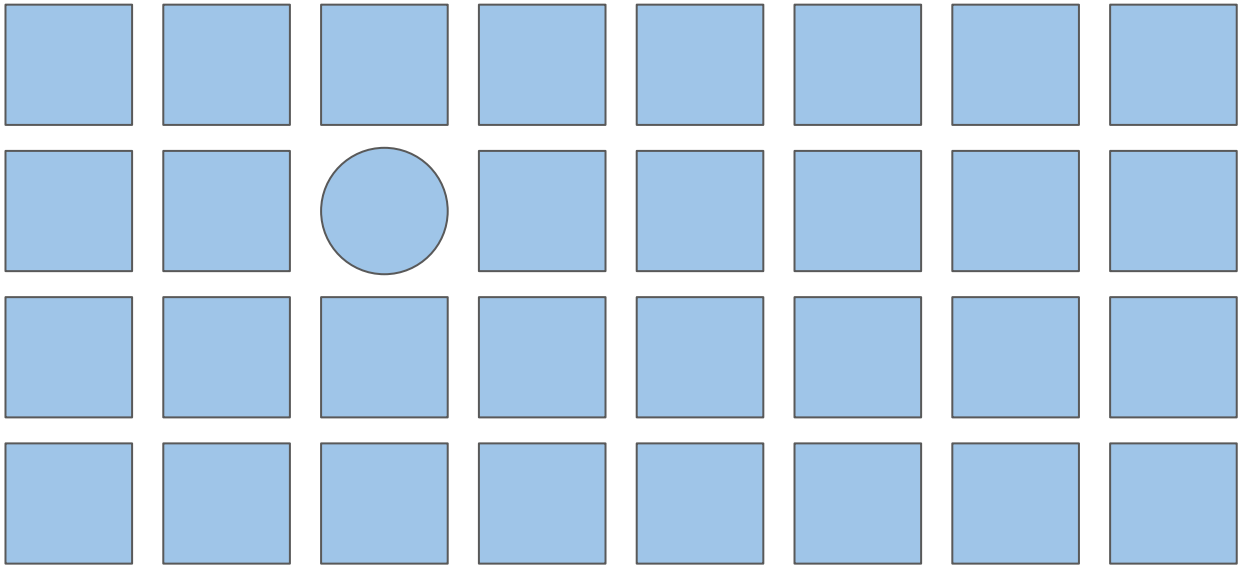


Color can be used as a pre-attentive feature in visualization

Pre-attentive Processing #2

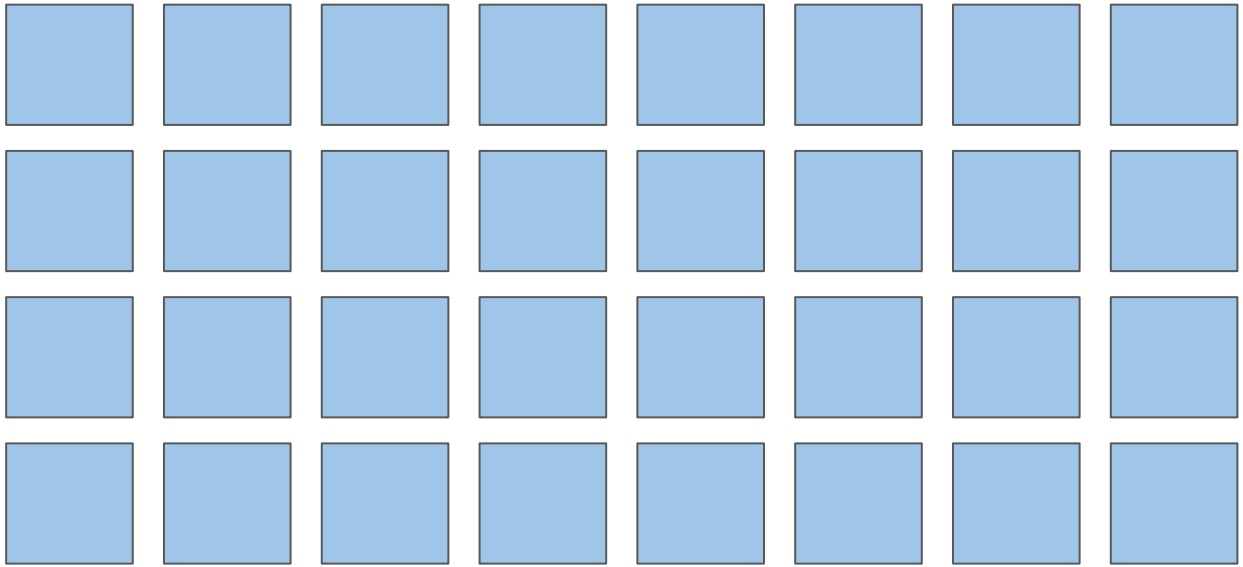


Form

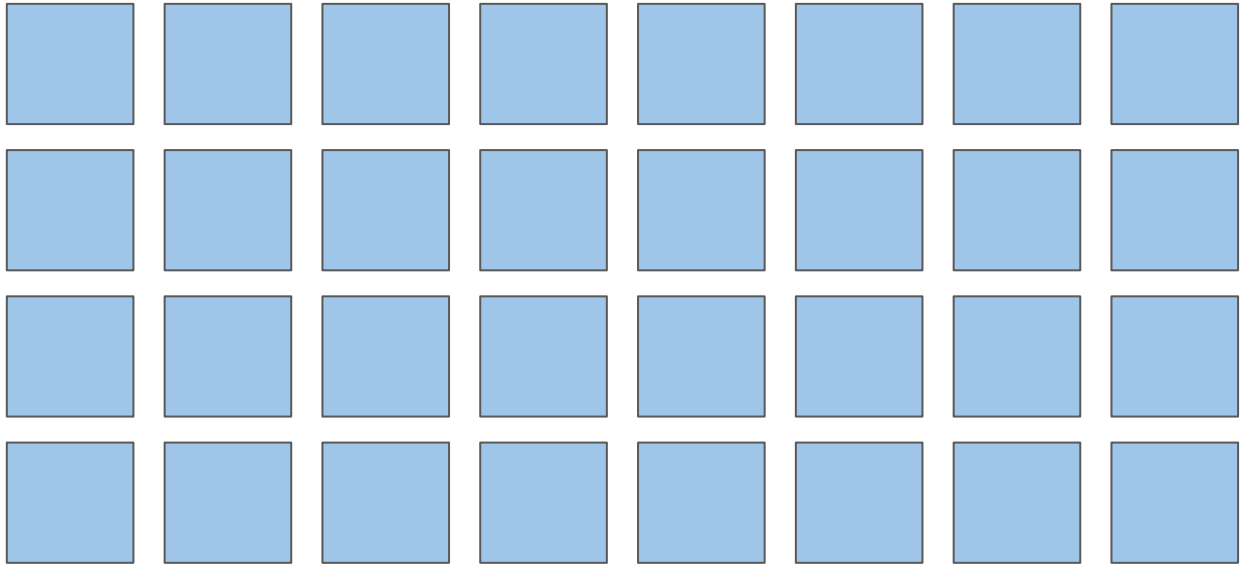


Form can be used as a pre-attentive feature in visualization

Pre-attentive Processing #3

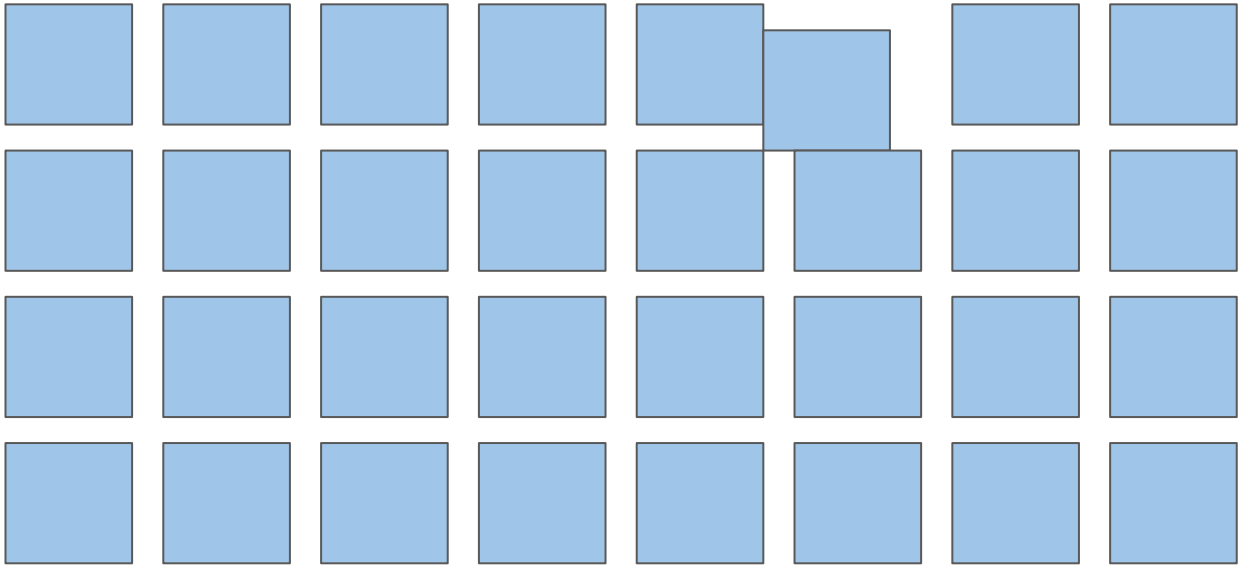


Movement

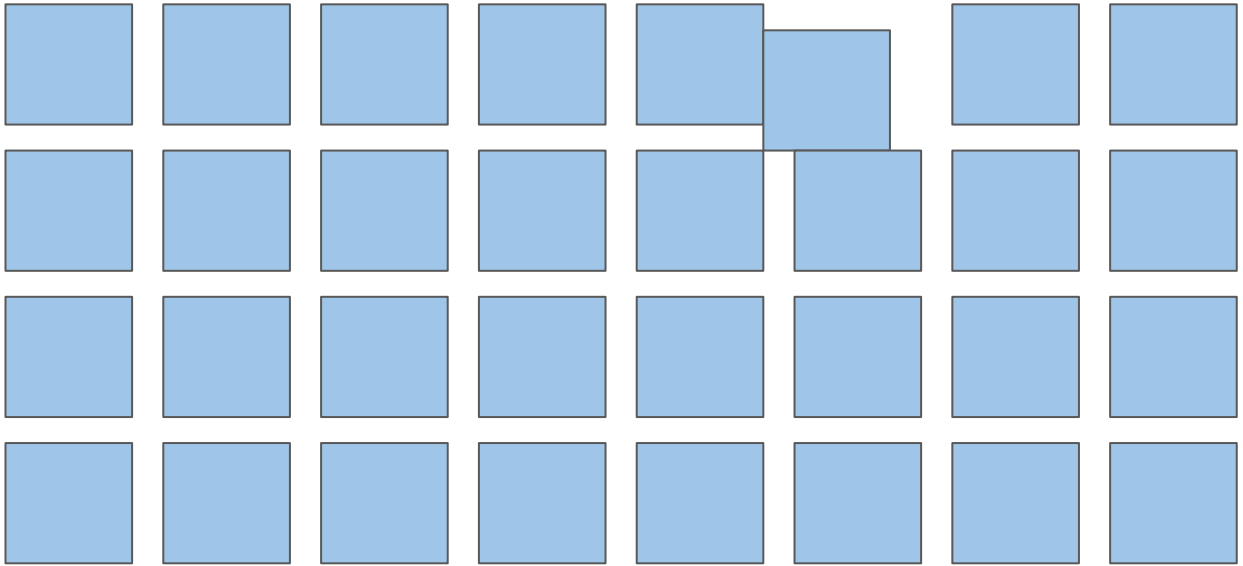


Movement can be used as a pre-attentive feature in visualization

Pre-attentive Processing #4

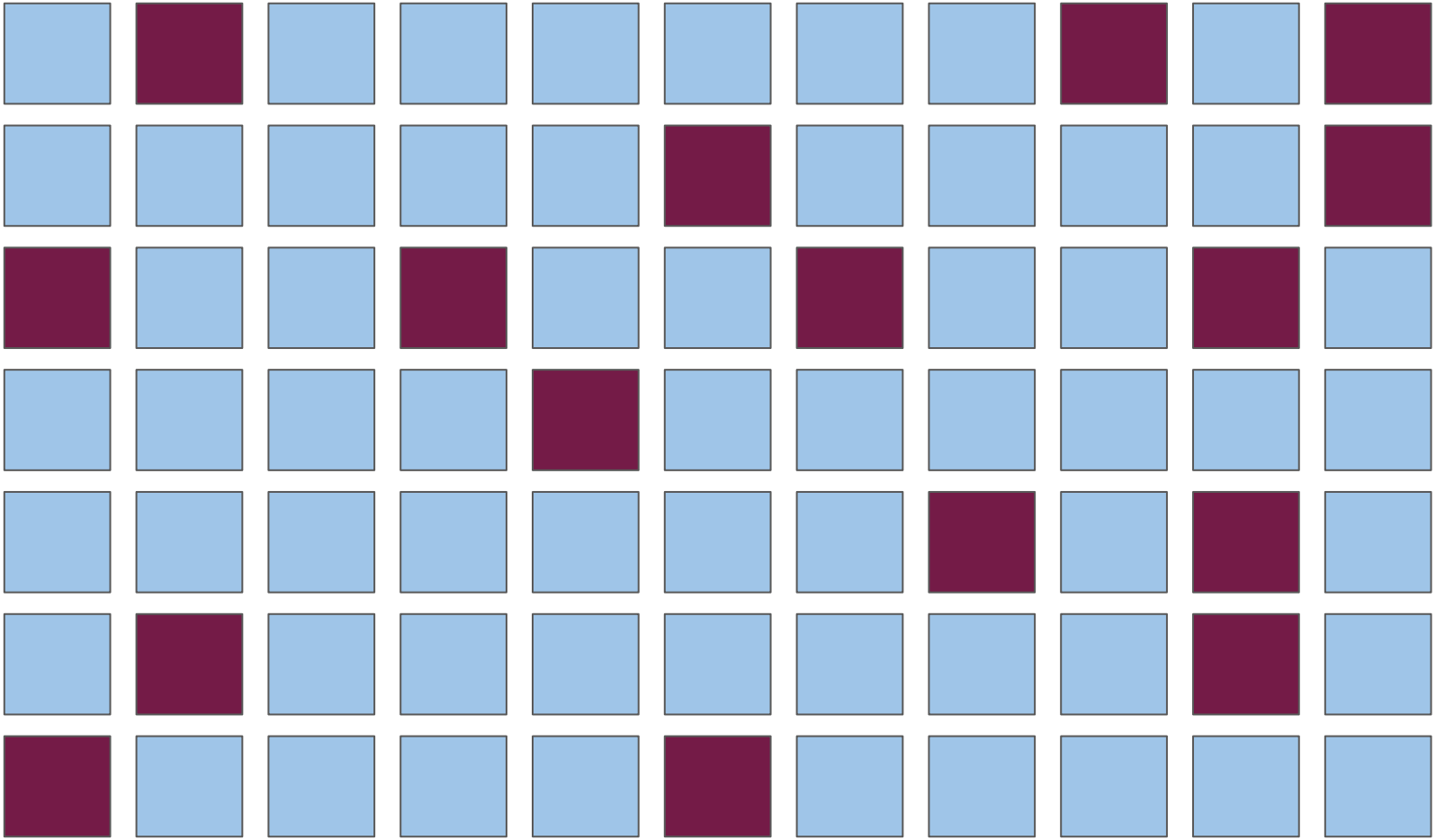


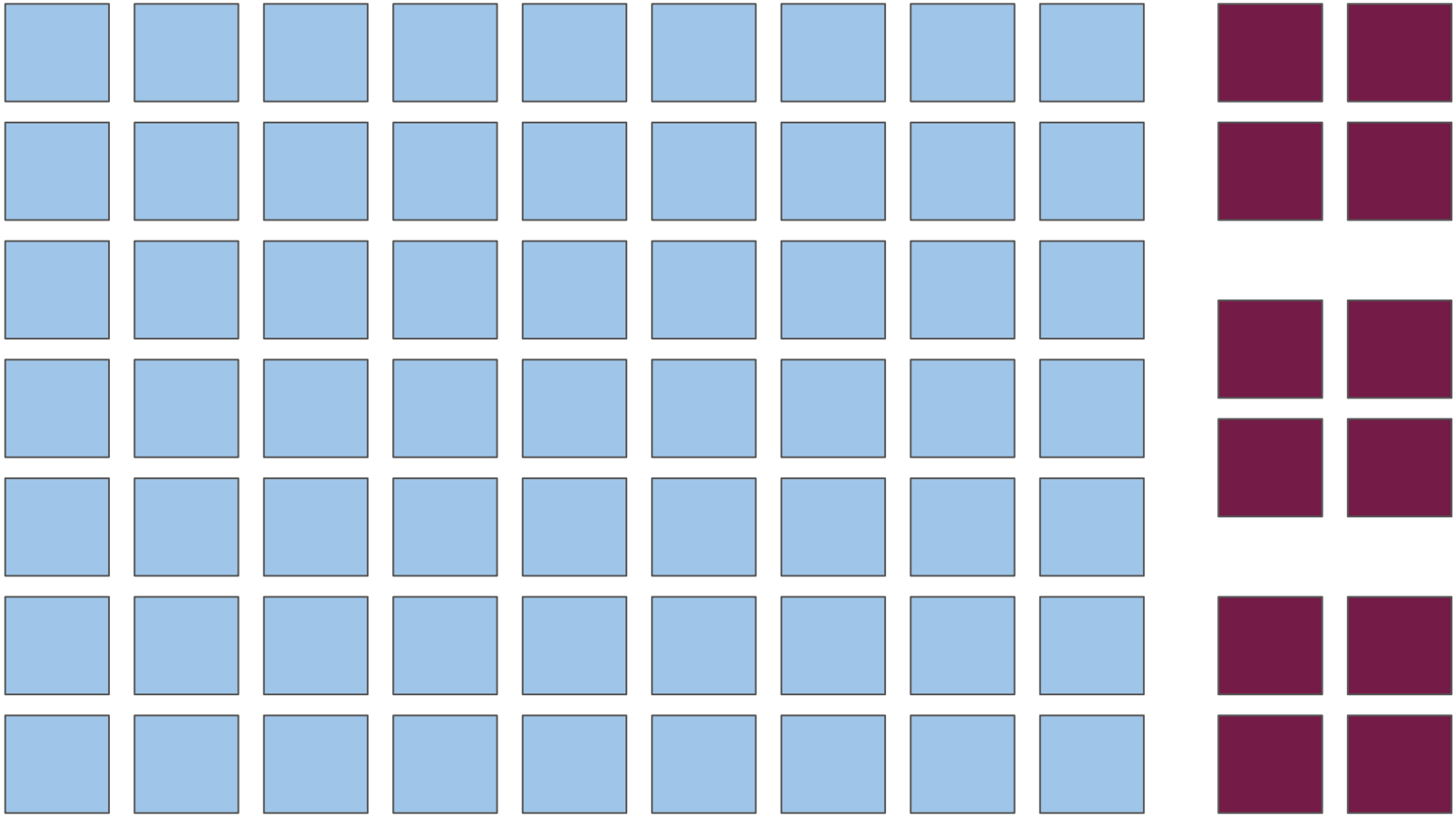
Spatial Position



Spatial positioning can be used as a pre-attentive feature in visualization

Putting It Together





An Illinois Dataset

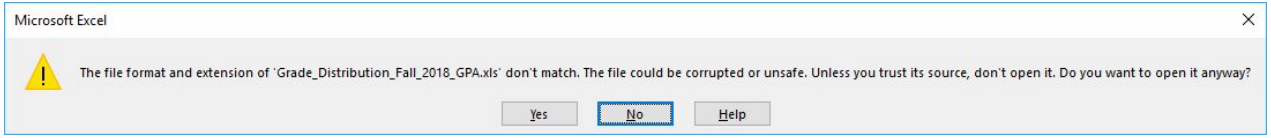
GPAs of Every Course at The University of Illinois

Since **at least** 2012, The University of Illinois publicly released statistical distributions of course grades.

GPAs of Every Course at The University of Illinois

Since **at least** 2012, The University of Illinois publicly released statistical distributions of course grades.

...but it was ugly:



...and Excel freezes for seconds every time you **try** to scroll.

GPAs of Every Course at The University of Illinois

Sad Color ⇔ Happy Color

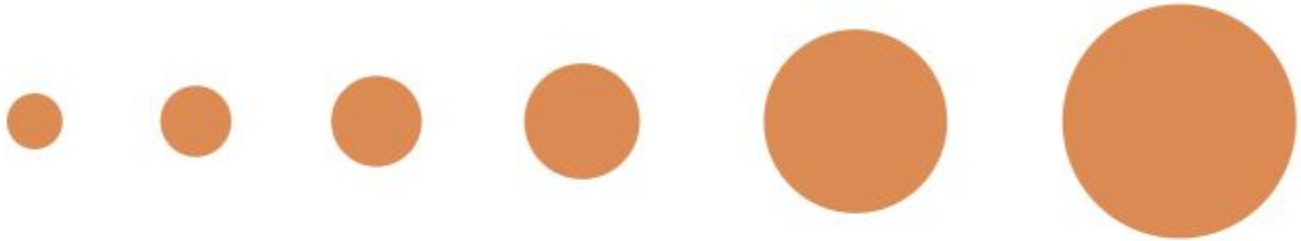
GPAs of Every Course at The University of Illinois

Sad Color ⇔ **Happy Color**

2.0 2.4 2.8 3.2 3.6 4.0

The worse the GPA, the more purple hue we add to the color.

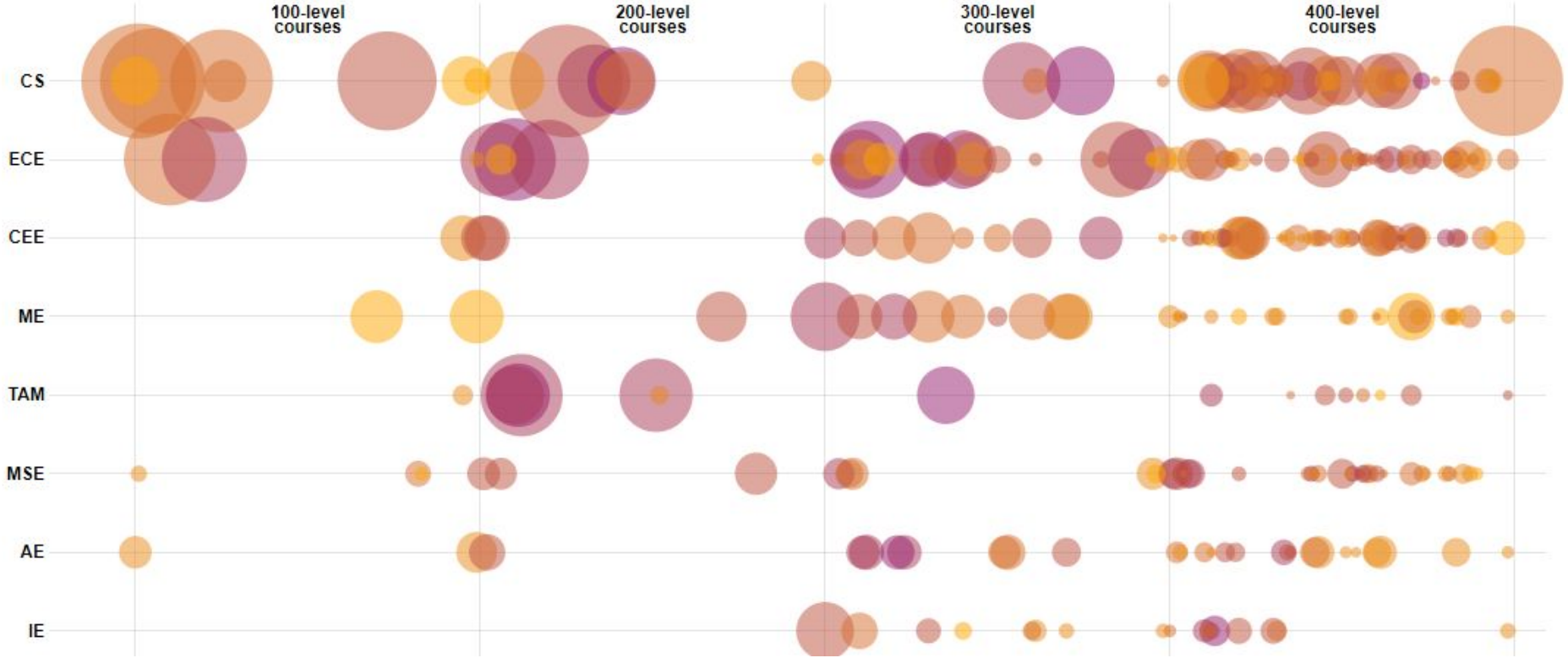
GPAs of Every Course at The University of Illinois



The larger the course, the larger the radius of the circle.

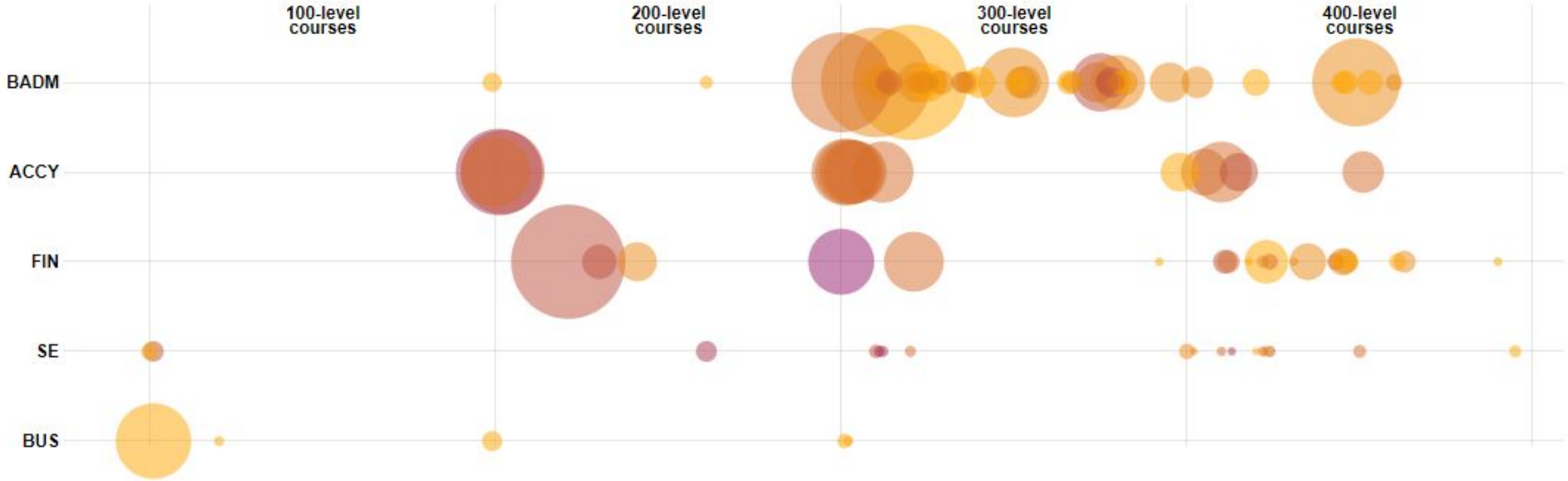
College of Liberal Arts and Sciences

College of Engineering



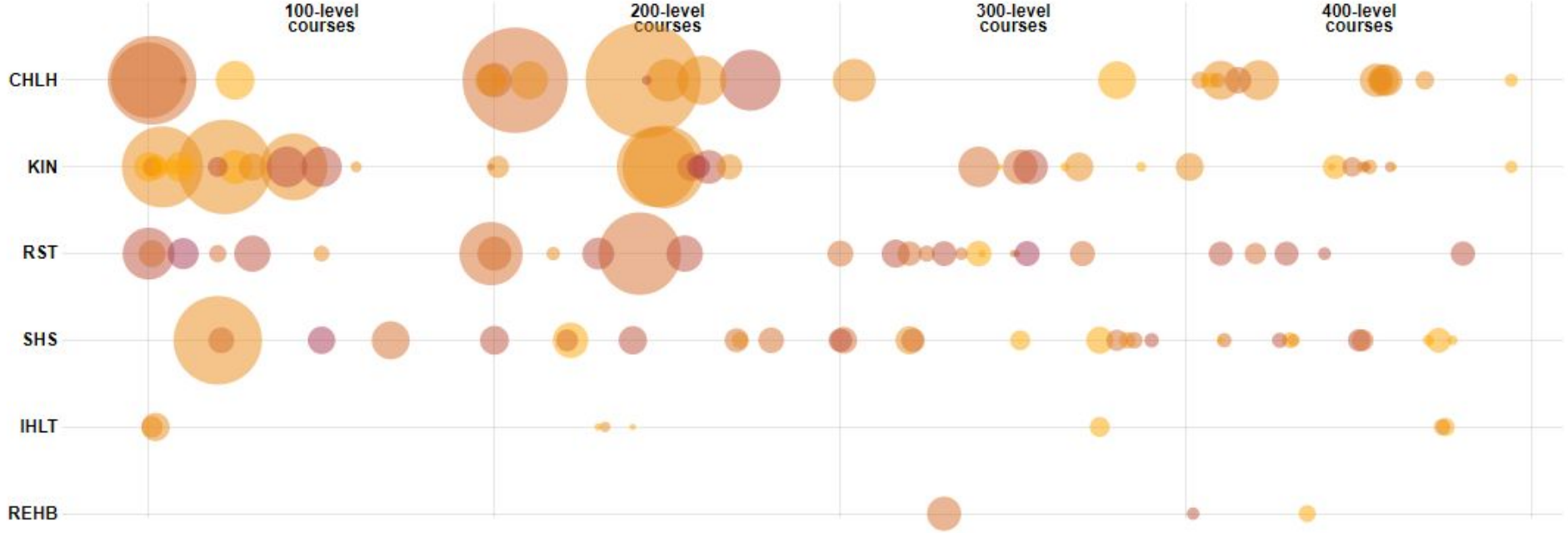
College of Business

College of Business

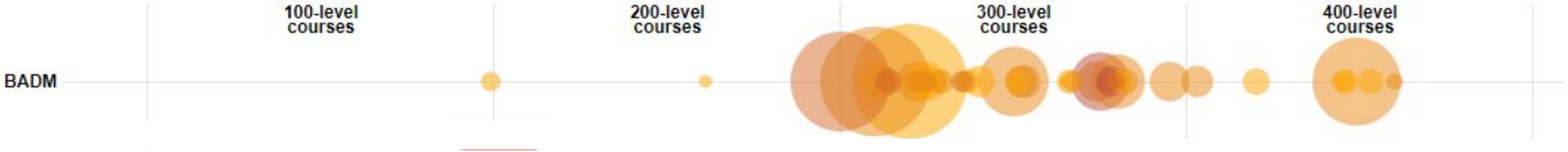


College of Business

Applied Health Sciences



College of Liberal Arts and Sciences



Data:

Data Type:

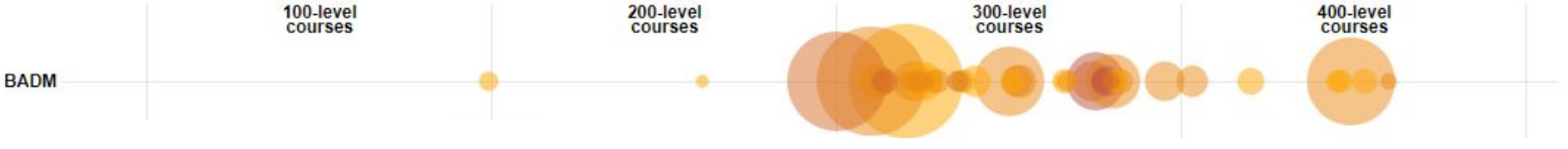
Visual Encoding:

Data:

Course Number
Subject
Course Size
Average GPA

Data Type:

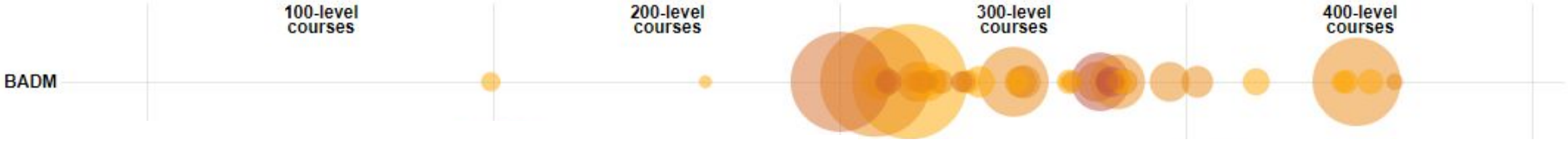
Visual Encoding:



Data:
Course Number
Subject
Course Size
Average GPA

Data Type:
Quant (Discrete)

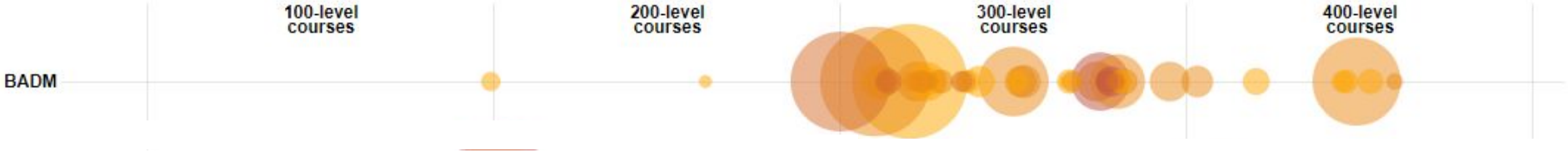
Visual Encoding:



Data:
Course Number
Subject
Course Size
Average GPA

Data Type:
Quant (Discrete)
Categorical (Nominal)

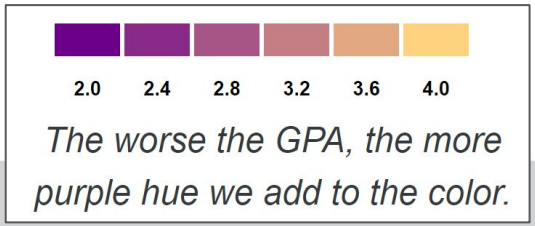
Visual Encoding:

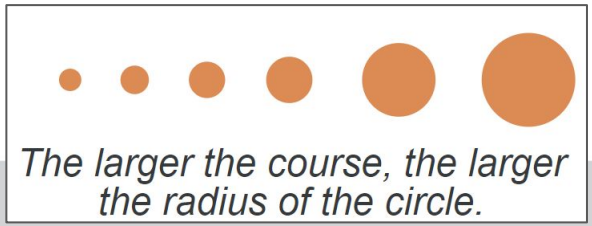


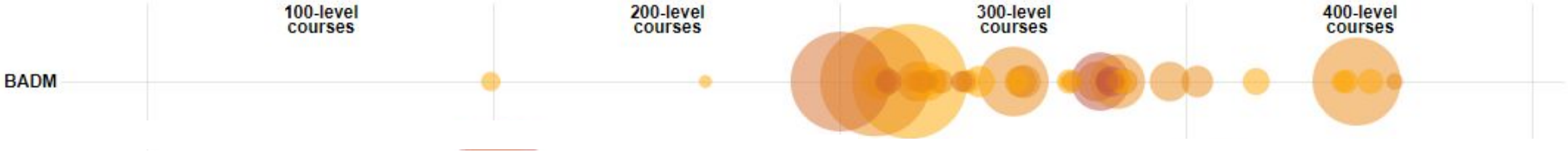
Data:
Course Number
Subject
Course Size
Average GPA

Data Type:
Quant (Discrete)
Categorical (Nominal)

Visual Encoding:



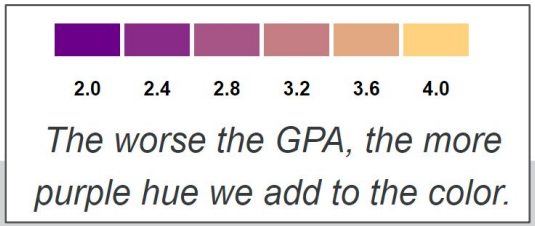


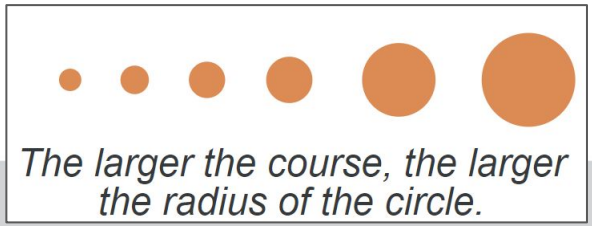


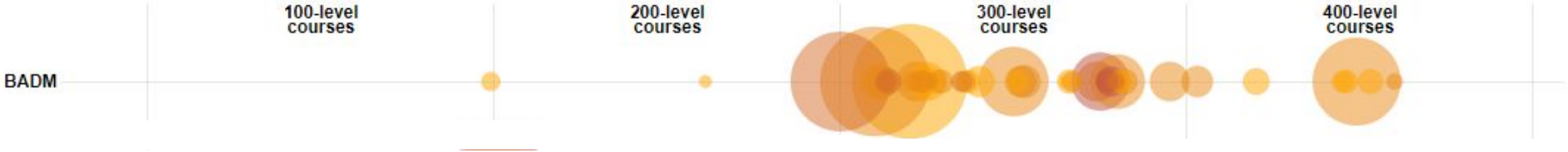
Data:
Course Number
Subject
Course Size
Average GPA

Data Type:
Quant (Discrete)
Categorical (Nominal)
Categorical (Ordered)

Visual Encoding:

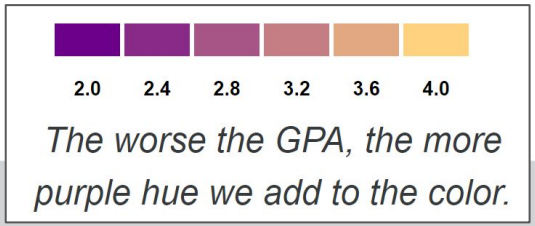


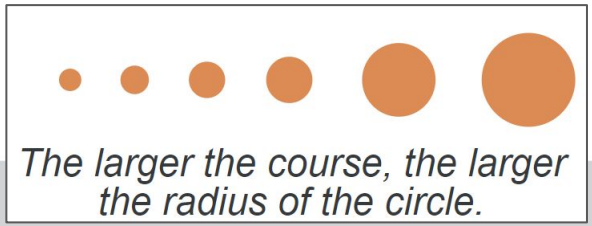




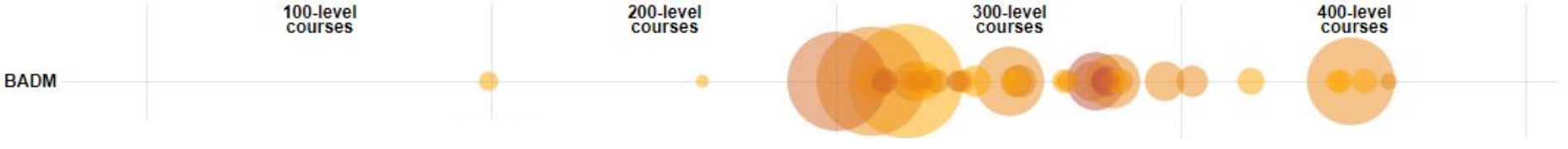
Data:	**Data Type:**
Course Number	Quant (Discrete)
Subject	Categorical (Nominal)
Course Size	Categorical (Ordered)
Average GPA	Categorical (Ordered)

Visual Encoding:





Data:	**Data Type:**	**Visual Encoding:**
Course Number	Quant (Discrete)	Spacial (x-axis)
Subject	Categorical (Nominal)	
Course Size	Categorical (Ordered)	
Average GPA	Categorical (Ordered)	



Data:	**Data Type:**	**Visual Encoding:**
Course Number	Quant (Discrete)	Spacial (x-axis)
Subject	Categorical (Nominal)	Spacial (y-axis)
Course Size	Categorical (Ordered)	
Average GPA	Categorical (Ordered)	

Data:	**Data Type:**	**Visual Encoding:**
Course Number	Quant (Discrete)	Spacial (x-axis)
Subject	Categorical (Nominal)	Spacial (y-axis)
Course Size	Categorical (Ordered)	Retinal (size)
Average GPA	Categorical (Ordered)	

Data:	**Data Type:**	**Visual Encoding:**
Course Number	Quant (Discrete)	Spacial (x-axis)
Subject	Categorical (Nominal)	Spacial (y-axis)
Course Size	Categorical (Ordered)	Retinal (size)
Average GPA	Categorical (Ordered)	Retinal (color)

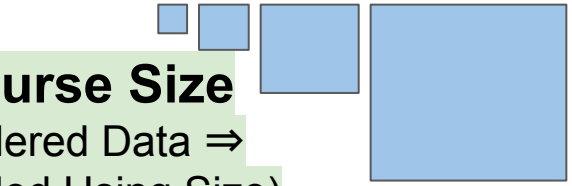
Data:	**Data Type:**	**Visual Encoding:**
Course Number	Quant (Discrete)	Spacial (x-axis)
Subject	Categorical (Nominal)	Spacial (y-axis)
Course Size	Categorical (Ordered)	Retinal (size)
Average GPA	Categorical (Ordered)	Retinal (color)

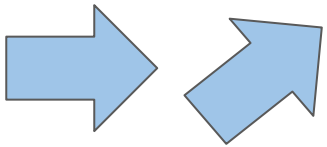
Retinal Encoding

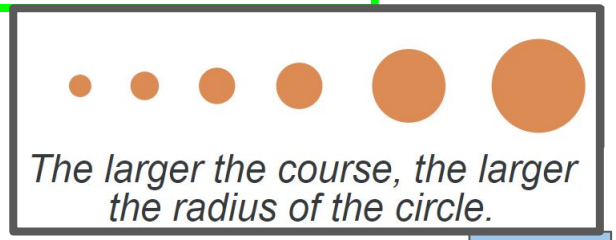
Works well for **Ordered Data**

Works well for **Nominal Data**

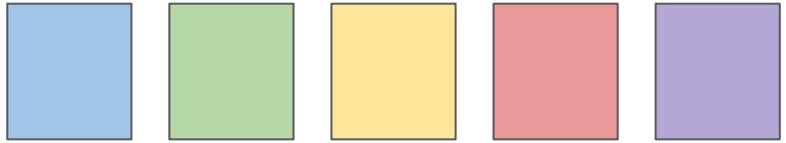
Course Size
(Ordered Data ⇒
Encoded Using Size)

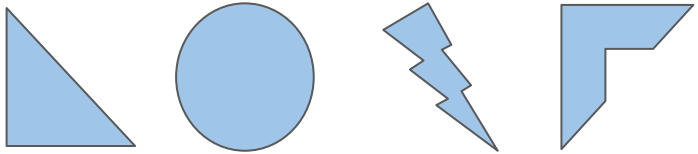


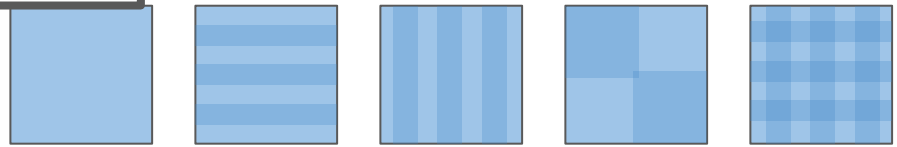




The larger the course, the larger the radius of the circle.



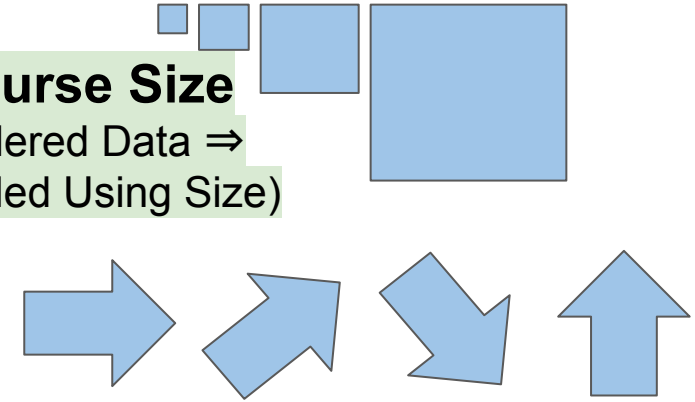




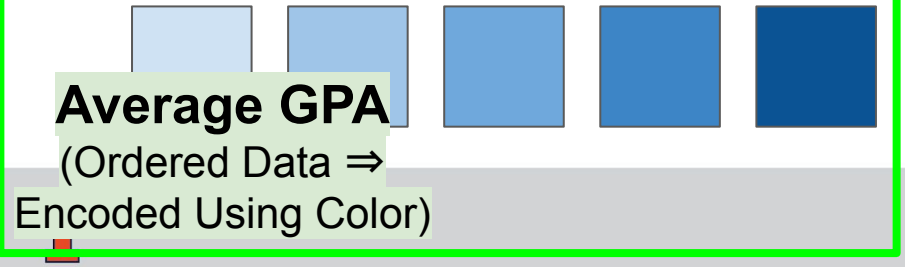
Retinal Encoding

Works well for **Ordered Data**

Course Size
(Ordered Data ⇒
Encoded Using Size)

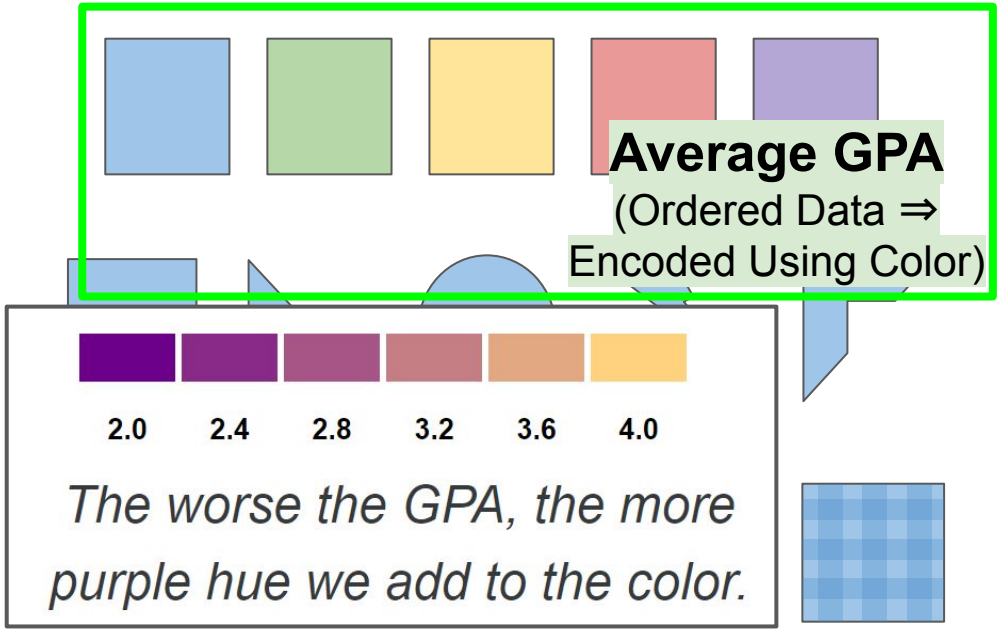


Average GPA
(Ordered Data ⇒
Encoded Using Color)



Works well for **Nominal Data**

Average GPA
(Ordered Data ⇒
Encoded Using Color)



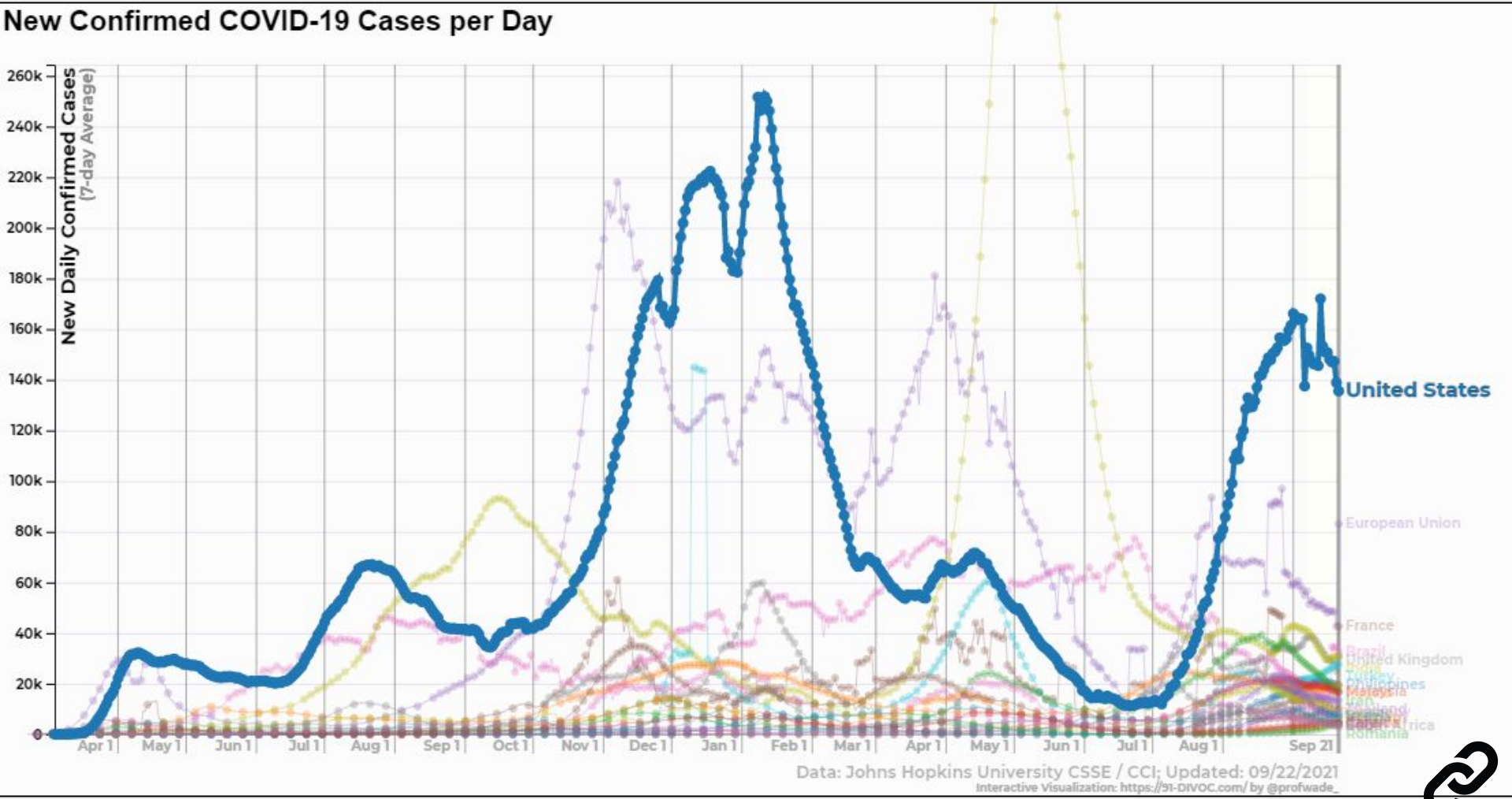
[P1]: Leading with Awesome

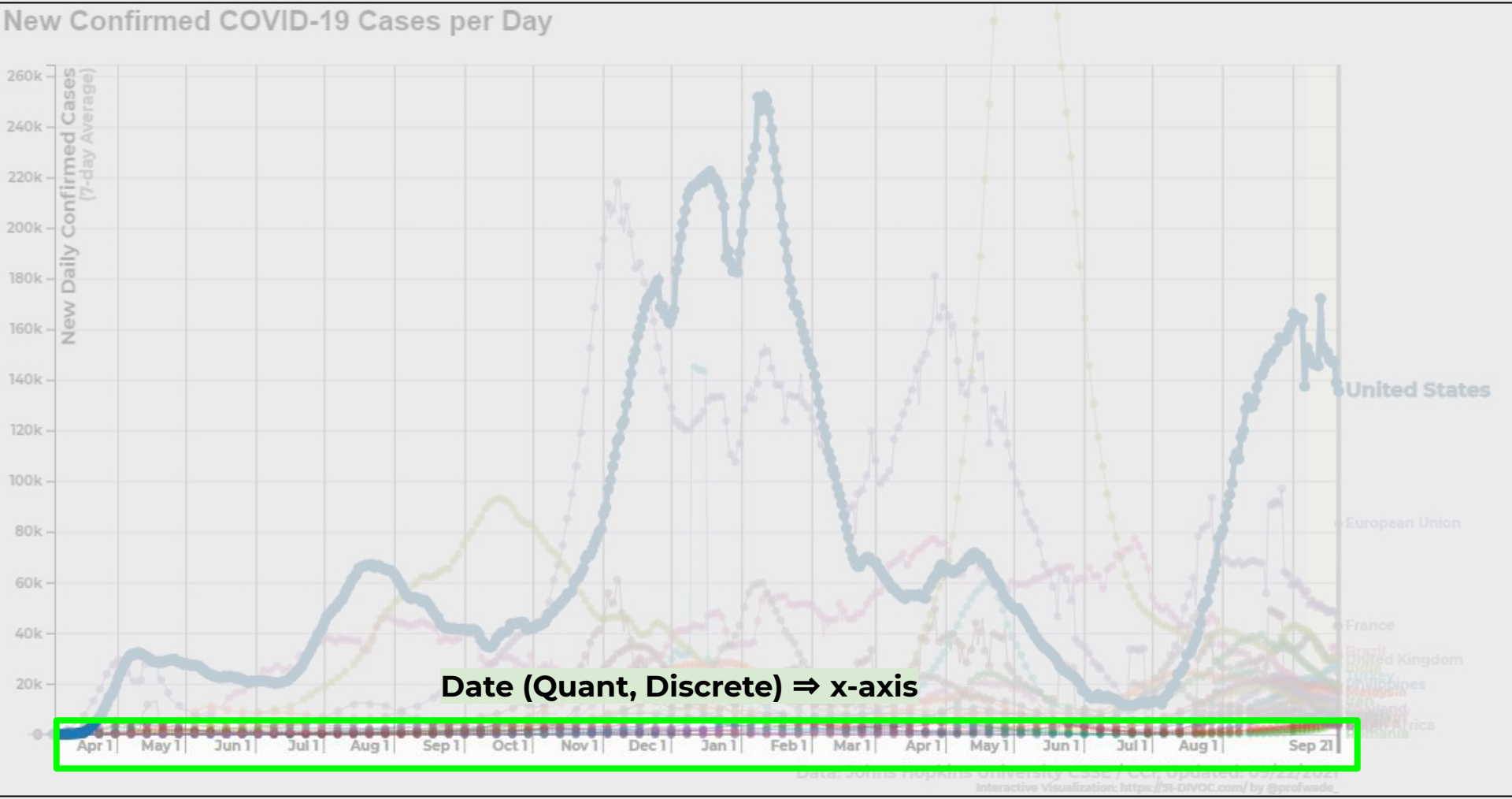
~50% of users **won’t** interact with your content

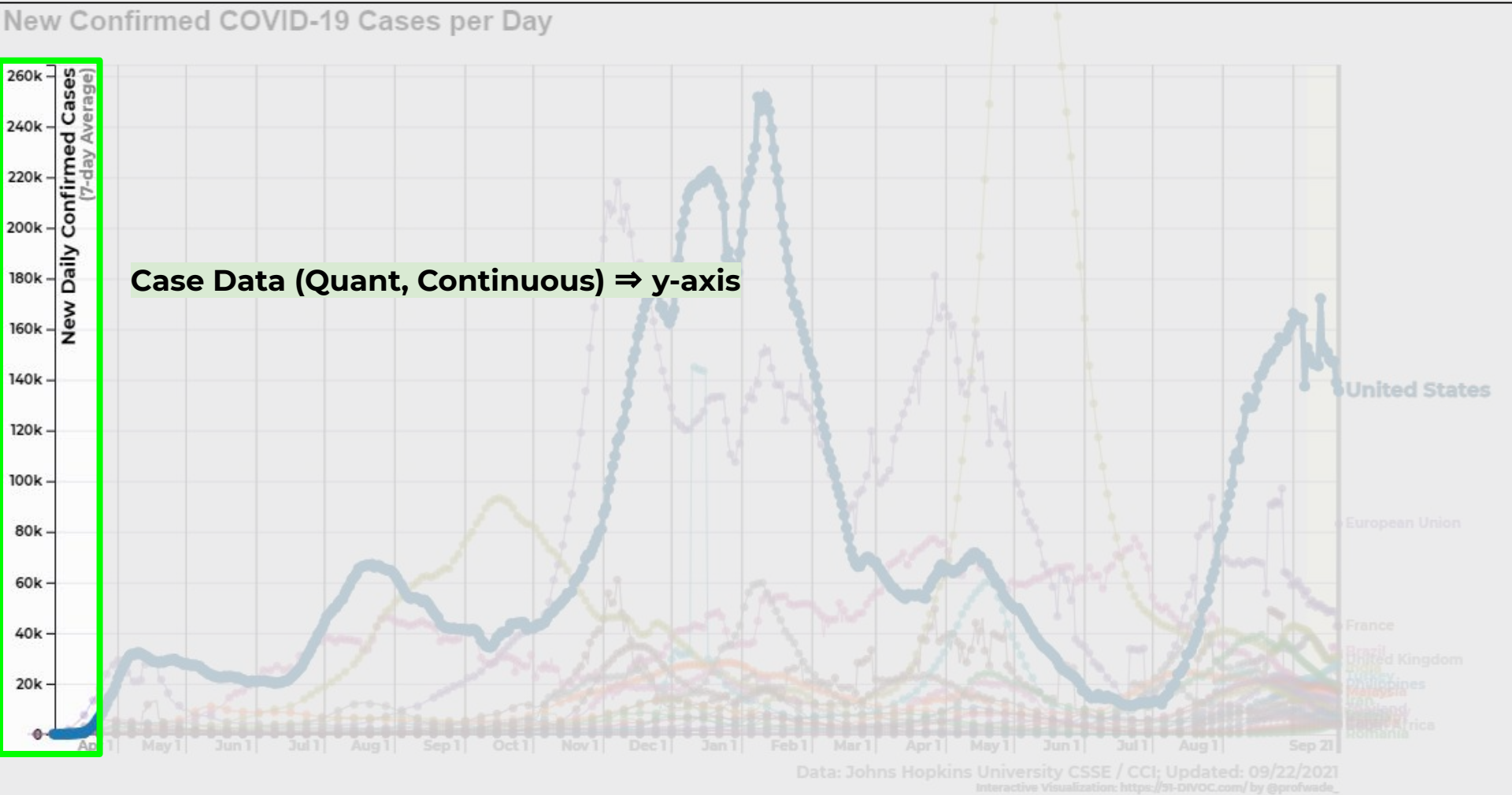
[P1]: Leading with Awesome

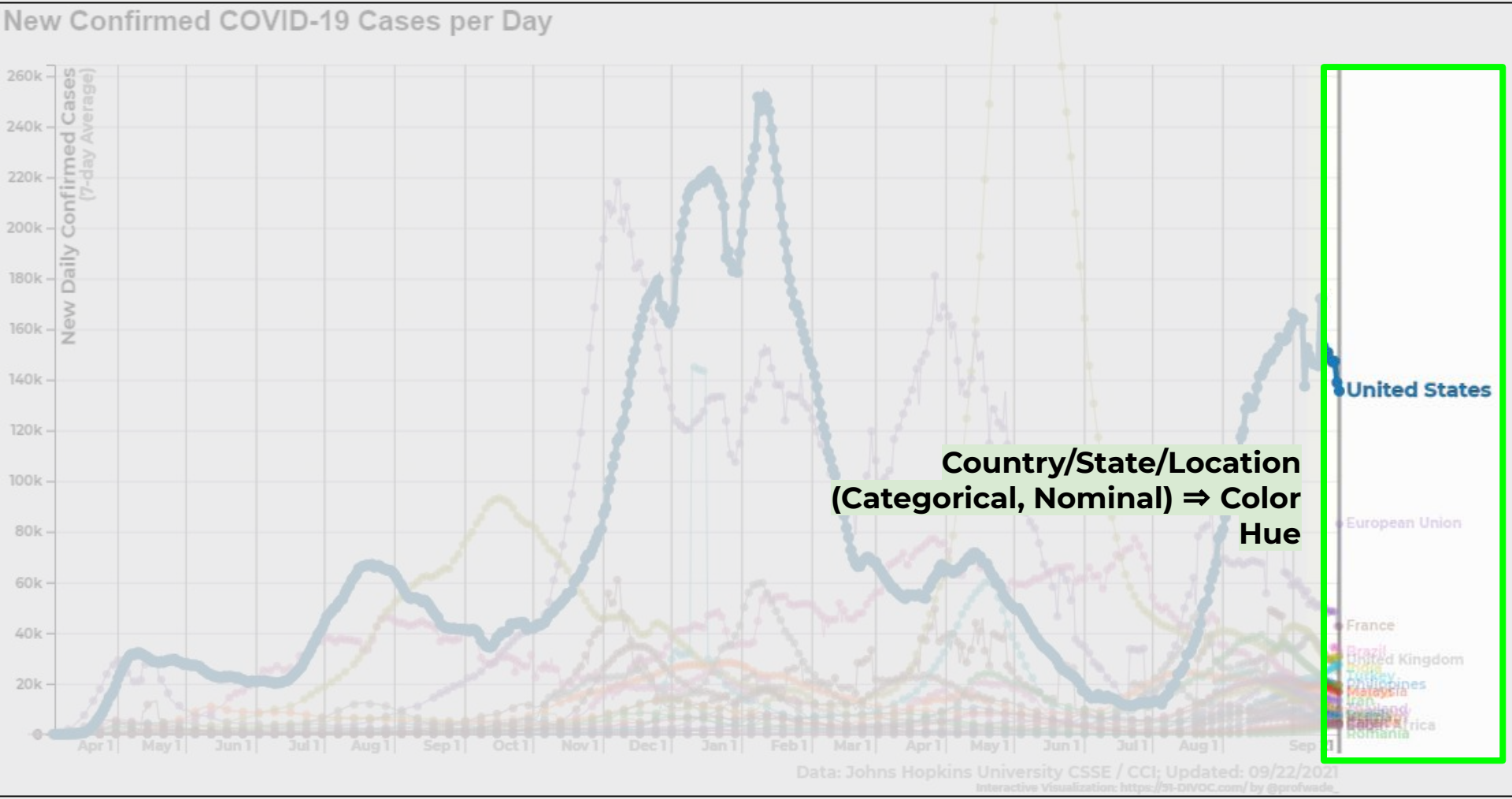
~50% of users **won't** interact with your content

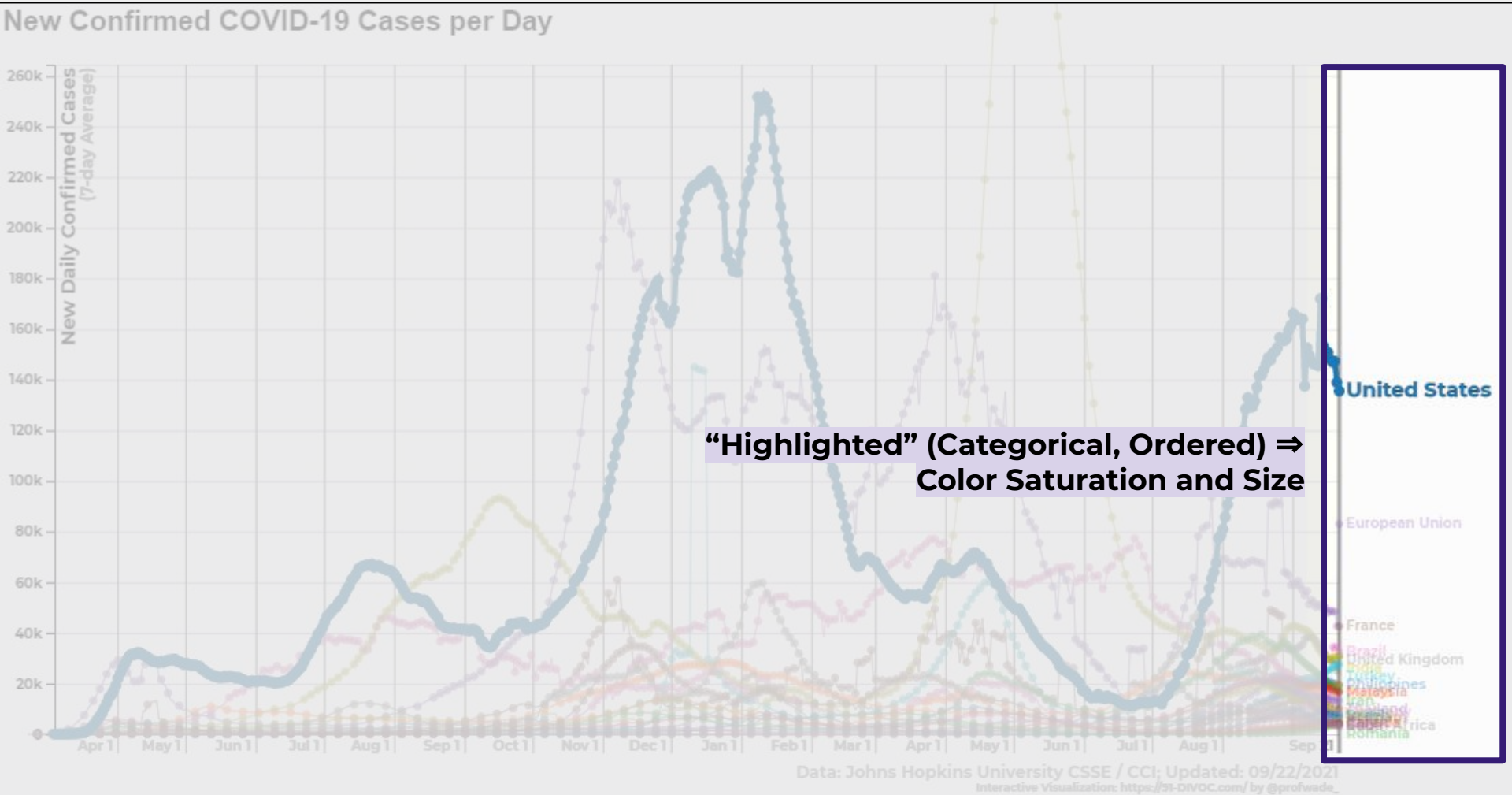
...so let them see what you've done without doing anything:

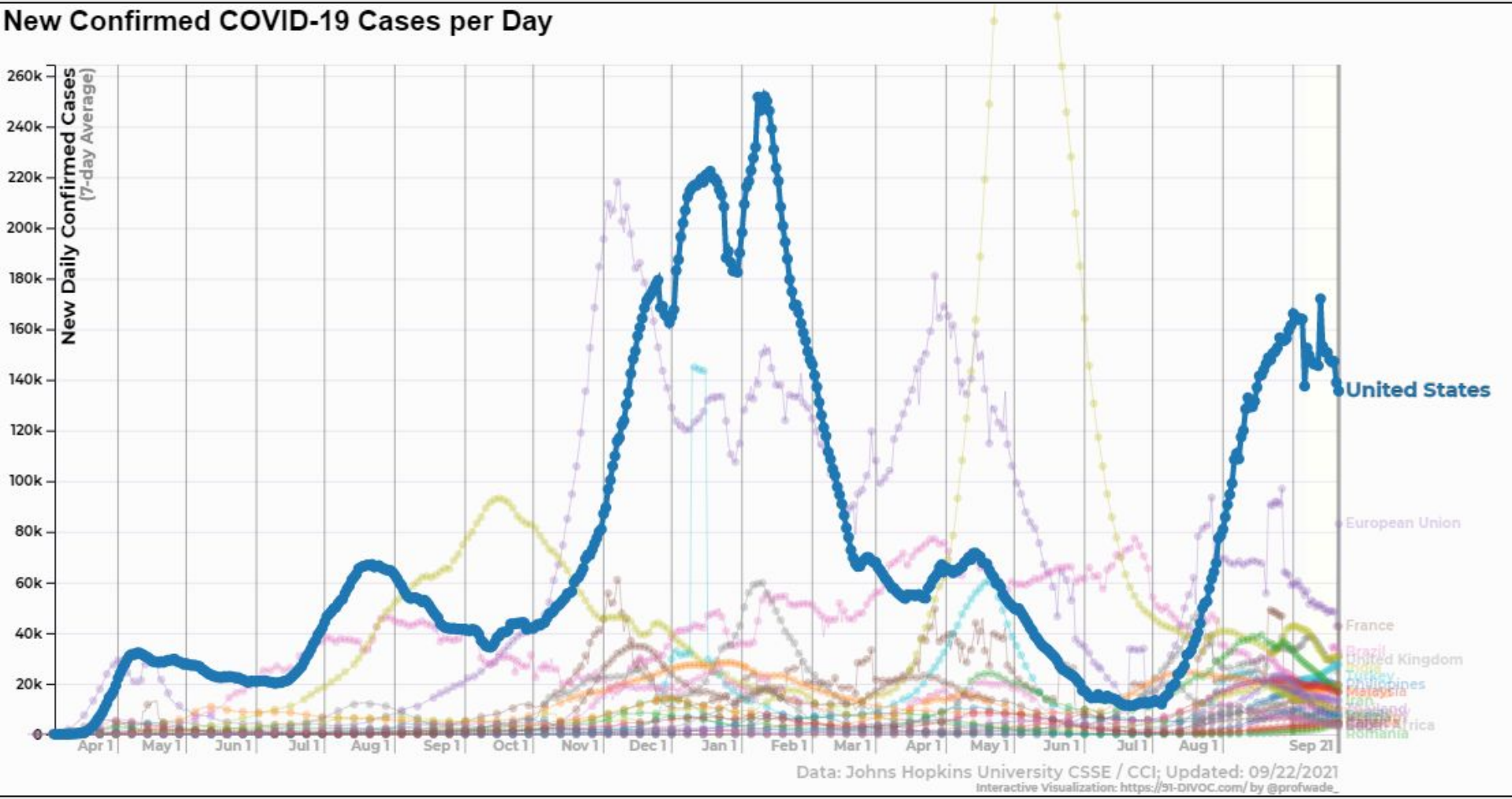

New Confirmed COVID-19 Cases per Day
New Daily Confirmed Cases
(7-day Average)
260k
240k
220k
200k
180k
160k
140k
120k
100k
80k
60k
40k
20k
0
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
Oct 1
Nov 1
Dec 1
Jan 1
Feb 1
Mar 1
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 21
United States
European Union
France
Brazil
United Kingdom
Turkey
Philippines
Malaysia
Poland
Thailand
South Africa
Romania
Data: Johns Hopkins University CSSE / CCI; Updated: 09/22/2021
Interactive Visualization: https://91-DIVOC.com/ by @profwade_

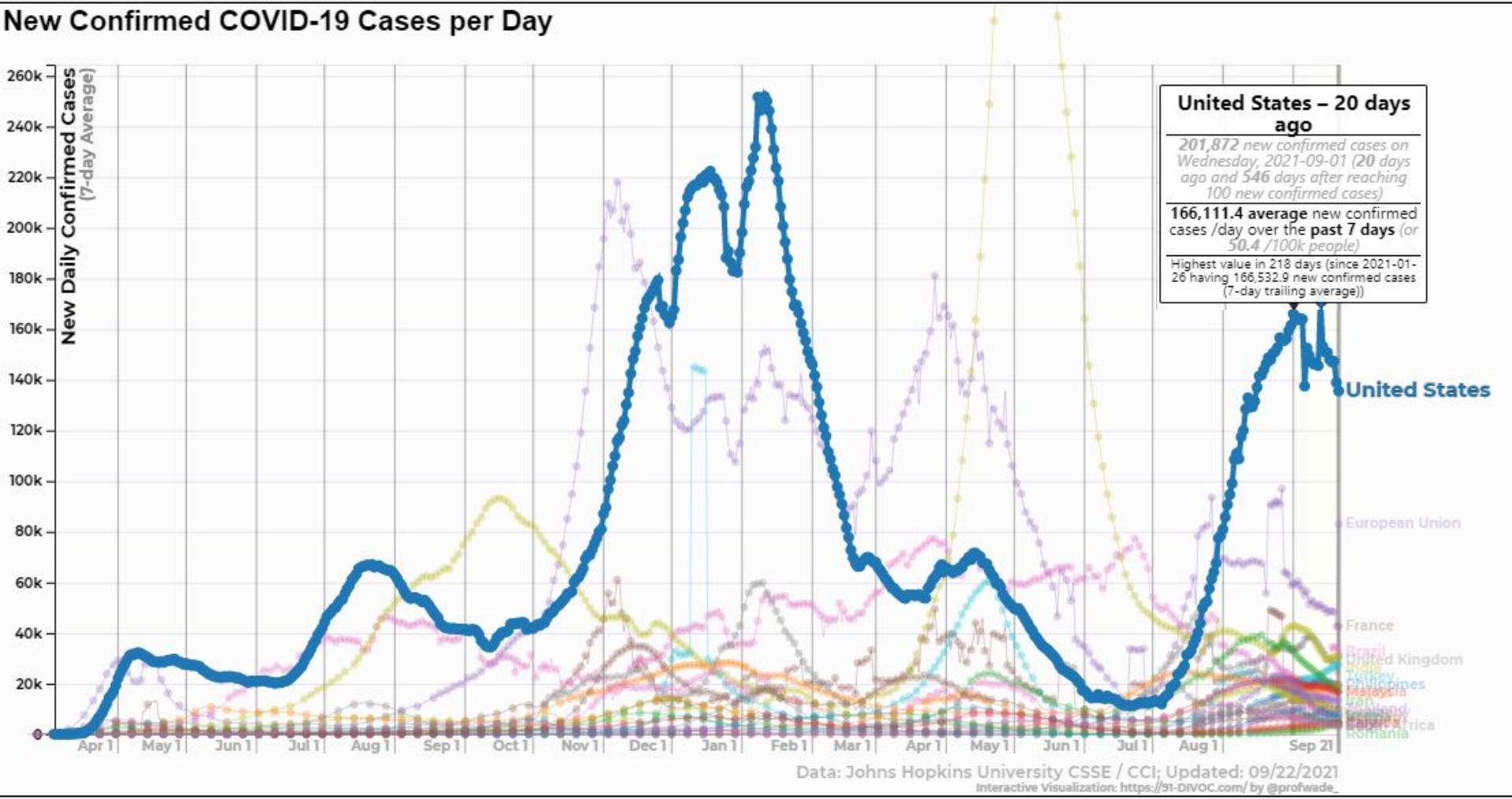

New Confirmed COVID-19 Cases per Day
New Daily Confirmed Cases (7-day Average)
260k
240k
220k
200k
180k
160k
140k
120k
100k
80k
60k
40k
20k
0
United States
European Union
France
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
Oct 1
Nov 1
Dec 1
Jan 1
Feb 1
Mar 1
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 21
Date (Quant, Discrete) ⇒ x-axis


New Confirmed COVID-19 Cases per Day
New Daily Confirmed Cases (7-day Average)
260k
240k
220k
200k
180k
160k
140k
120k
100k
80k
60k
40k
20k
0
Case Data (Quant, Continuous) ⇒ y-axis
United States
European Union
France
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
Oct 1
Nov 1
Dec 1
Jan 1
Feb 1
Mar 1
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 21
Data: Johns Hopkins University CSSE / CCI; Updated: 09/22/2021


New Confirmed COVID-19 Cases per Day
New Daily Confirmed Cases (7-day Average)
260k
240k
220k
200k
180k
160k
140k
120k
100k
80k
60k
40k
20k
0
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
Oct 1
Nov 1
Dec 1
Jan 1
Feb 1
Mar 1
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
United States
European Union
France
Brazil
United Kingdom
Turkey
Philippines
Malaysia
Thailand
Romania
Country/State/Location (Categorical, Nominal) ⇒ Color Hue
Data: Johns Hopkins University CSSE / CCI; Updated: 09/22/2021
Interactive Visualization: https://91-DIVOC.com/ by @arofwade


New Confirmed COVID-19 Cases per Day
New Daily Confirmed Cases (7-day Average)
260k
240k
220k
200k
180k
160k
140k
120k
100k
80k
60k
40k
20k
0
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
Oct 1
Nov 1
Dec 1
Jan 1
Feb 1
Mar 1
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
United States
European Union
France
Brazil
United Kingdom
Turkey
Philippines
Malaysia
Thailand
Romania
“Highlighted” (Categorical, Ordered) ⇒
Color Saturation and Size
Data: Johns Hopkins University CSSE / CCI; Updated: 09/22/2021
Interactive Visualization: https://91-DIVOC.com/ by @profwade

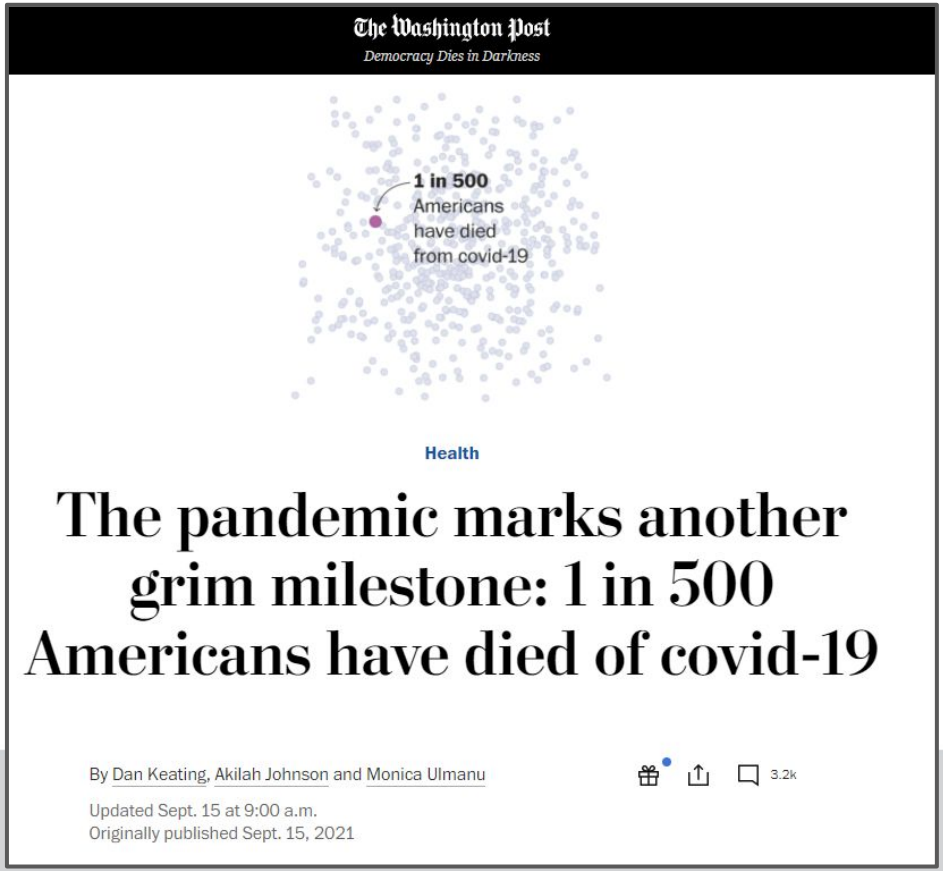

New Confirmed COVID-19 Cases per Day
New Daily Confirmed Cases
(7-day Average)
260k
240k
220k
200k
180k
160k
140k
120k
100k
80k
60k
40k
20k
0
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
Oct 1
Nov 1
Dec 1
Jan 1
Feb 1
Mar 1
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 21
United States
European Union
France
Brazil
United Kingdom
Turkey
Philippines
Malaysia
Poland
Thailand
Russia
South Africa
Romania
Data: Johns Hopkins University CSSE / CCI; Updated: 09/22/2021
Interactive Visualization: https://91-DIVOC.com/ by @profwade_


New Confirmed COVID-19 Cases per Day
New Daily Confirmed Cases (7-day Average)
260k
240k
220k
200k
180k
160k
140k
120k
100k
80k
60k
40k
20k
0
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
Oct 1
Nov 1
Dec 1
Jan 1
Feb 1
Mar 1
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 21
United States – 20 days ago
201,872 new confirmed cases on Wednesday, 2021-09-01 (20 days ago and 546 days after reaching 100 new confirmed cases)
166,111.4 average new confirmed cases /day over the past 7 days (or 50.4 /100k people)
Highest value in 218 days (since 2021-01-26 having 166,532.9 new confirmed cases (7-day trailing average))
United States
European Union
France
Brazil
United Kingdom
Turkey
Philippines
Malaysia
Poland
Iran
South Africa
Romania
Data: Johns Hopkins University CSSE / CCI; Updated: 09/22/2021
Interactive Visualization: https://91-DIVOC.com/ by @profwade_

[P2]: Storytelling and Nerding Out with Data

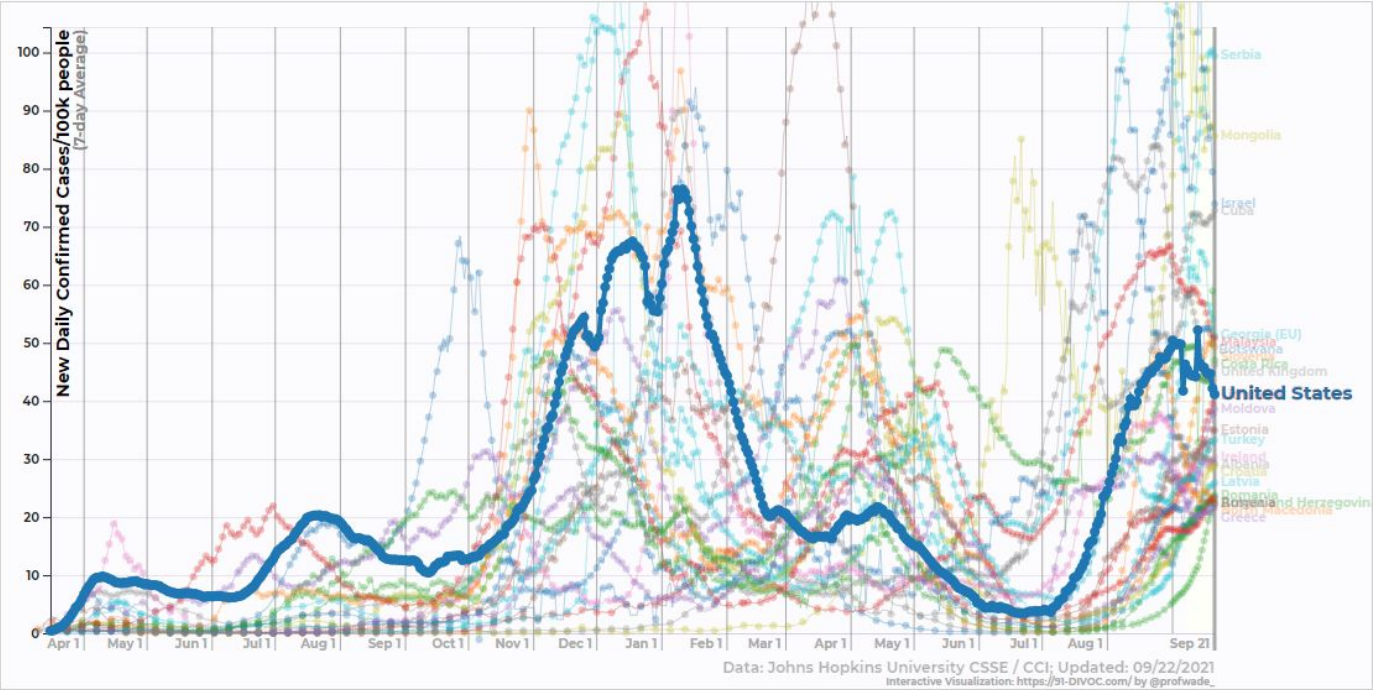
~50% of users **want to** interact with your content!

[P2]: Storytelling and Nerding Out with Data



https://www.washingtonpost.com/health/interactive/2021/1-in-500-covid-deaths/

New Confirmed COVID-19 Cases per Day, normalized by population



Highlight: United States | Data: New Cases, 1 Wk. Avg. | Scale: Log Linear

Show: Top 25 by Data w/ Pop. >1m | X-Axis: Show all highlighted data | Y-Axis: All Highlight & All Current

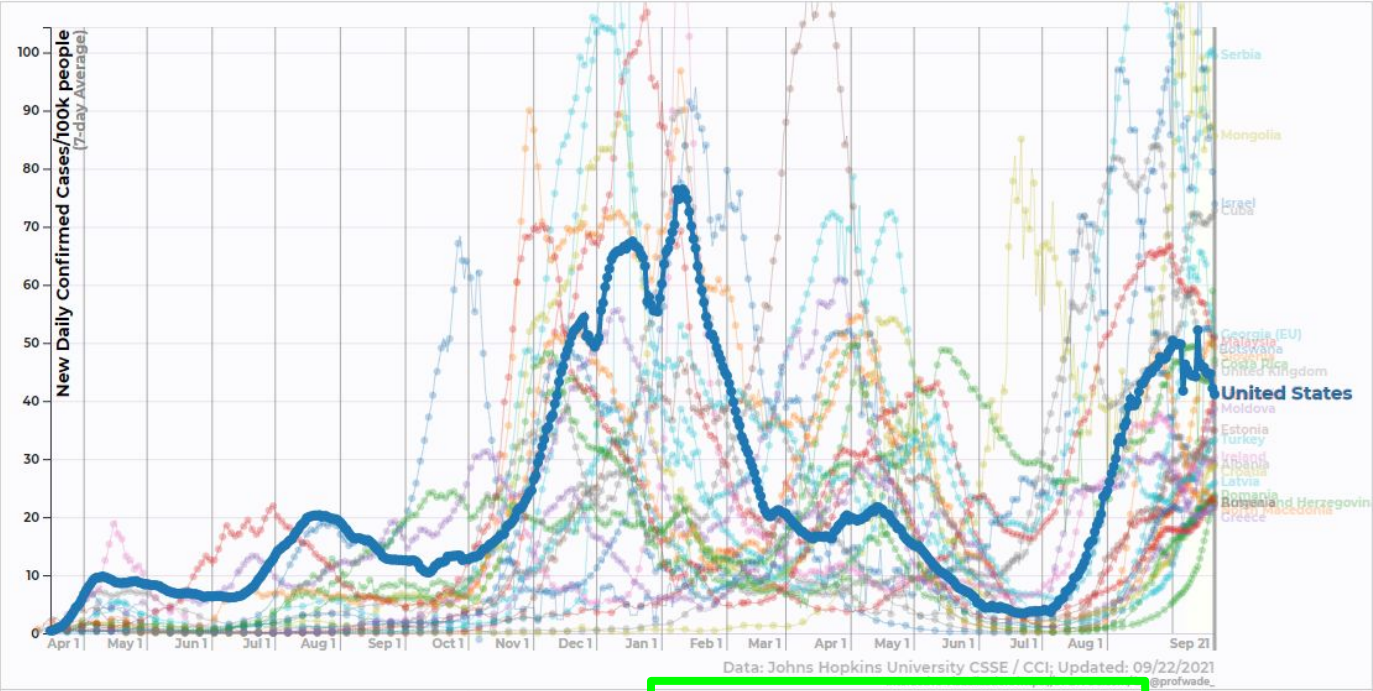
Animate

+Add Additional Highlight or +Add US State or +Add Additional Data — Expand Graph

Save: PNG | SVG | GIF | WebM | CSV

Generate Report

New Confirmed COVID-19 Cases per Day, normalized by population



Highlight: United States

Data: New Cases, 1 Wk. Avg.

Scale: Log Linear

Show: Top 25 by Data w/ Pop. >1m

X-Axis: Show all highlighted data

Y-Axis: All Highlight & All Current

Animate

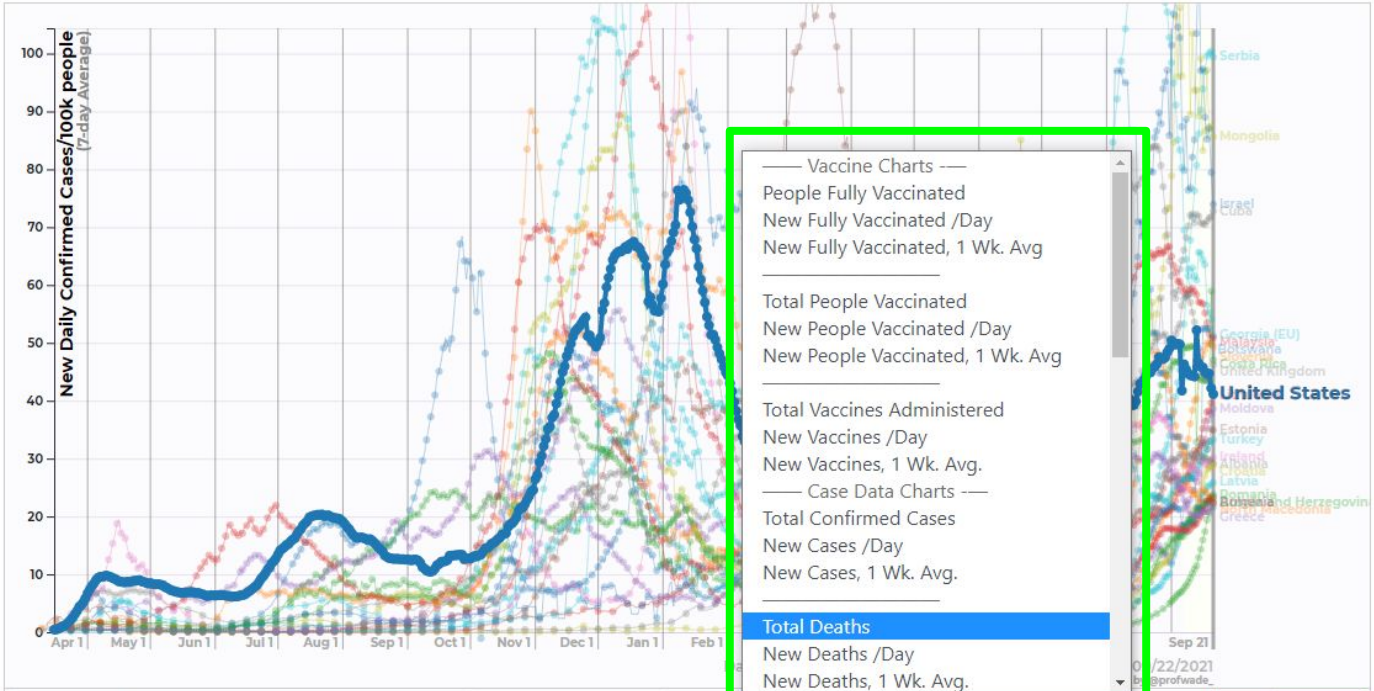
+Add Additional Highlight or +Add US State or +Add Additional Data

Expand Graph

Save: PNG | SVG | GIF | WebM | CSV

Generate Report

New Confirmed COVID-19 Cases per Day, normalized by population



Highlight: United States | Data: New Cases, 1 Wk. Avg. | Scale: Log Linear

Show: Top 25 by Data w/ Pop. >1m | X-Axis: Show all highlighted data | Y-Axis: All Highlight & All Current

Animate

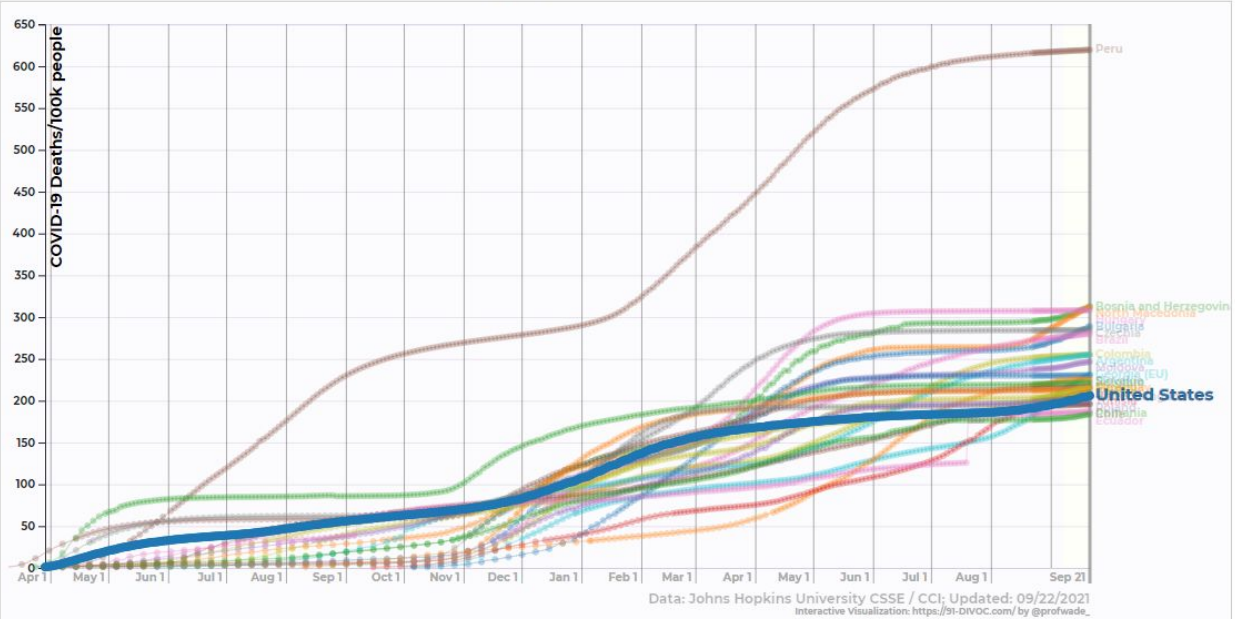
+Add Additional Highlight or +Add US State or +Add Additional Data

Expand Graph

Save: PNG | SVG | GIF | WebM | CSV

Generate Report

Deaths from COVID-19, normalized by population



Note: All of your highlighted data is in the bottom third of the graph. You can get a zoomed-in view of the graph by setting **Y-Axis** to **"Scale to Highlight"**.

Highlight: United States | Data: Total Deaths | Scale: Log / Linear

Show: Top 25 by Data w/ Pop. >1m | X-Axis: Show all highlighted data | Y-Axis: All Highlight & All Current

Animate

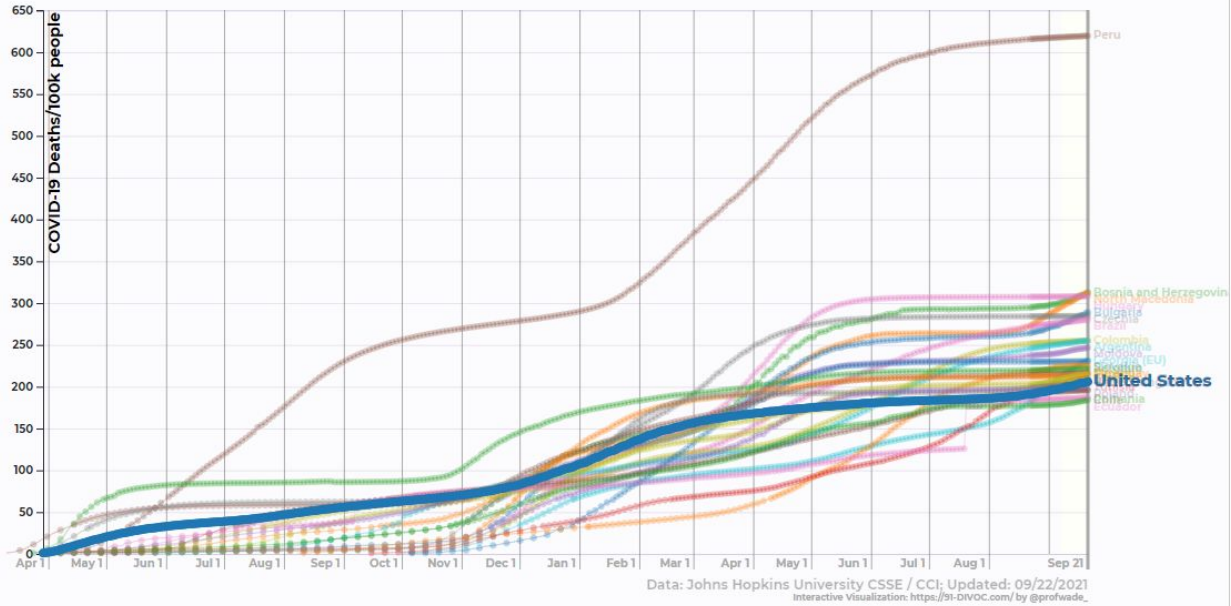
+Add Additional Highlight or +Add US State or +Add Additional Data — Expand Graph

Save: PNG | SVG | GIF | WebM | CSV

Direct Link w/ Your Options: https://91-divoc.com/pages/covid-visualization/?chart=countries-normalized&highlight=United%20States&show=25-lg&y=both&scale=linear&data=deaths&data-source=jhu&xaxis=right#countries-normalized

Generate Report

Deaths from COVID-19, normalized by population



Note: All of your highlighted data is in the bottom third of the graph. You can get a zoomed-in view of the graph by setting **Y-Axis** to **"Scale to Highlight"**.

Highlight: United States | Data: Total Deaths | Scale: Log / Linear

Show: Top 25 by Data w/ Pop. >1m | X-Axis: Show all highlighted data | Y-Axis: All Highlight & All Current

Animate

+Add Additional Highlight or +Add US State or +Add Additional Data — Expand Graph

Save: PNG | SVG | GIF | WebM | CSV

Direct Link w/ Your Options: https://91-divoc.com/pages/covid-visualization/?chart=countries-normalized&highlight=United%20States&show=25-lg&y=both&scale=linear&data=deaths&data-source=jhu&xaxis=right#countries-normalized

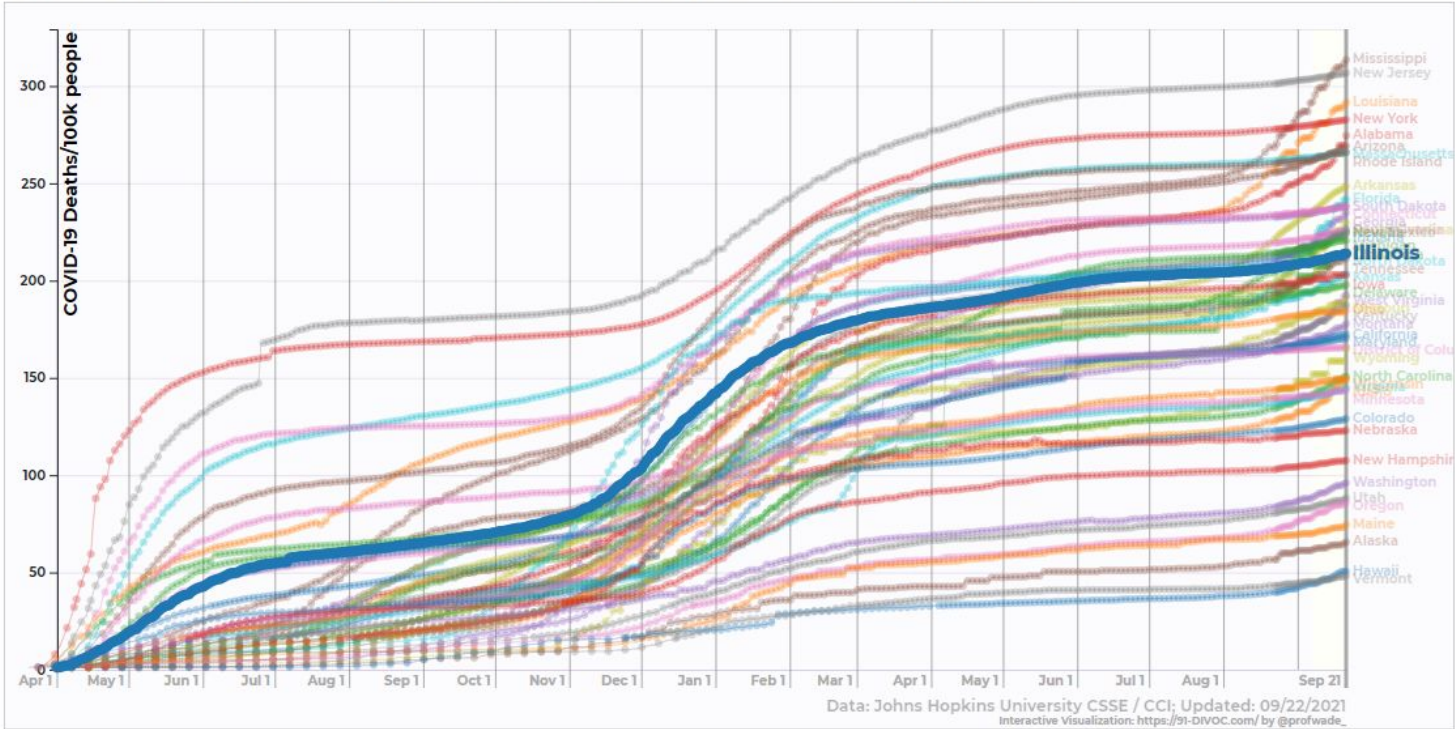
Generate Report

Deaths /100,000 people

619	Peru
312	Bosnia and Herzegovina
312	North Macedonia
308	Hungary
288	Bulgaria
284	Czechia
279	Brazil
255	Colombia
254	Argentina
246	Moldova
231	Georgia (EU)
230	Slovakia
225	Paraguay
221	Belgium
216	Italy
215	Slovenia
214	Mexico
209	Tunisia
209	Croatia
205	United States

Q: What about Illinois?

Deaths from COVID-19 by States/Territories, normalized by population



Highlight: Illinois | Data: Total Deaths | Scale: Log Linear

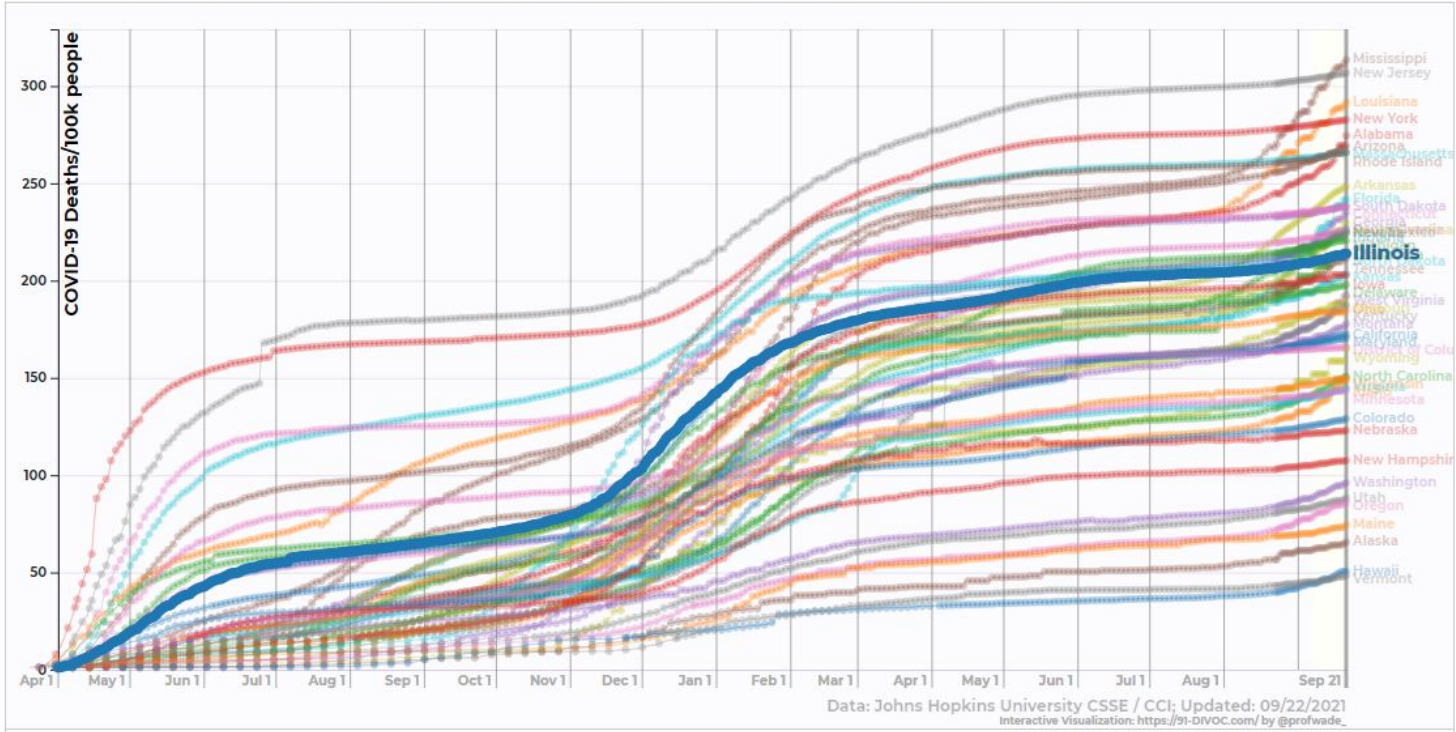
Show: All States & DC | X-Axis: Show all highlighted data | Y-Axis: All Highlight & All Current | Animate

+Add Additional Highlight or +Add Additional Data | Expand Graph

Save: PNG | SVG | GIF | WebM | CSV

Direct Link w/ Your Options: https://91-divoc.com/pages/covid-visualization/?chart=states-normalized&highlight=Illinois&show=us-states&y=both&scale=linear&data=deaths&data-source=jhu&xaxis=right#states-normalized

Deaths from COVID-19 by States/Territories, normalized by population



Highlight: Illinois | Data: Total Deaths | Scale: Log Linear

Show: All States & DC | X-Axis: Show all highlighted data | Y-Axis: All Highlight & All Current | Animate

+Add Additional Highlight or +Add Additional Data | Expand Graph

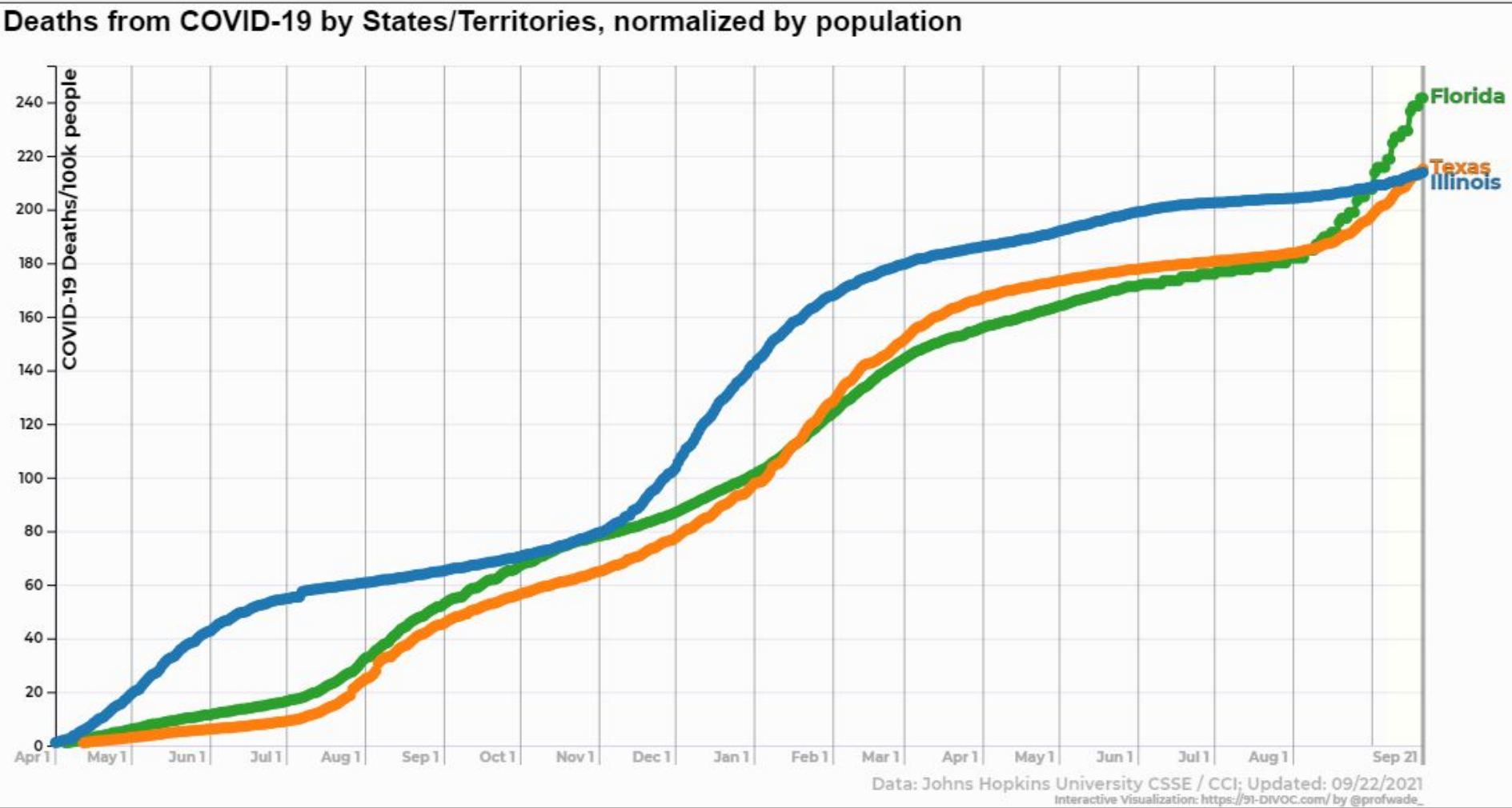
Save: PNG | SVG | GIF | WebM | CSV

Direct Link w/ Your Options: https://91-divoc.com/pages/covid-visualization/?chart=states-normalized&highlight=Illinois&show=us-states&y=both&scale=linear&data=deaths&data-source=jhu&xaxis=right#states-normalized

Deaths /100,000 people

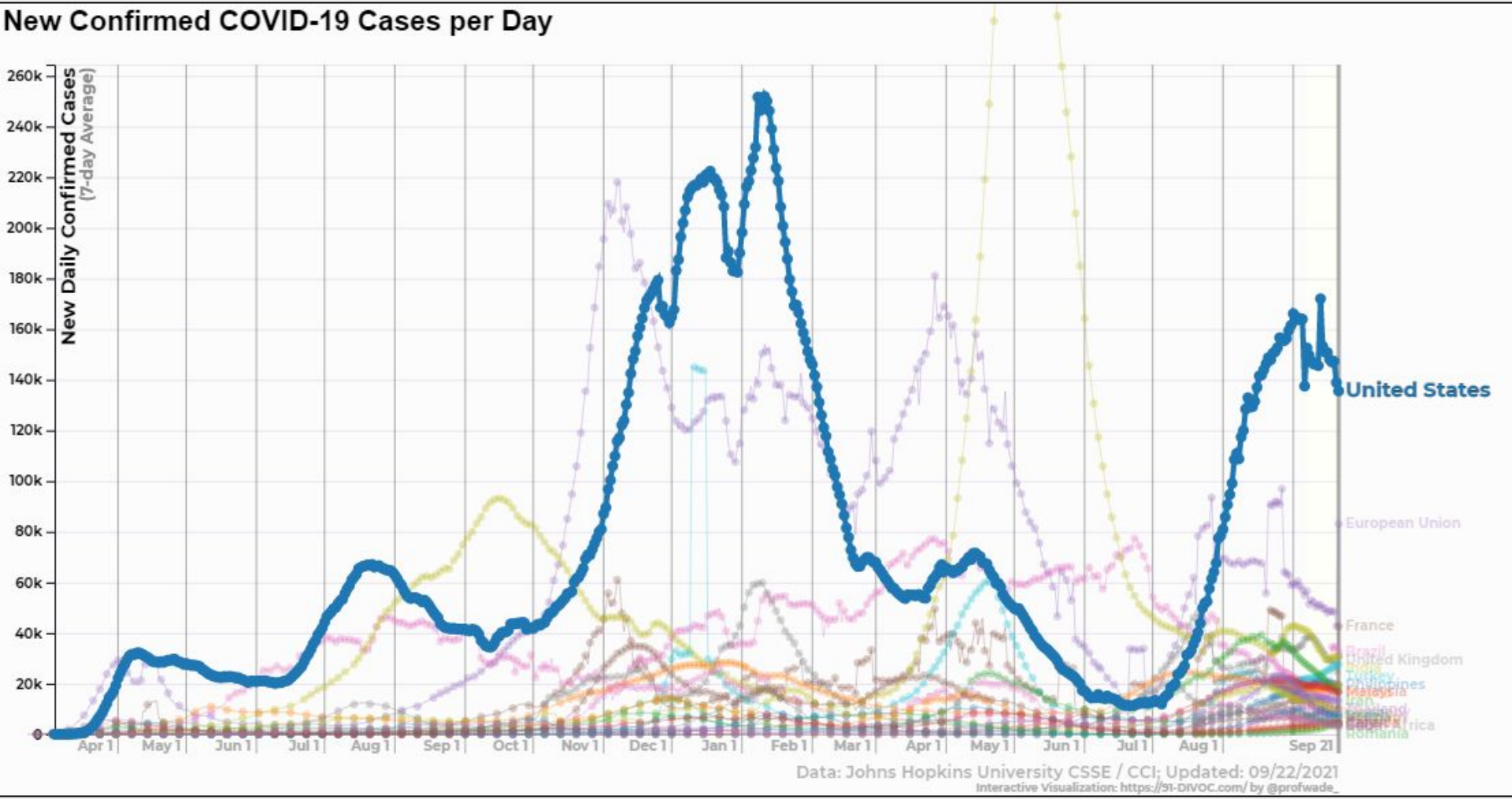
313	Mississippi
306	New Jersey
291	Louisiana
282	New York
274	Alabama
269	Arizona
265	Massachusetts
265	Rhode Island
248	Arkansas
241	Florida
238	South Dakota
237	Connecticut
235	Georgia
229	South Carolina
226	Indiana
225	Pennsylvania
224	Nevada
224	New Mexico
220	Michigan
215	Texas
213	Illinois

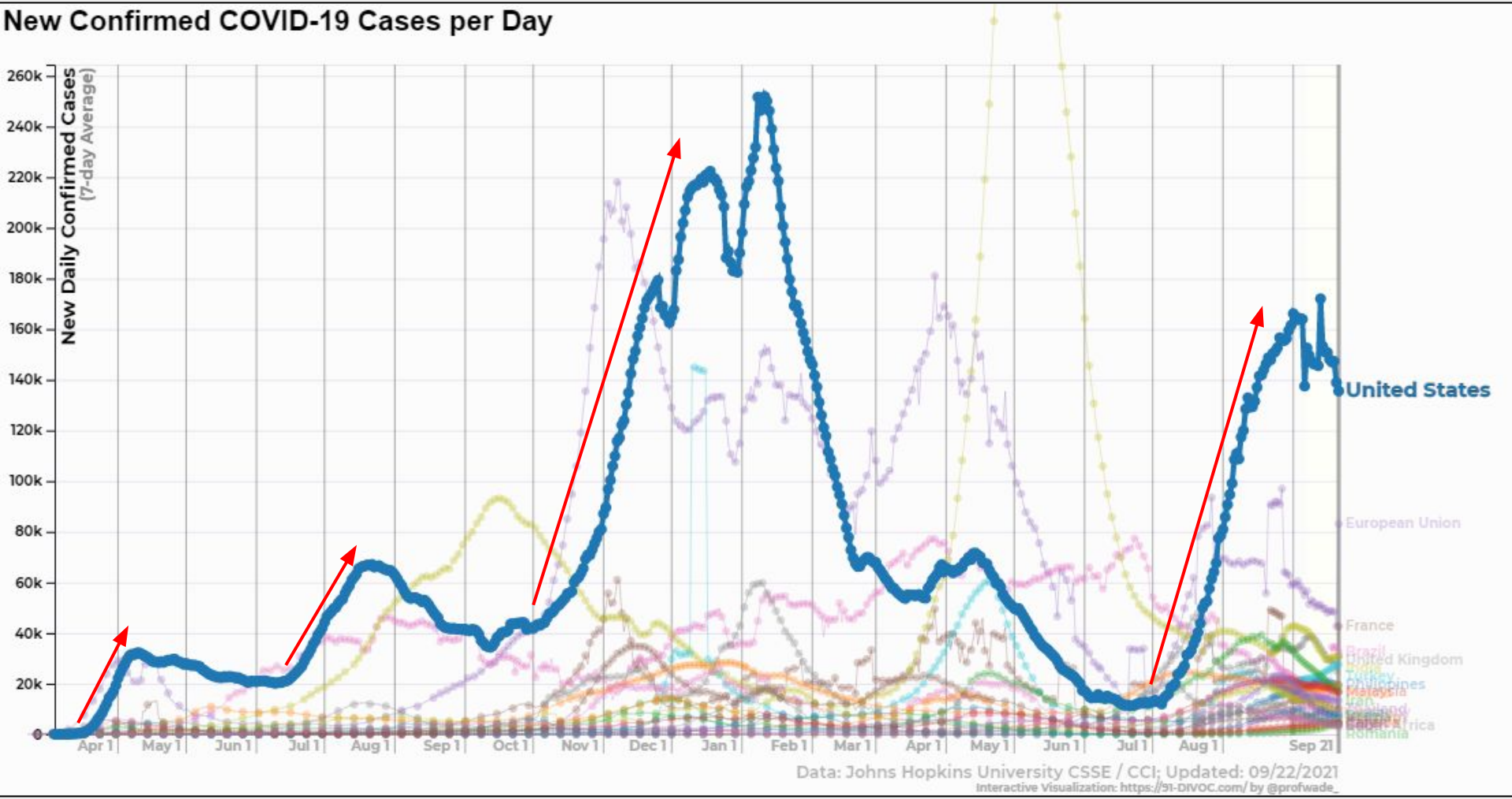
Deaths from COVID-19 by States/Territories, normalized by population

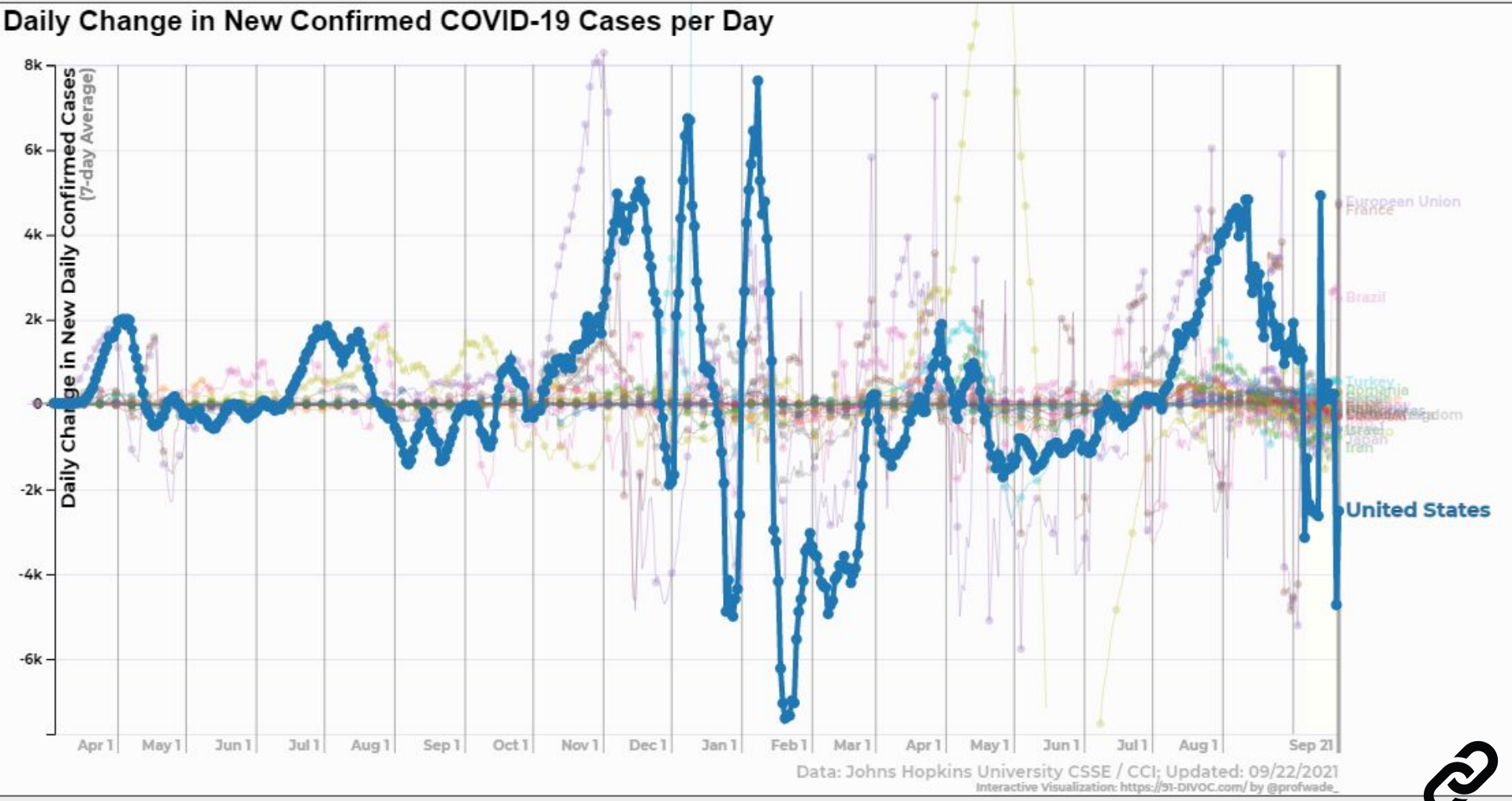

Deaths from COVID-19 by States/Territories, normalized by population
COVID-19 Deaths/100k people
240
220
200
180
160
140
120
100
80
60
40
20
0
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
Oct 1
Nov 1
Dec 1
Jan 1
Feb 1
Mar 1
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 21
Florida
Texas
Illinois
Data: Johns Hopkins University CSSE / CCI; Updated: 09/22/2021
Interactive Visualization: https://91-DIVOC.com/ by @profwade_

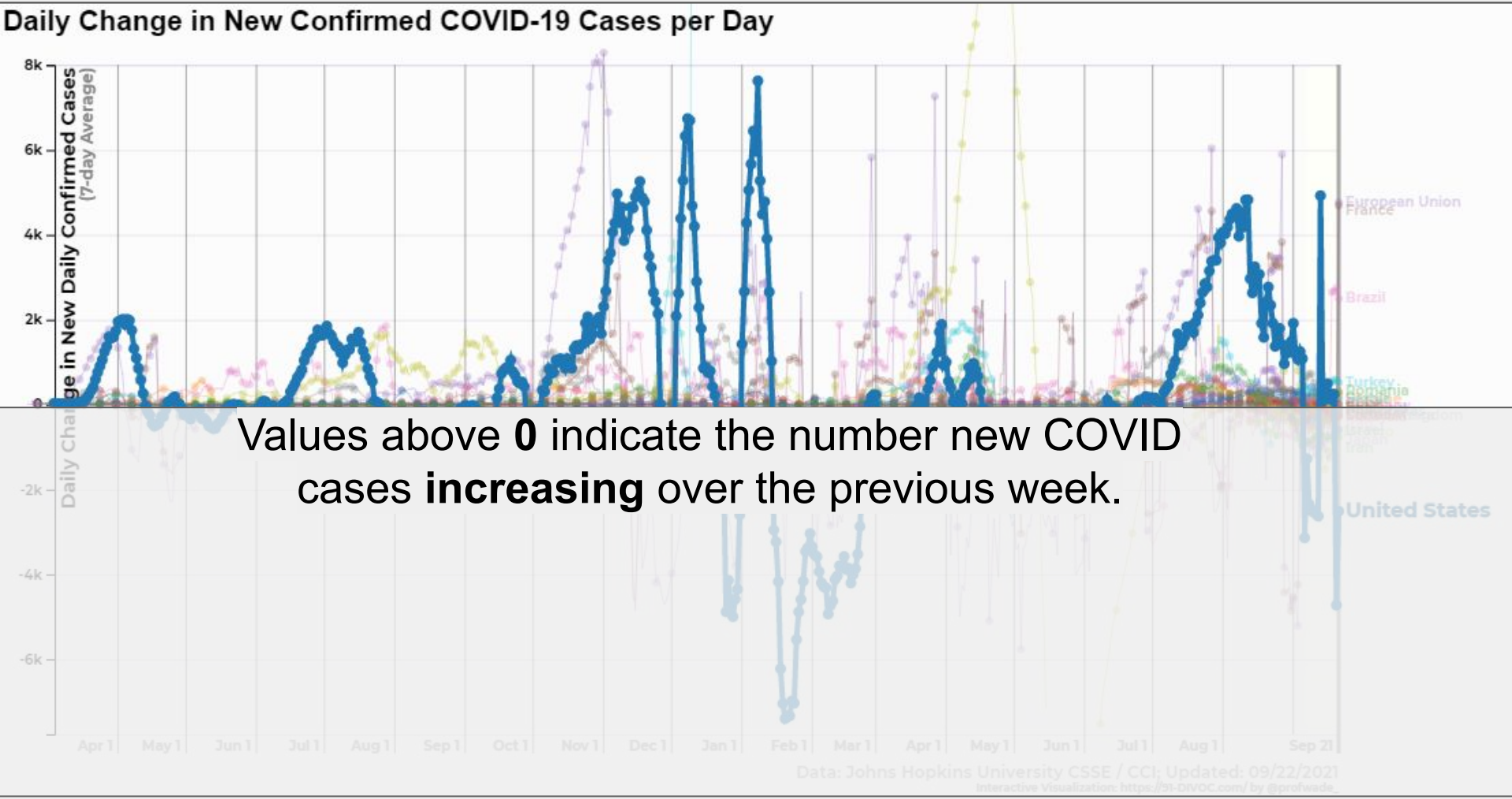
[P3]: Provide Unique Value

What is unique about what we've done?

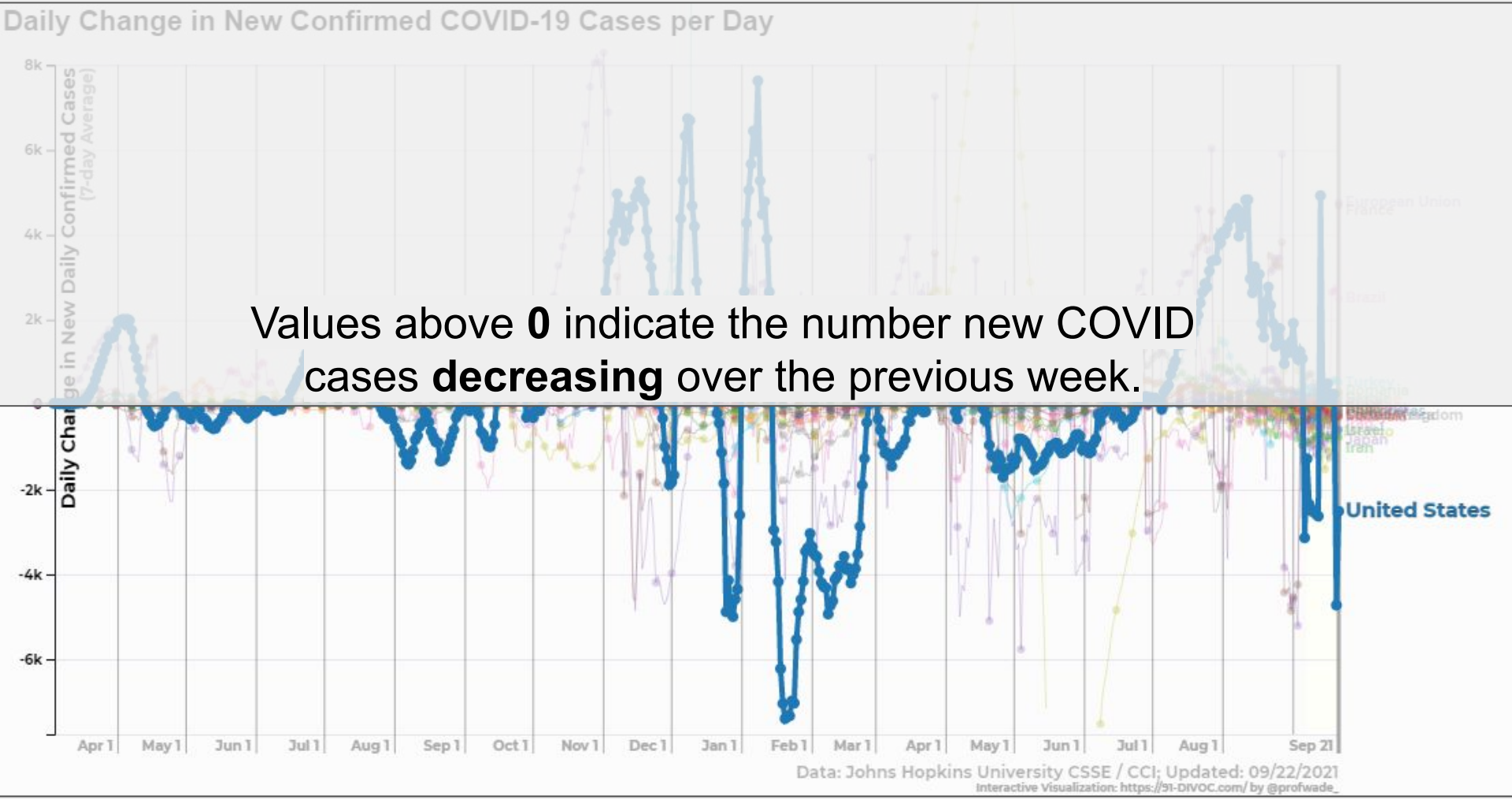

New Confirmed COVID-19 Cases per Day
New Daily Confirmed Cases
(7-day Average)
260k
240k
220k
200k
180k
160k
140k
120k
100k
80k
60k
40k
20k
0
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
Oct 1
Nov 1
Dec 1
Jan 1
Feb 1
Mar 1
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 21
United States
European Union
France
Brazil
United Kingdom
Turkey
Philippines
Malaysia
Poland
Thailand
Russia
South Africa
Romania
Data: Johns Hopkins University CSSE / CCI; Updated: 09/22/2021
Interactive Visualization: https://91-DIVOC.com/ by @profwade_

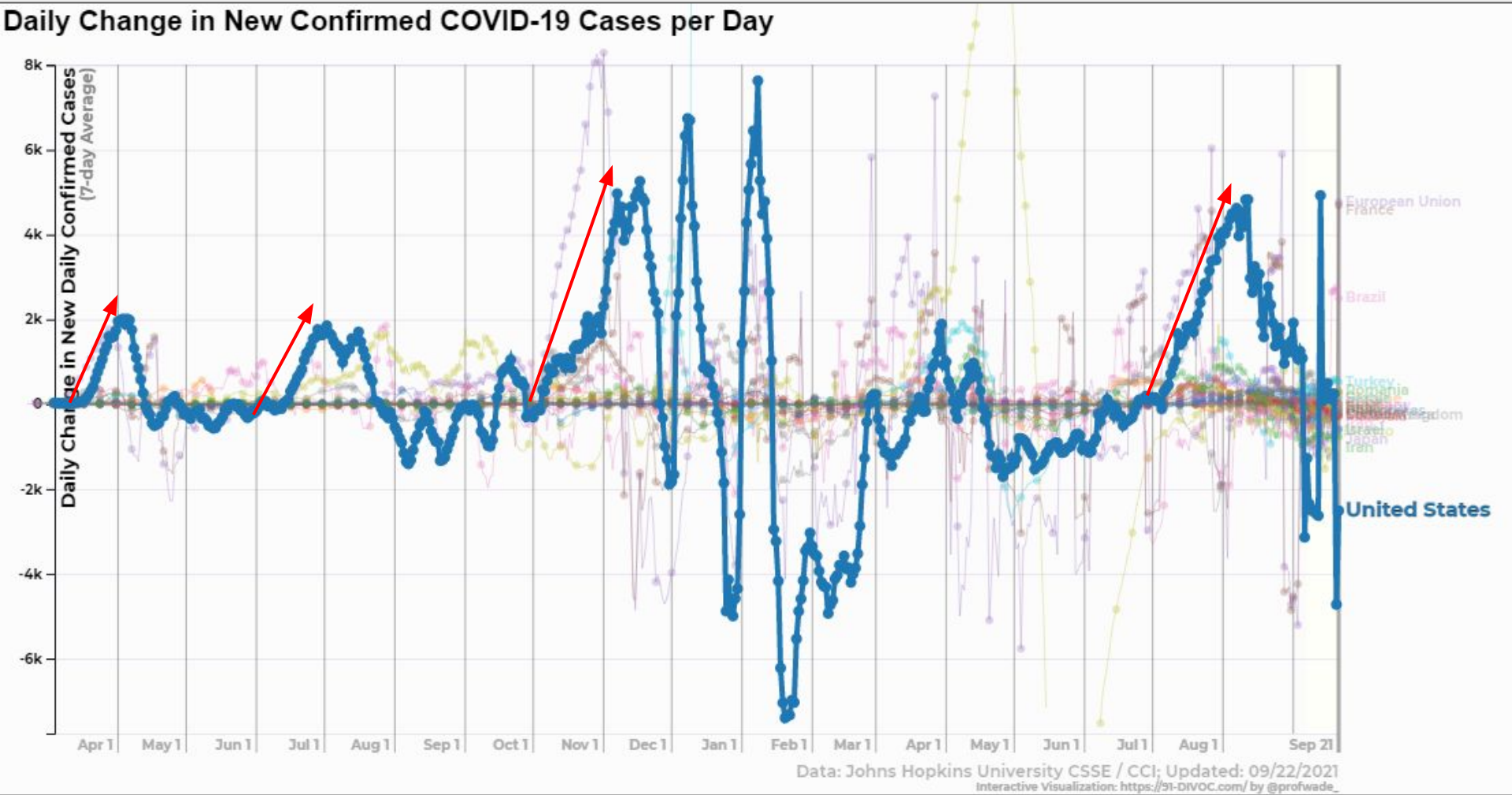

New Confirmed COVID-19 Cases per Day
New Daily Confirmed Cases
(7-day Average)
260k
240k
220k
200k
180k
160k
140k
120k
100k
80k
60k
40k
20k
0
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
Oct 1
Nov 1
Dec 1
Jan 1
Feb 1
Mar 1
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 21
United States
European Union
France
Brazil
United Kingdom
Turkey
Philippines
Malaysia
Poland
Thailand
Russia
South Africa
Romania
Data: Johns Hopkins University CSSE / CCI; Updated: 09/22/2021
Interactive Visualization: https://91-DIVOC.com/ by @profwade_

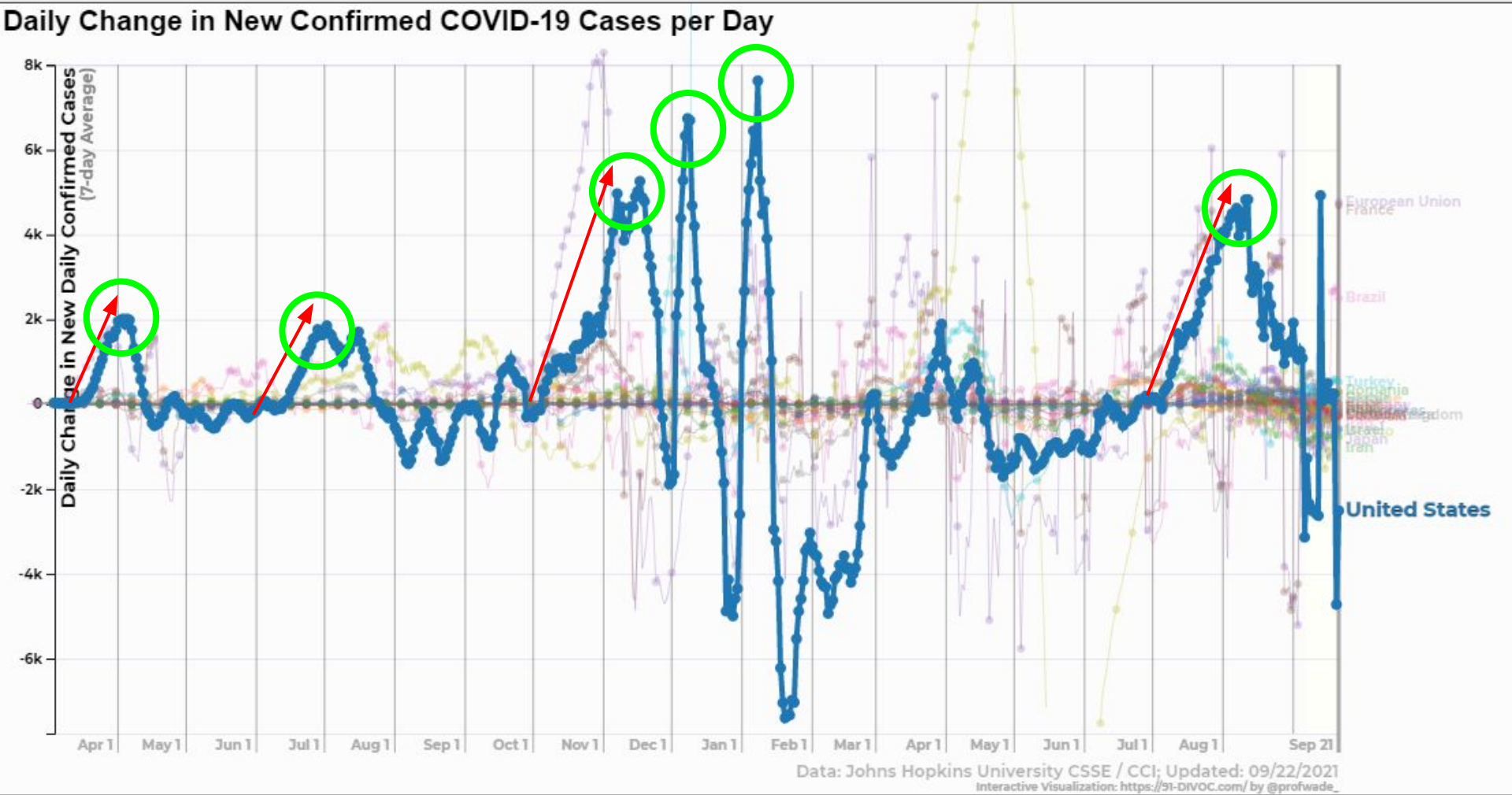

Daily Change in New Confirmed COVID-19 Cases per Day
Daily Change in New Daily Confirmed Cases (7-day Average)
8k
6k
4k
2k
0
-2k
-4k
-6k
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
Oct 1
Nov 1
Dec 1
Jan 1
Feb 1
Mar 1
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 21
European Union
France
Brazil
Turkey
Romania
Israel
Japan
Iran
United States
Data: Johns Hopkins University CSSE / CCI; Updated: 09/22/2021
Interactive Visualization: https://91-DIVOC.com/ by @profwade_

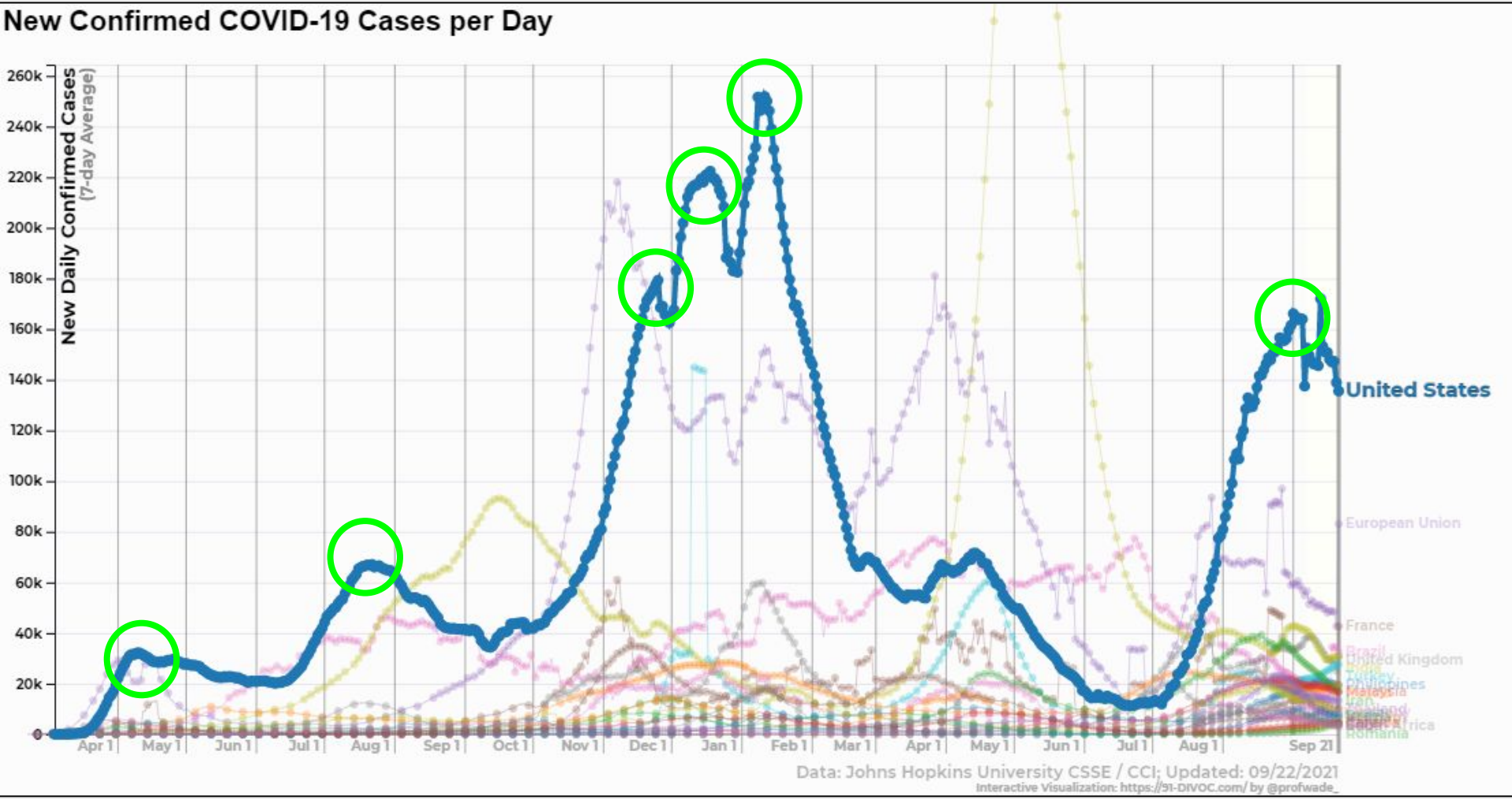


Values above **0** indicate the number new COVID cases **increasing** over the previous week.


Daily Change in New Confirmed COVID-19 Cases per Day
Daily Change in New Daily Confirmed Cases (7-day Average)
8k
6k
4k
2k
0
-2k
-4k
-6k
Values above **0** indicate the number new COVID cases **decreasing** over the previous week.
United States
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
Oct 1
Nov 1
Dec 1
Jan 1
Feb 1
Mar 1
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 21
Data: Johns Hopkins University CSSE / CCI; Updated: 09/22/2021
Interactive Visualization: https://91-DIVOC.com/ by @profwade_


Daily Change in New Confirmed COVID-19 Cases per Day
Daily Change in New Daily Confirmed Cases (7-day Average)
8k
6k
4k
2k
0
-2k
-4k
-6k
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
Oct 1
Nov 1
Dec 1
Jan 1
Feb 1
Mar 1
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 21
European Union
France
Brazil
Turkey
Romania
United States
Data: Johns Hopkins University CSSE / CCI; Updated: 09/22/2021
Interactive Visualization: https://91-DIVOC.com/ by @profwade_


Daily Change in New Confirmed COVID-19 Cases per Day
Daily Change in New Daily Confirmed Cases (7-day Average)
8k
6k
4k
2k
0
-2k
-4k
-6k
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
Oct 1
Nov 1
Dec 1
Jan 1
Feb 1
Mar 1
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 21
European Union
France
Brazil
Turkey
Romania
Israel
Japan
Iran
United States
Data: Johns Hopkins University CSSE / CCI; Updated: 09/22/2021
Interactive Visualization: https://91-DIVOC.com/ by @profwade_


New Confirmed COVID-19 Cases per Day
New Daily Confirmed Cases
(7-day Average)
260k
240k
220k
200k
180k
160k
140k
120k
100k
80k
60k
40k
20k
0
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 1
Oct 1
Nov 1
Dec 1
Jan 1
Feb 1
Mar 1
Apr 1
May 1
Jun 1
Jul 1
Aug 1
Sep 21
United States
European Union
France
Brazil
United Kingdom
Turkey
Philippines
Malaysia
Thailand
Russia
South Africa
Romania
Data: Johns Hopkins University CSSE / CCI; Updated: 09/22/2021
Interactive Visualization: https://91-DIVOC.com/ by @profwade_

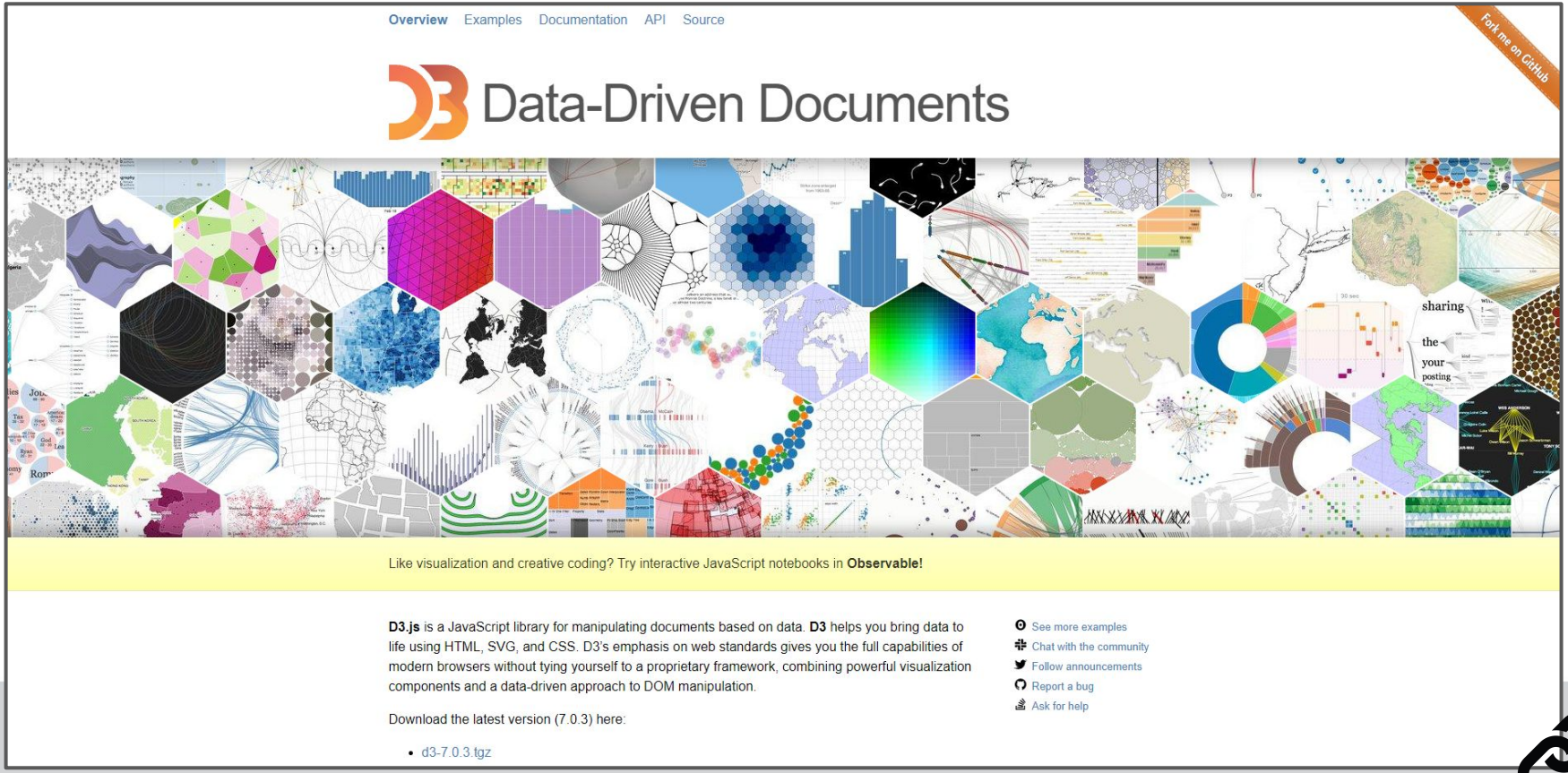
Principles That Work in Data Visualization:

[P1]: Leading with Awesome

[P2]: Storytelling and Nerding Out with Data

[P3]: Provide Unique Value

d3.js


Overview Examples Documentation API Source
Fork me on GitHub
Data-Driven Documents
sharing
the
your
posting
Like visualization and creative coding? Try interactive JavaScript notebooks in Observable!
D3.js is a JavaScript library for manipulating documents based on data. D3 helps you bring data to life using HTML, SVG, and CSS. D3's emphasis on web standards gives you the full capabilities of modern browsers without tying yourself to a proprietary framework, combining powerful visualization components and a data-driven approach to DOM manipulation.
Download the latest version (7.0.3) here:
d3-7.0.3.tgz
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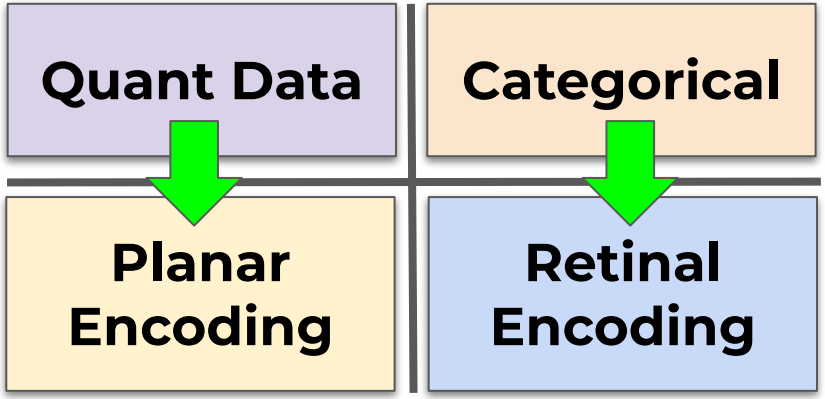
Data Visualization Quadrant:



d3.js

Principles That Work for Data Visualization

- [P1]: Leading with Awesome
- [P2]: Storytelling and Nerding Out with Data
- [P3]: Provide Unique Value

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