

Maps

DSC 106: Data Visualization

Sam Lau

UC San Diego

Announcements

Lab 7 out, due Friday.

Final Project out, proposals (and teams) due Tuesday.

FAQs:

- 1. What happens if I can't find a final project team by Proposal Deadline?** We will not take your submission!
- 2. Do I need to enter in a credit card to use Mapbox in Lab 7?**
No, use your UCSD email and you should get an API key for free.

**How much time did you spend on Lab
6? (And how do you feel about your D3
knowledge now?)**

tryclassbuzz.com
Code: lab6

Final Project:

Explorable Explanation

Final Project (out now)

Create an **Explorable Explanation**: interactive article that explains something complex to the reader.

Must use one of the health datasets for the class.

Teams of 3-4 only.

Four submissions: proposal (Week 8), prototype (Week 9), video (Week 10), final submission (finals week).

Final Project Showcase: Thurs June 12th 11:30am-2:30pm.

Maps

When to use a map?

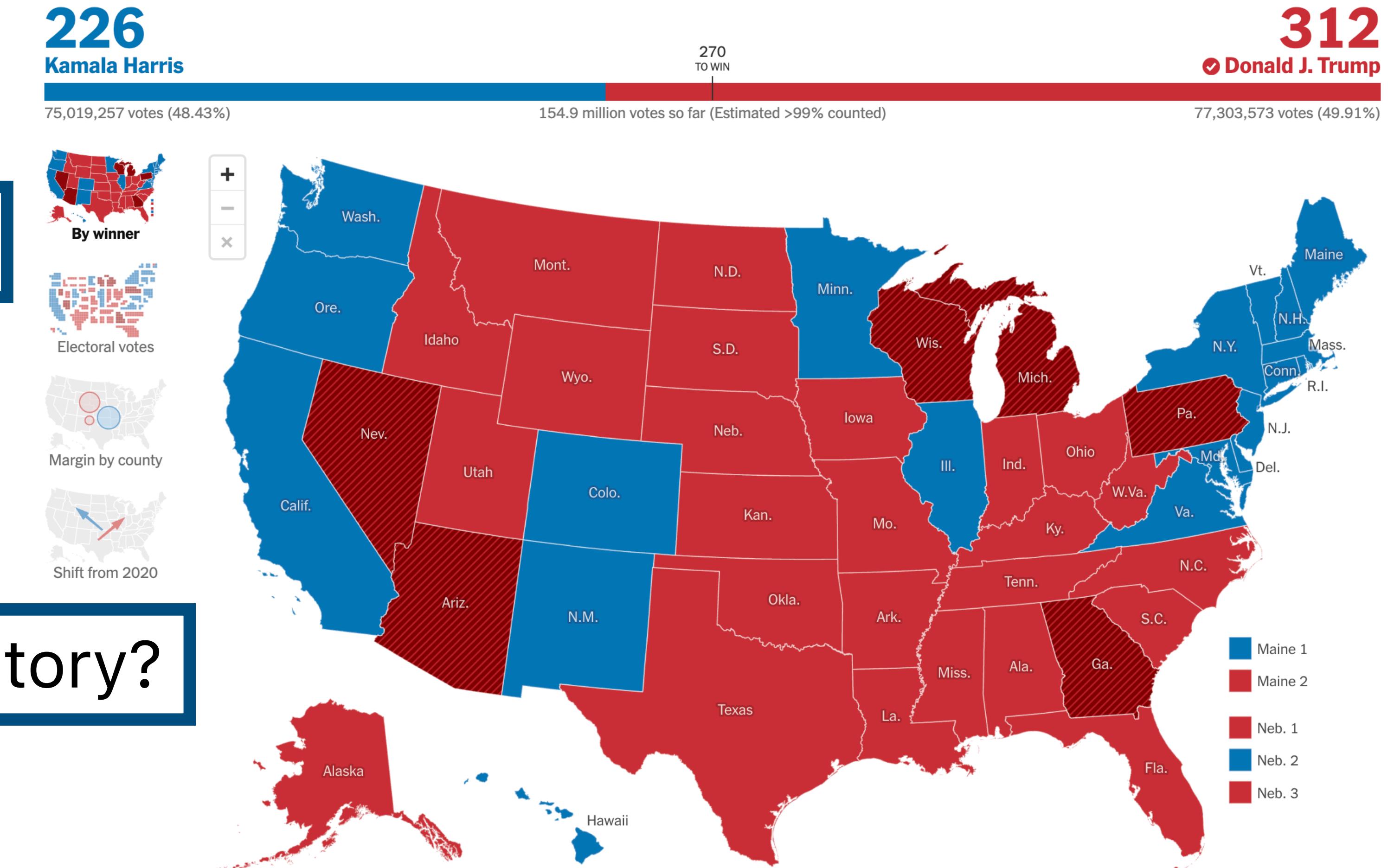
1. When data contains geographical attributes (e.g., latitude, longitude, city, state, country, etc.).
2. When you want to emphasize **geographic relationship**.

Geographic Relationships

Who's winning my state?

Is it a landslide?

What are the paths to victory?



Geographic Relationships

Results by state

Below are the latest results for each state, grouped according to pre-election ratings by the [Cook Political Report](#).

Dem. Win Flip Rep. Win Flip

Harris expected to win easily			Harris expected to win narrowly			Most competitive states			Trump expected to win narrowly			Trump expected to win easily			
State	Margin	% In	State	Margin	% In	State	Margin	% In	State	Margin	% In	State	Margin	% In	
Calif.	D+20	✓	100%	Maine	D+7	✓	100%	Ariz.	R+6	✓	100%	Fla.	R+13	✓	100%
Colo.	D+11	✓	100%	Minn.	D+4	✓	100%	Ga.	R+2	✓	100%	Iowa	R+13	✓	100%
Conn.	D+15	✓	100%	Neb. 2	D+5	✓	100%	Mich.	R+1.4	✓	100%	Maine 2	R+10	✓	100%
Del.	D+15	✓	100%	N.H.	D+3	✓	100%	Nev.	R+3	✓	100%	Texas	R+14	✓	100%
Hawaii	D+23	✓	100%	N.M.	D+6	✓	100%	N.C.	R+3	✓	100%				
Ill.	D+11	✓	100%	Va.	D+6	✓	100%	Pa.	R+1.7	✓	100%				
Maine 1	D+22	✓	100%					Wis.	R+0.86	✓	100%				
Md.	D+29	✓	100%												
Mass.	D+25	✓	100%												
N.J.	D+6	✓	100%												
N.Y.	D+13	✓	100%												
Ore.	D+14	✓	100%												
R.I.	D+14	✓	100%												
	D+32	✓	100%												
	D+18	✓	100%												
	D+86	✓	100%												

 Who's winning my state?

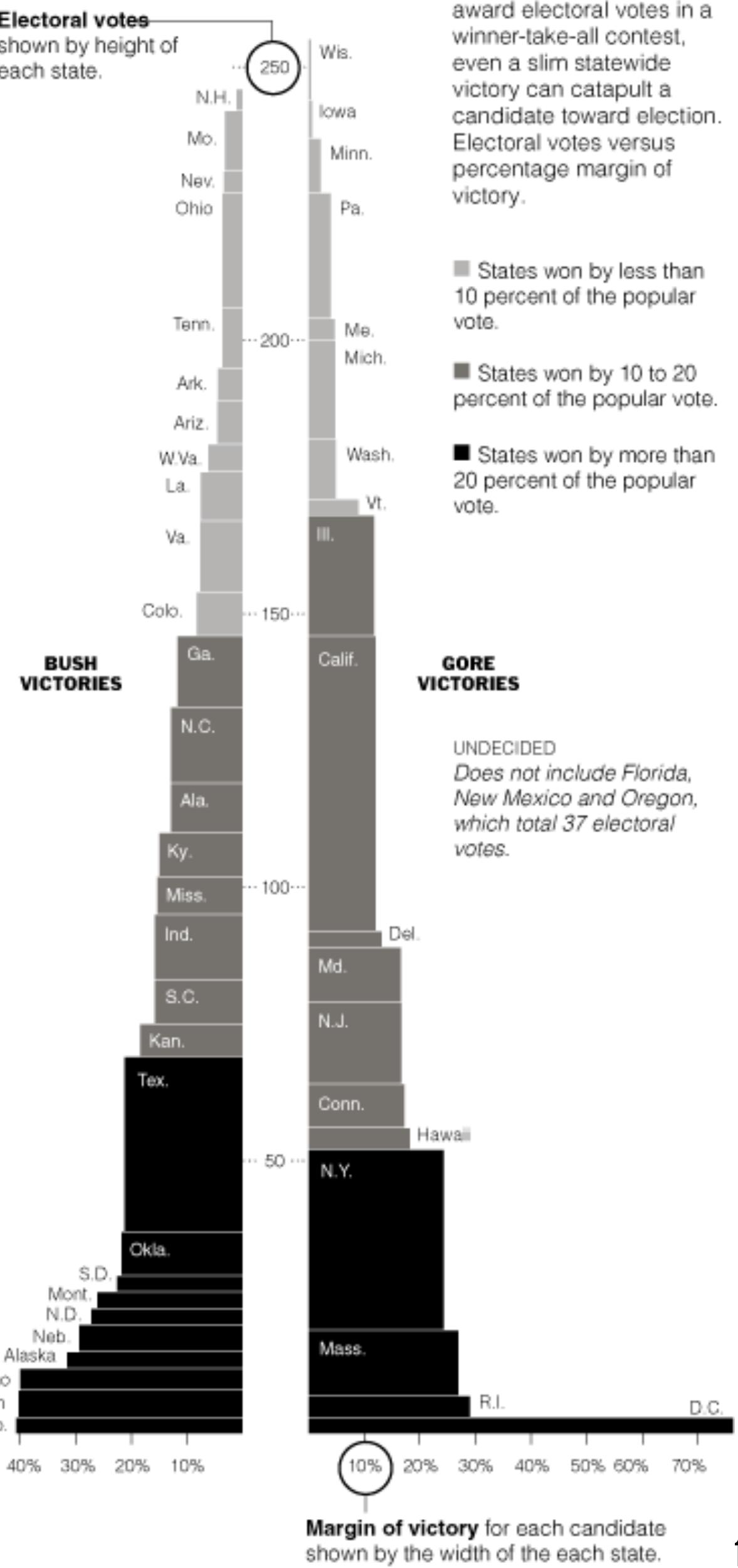
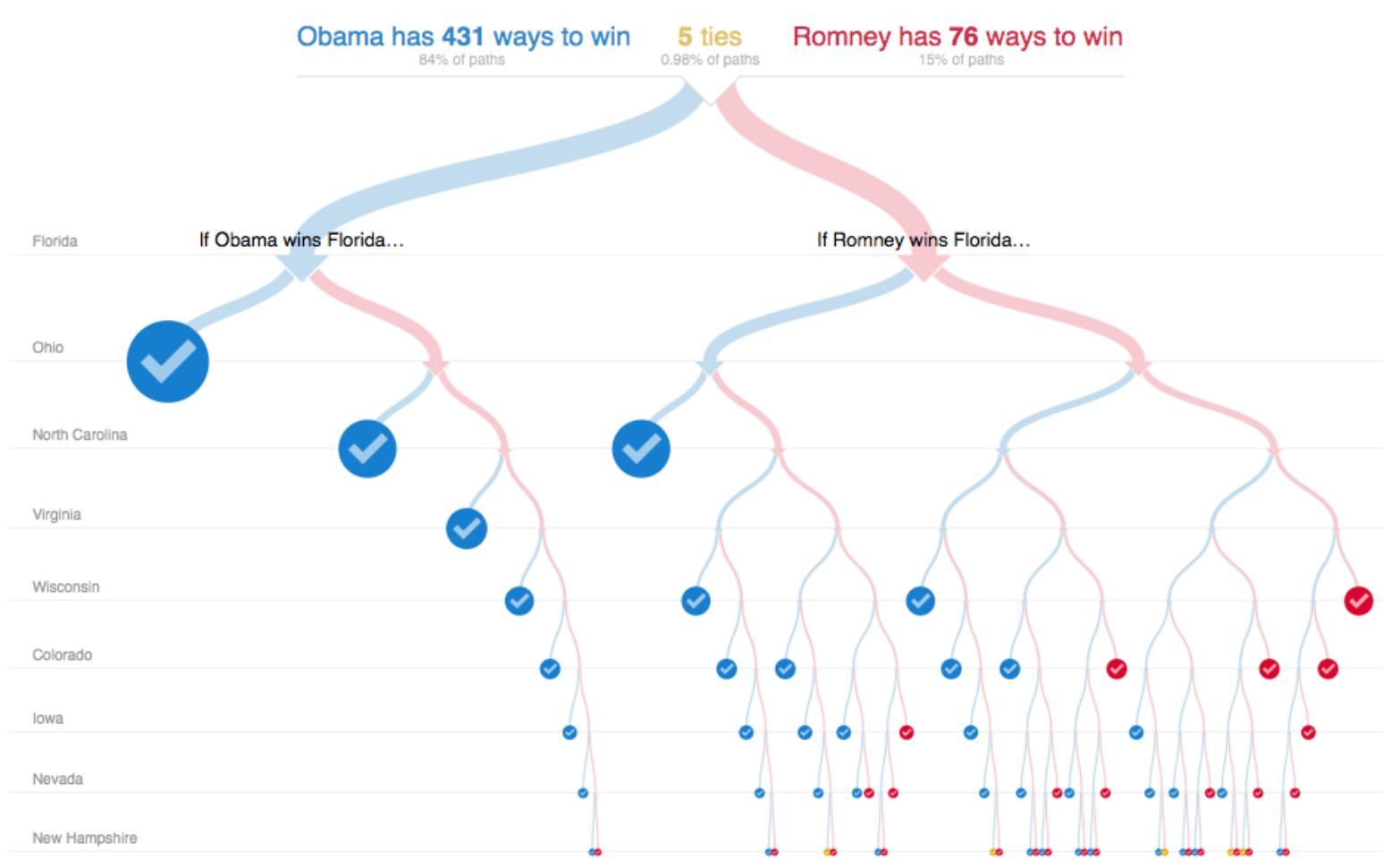
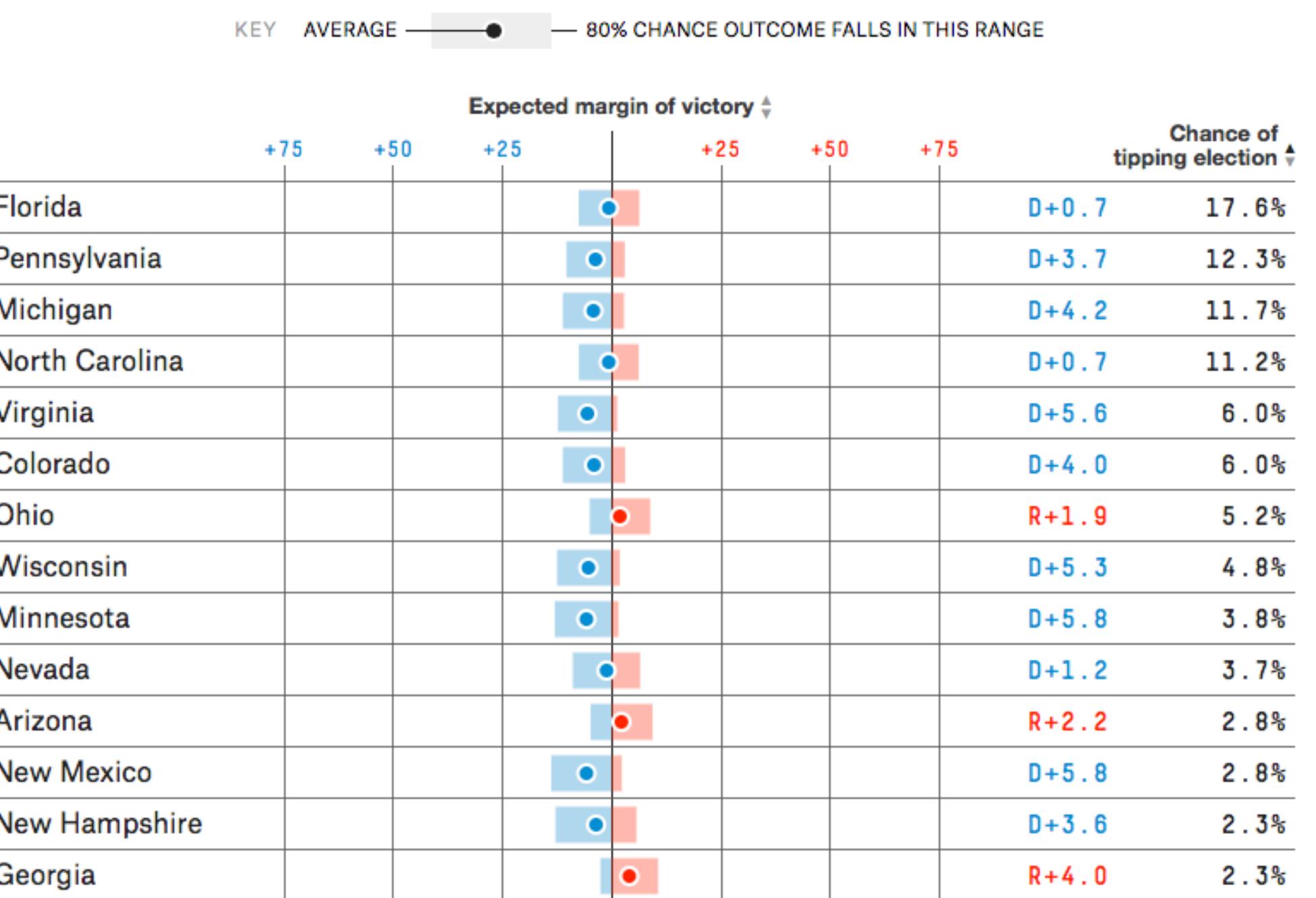
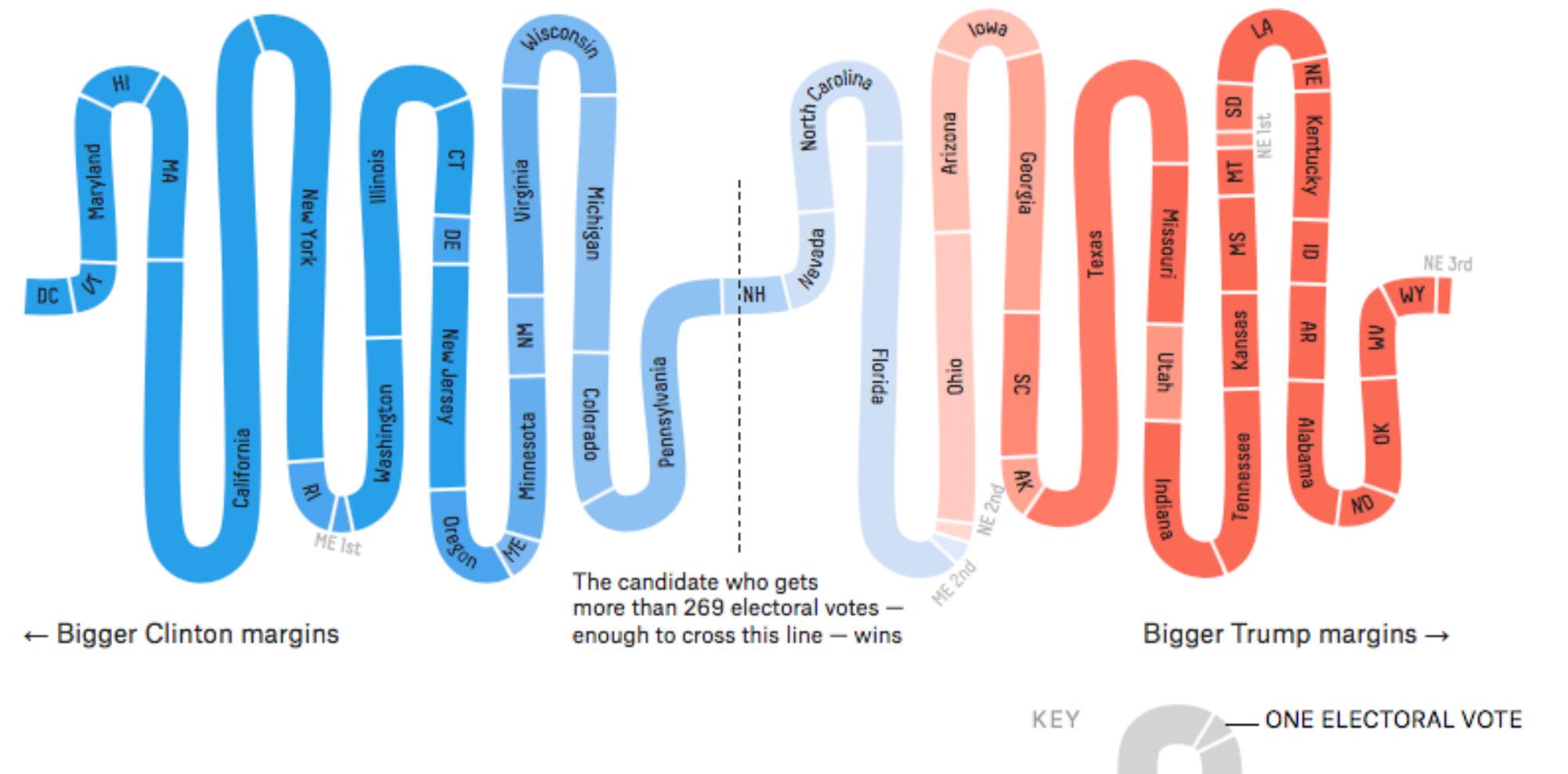
 Is it a landslide?

 What are the paths to victory?

Building An Electoral Victory

270 electoral votes are needed to win the election.

270



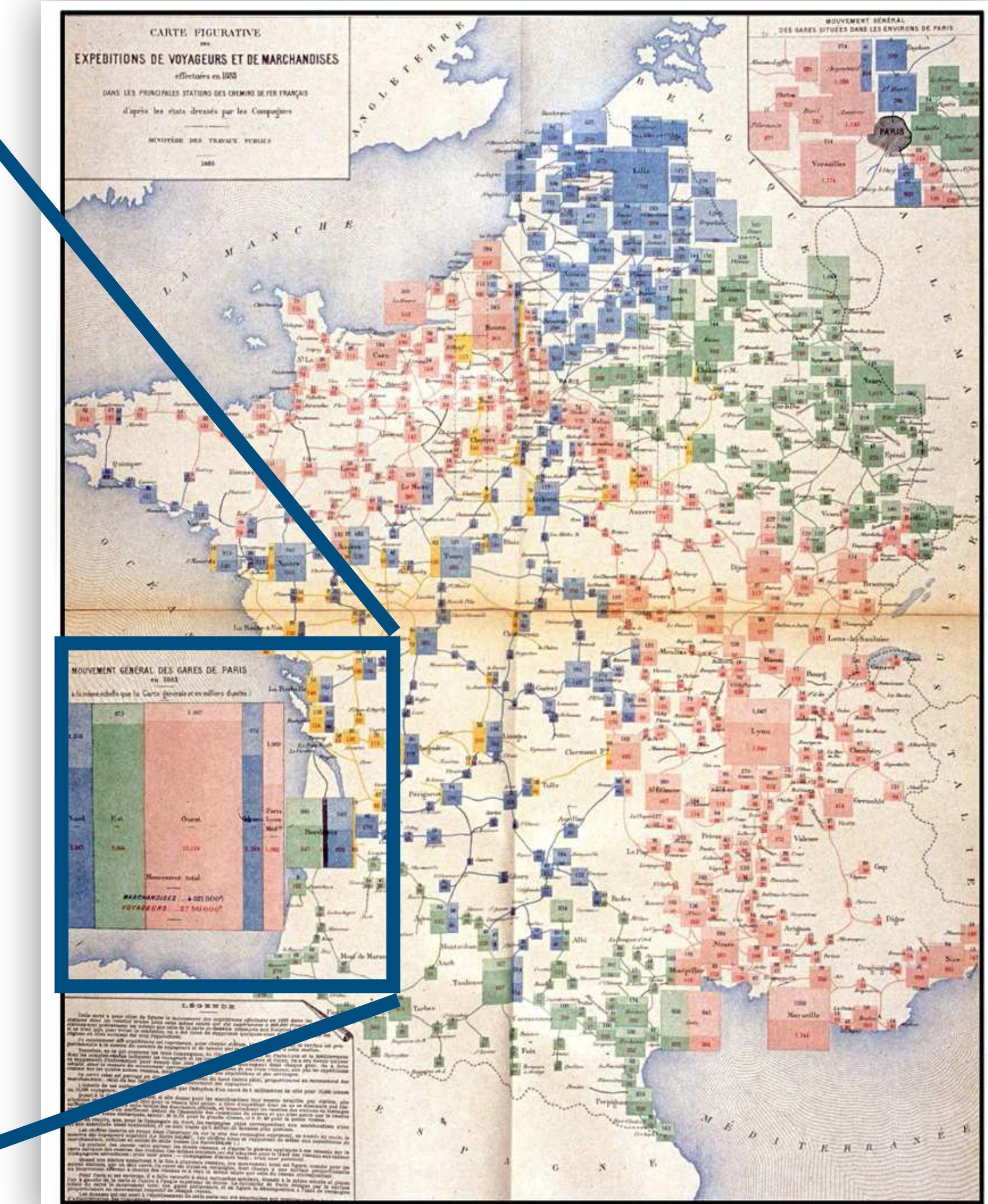
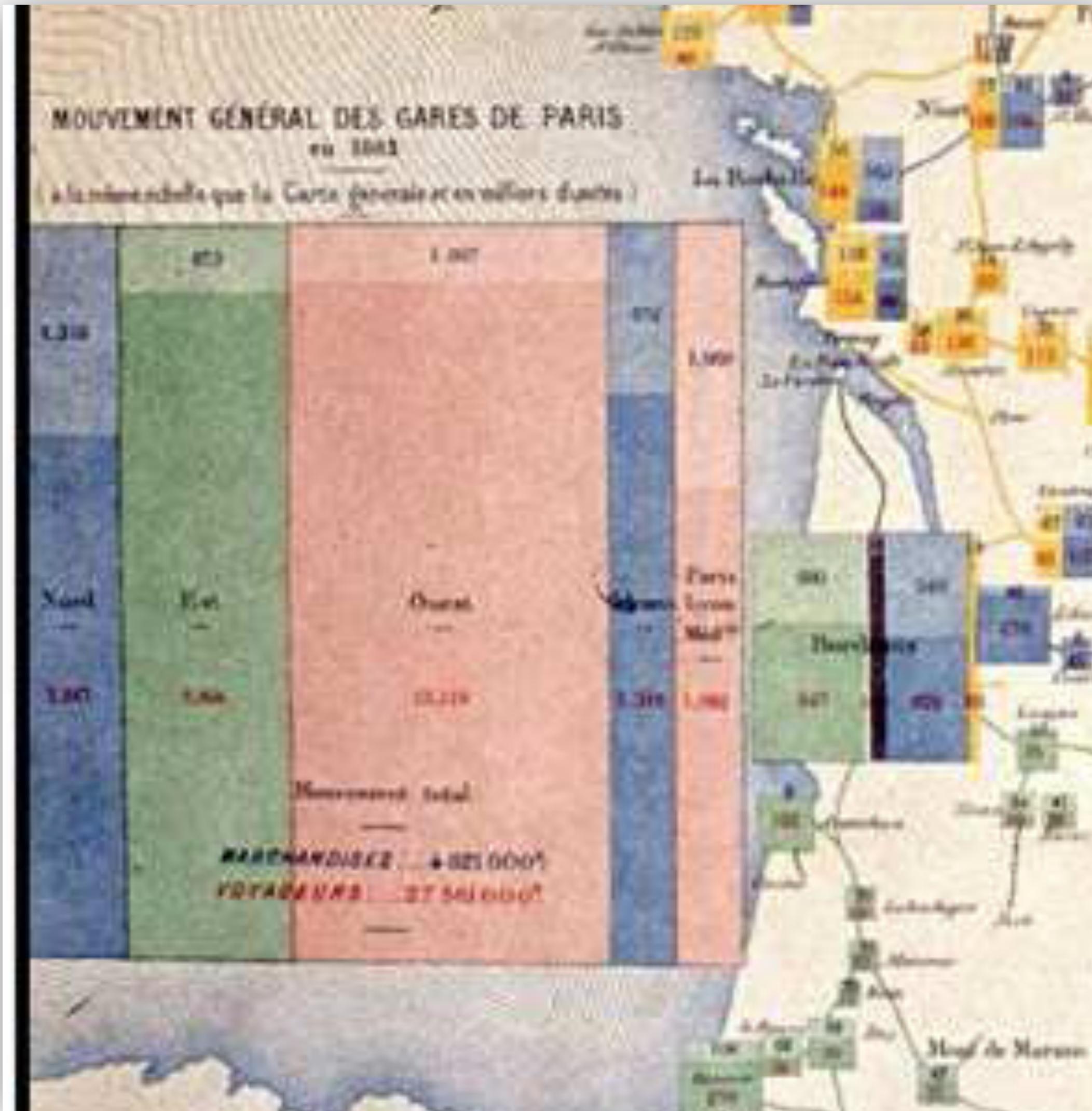
Cartography

(Map Making)

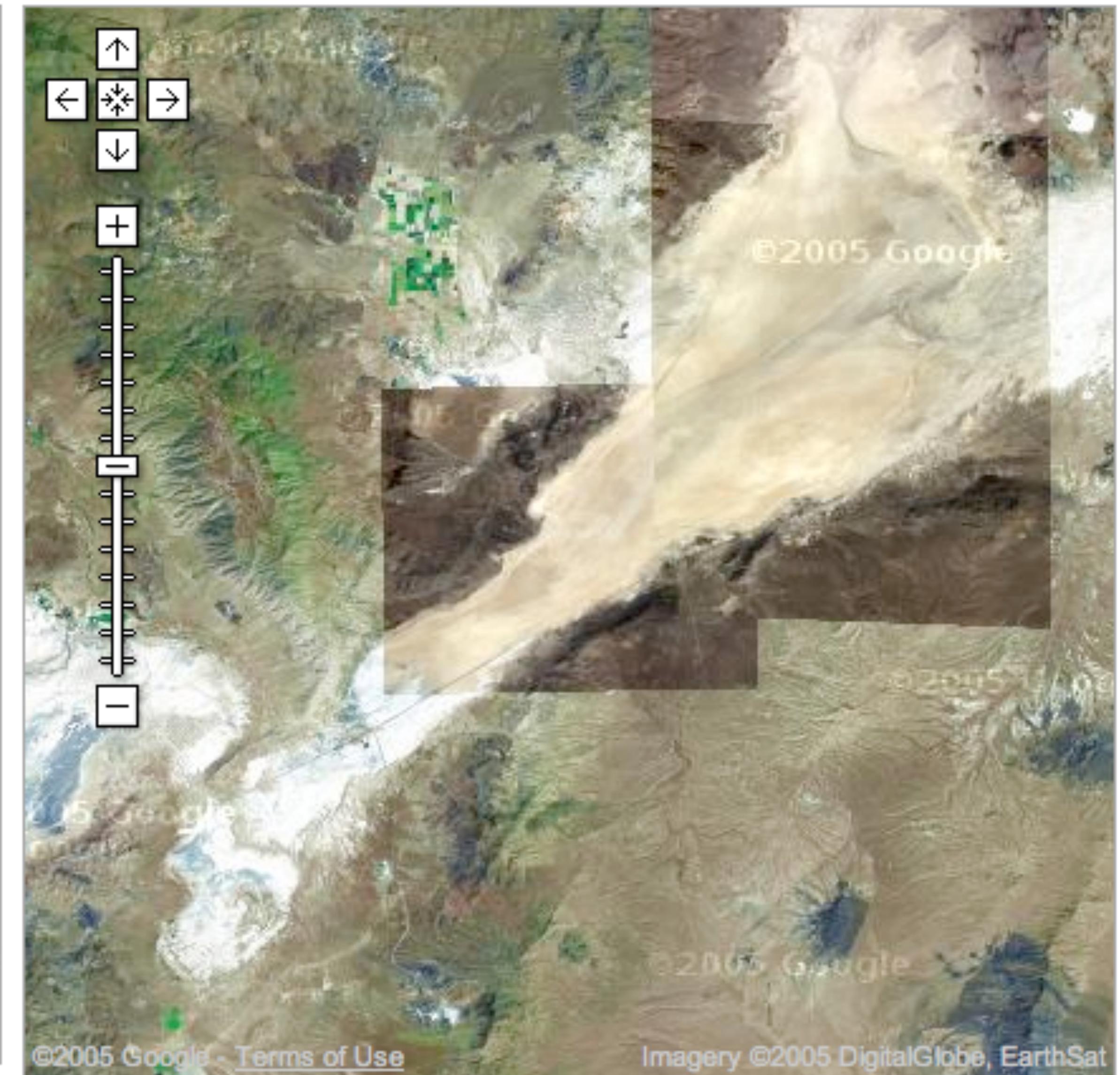
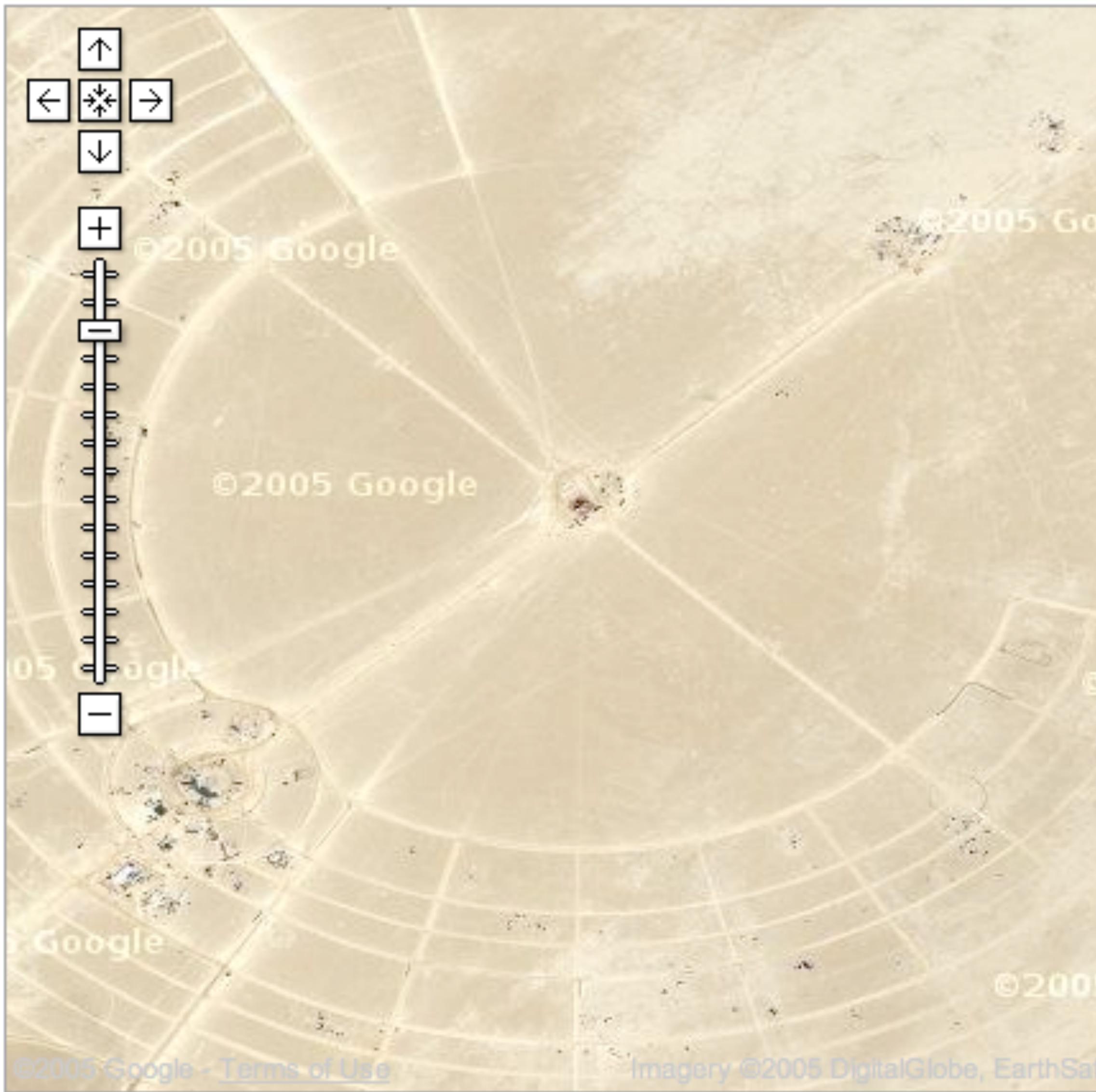
Oldest Known Map: Konya, Turkey (~6200 BC)

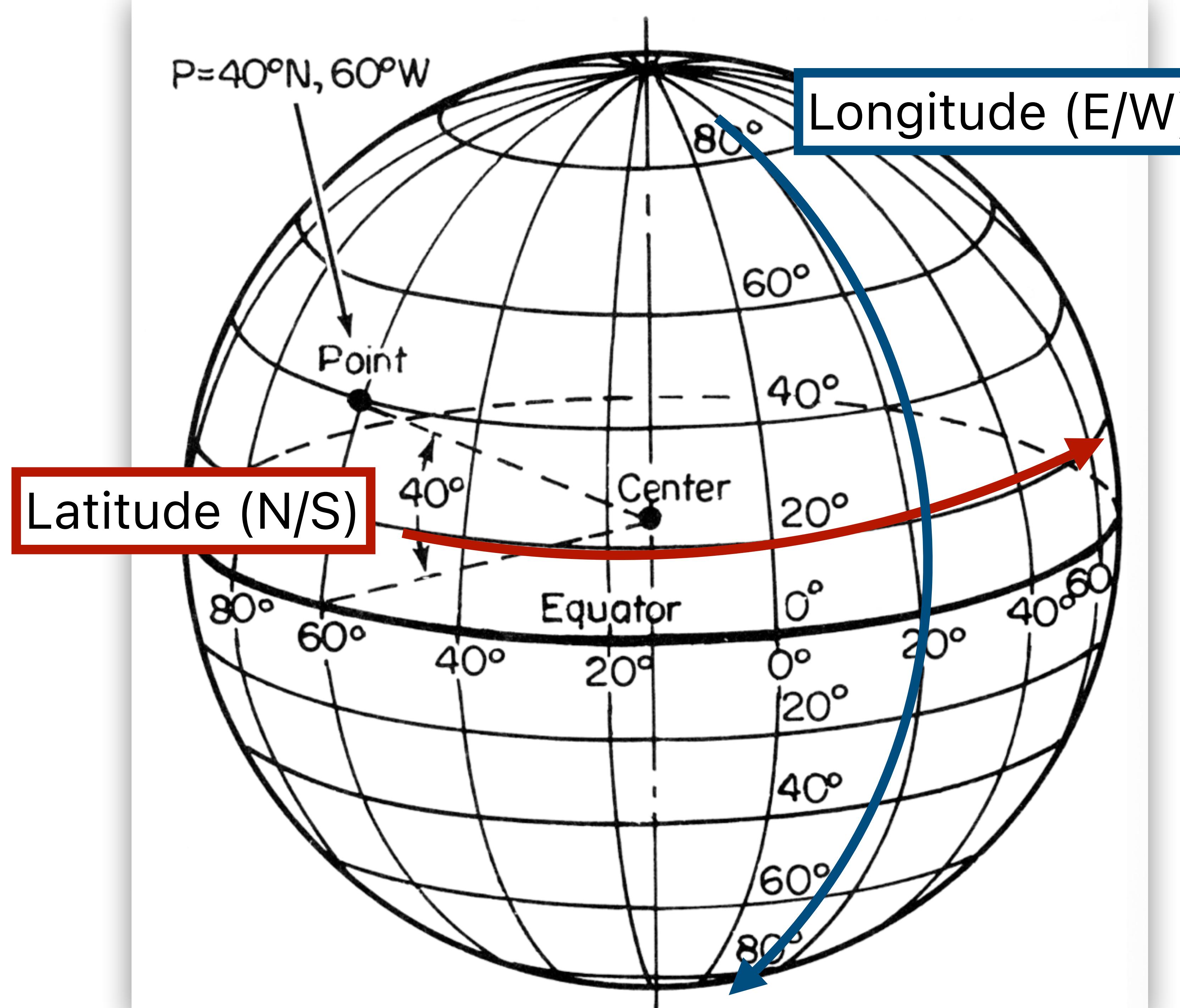


Rail Passengers and Freight from Paris 1884



Google Maps, 2005



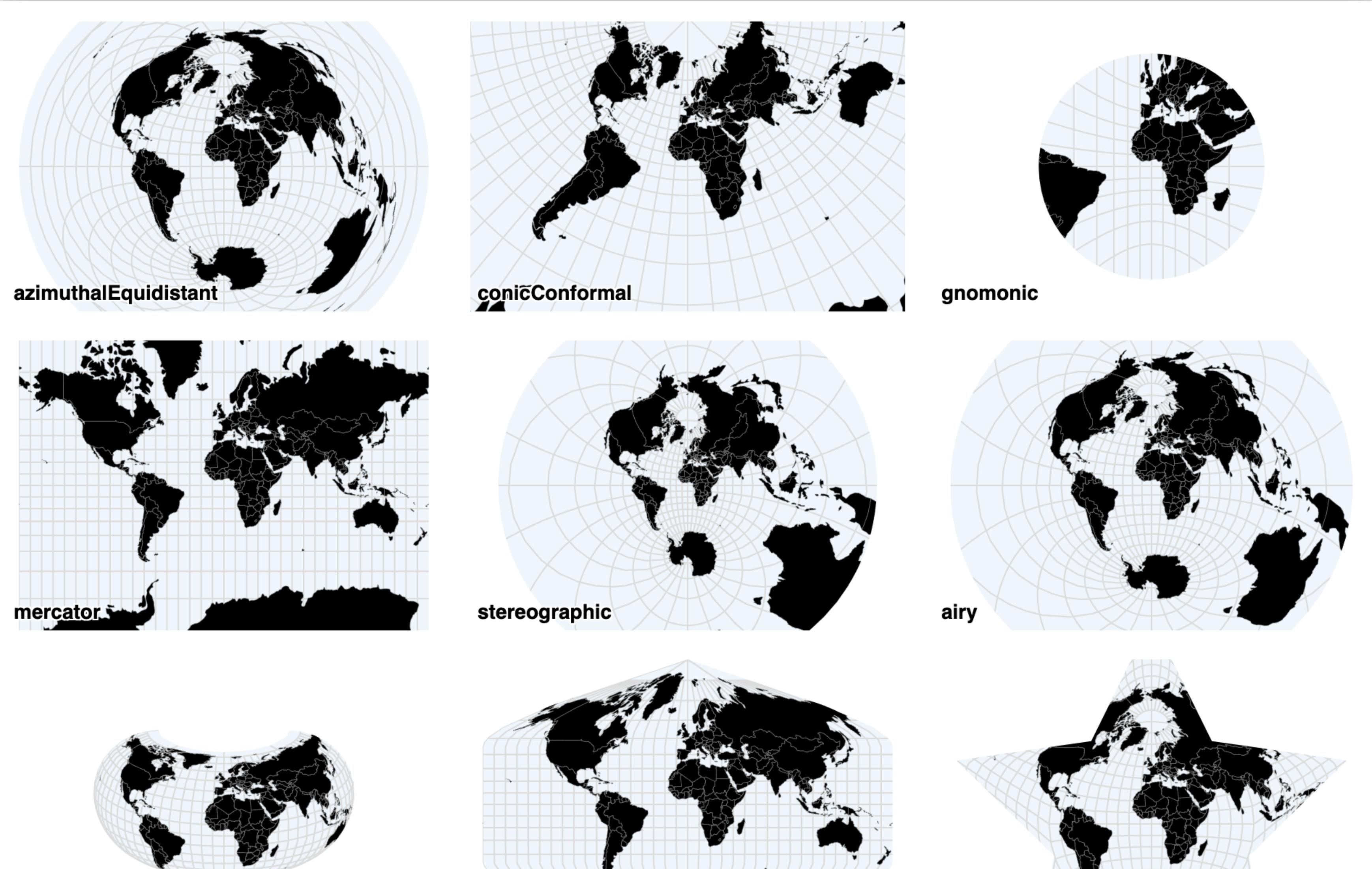


LONGitude lines are
all long (some latitude
lines are quite short!)



A sphere tears
when you flatten it

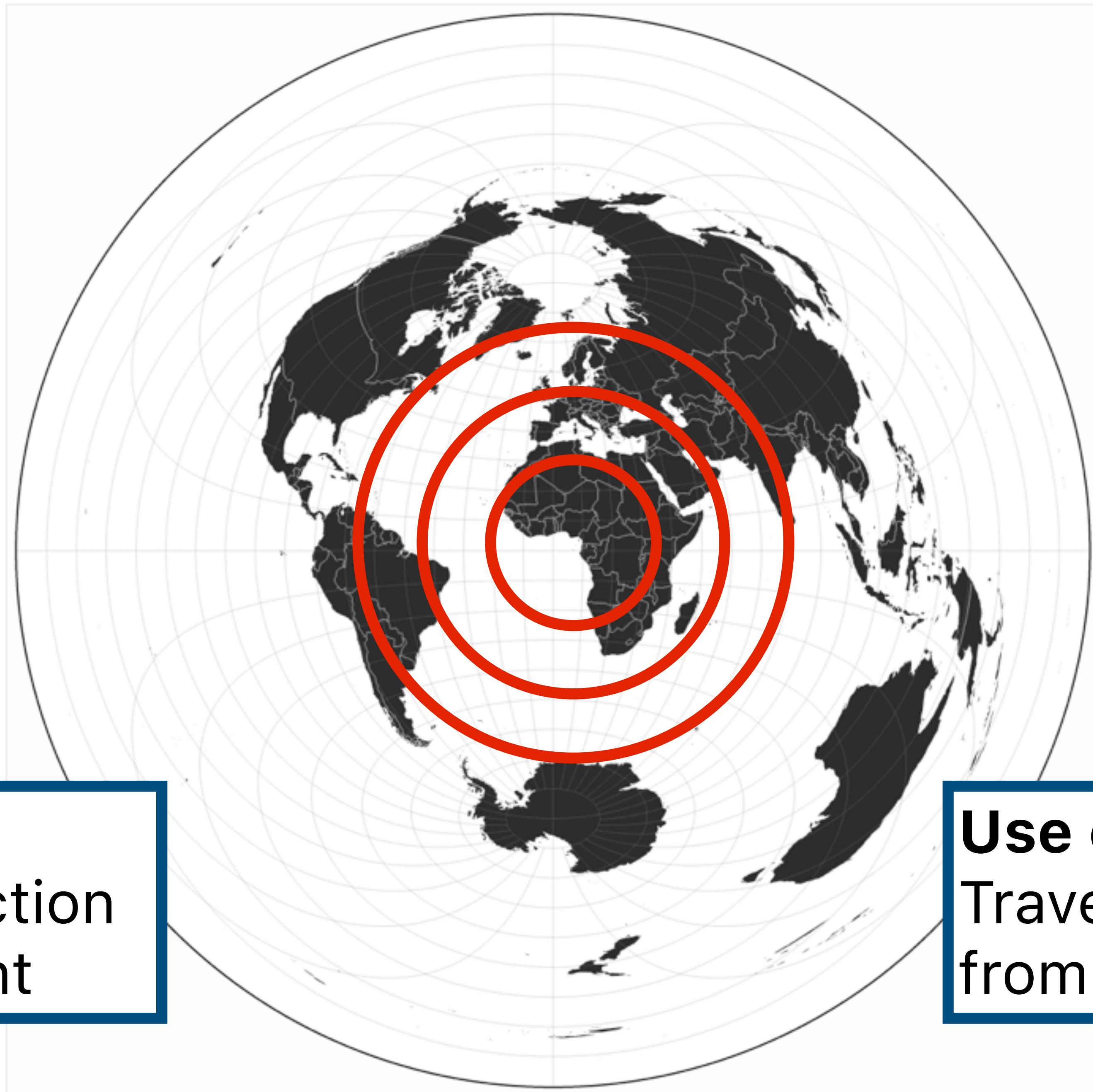
Exploring Projections



<https://vega.github.io/vega/examples/projections/>

**Projections preserve some
metrics, distort others**

Azimuthal Equidistant



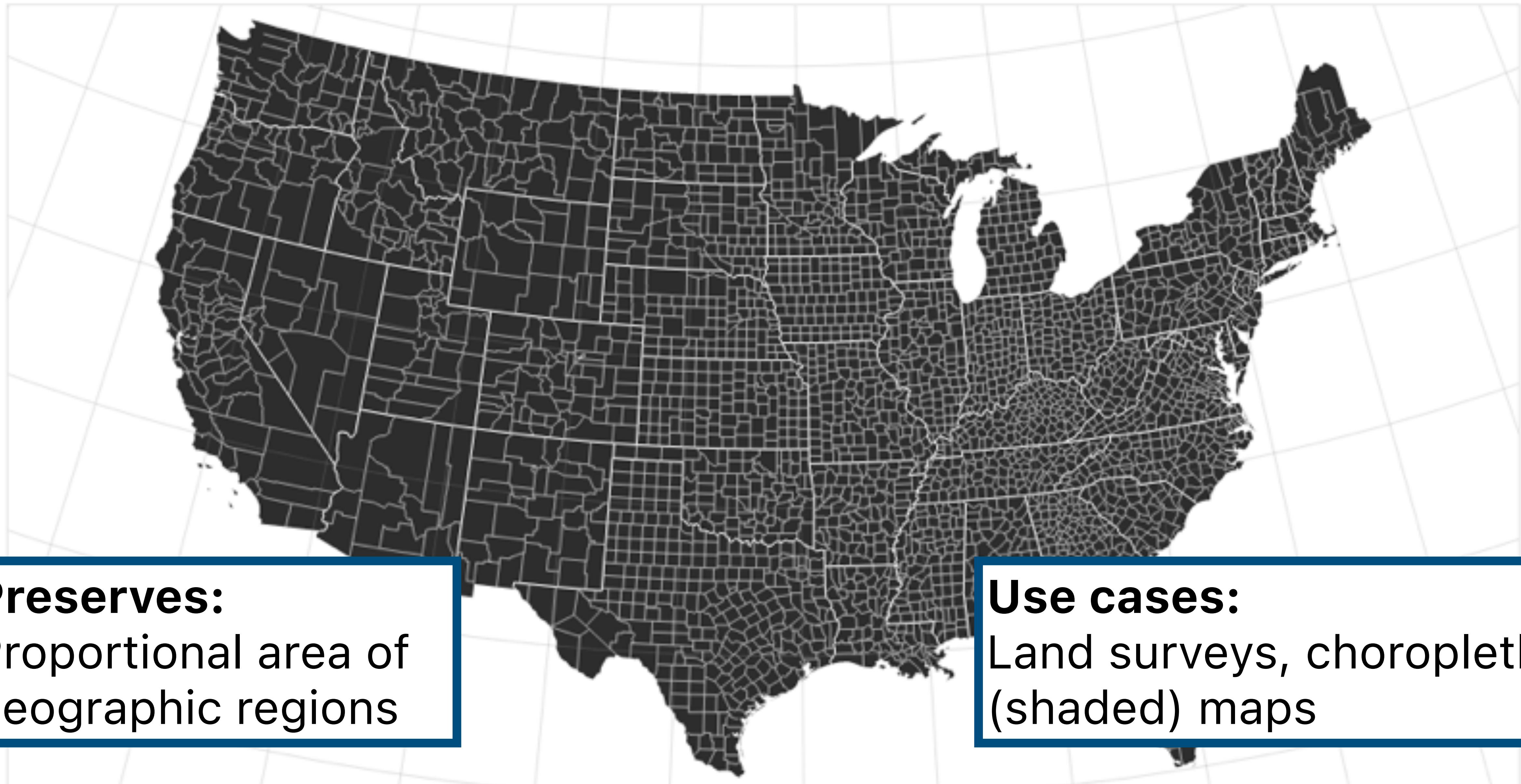
Preserves:

Distance & direction
from center point

Use cases:

Travel / propagation
from center point

Albers Equal-Area Conic



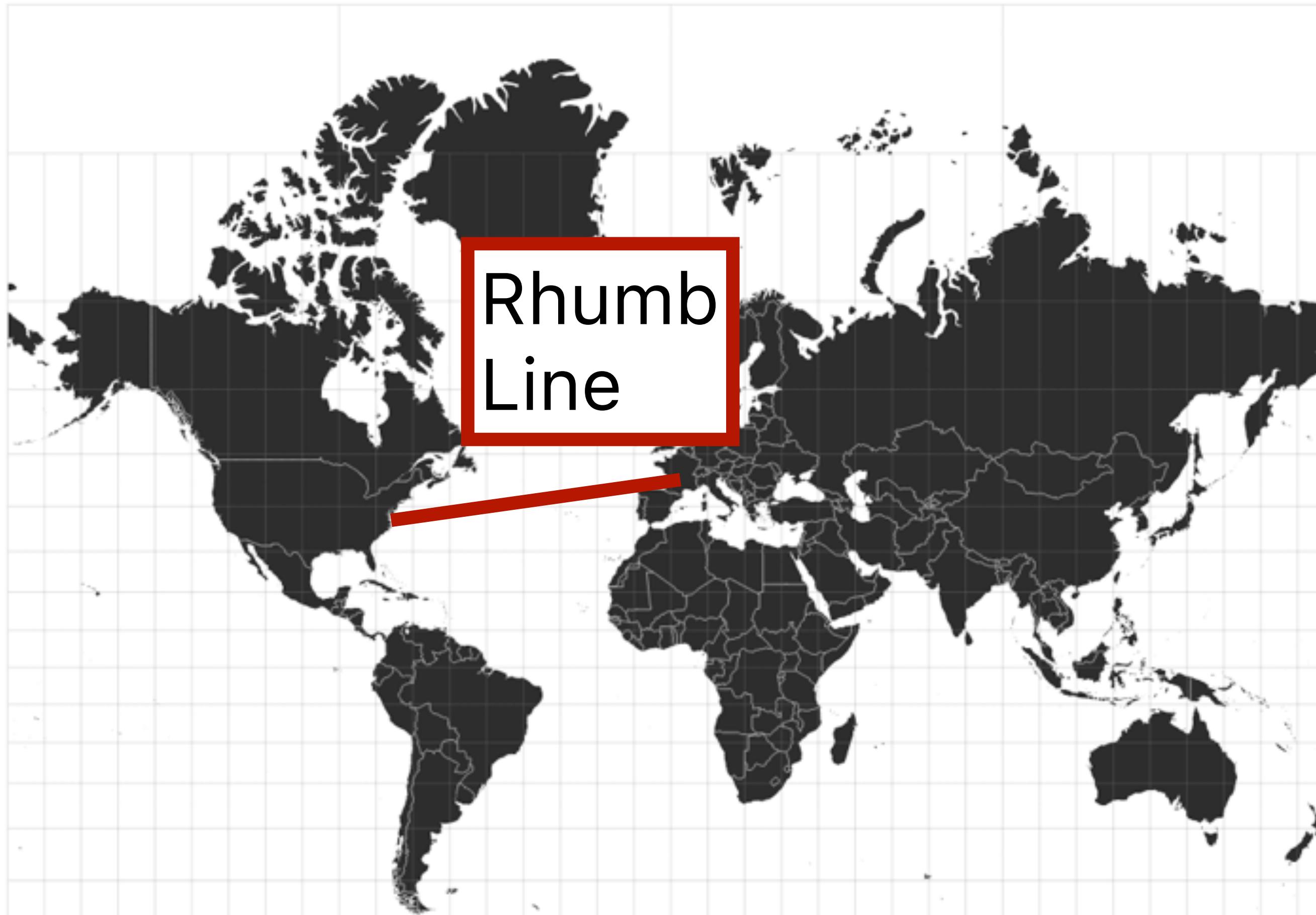
Preserves:

Proportional area of
geographic regions

Use cases:

Land surveys, choropleth
(shaded) maps

Spherical Mercator



Preserves:
Compass bearing as
straight line

Use cases:
Navigation (left / right is
always east / west)



Spherical Mercator

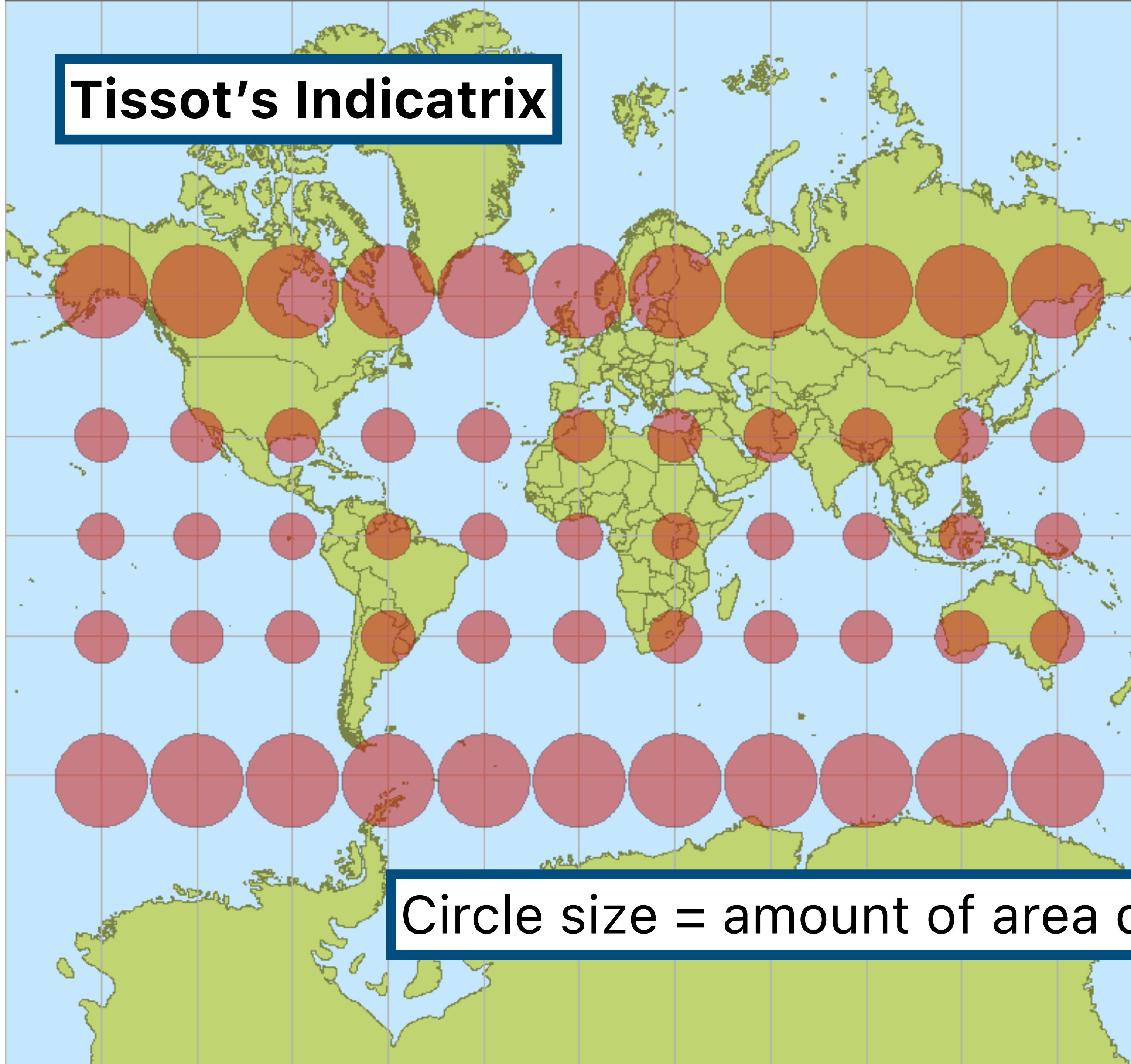


Preserves:
Compass bearing as
straight line

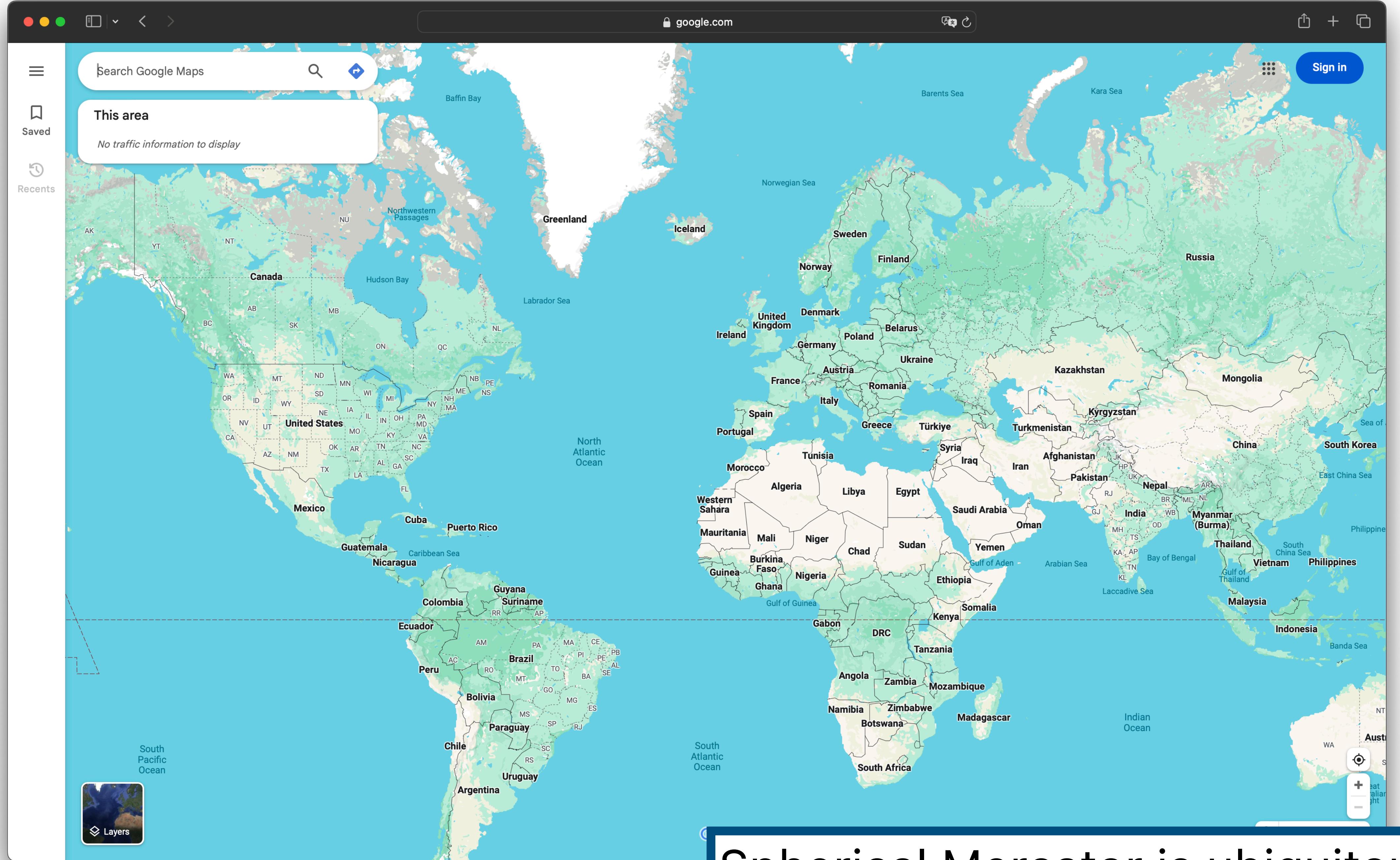


Use cases:
Navigation (left / right is
always east / west)

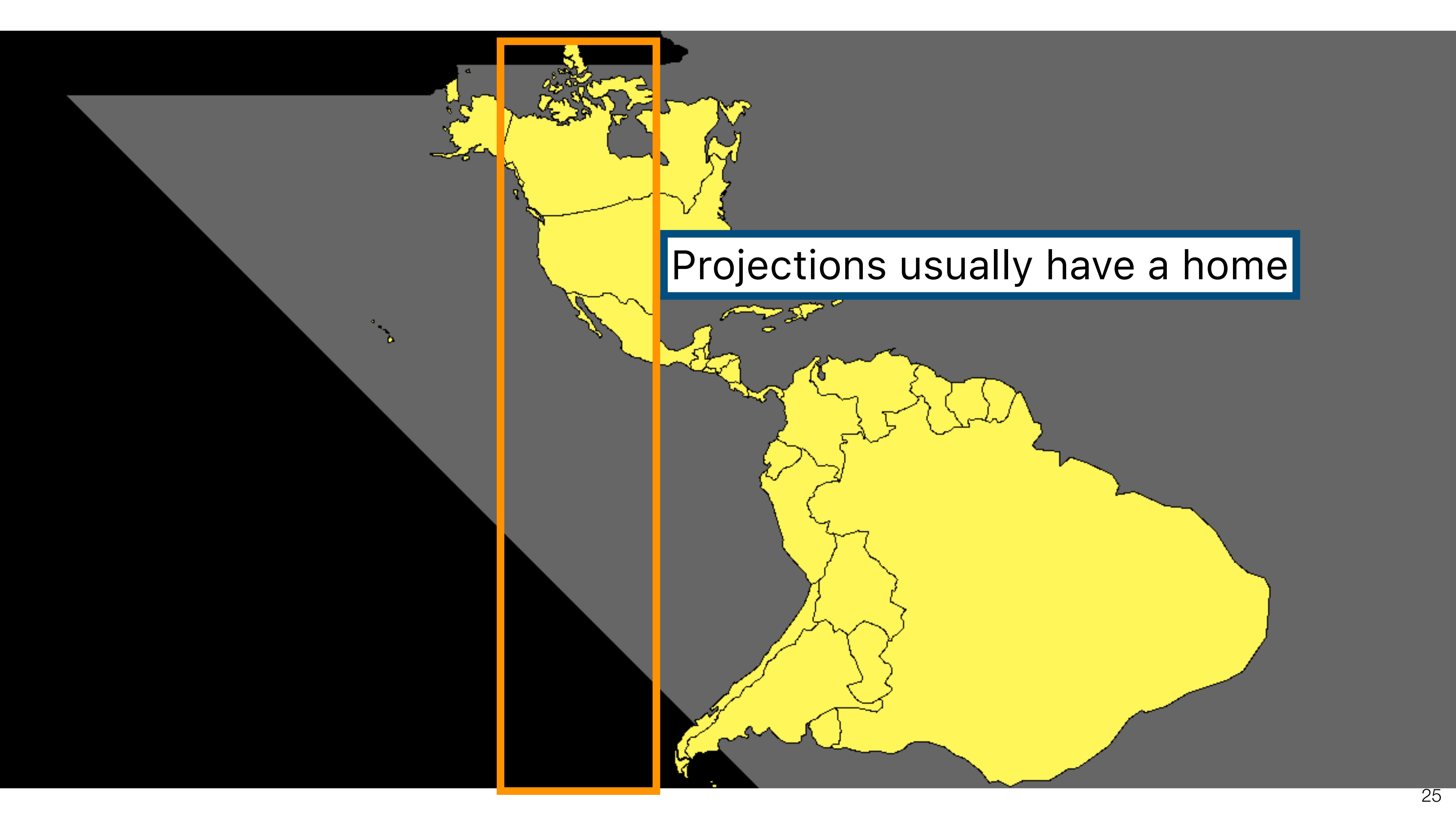
Tissot's Indicatrix



Circle size = amount of area distortion



Spherical Mercator is ubiquitous on web



Projections usually have a home

Increased Border Enforcement, With Varying Results



There are now more agents along the 1,954 mile-long border than ever before...

Border agents per sector.



Satellite Projection, NY Times

Not appropriate for the whole Earth,
but fits the chosen focus region!

WHAT YOUR FAVORITE
MAP PROJECTION
SAYS ABOUT YOU

<http://xkcd.com/977>

MERCATOR



YOU'RE NOT REALLY INTO MAPS.

VAN DER GRINTEN



YOU'RE NOT A COMPLICATED PERSON. YOU LOVE THE MERCATOR PROJECTION; YOU JUST WISH IT WEREN'T SQUARE. THE EARTH'S NOT A SQUARE, IT'S A CIRCLE. YOU LIKE CIRCLES. TODAY IS GONNA BE A GOOD DAY!

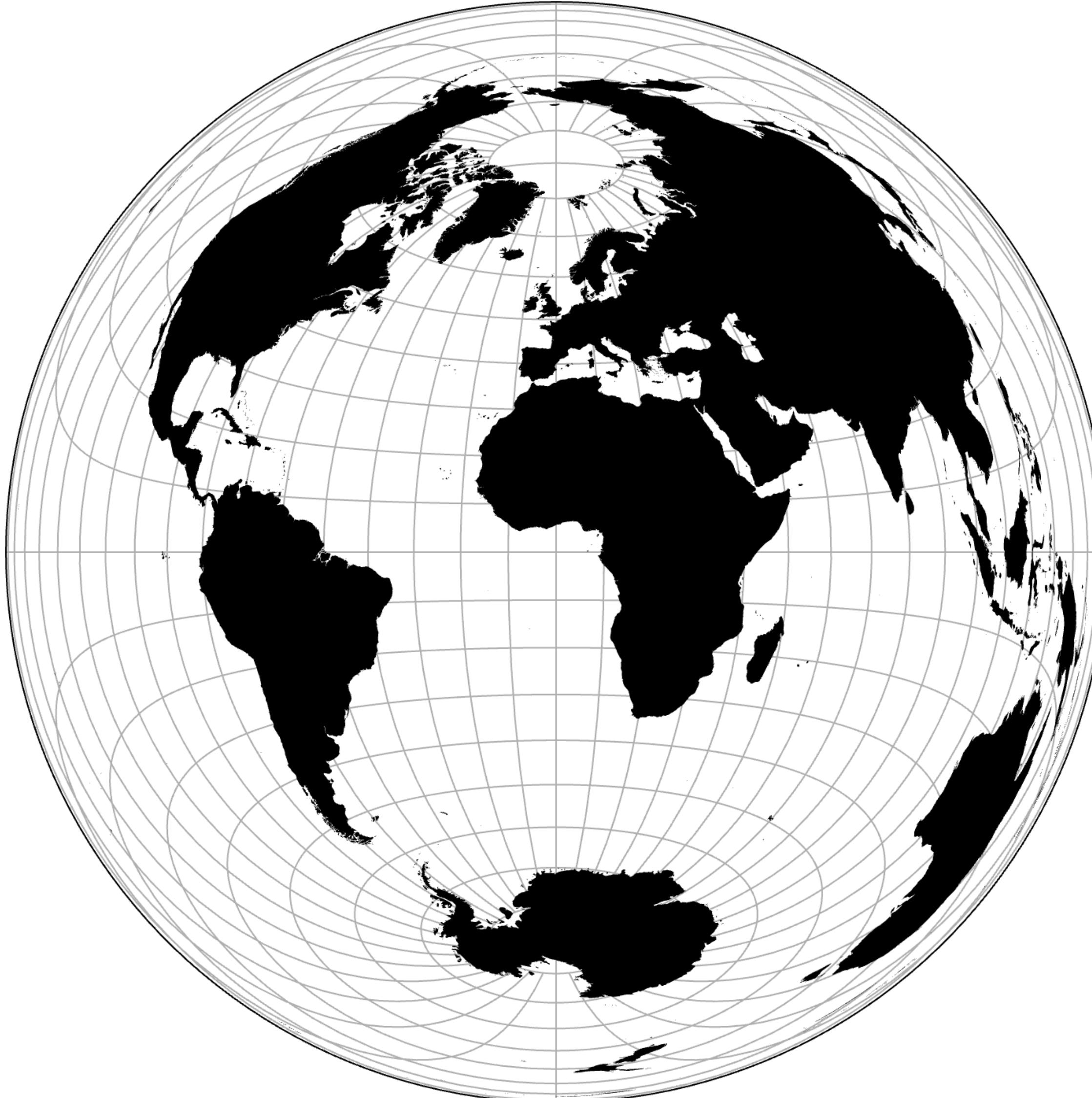


There are many interesting ways to tear spheres...

Projection comparison

Choose a projection below to view.

azimuthal equal-area proj



<https://bit.ly/d3-proj>

Respond with this format:

projection:

pros:

cons:

<tryclassbuzz.com>

Code: **proj**

Mapping (Visualizing Geospatial Data)

How does the data change?

Where
does the
data
occur?

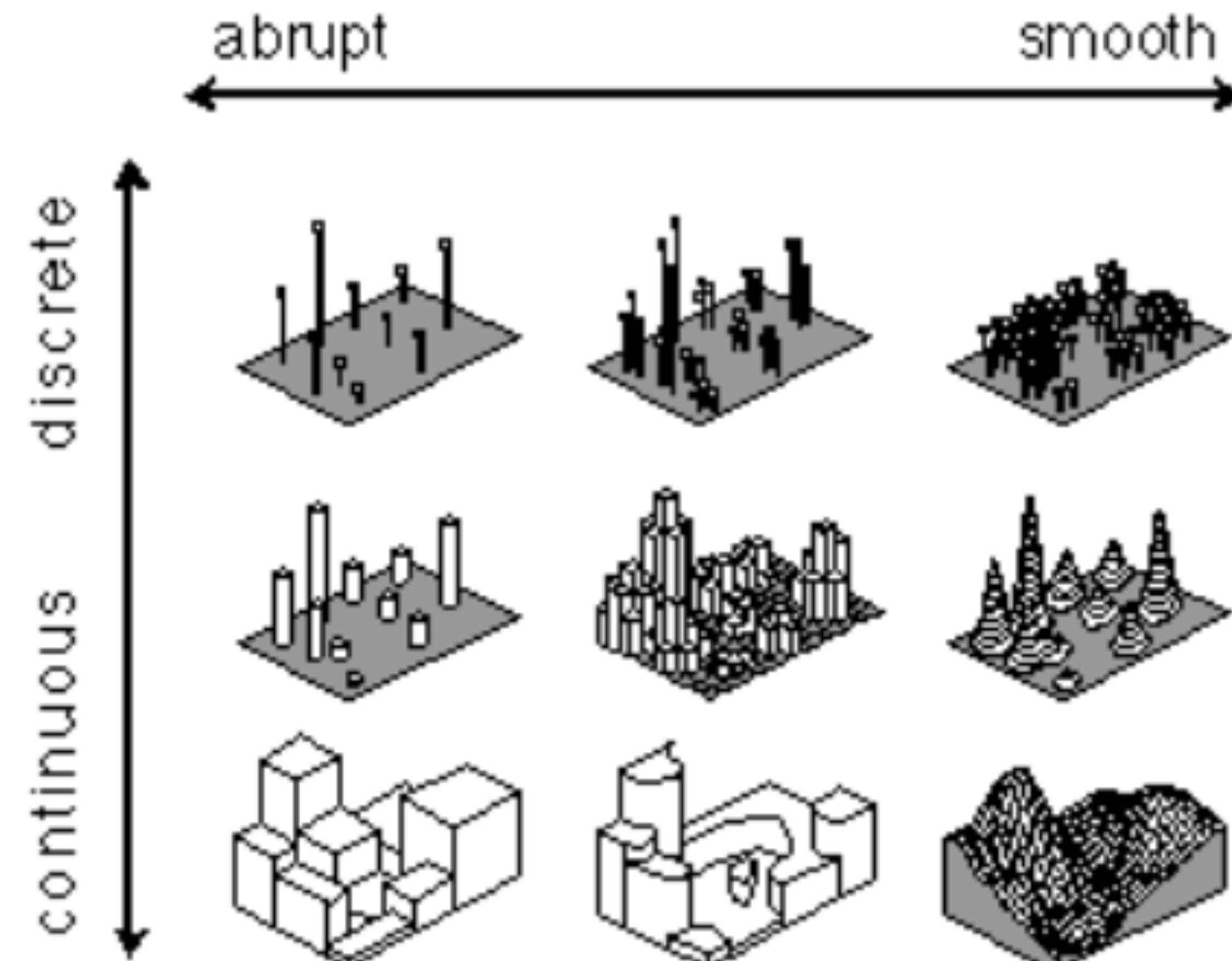


Fig. 8. Data models representing points in the continuity-abruptness phenomena space.

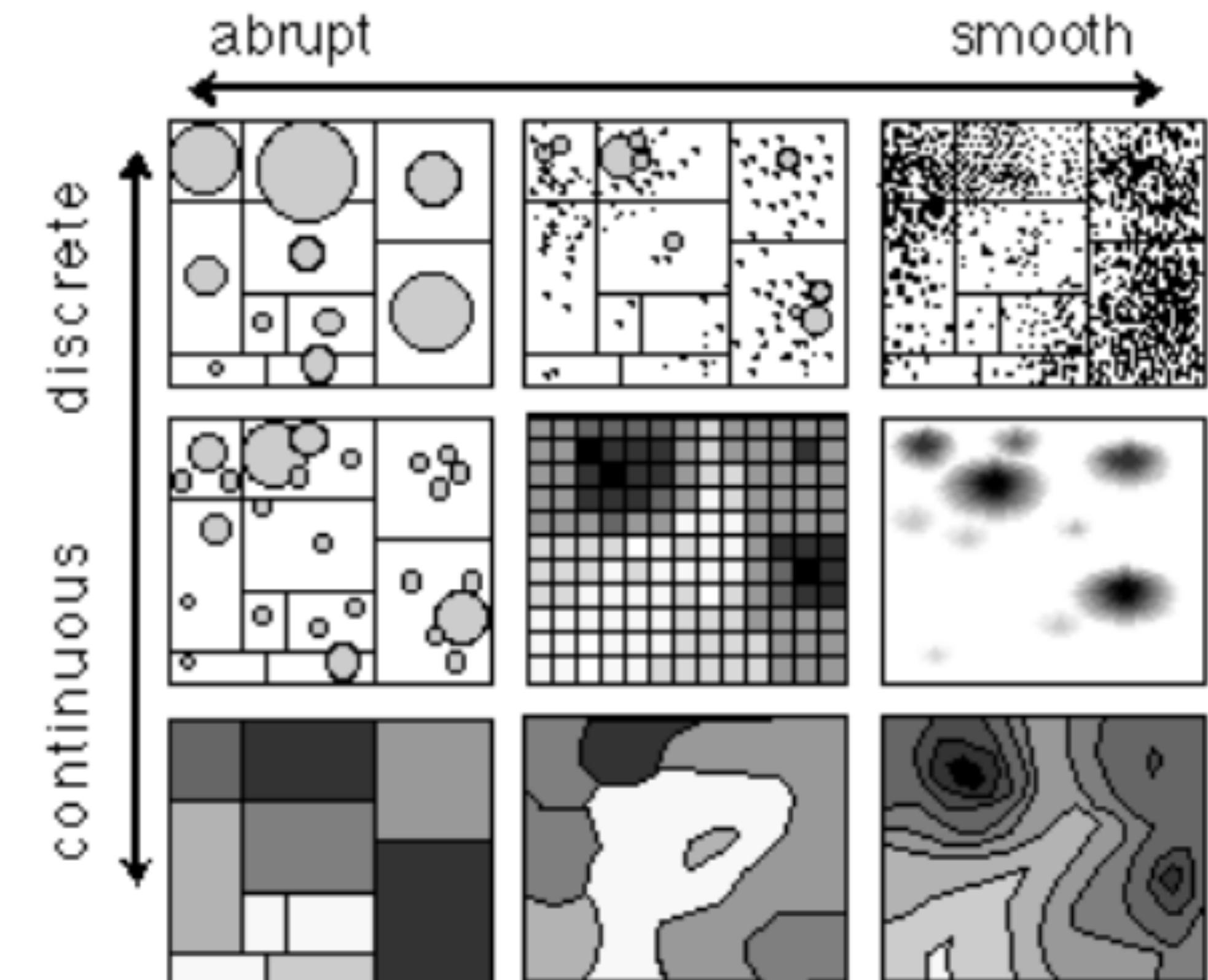


Fig. 9. Possible 2D translations of the 3D data models shown in figure 8.

Dot Distribution Map

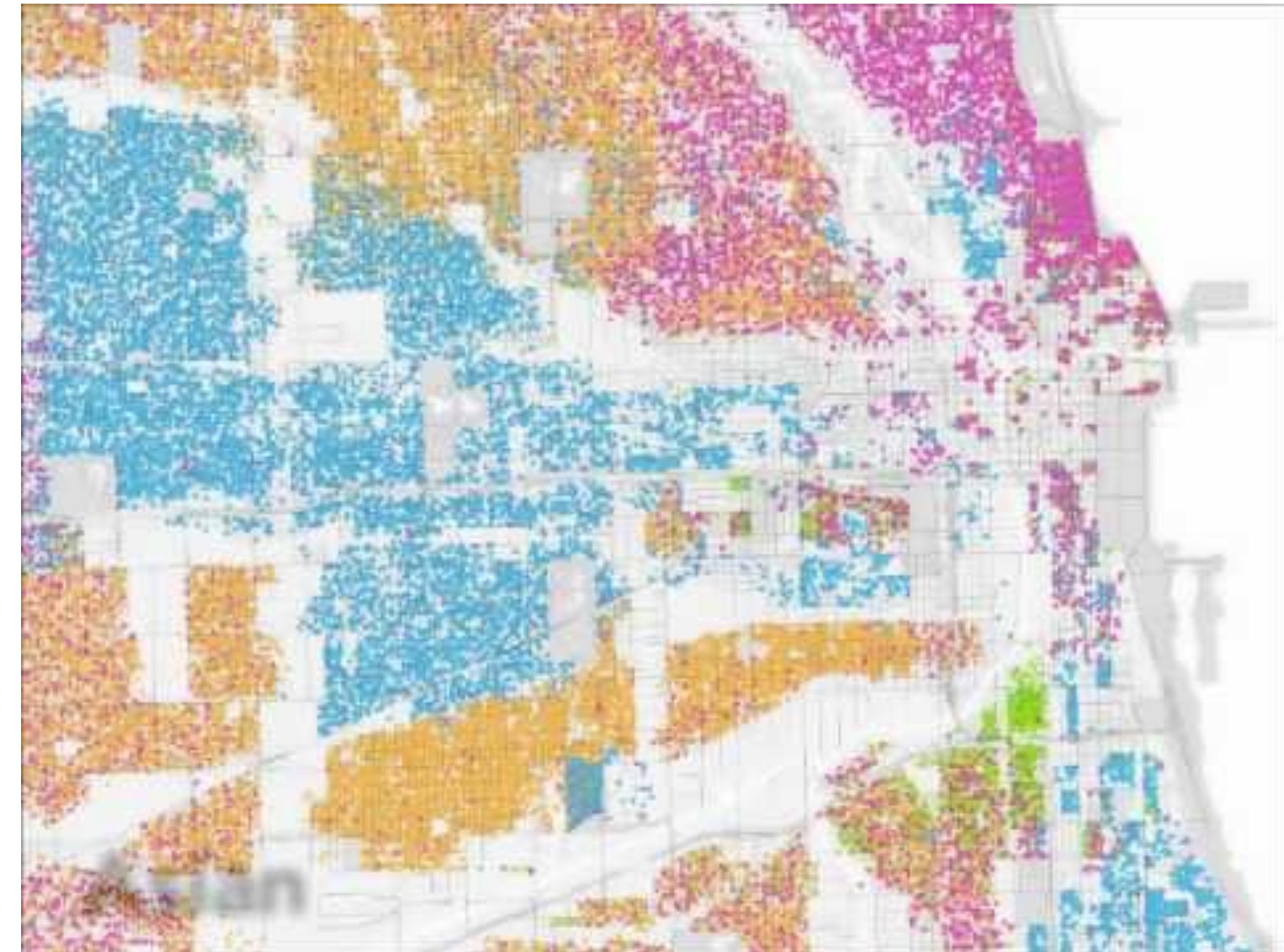
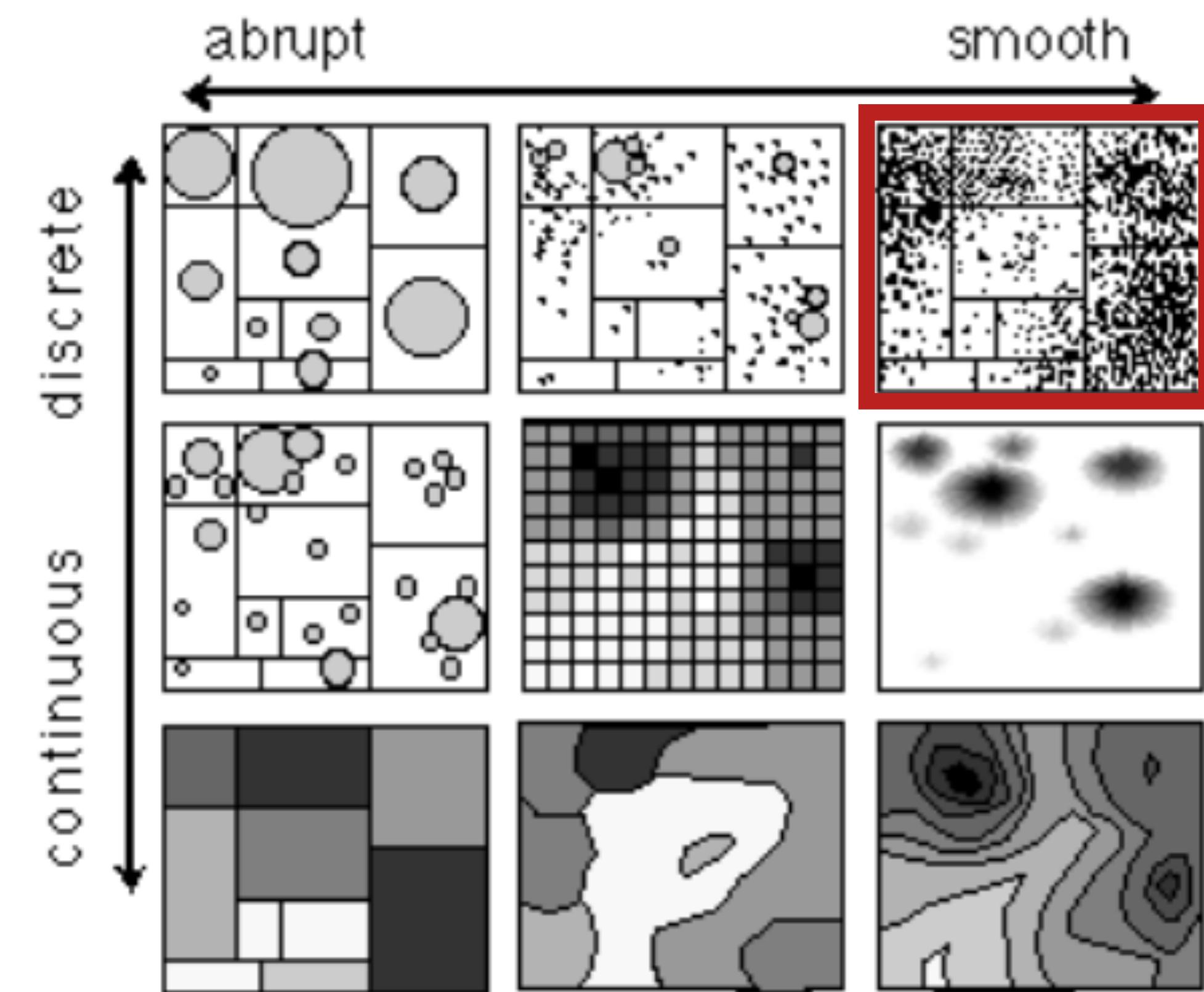


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<https://www.youtube.com/watch?v=8pRcdMVkA3k>

Dot Distribution Map

A TAXONOMY OF TRANSITIONS

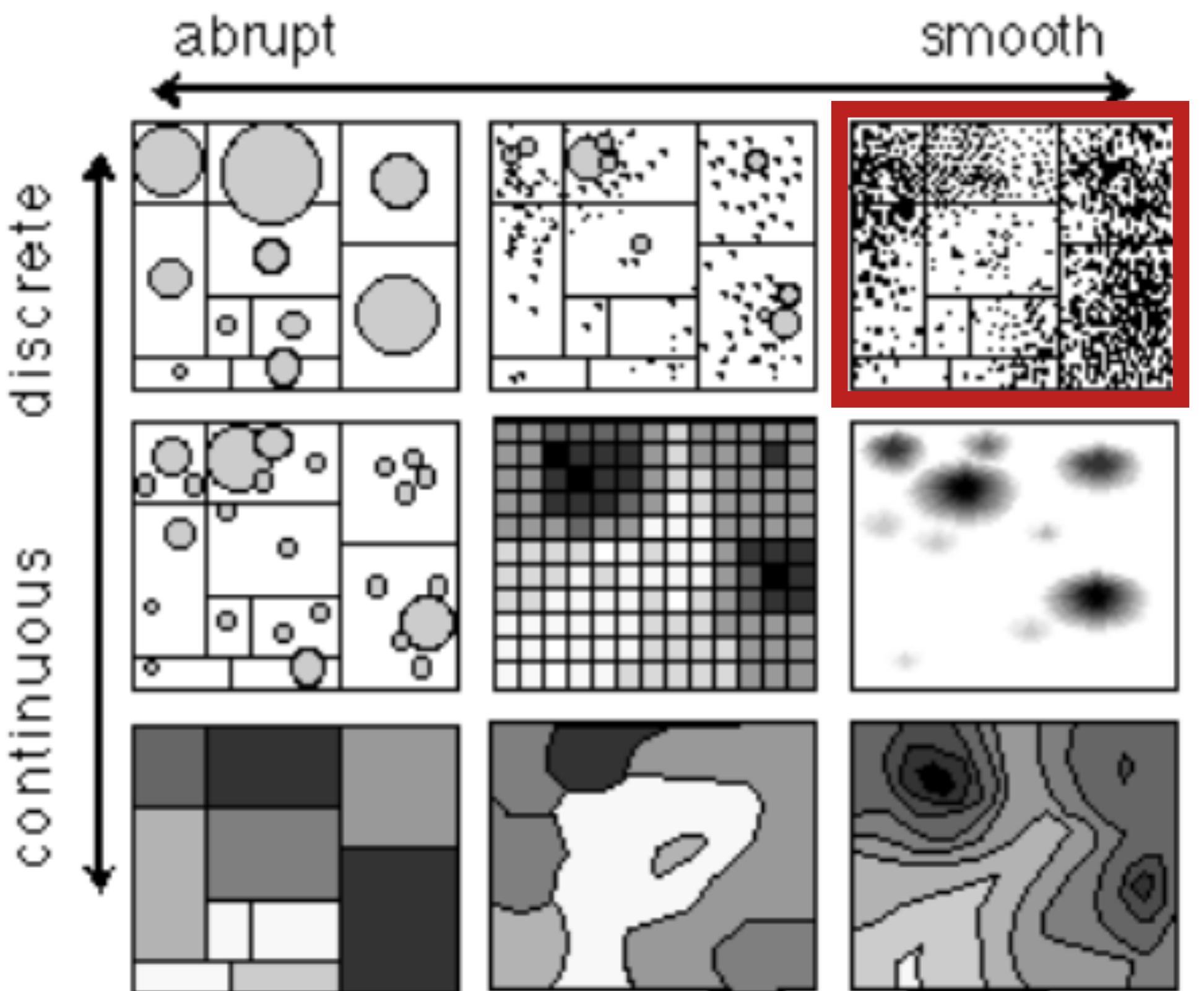
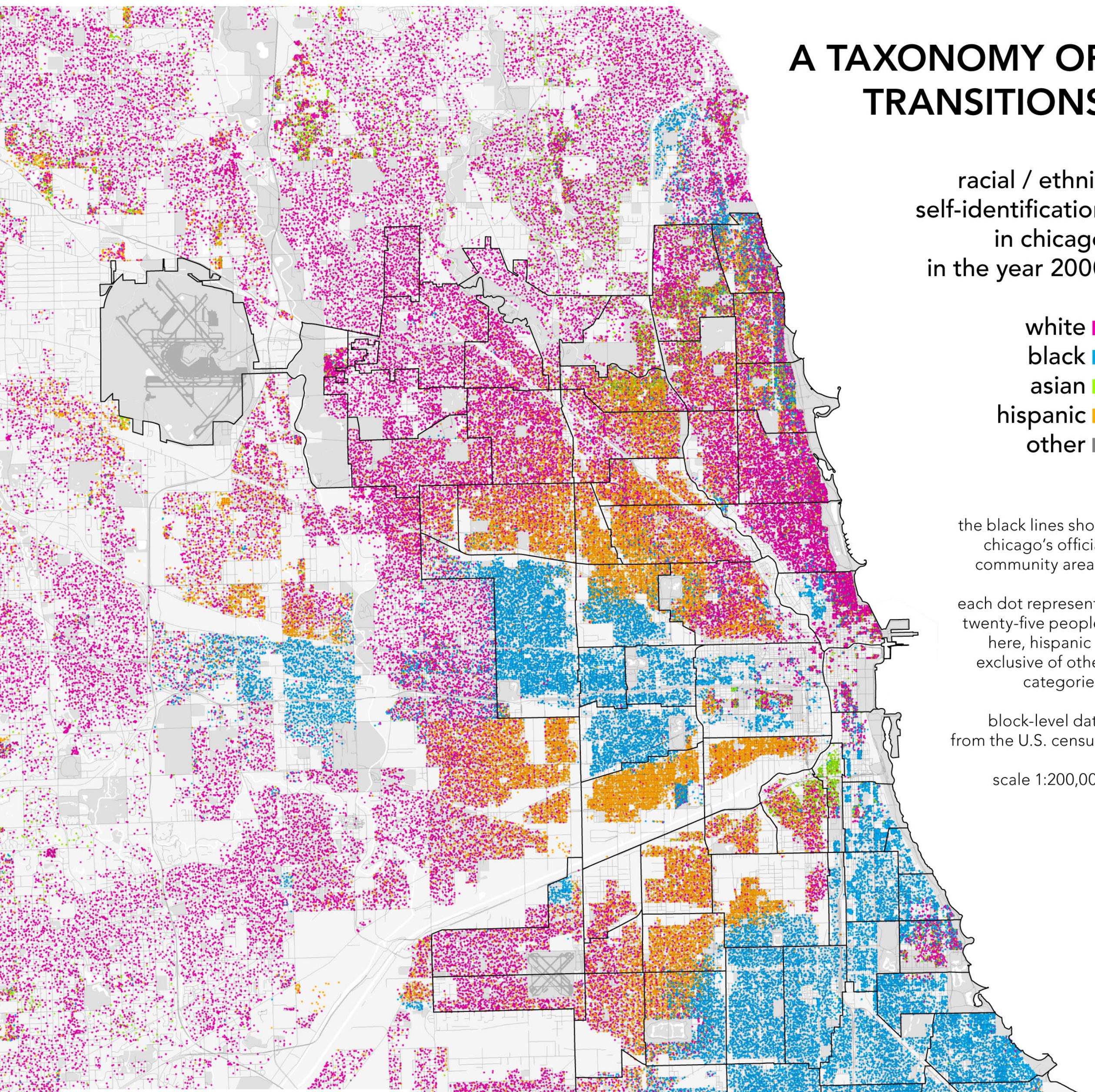


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Dot Distribution Map

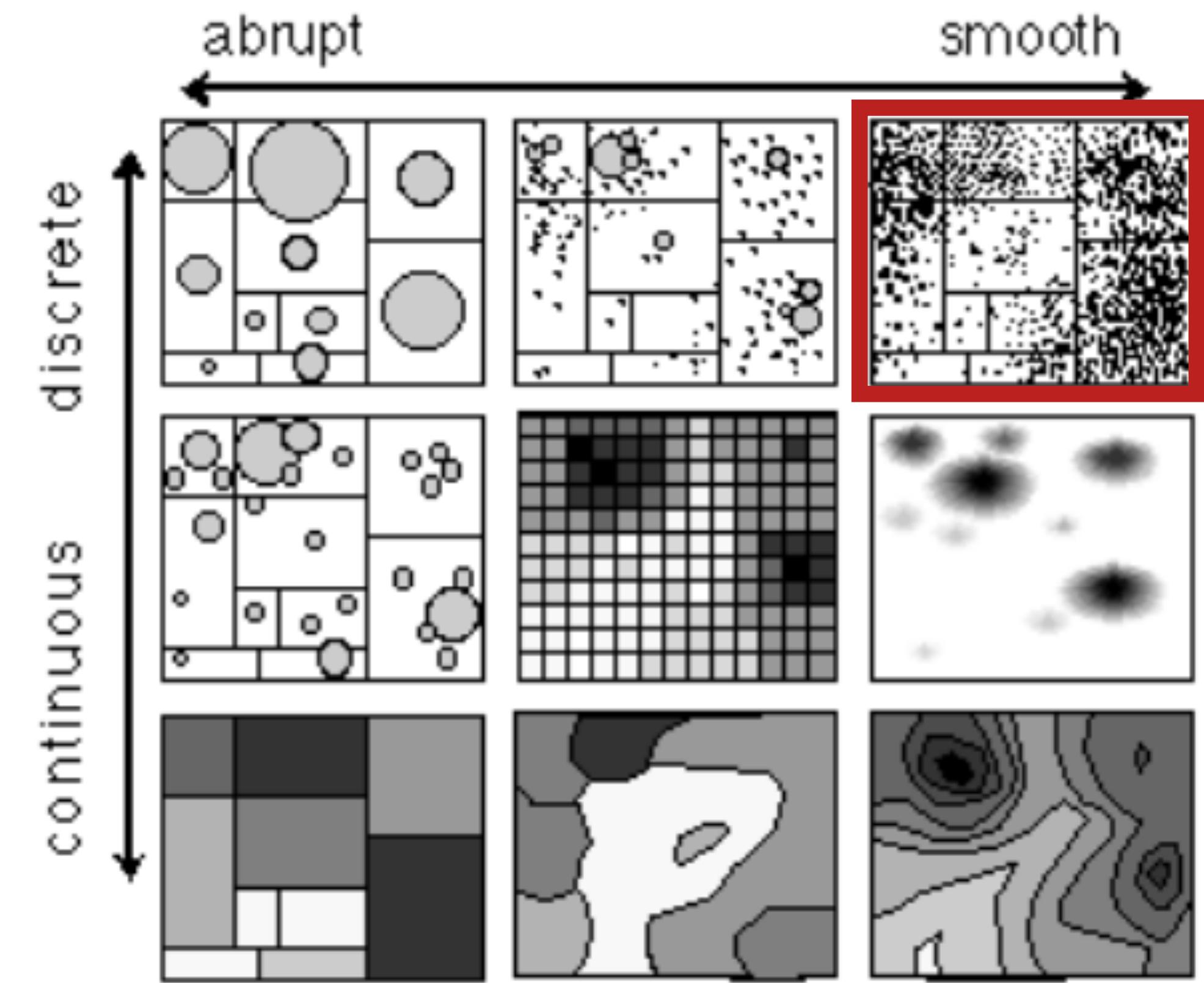
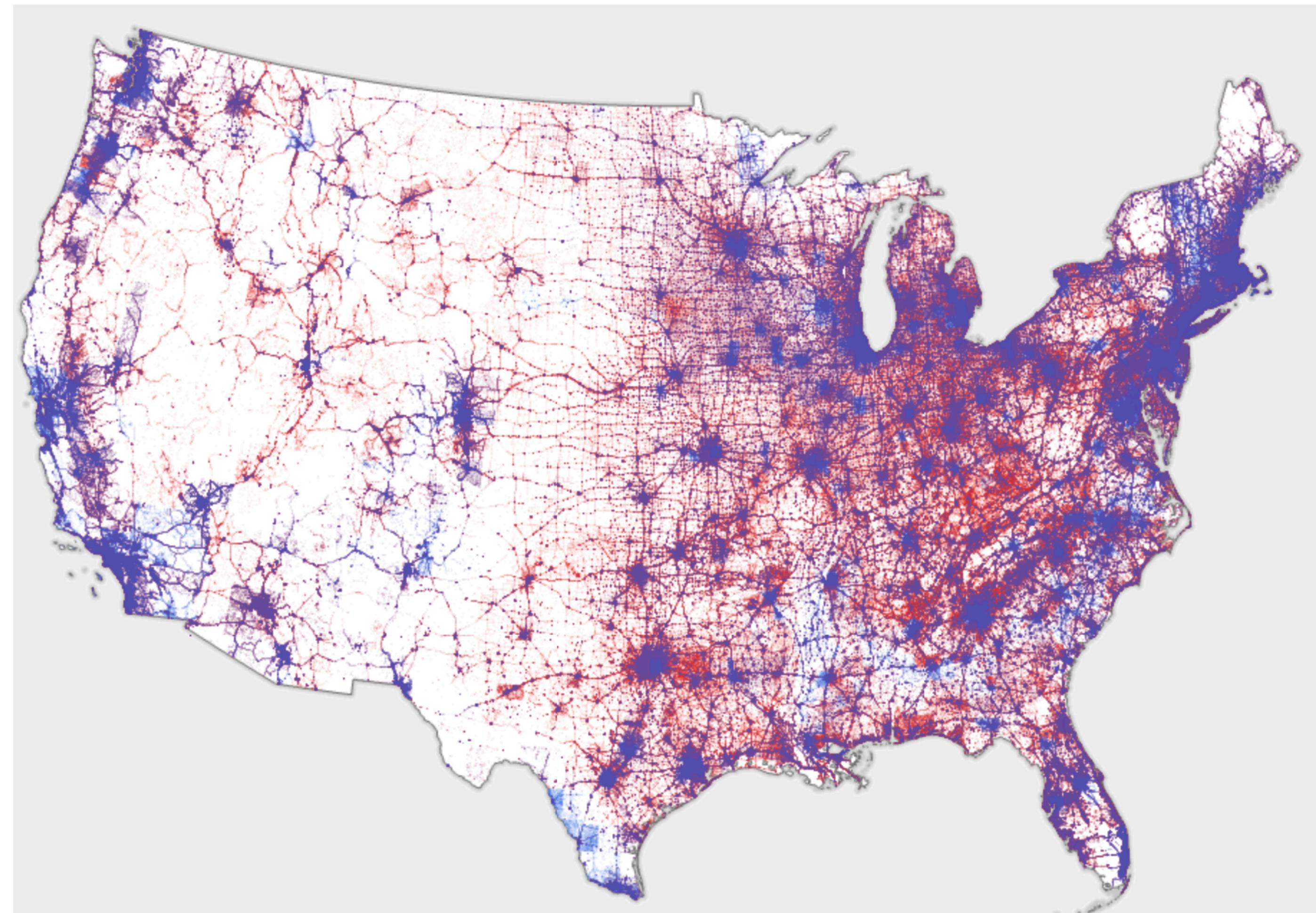


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Votes cast in the 2016 Presidential Election

Dot Distribution Map

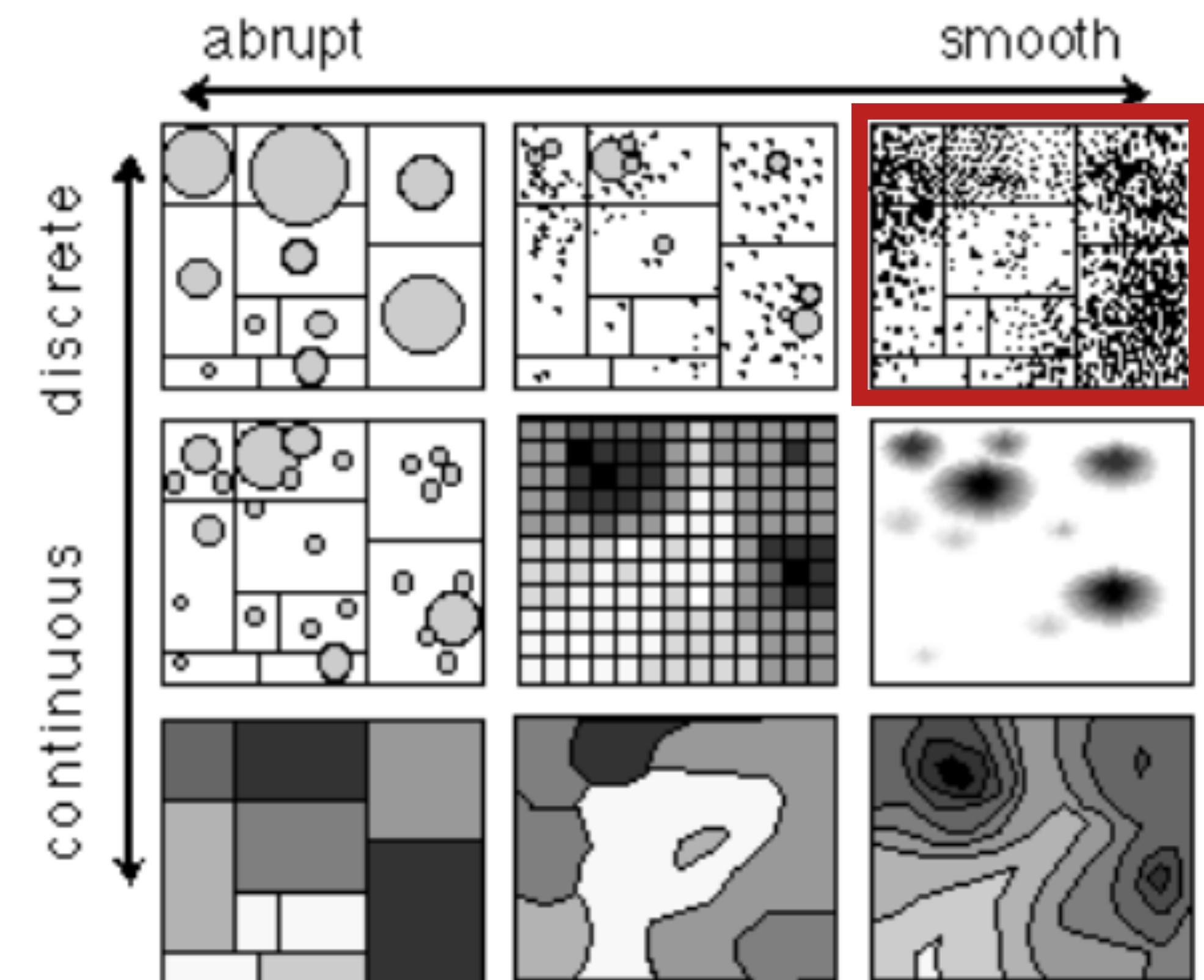
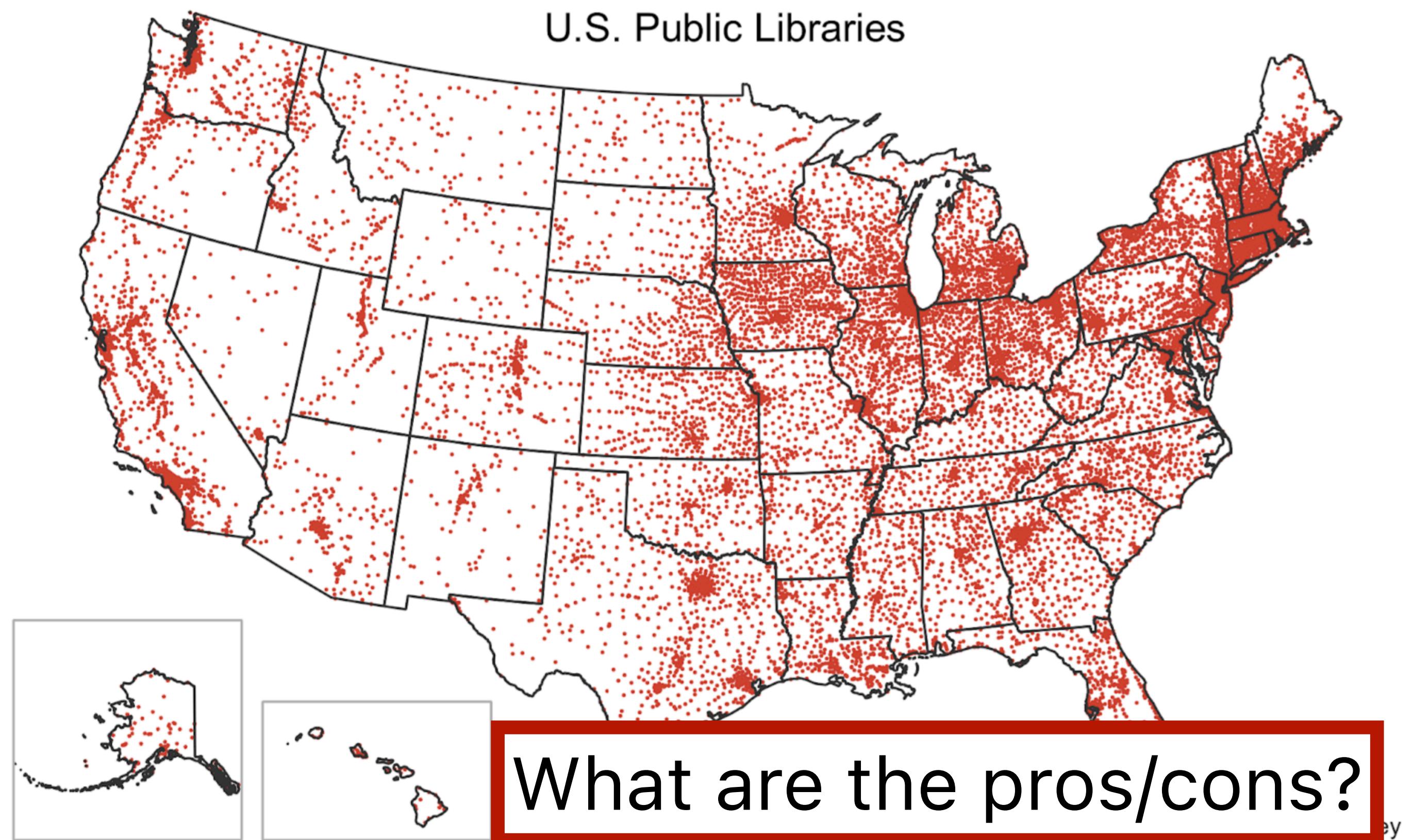


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tryclassbuzz.com
Code: **dots**

Dot Distribution Map

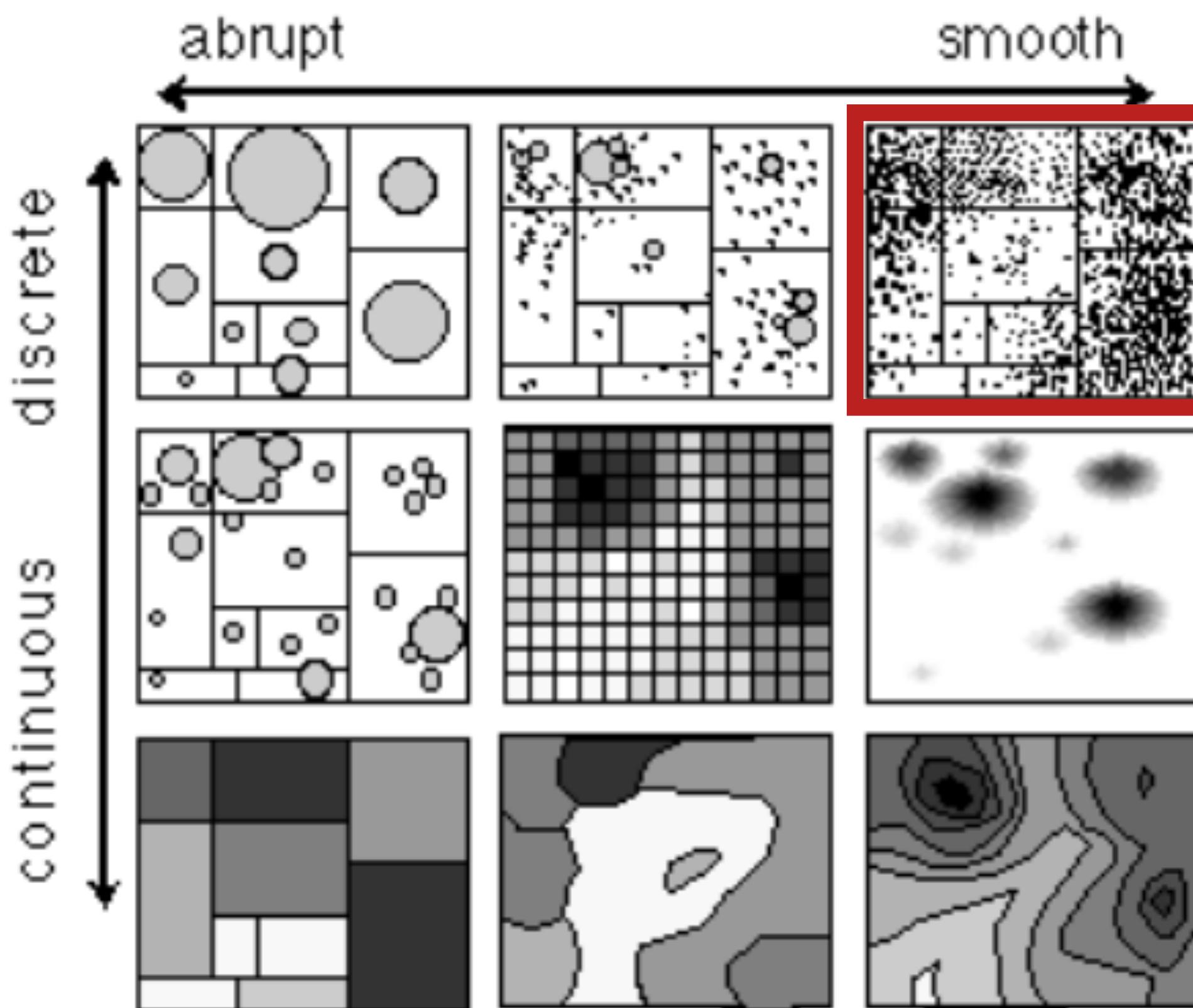
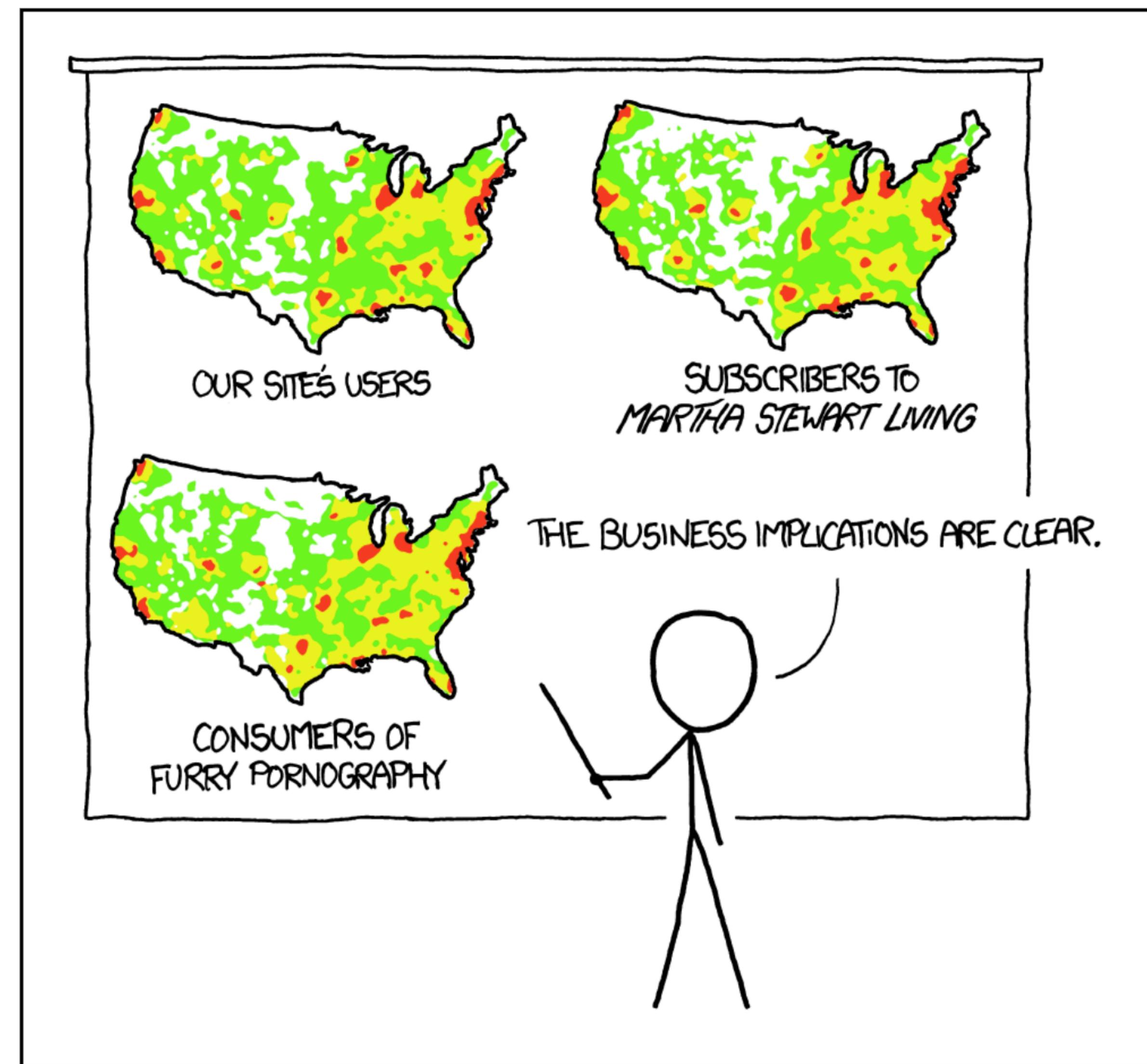
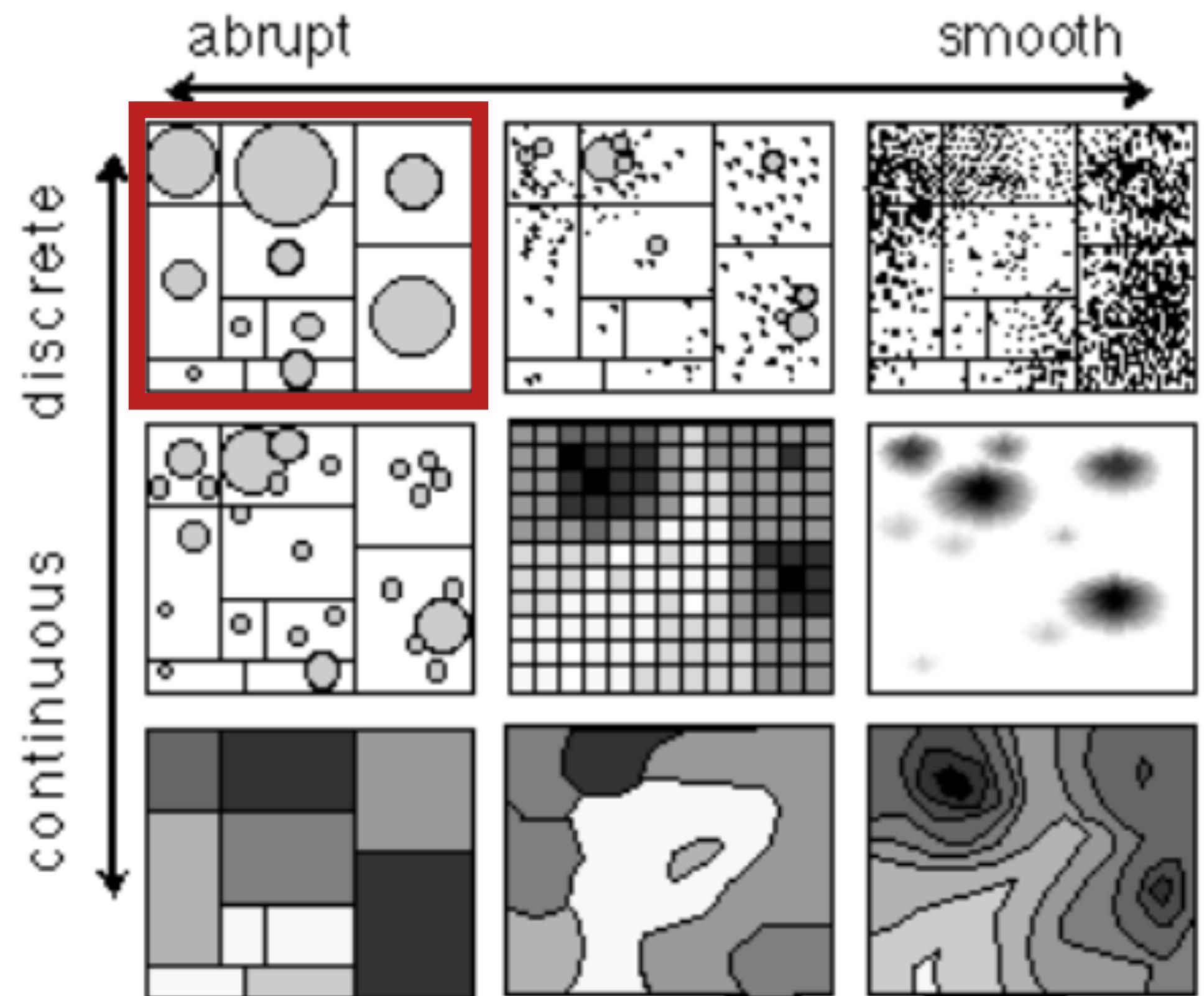


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Proportional Symbol Map



Craters

The earth is marked with about 180 named craters that are scars from previous run-ins with asteroids like the one that exploded over Russia on Friday.

Crater diameter



99 miles

20 miles

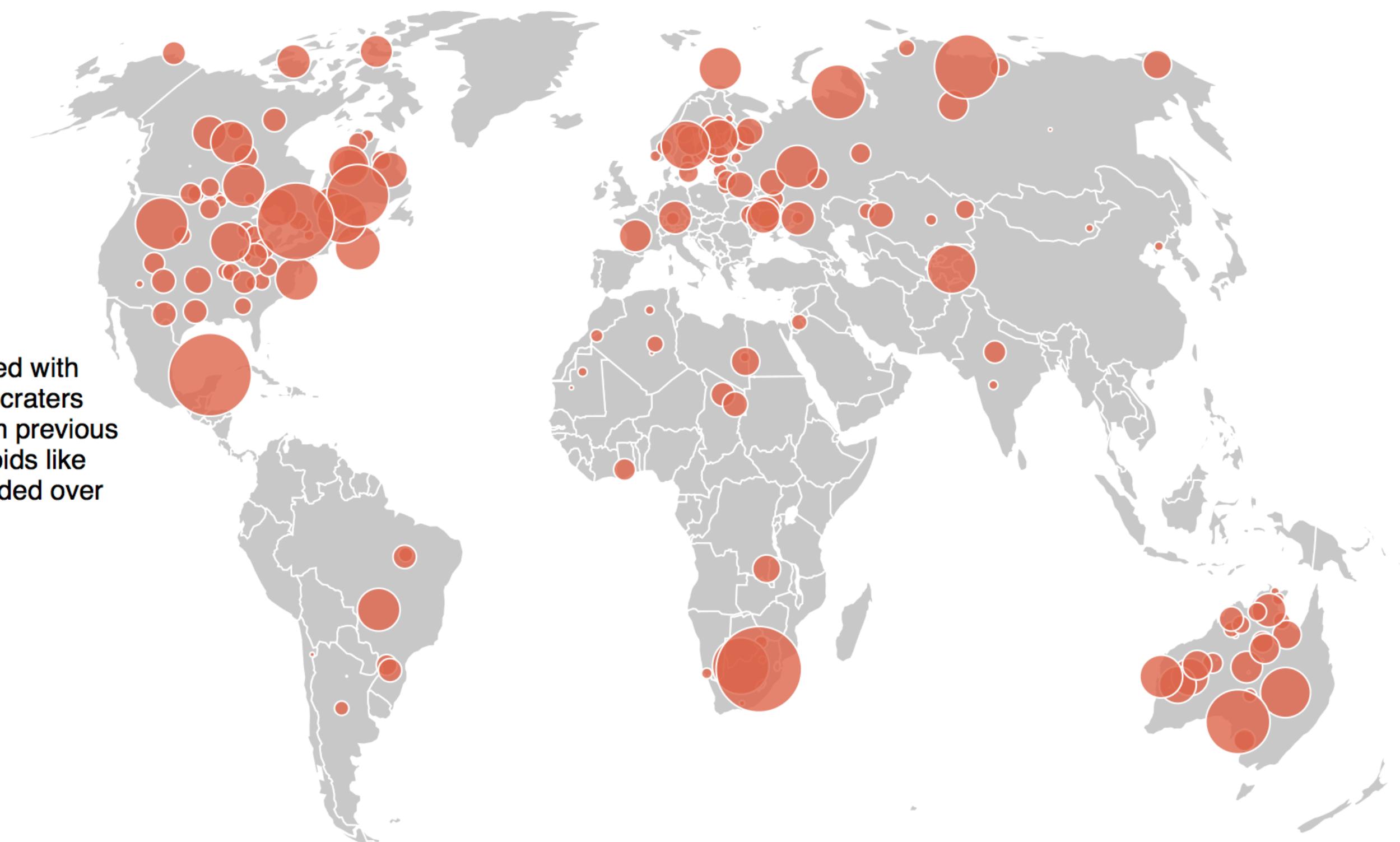


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<http://www.washingtonpost.com/wp-srv/special/world/russia-meteor/index.html>

Proportional Symbol Map

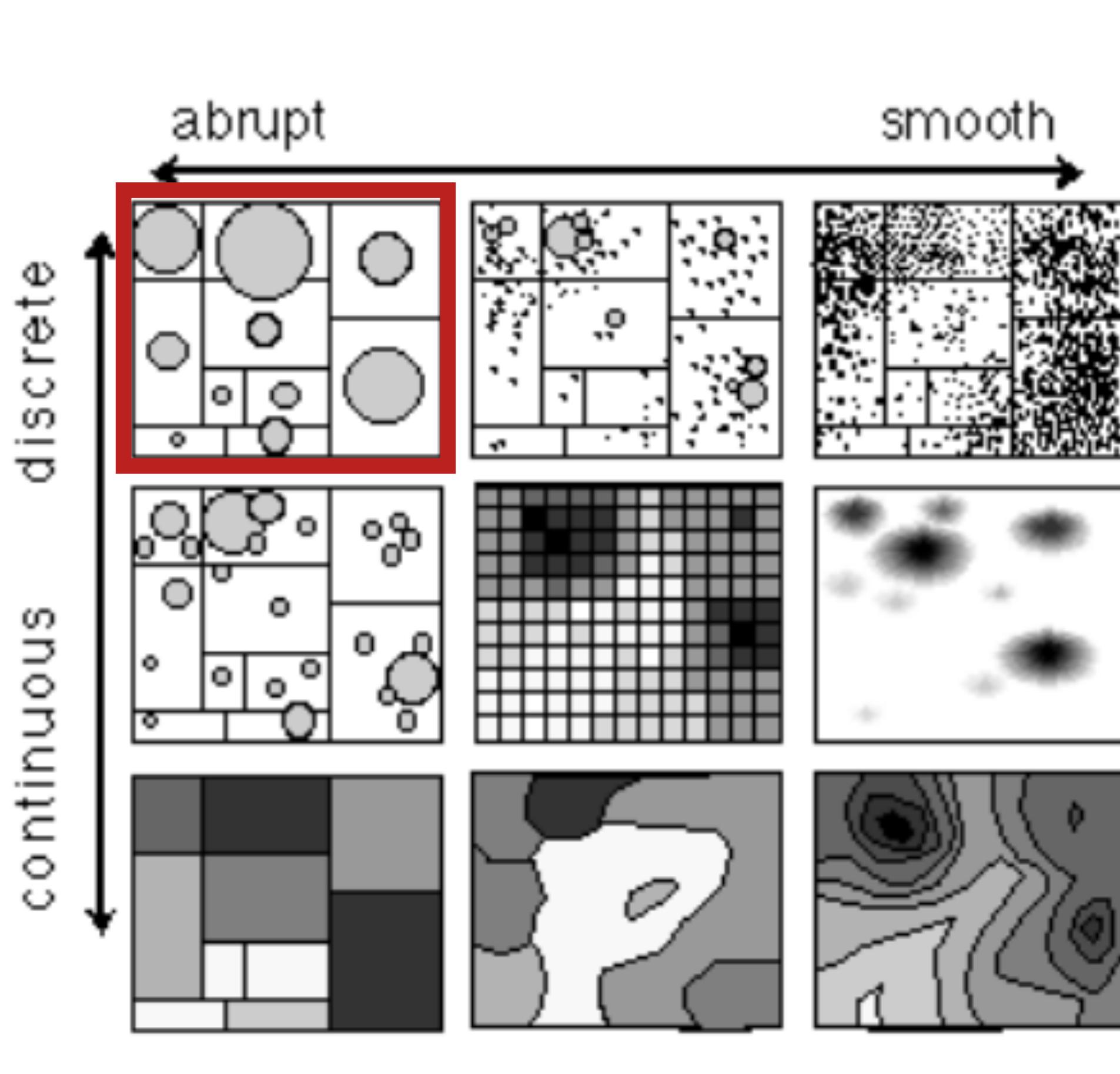
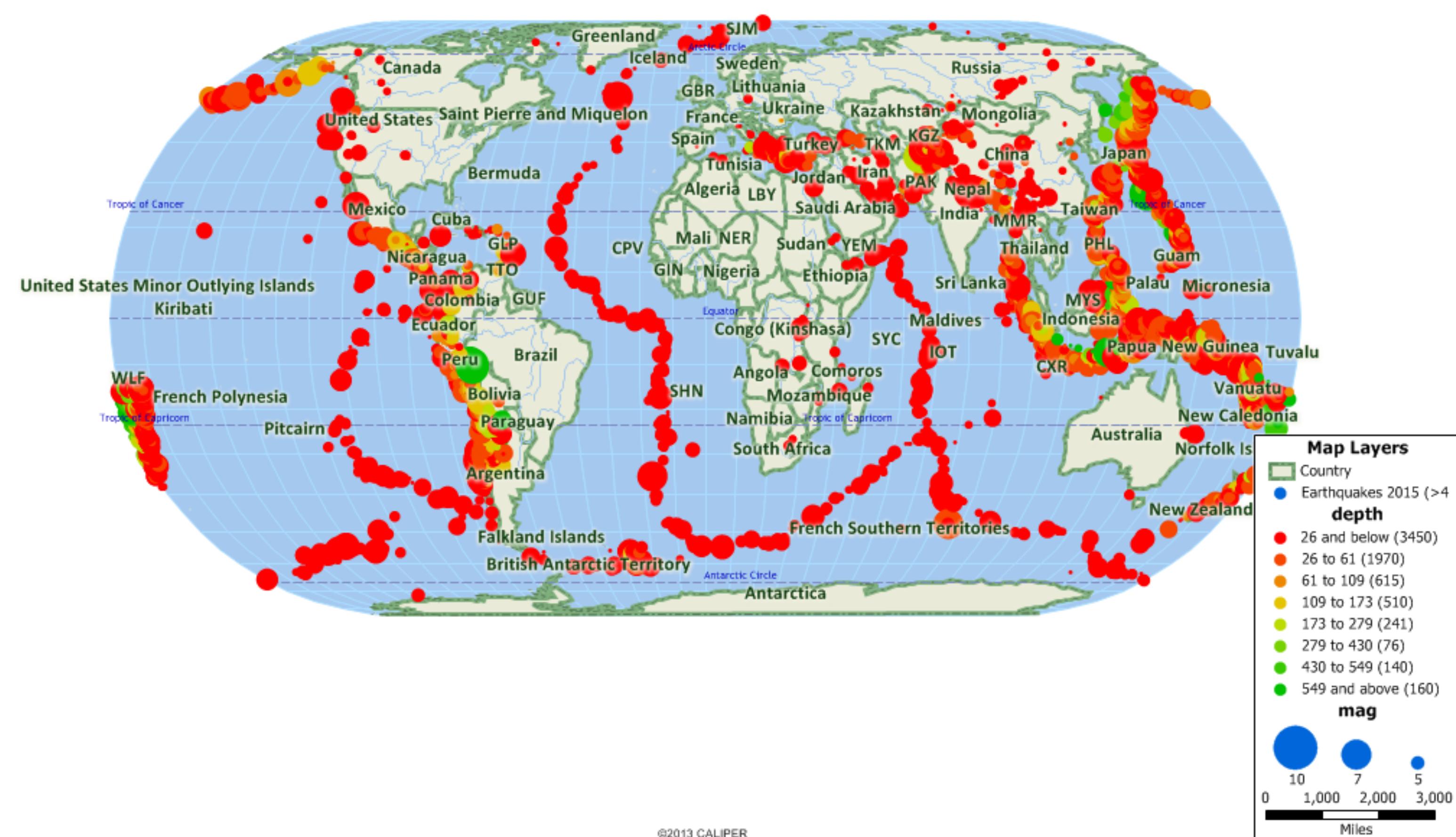


Fig. 9. Possible 2D translations of the 3D data models shown in figure 8.



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Graduated Symbol Map

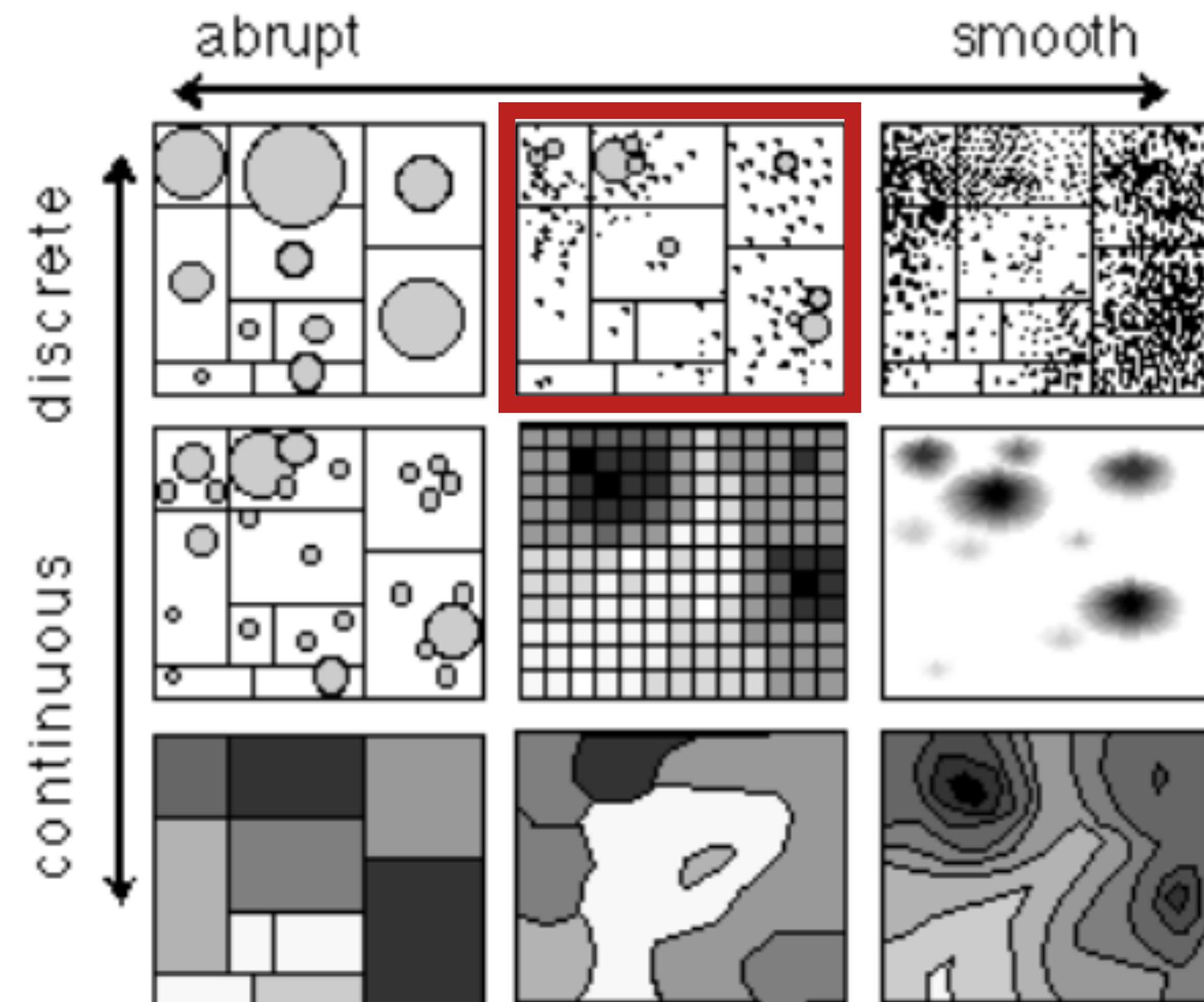


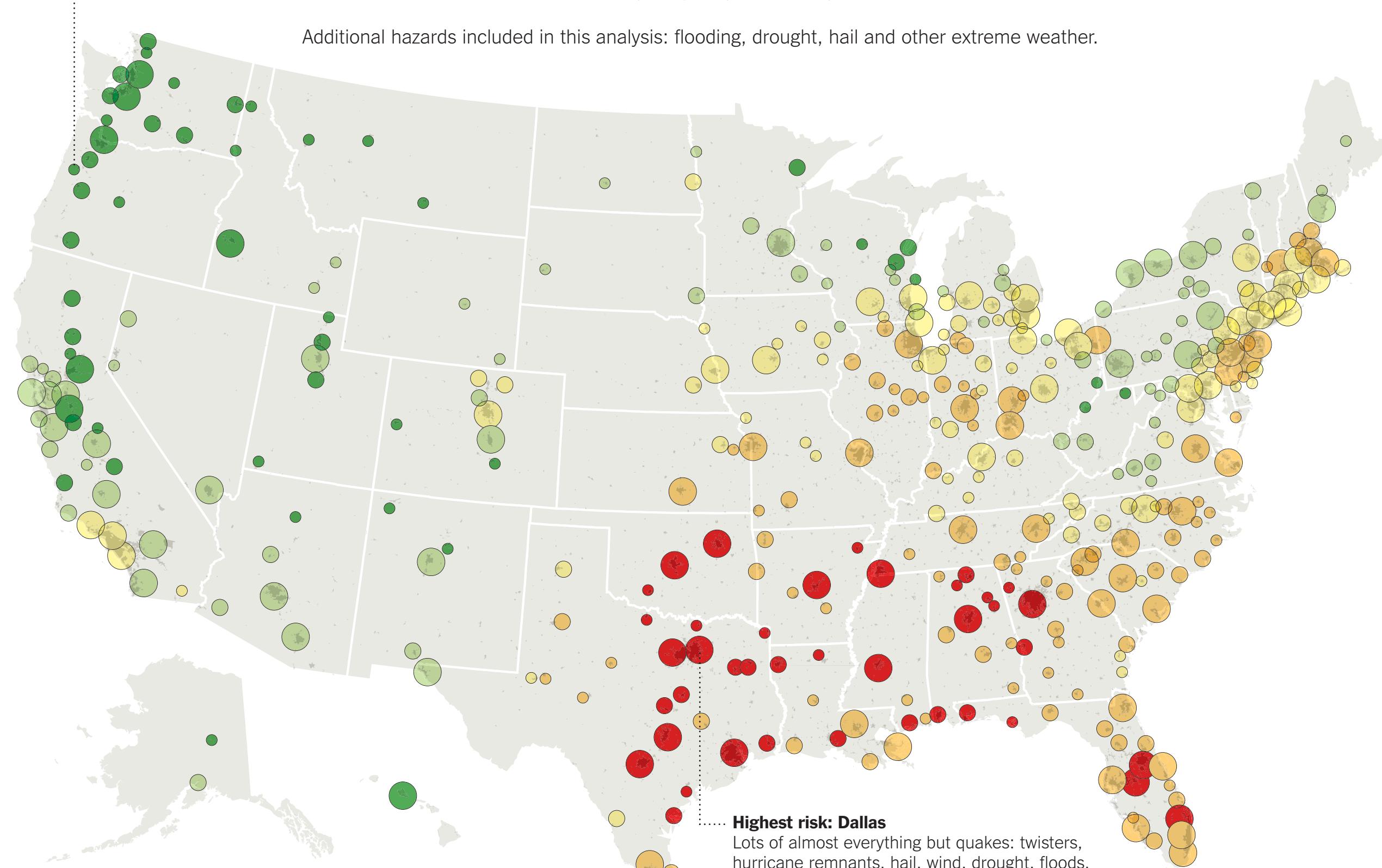
Fig. 9. Possible 2D translations of the 3D data models shown in figure 8.

Some Places Are Riskier Than Others

Weather disasters and quakes: who's most at risk? The analysis below, by Sperling's Best Places, a publisher of city rankings, is an attempt to assess a combination of those risks in 379 American metro areas.

Risks for twisters and hurricanes (including storms from hurricane remnants) are based on historical data showing where storms occurred. Earthquake risks are based on United States Geological Survey assessments and take into account the relative infrequency of quakes, compared with weather events and floods.

Additional hazards included in this analysis: flooding, drought, hail and other extreme weather.



Metro area population

- Less than 175,000
- 175,000 to 500,000
- More than 500,000

Scale of hazards

- Lower → Higher

Metro areas with lowest risk:

1. Corvallis, Ore.
2. Mt. Vernon-Anacortes, Wash.
3. Bellingham, Wash.
4. Wenatchee, Wash.
5. Grand Junction, Colo.
6. Spokane, Wash.
7. Salem, Ore.
8. Seattle

Highest risk:

1. Dallas-Plano-Irving, Tex.
2. Jonesboro, Ark.
3. Corpus Christi, Tex.
4. Houston
5. Beaumont-Port Arthur, Tex.
6. Shreveport, La.
7. Austin, Tex.
8. Birmingham, Ala.

Graduated Symbol Map

ASIA PACIFIC

The New York Times

PLAY THE CROSSWORD

Account

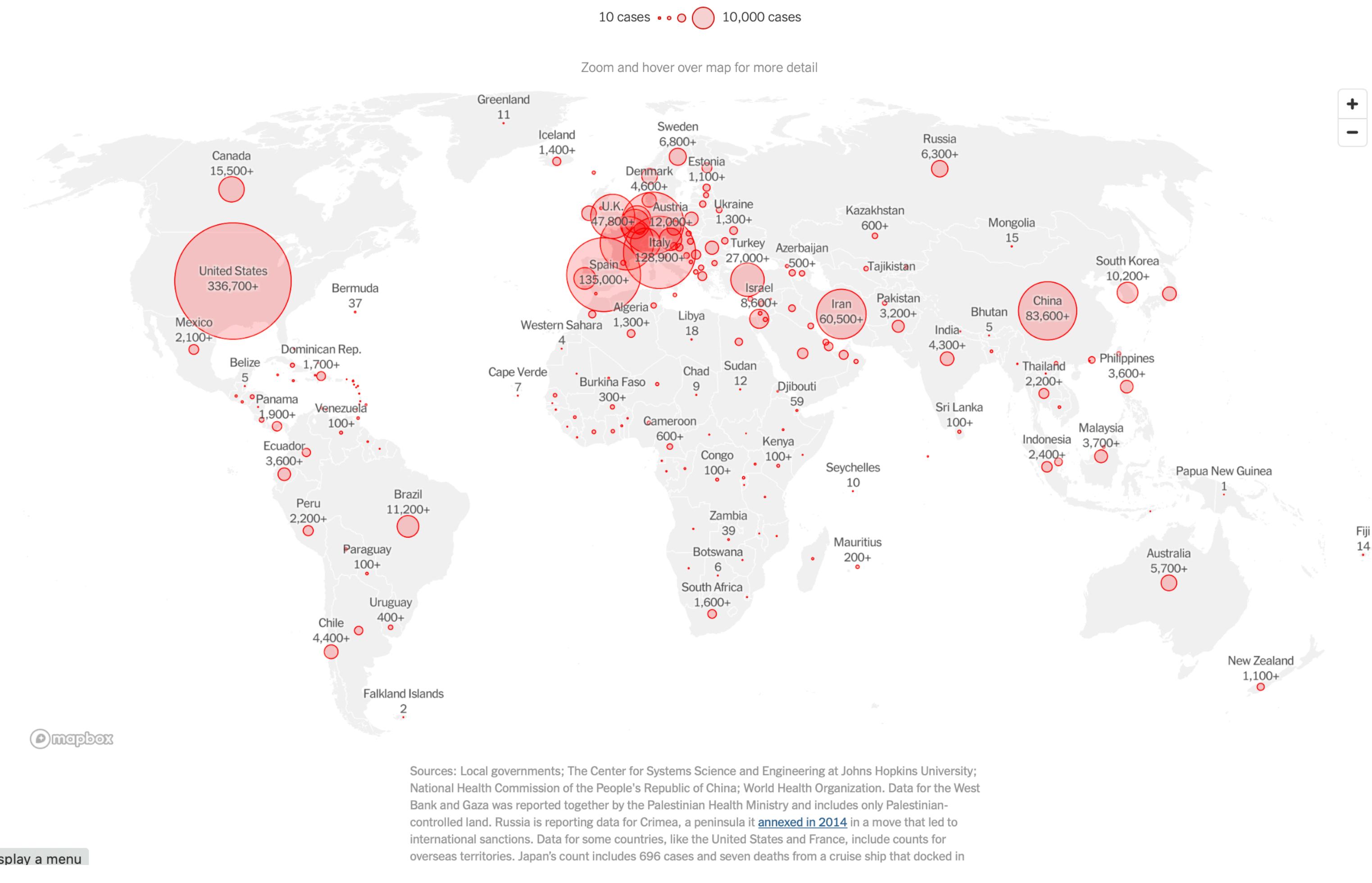
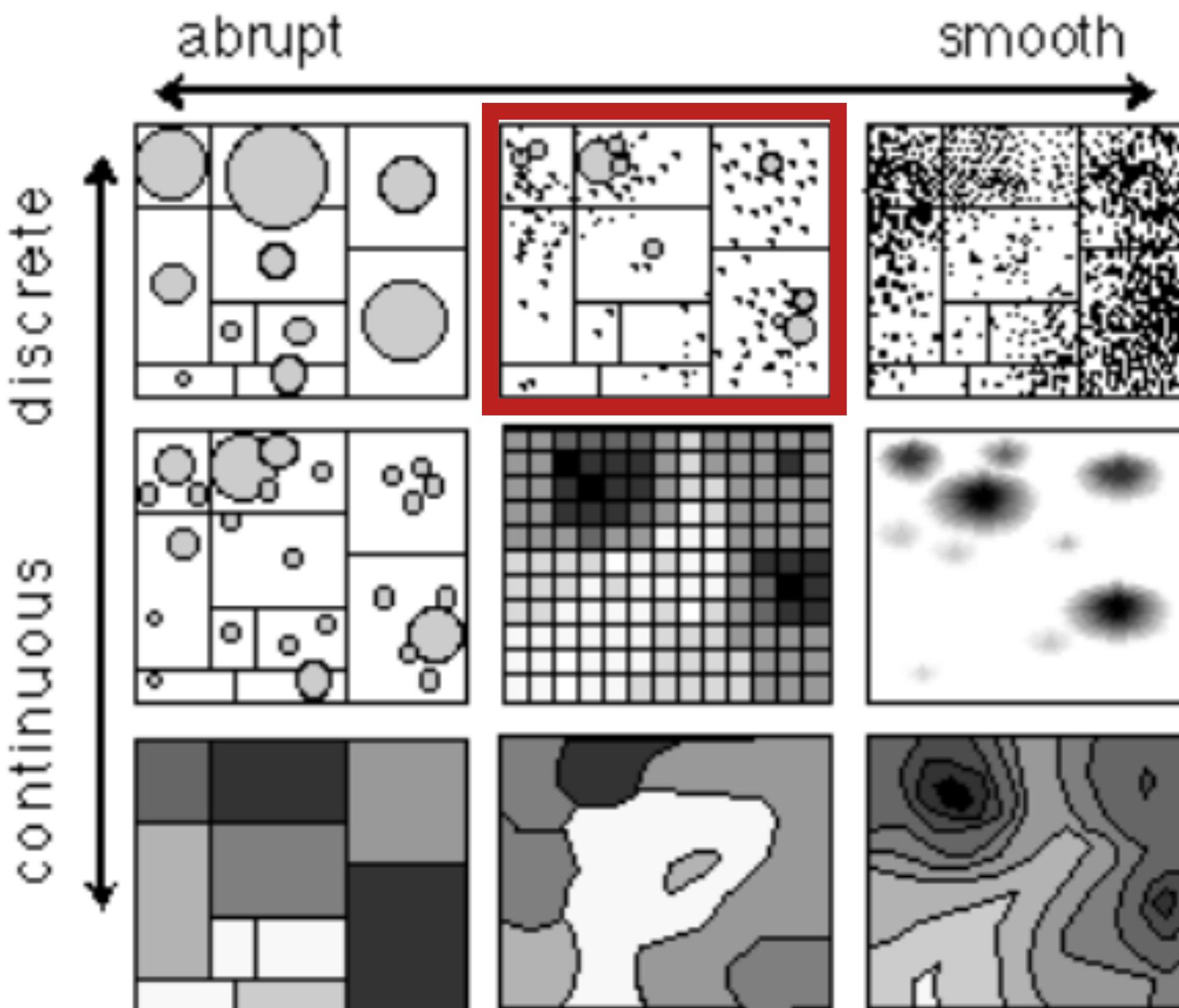


Fig. 9. Possible 2D translations of the 3D data models shown in figure 8.

<https://www.nytimes.com/interactive/2021/world/covid-cases.html>

Graduated Symbol Map?

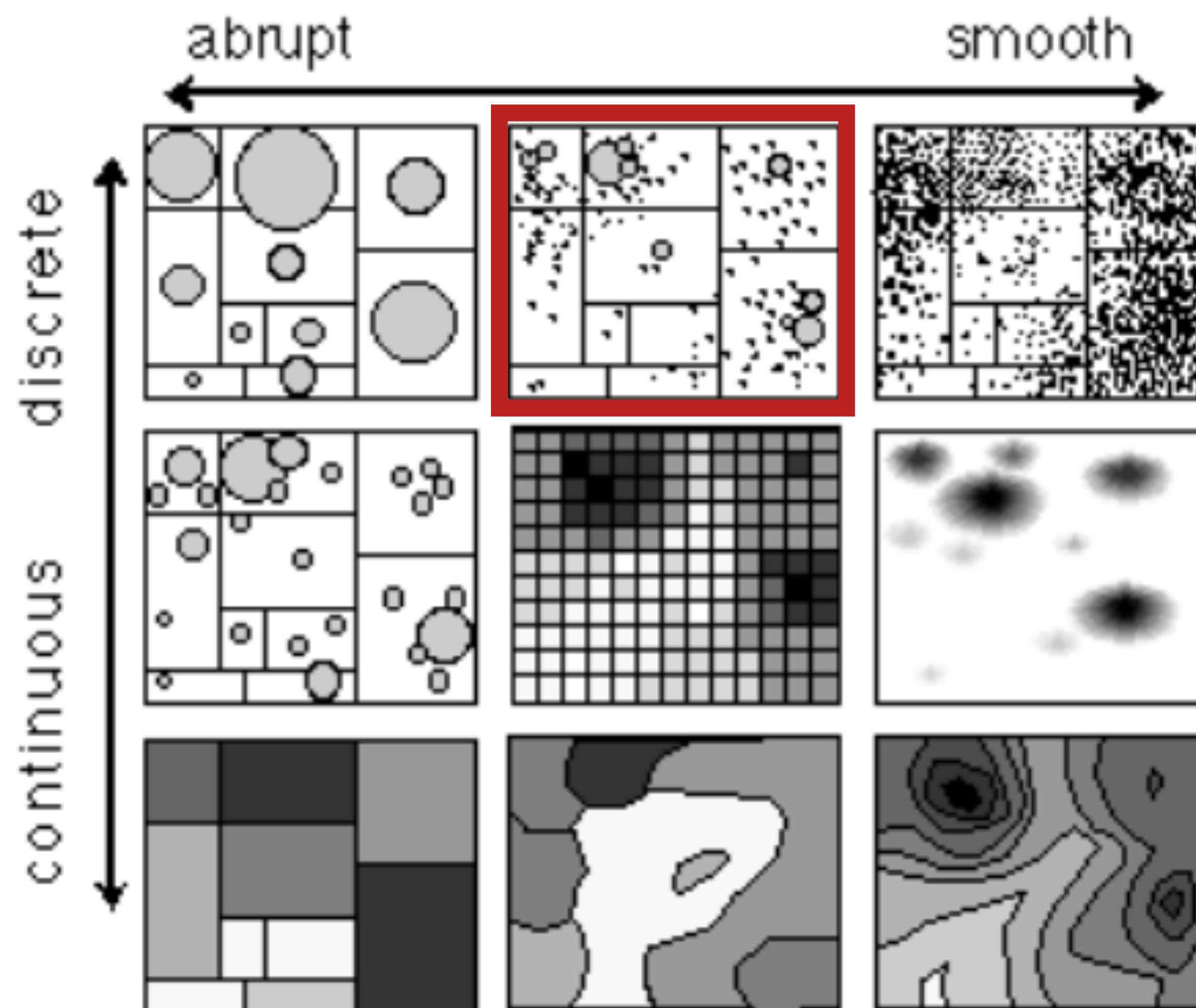
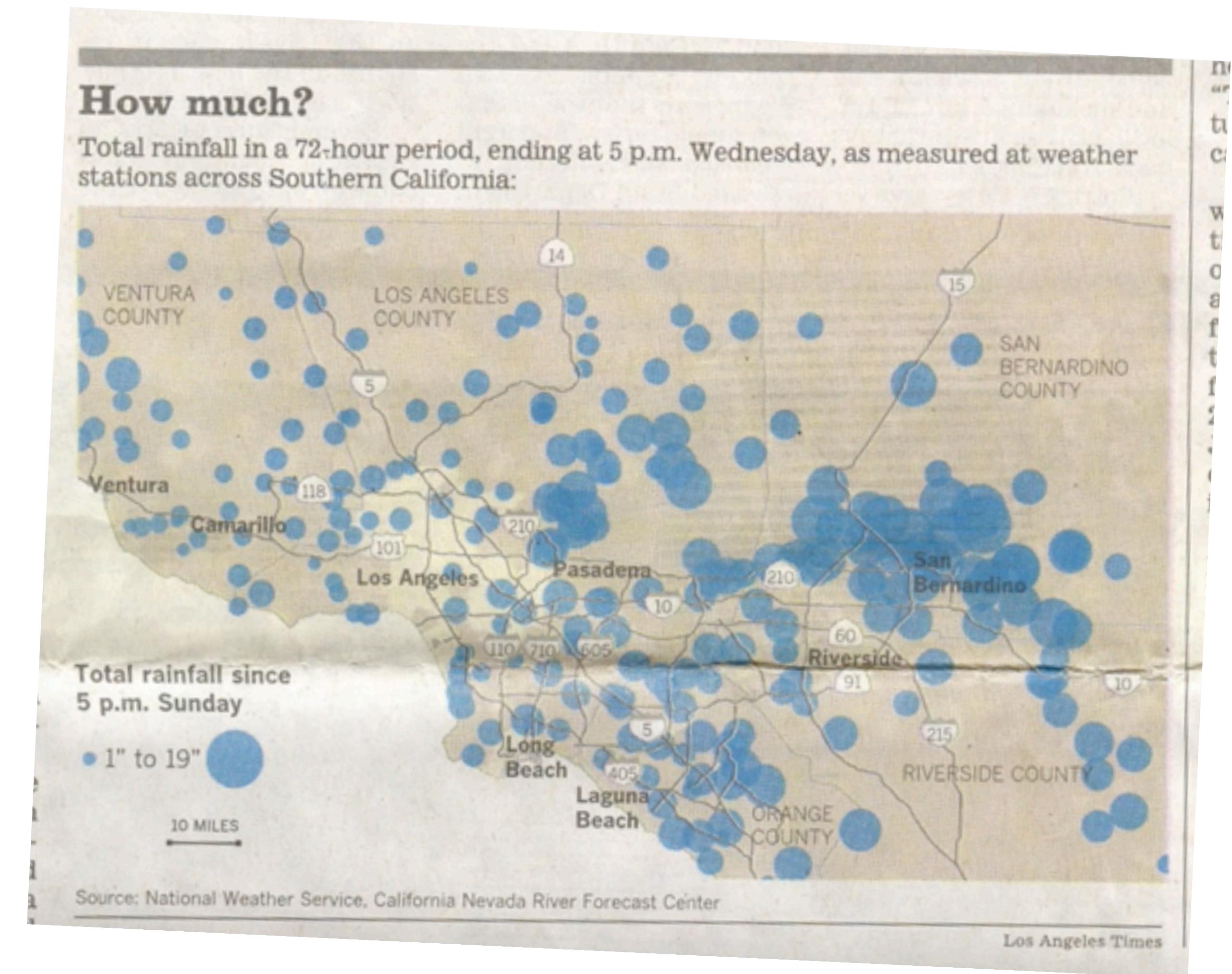


Fig. 9. Possible 2D translations of the 3D data models shown in figure 8.



Isopleth / Heat Map

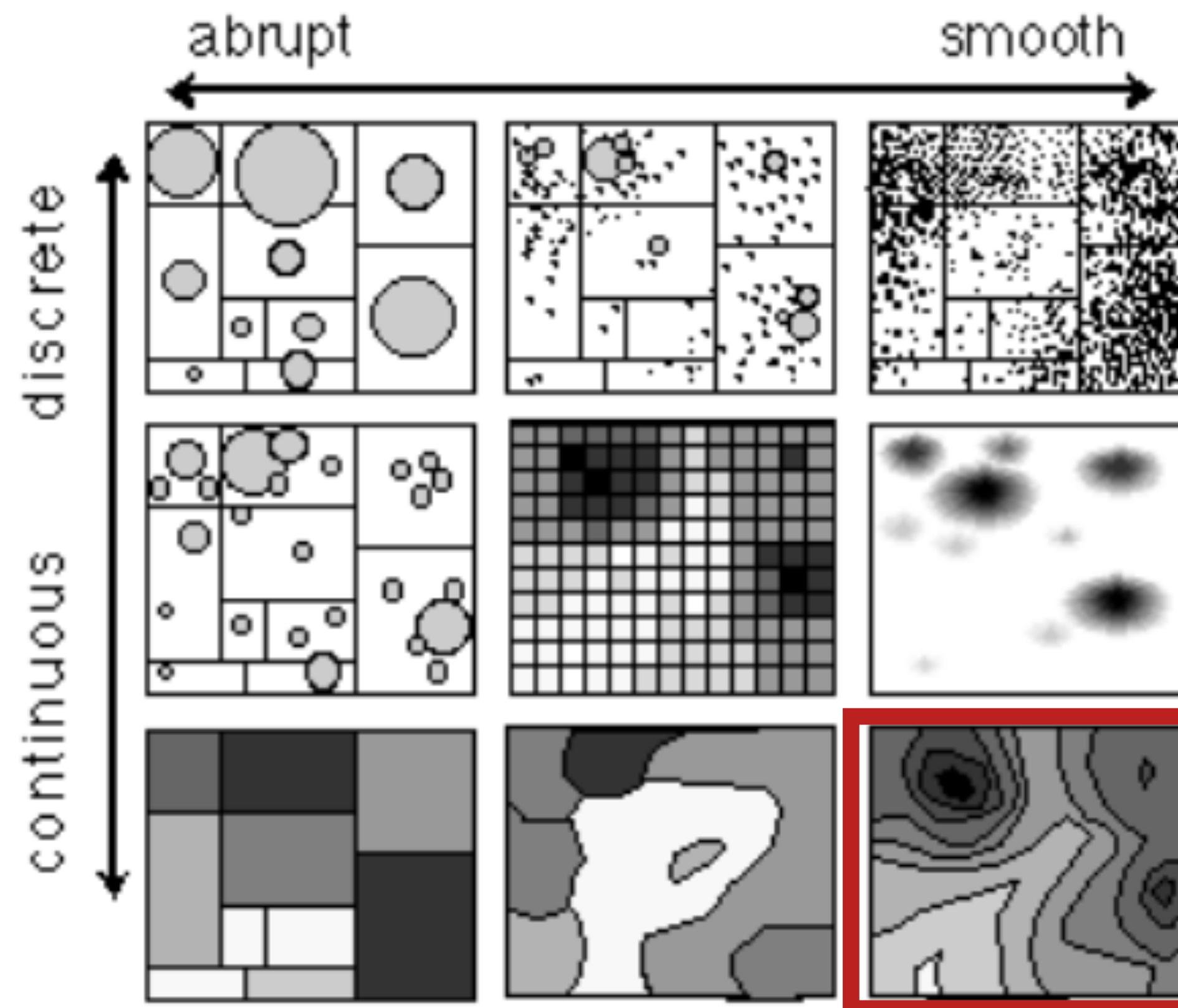
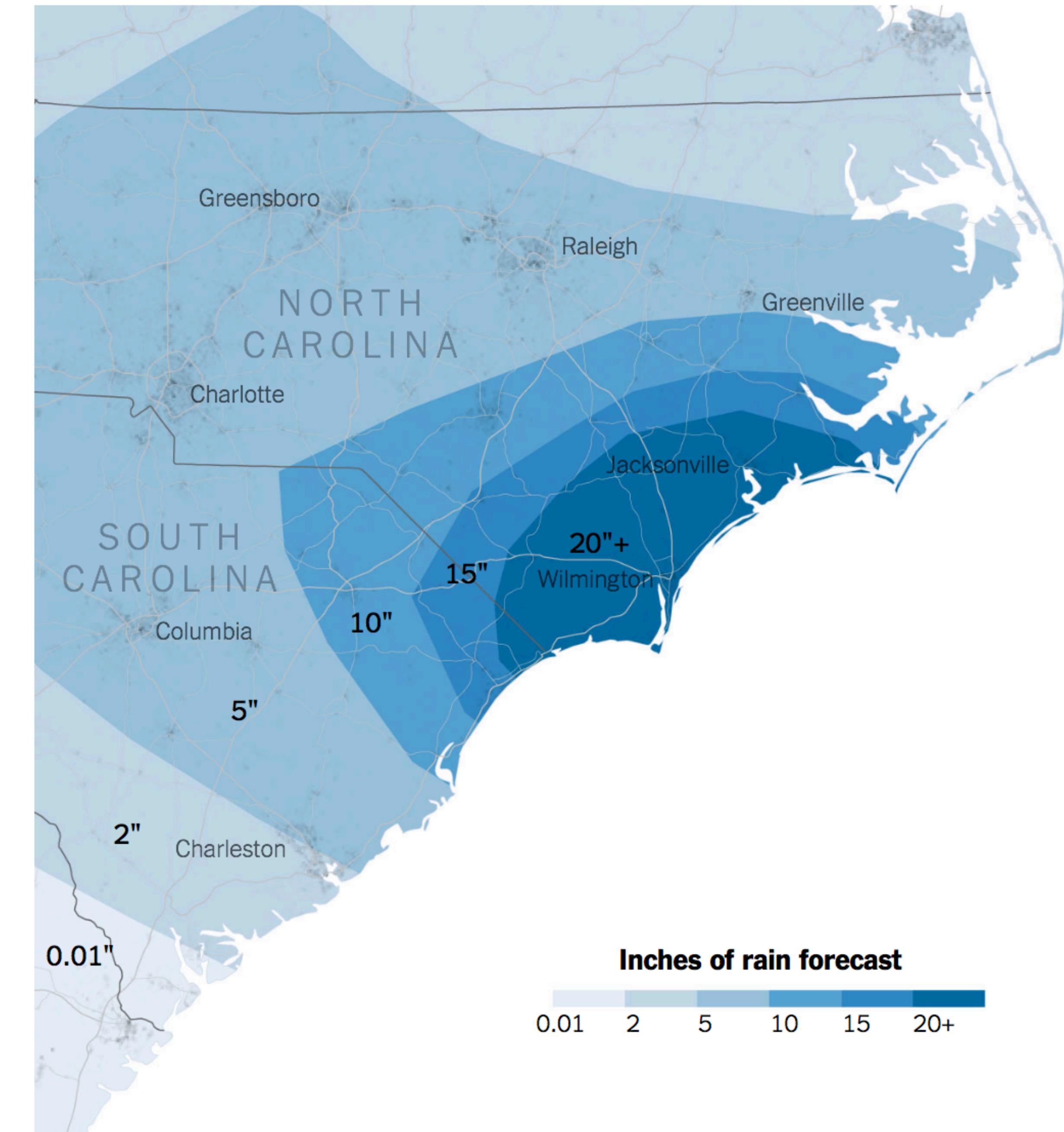


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Source: National Weather Service

Choropleth

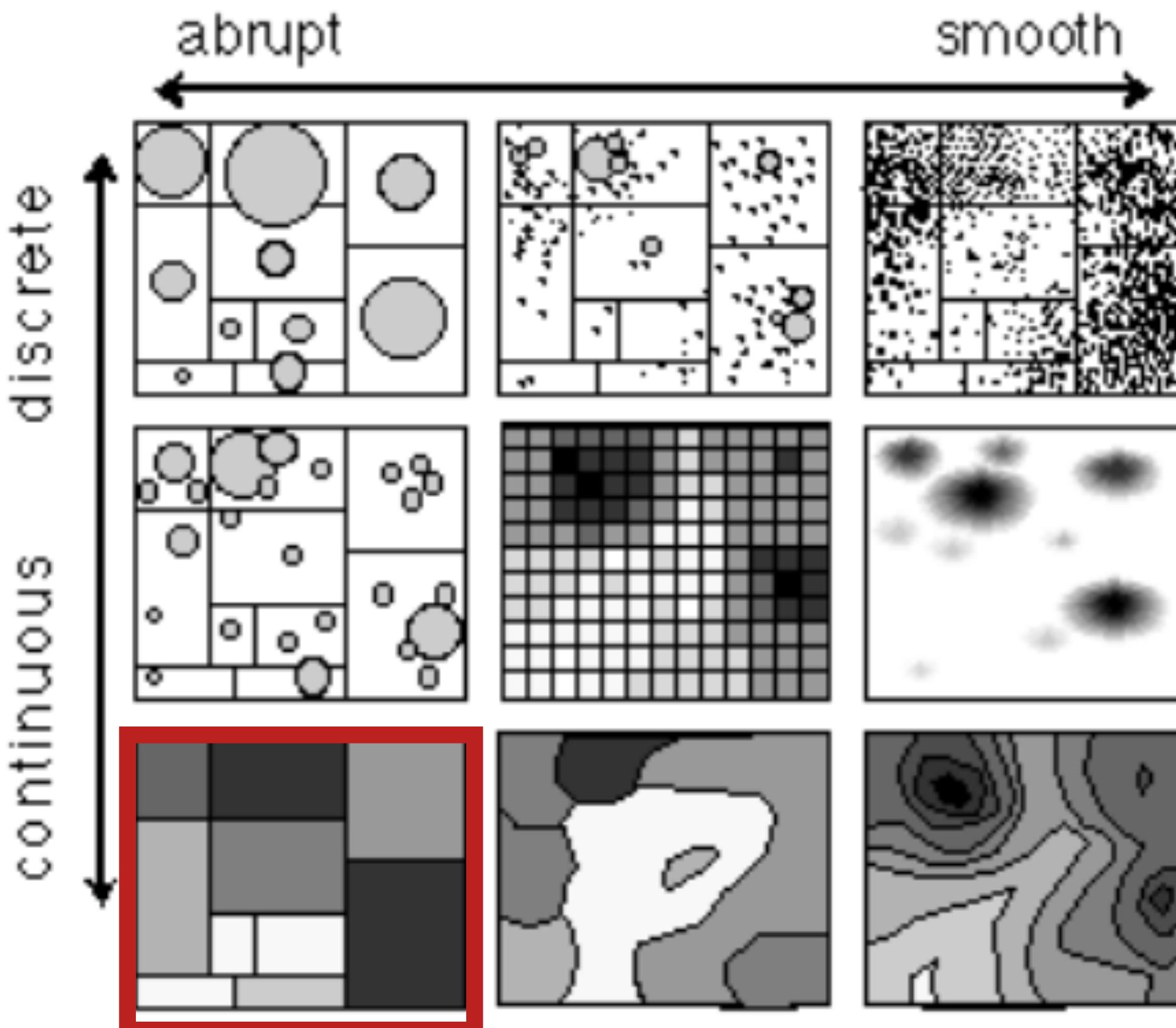
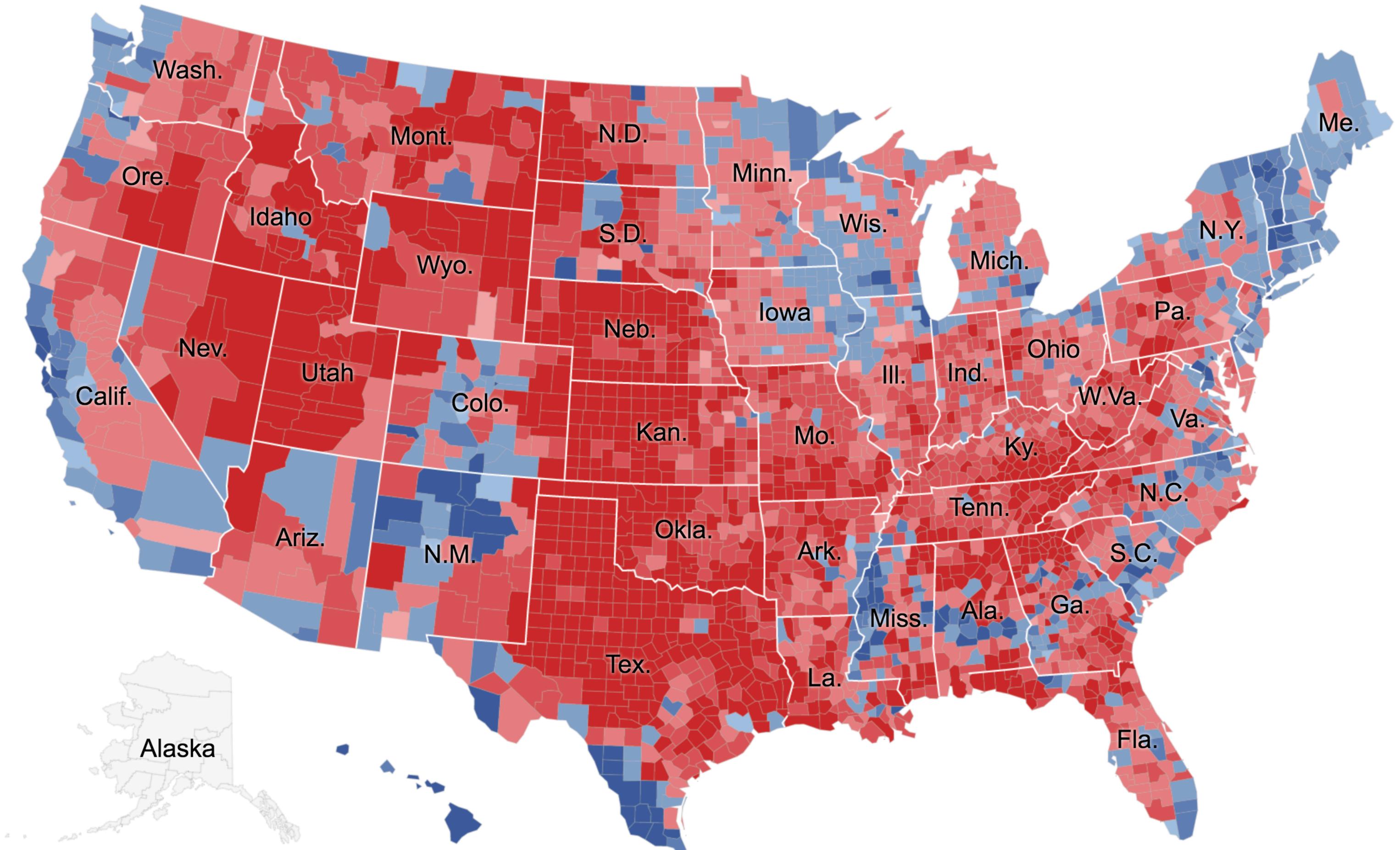


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<https://www.nytimes.com/interactive/2016/11/01/upshot/many-ways-to-map-election-results.html>

Choropleth

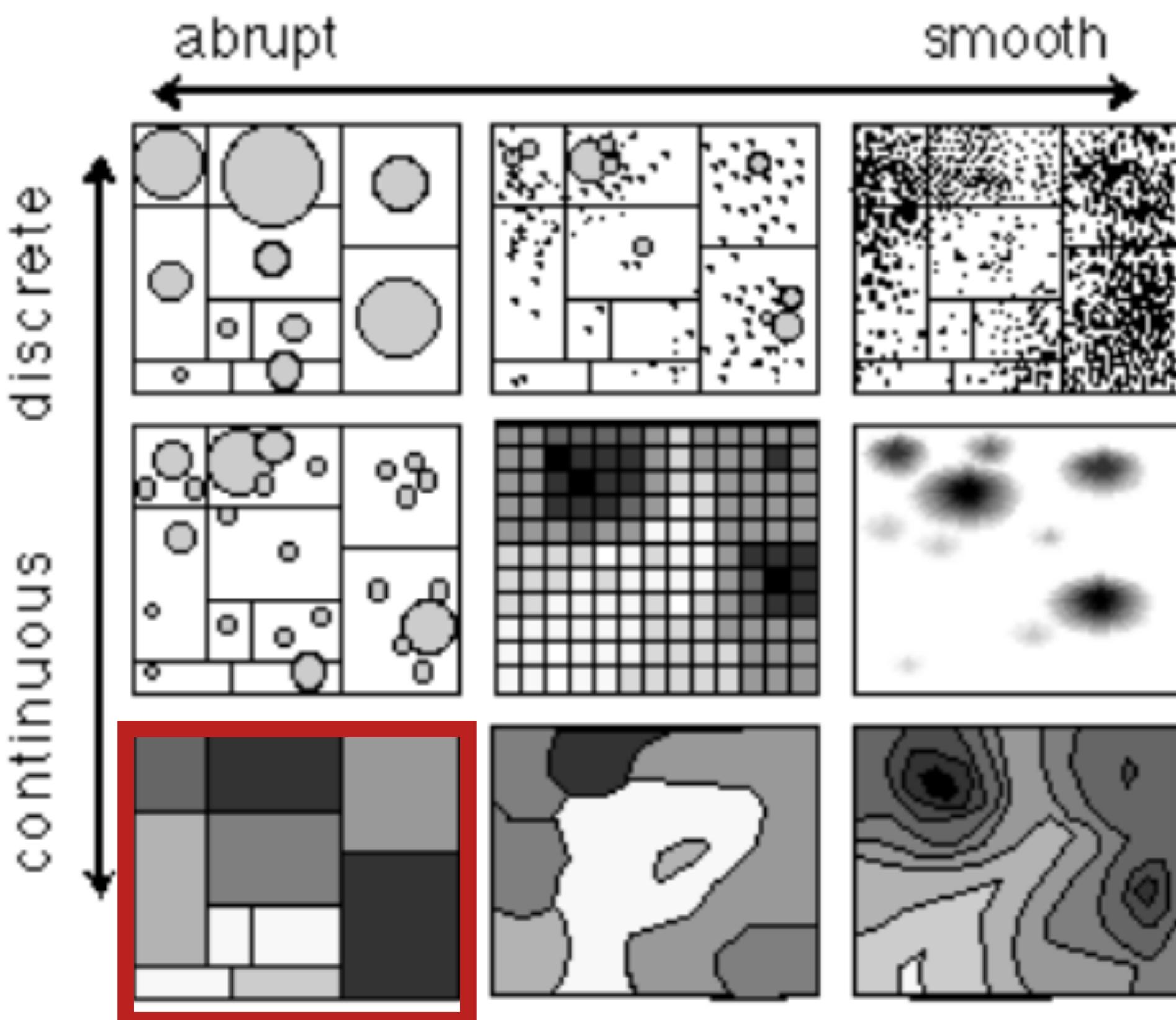
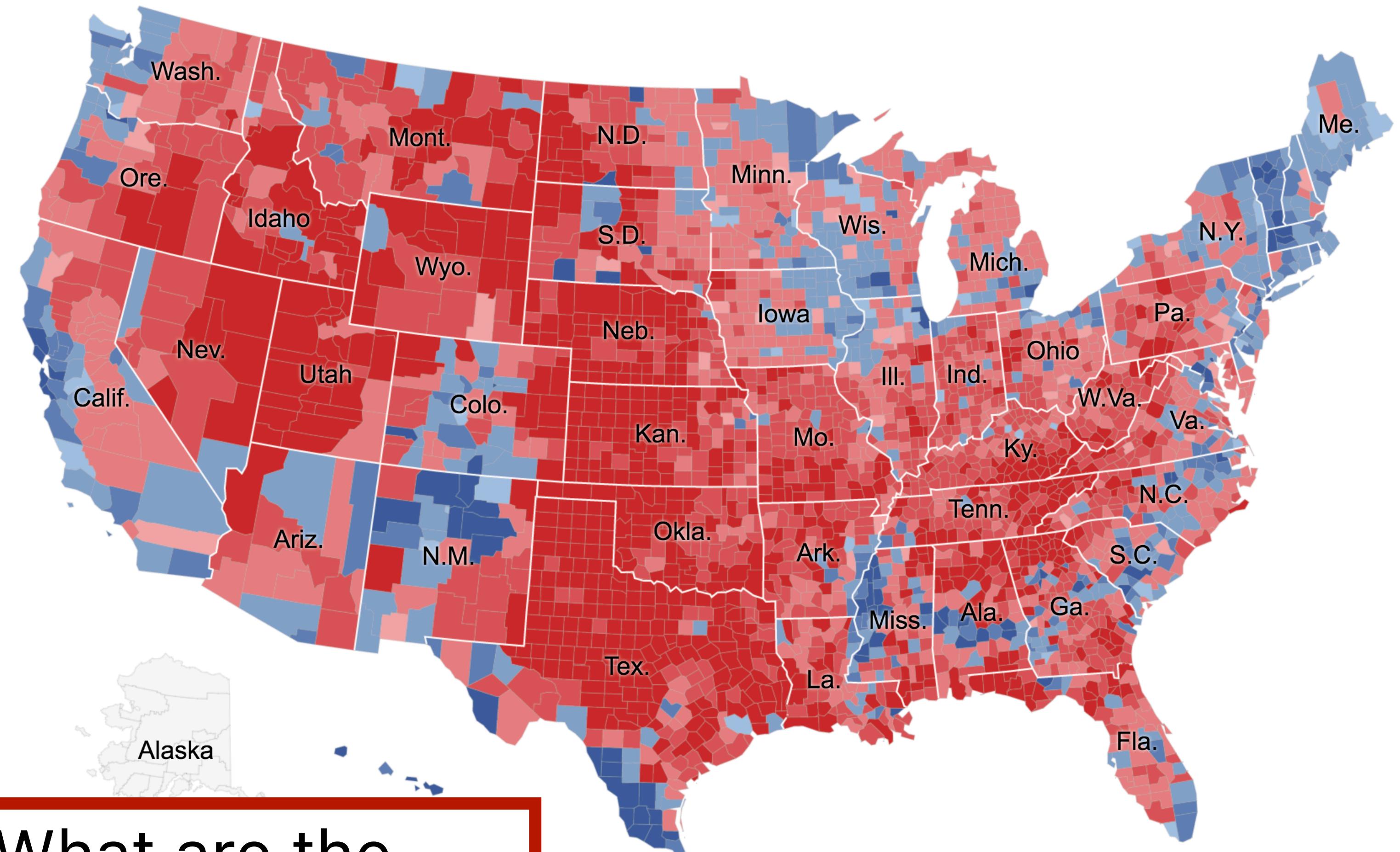


Fig. 9. Possible 2D translations of the 3D data models shown in figure 8.

What are the pros/cons of this display?

tryclassbuzz.com
Code: **choro**



ion-results.html

GEOGRAPHIC MAP

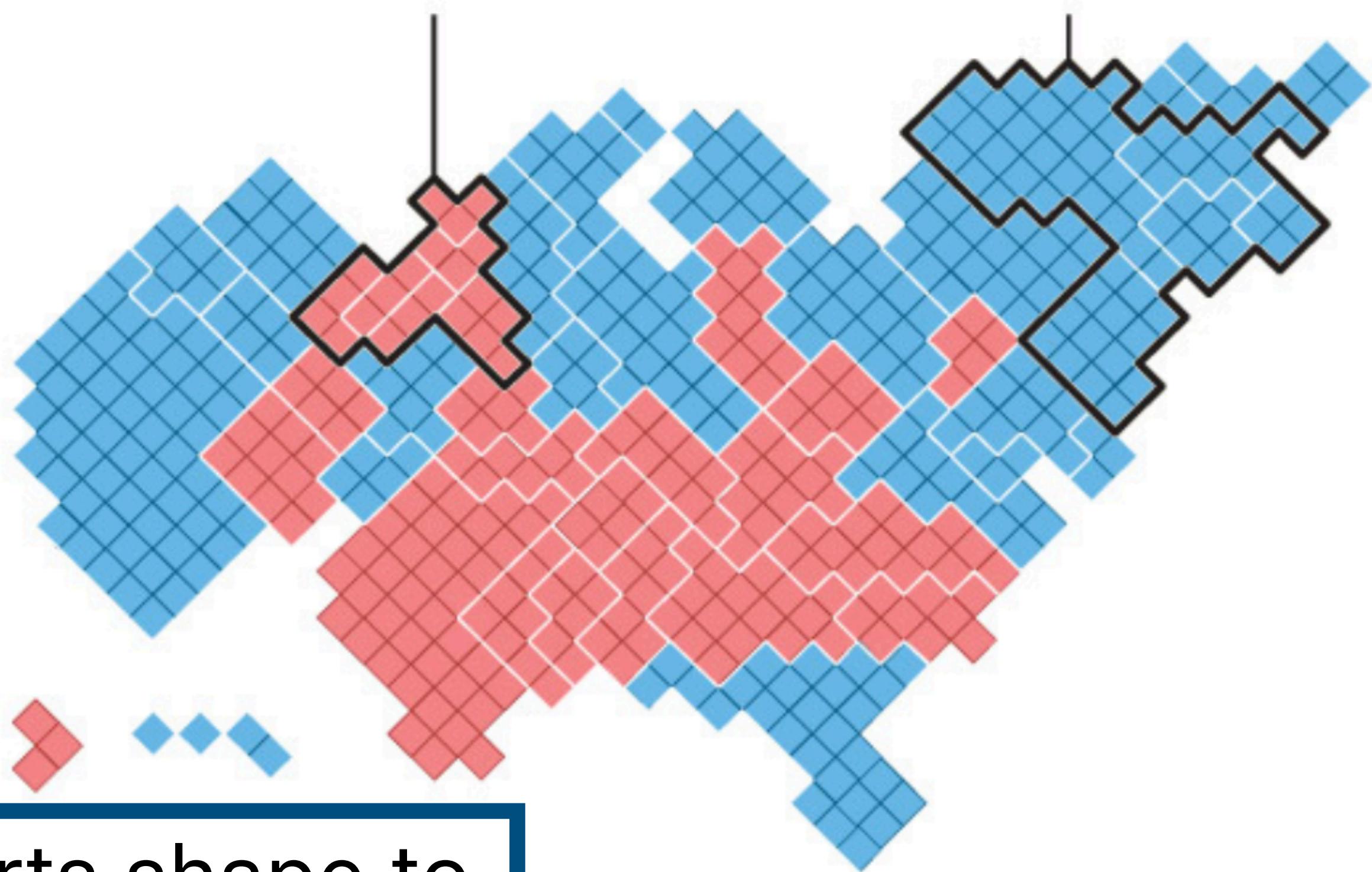
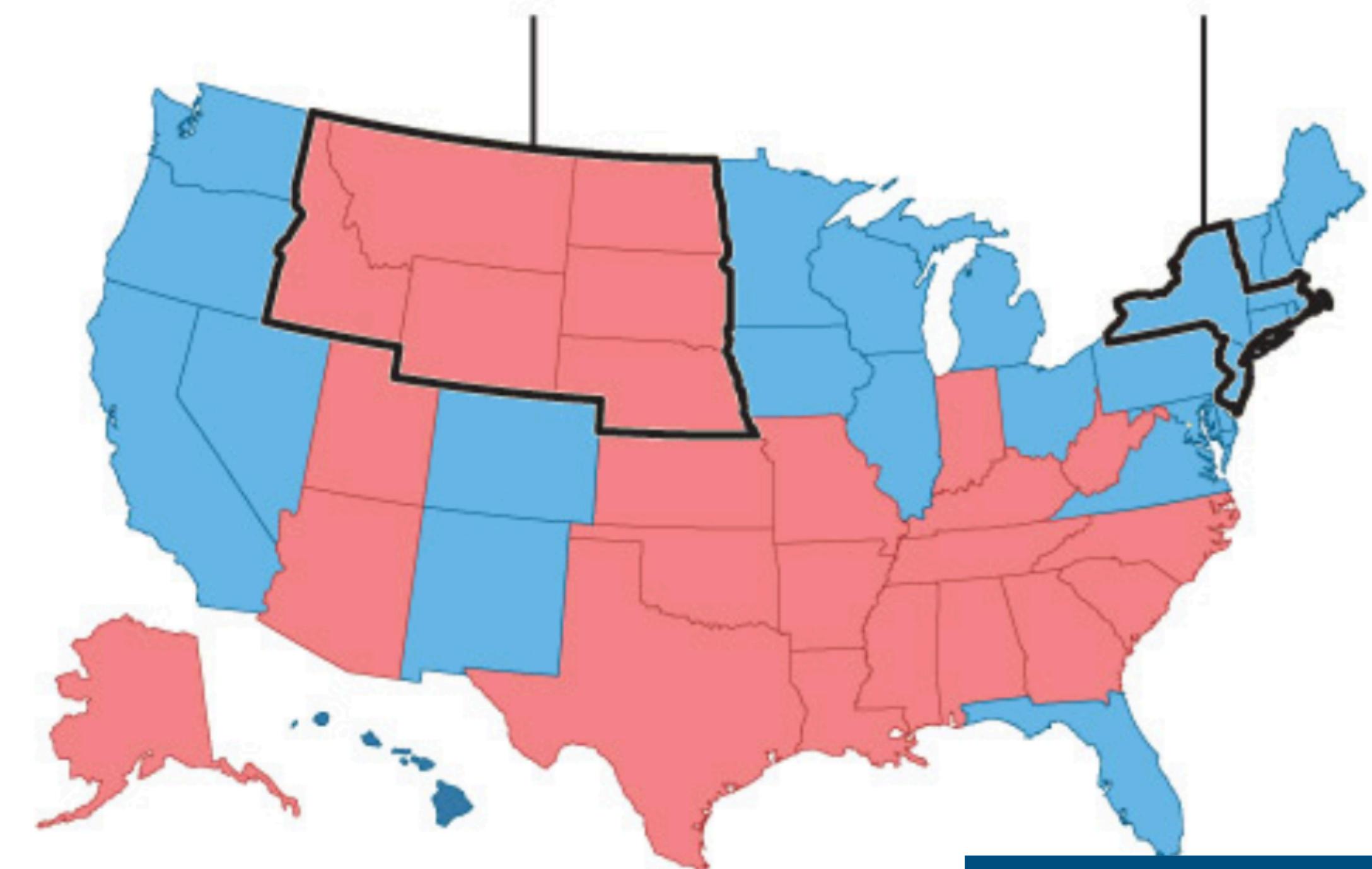
CARTOGRAM OF ELECTORAL VOTES

Six Western states

Five Northeastern states

Six Western states

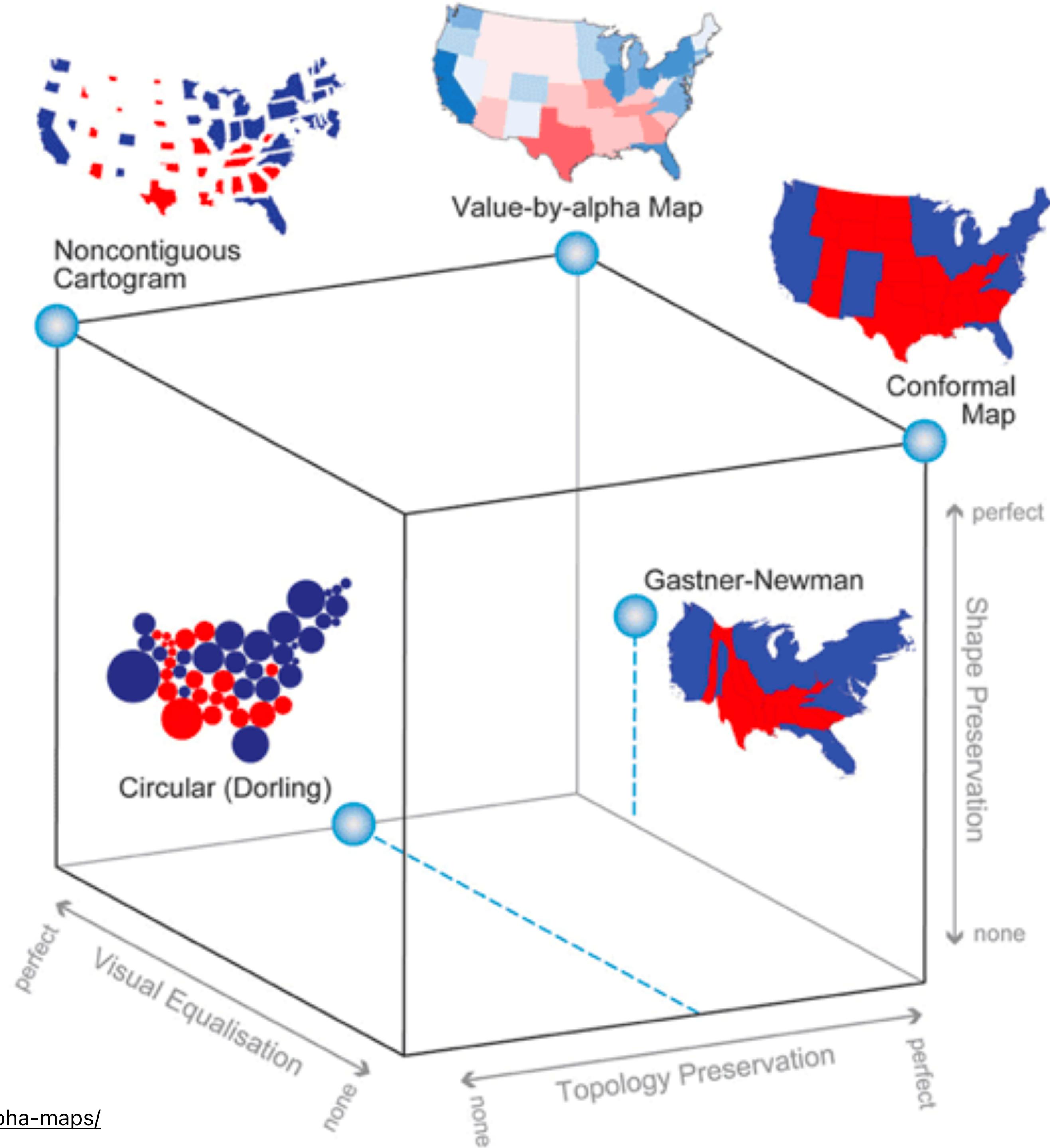
Five Northeastern states



Cartogram: Distorts shape to convey quantity

What are the pros/cons of this display?

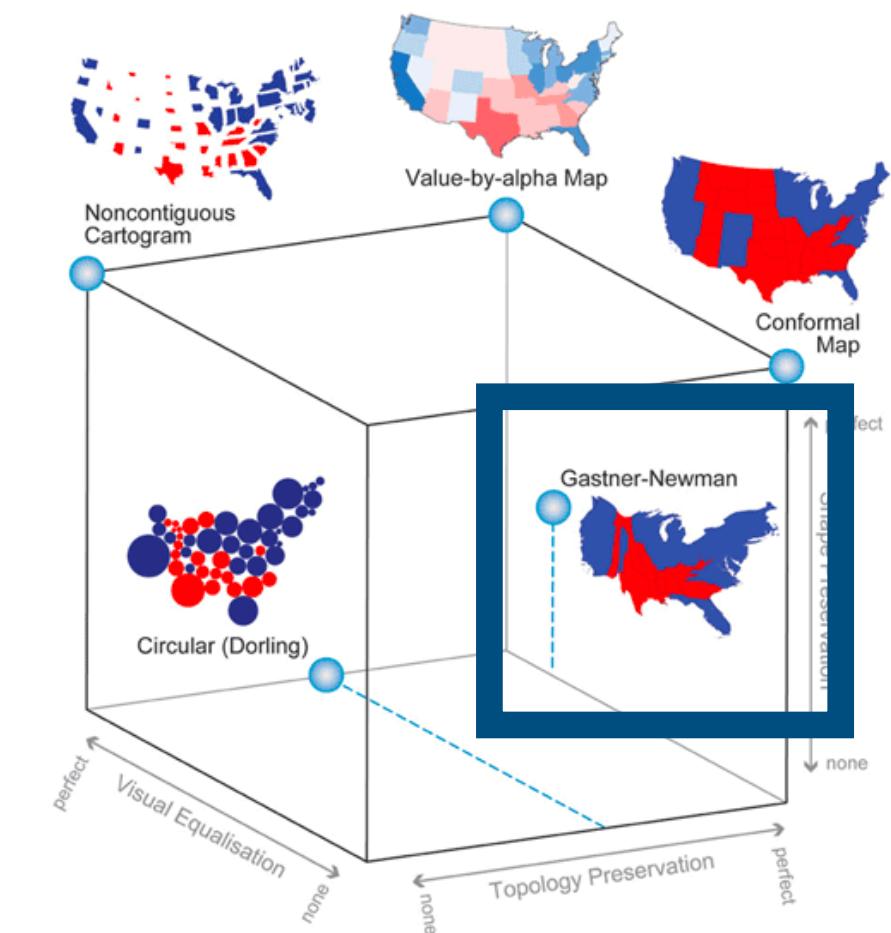
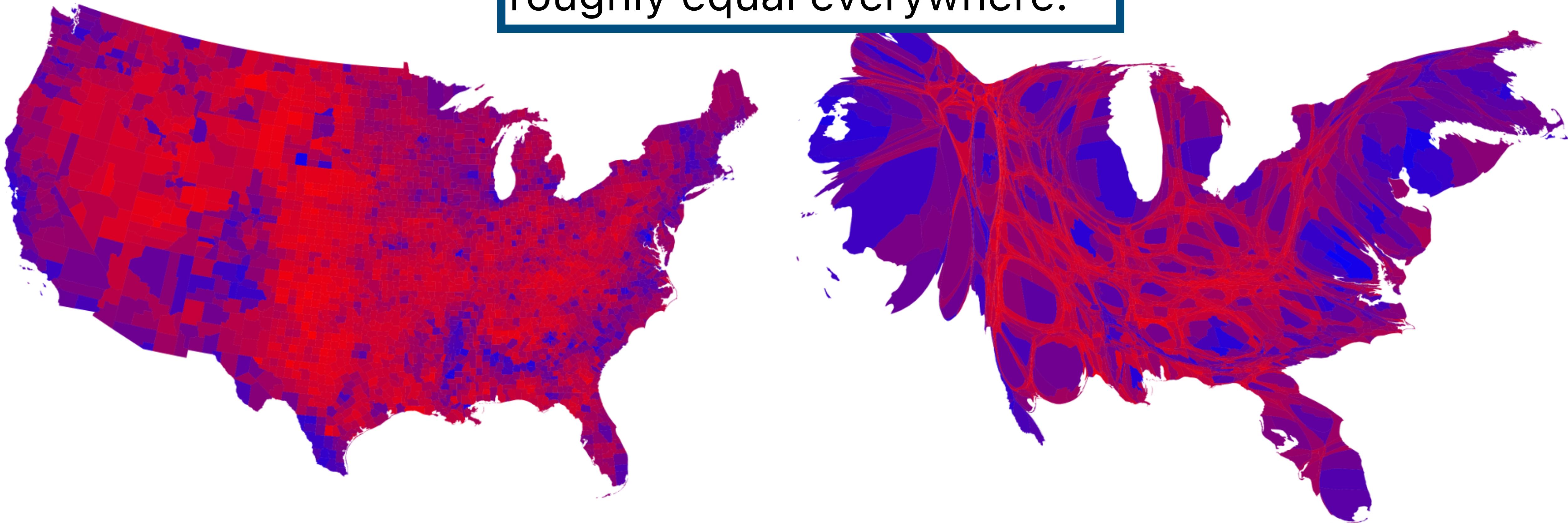
tryclassbuzz.com
Code: **carto**



Gaster-Newman

Physical diffusion model.

Population "flows" from high-density areas to low-density areas until density is roughly equal everywhere.



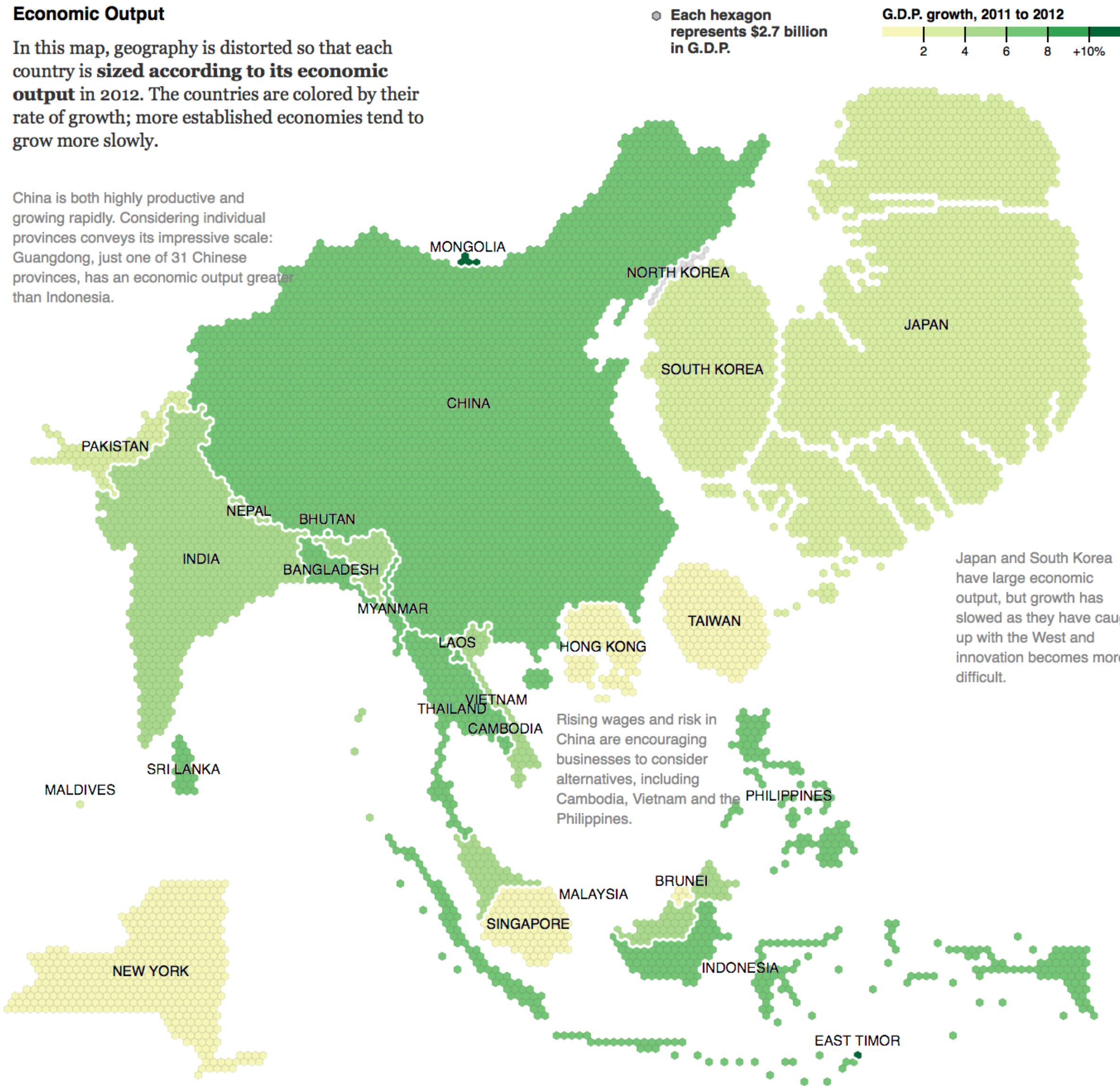
China Still Dominates, but Some Manufacturers Look Elsewhere

While China maintains its overwhelming dominance in manufacturing, multinational companies are looking for ways to limit their reliance on factories there. [Related Article »](#)

Economic Output

In this map, geography is distorted so that each country is **sized according to its economic output** in 2012. The countries are colored by their rate of growth; more established economies tend to grow more slowly.

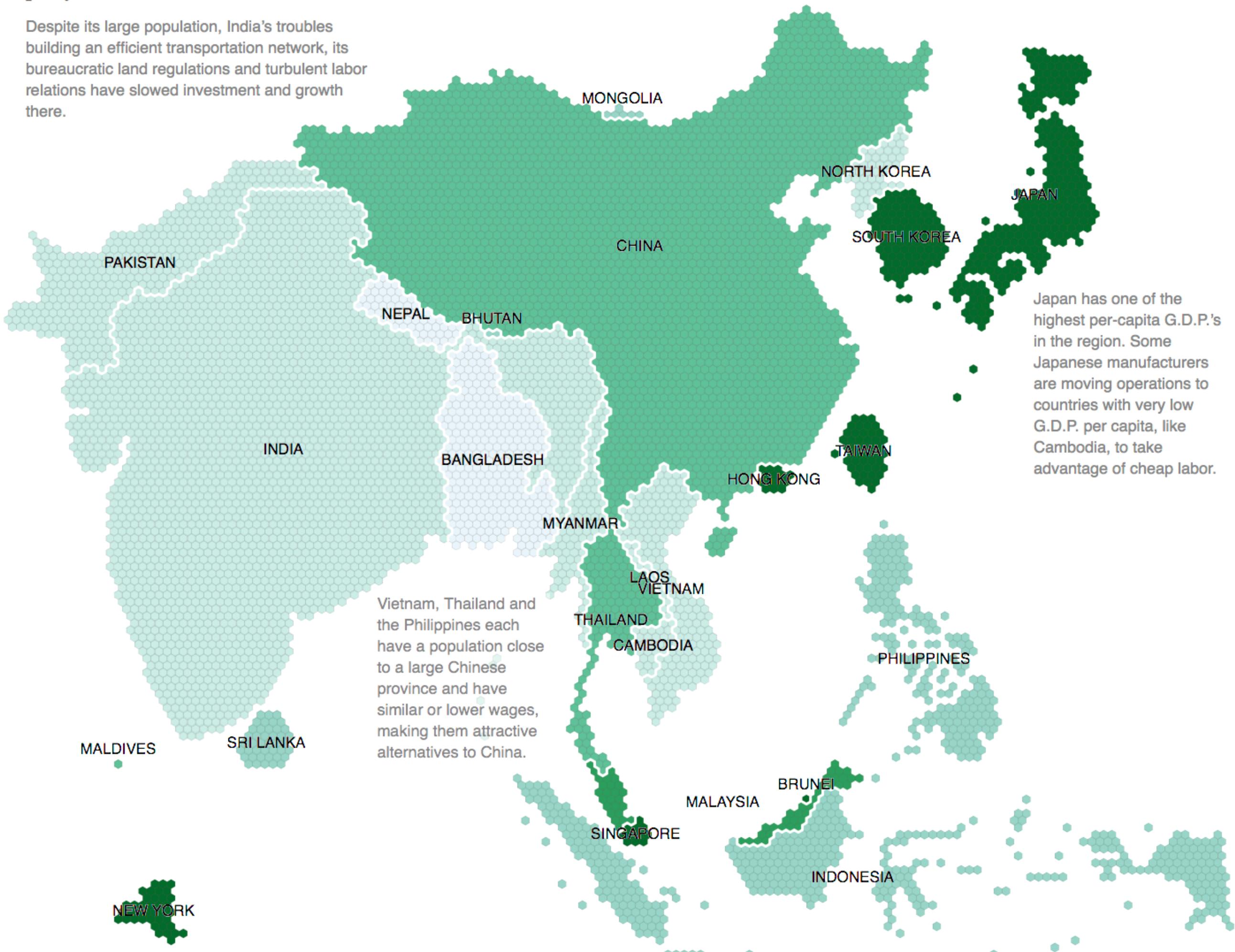
China is both highly productive and growing rapidly. Considering individual provinces conveys its impressive scale: Guangdong, just one of 31 Chinese provinces, has an economic output greater than Indonesia.



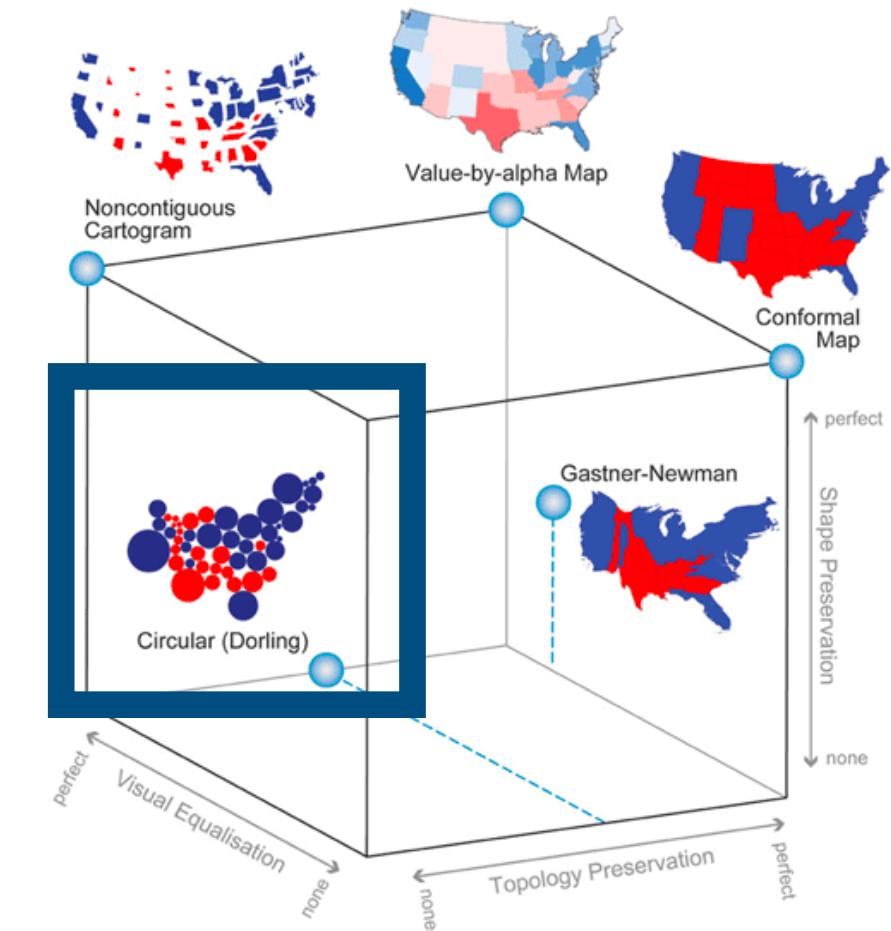
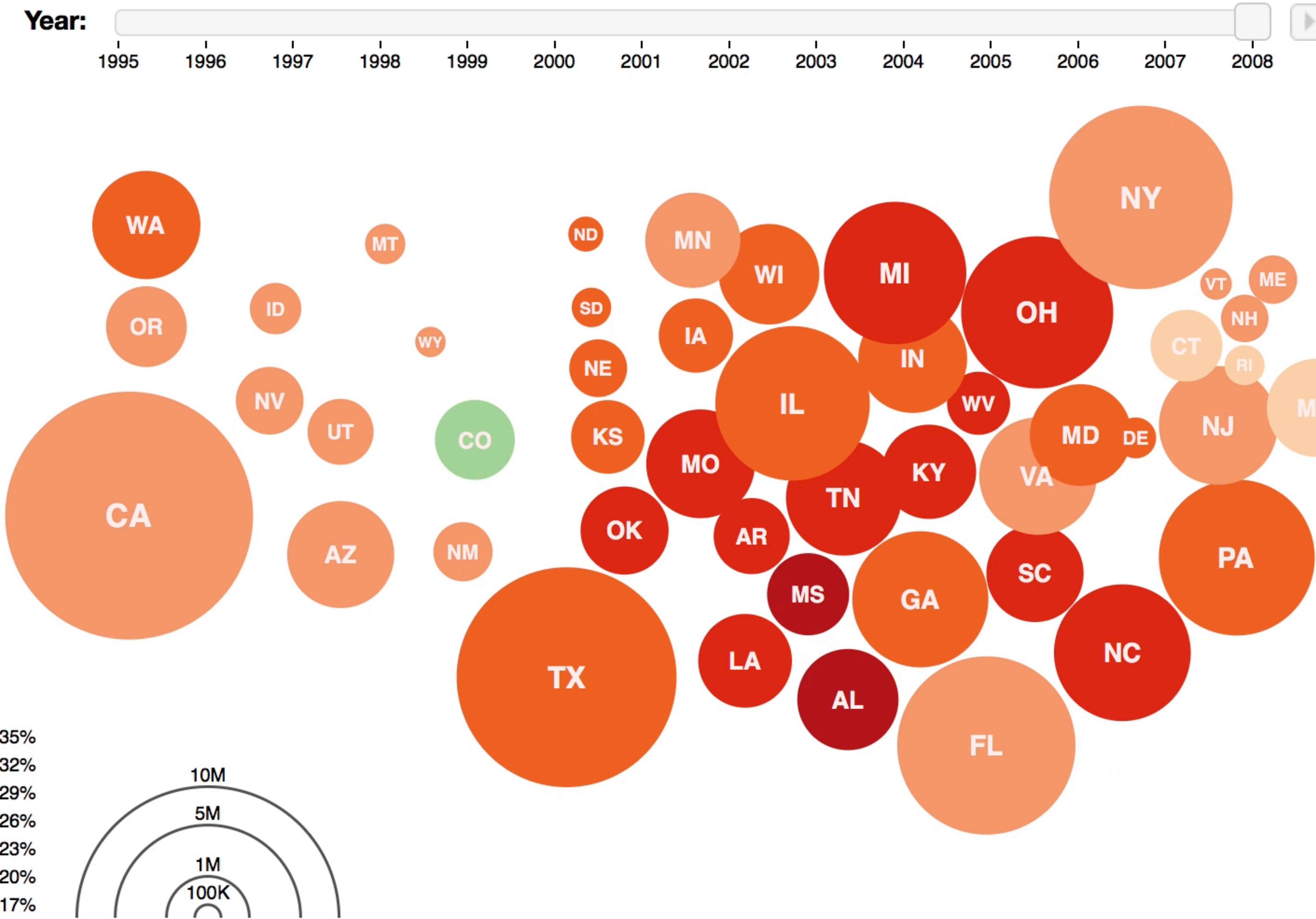
Population

Sizing by population instead gives an estimate of a country's economic potential, at least for labor-based manufacturing. The color here shows the economic output per capita: a measure of how effectively that potential has been realized, and a proxy for labor cost.

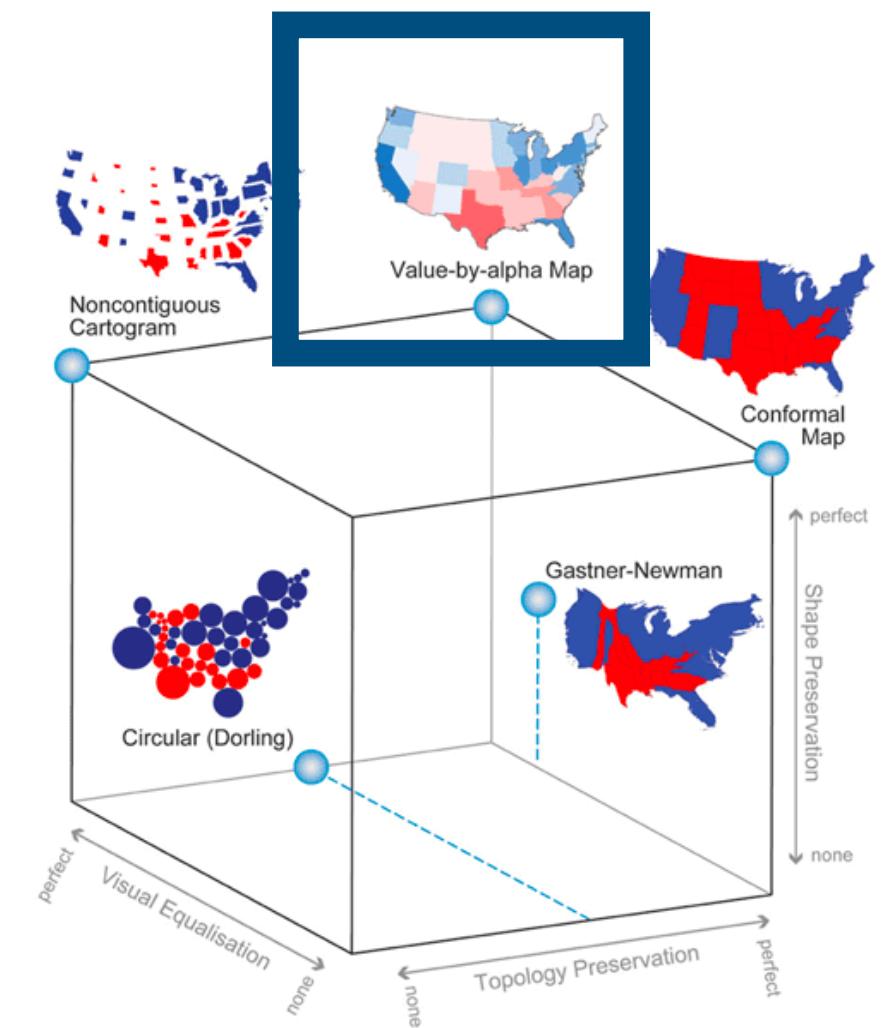
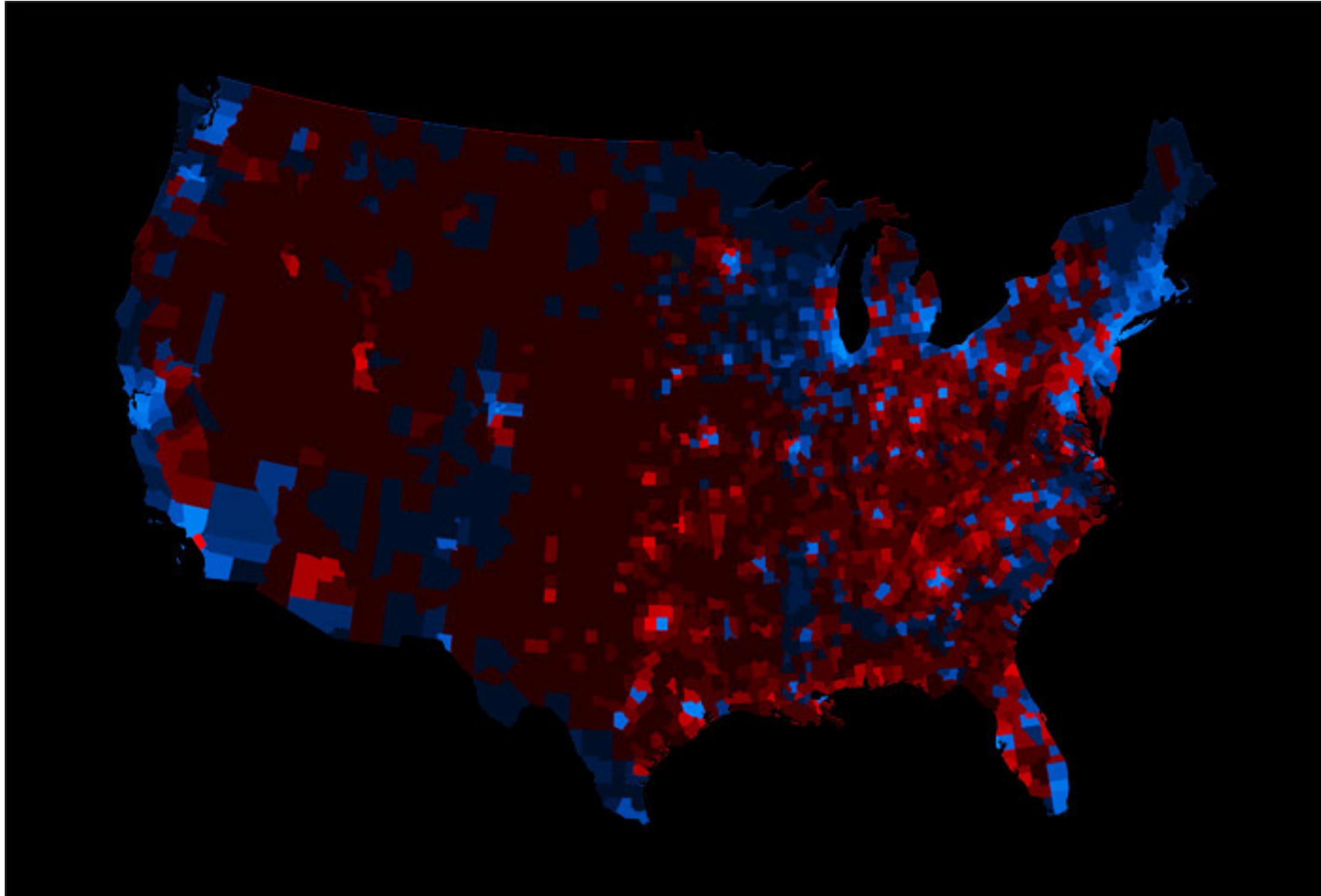
Despite its large population, India's troubles building an efficient transportation network, its bureaucratic land regulations and turbulent labor relations have slowed investment and growth there.



Dorling Cartograms

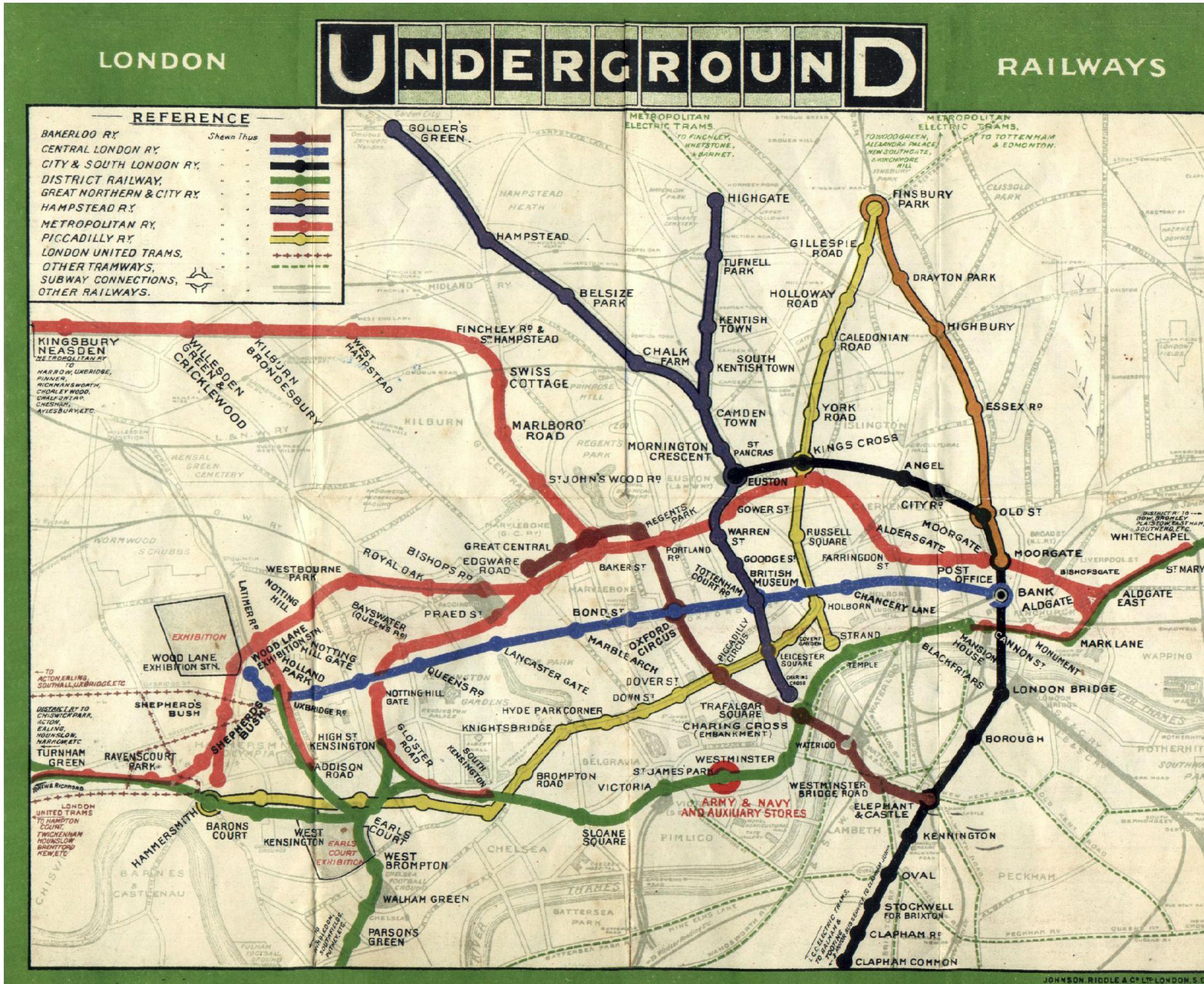


Value-By-Alpha



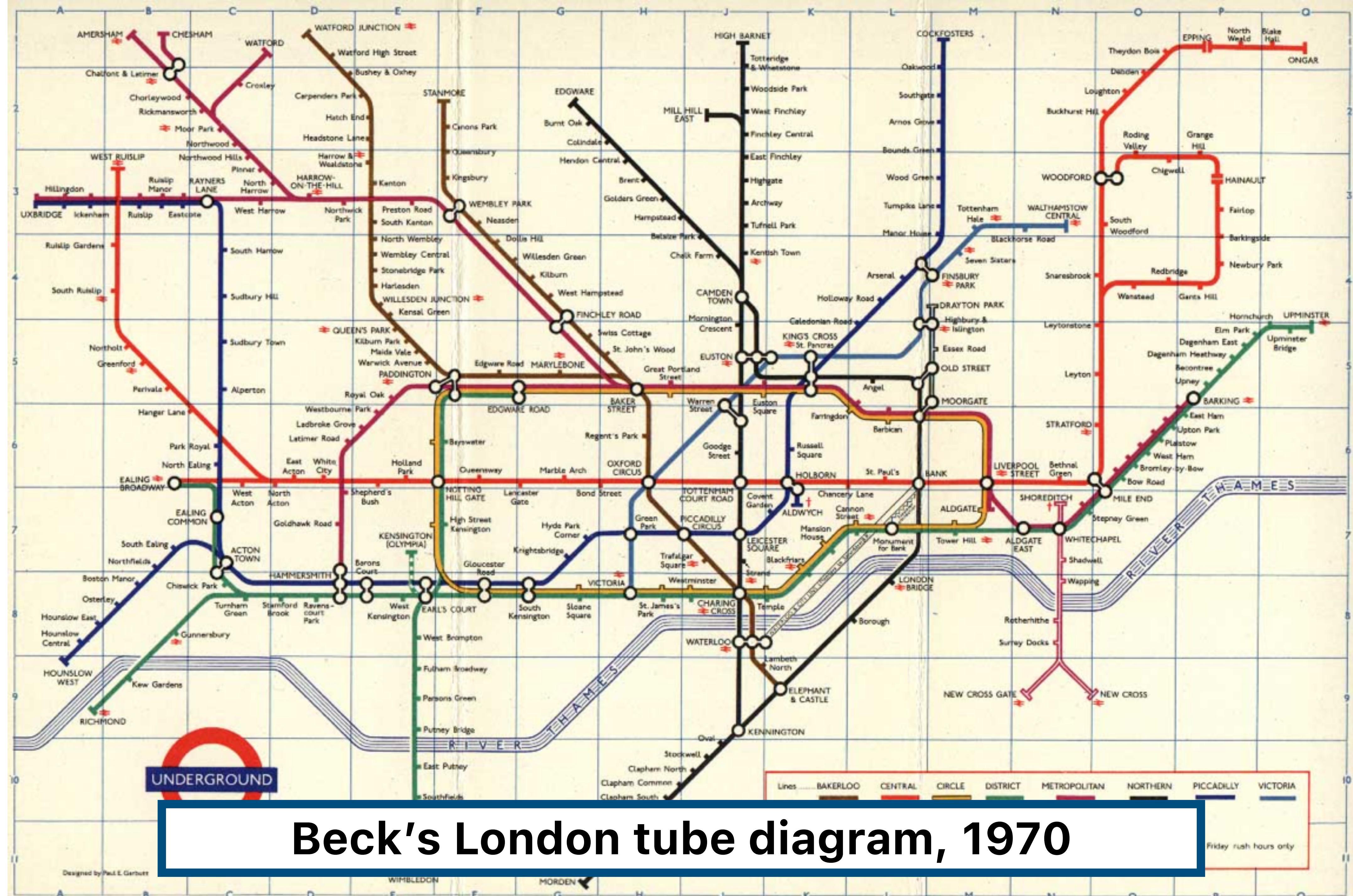
<https://andywoodruff.com/blog/value-by-alpha-maps/>

Route Maps

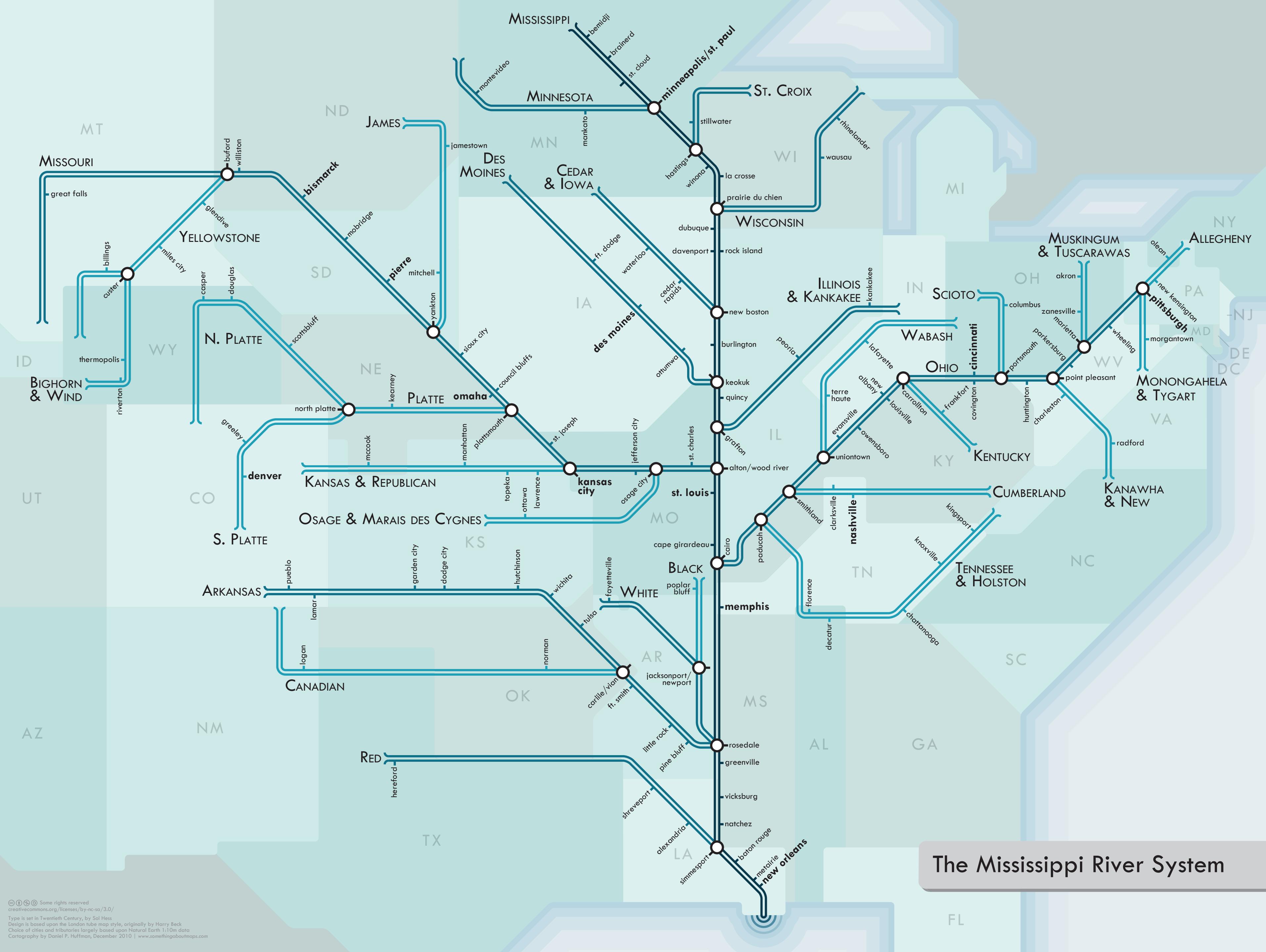


Geographic version of

London Underground



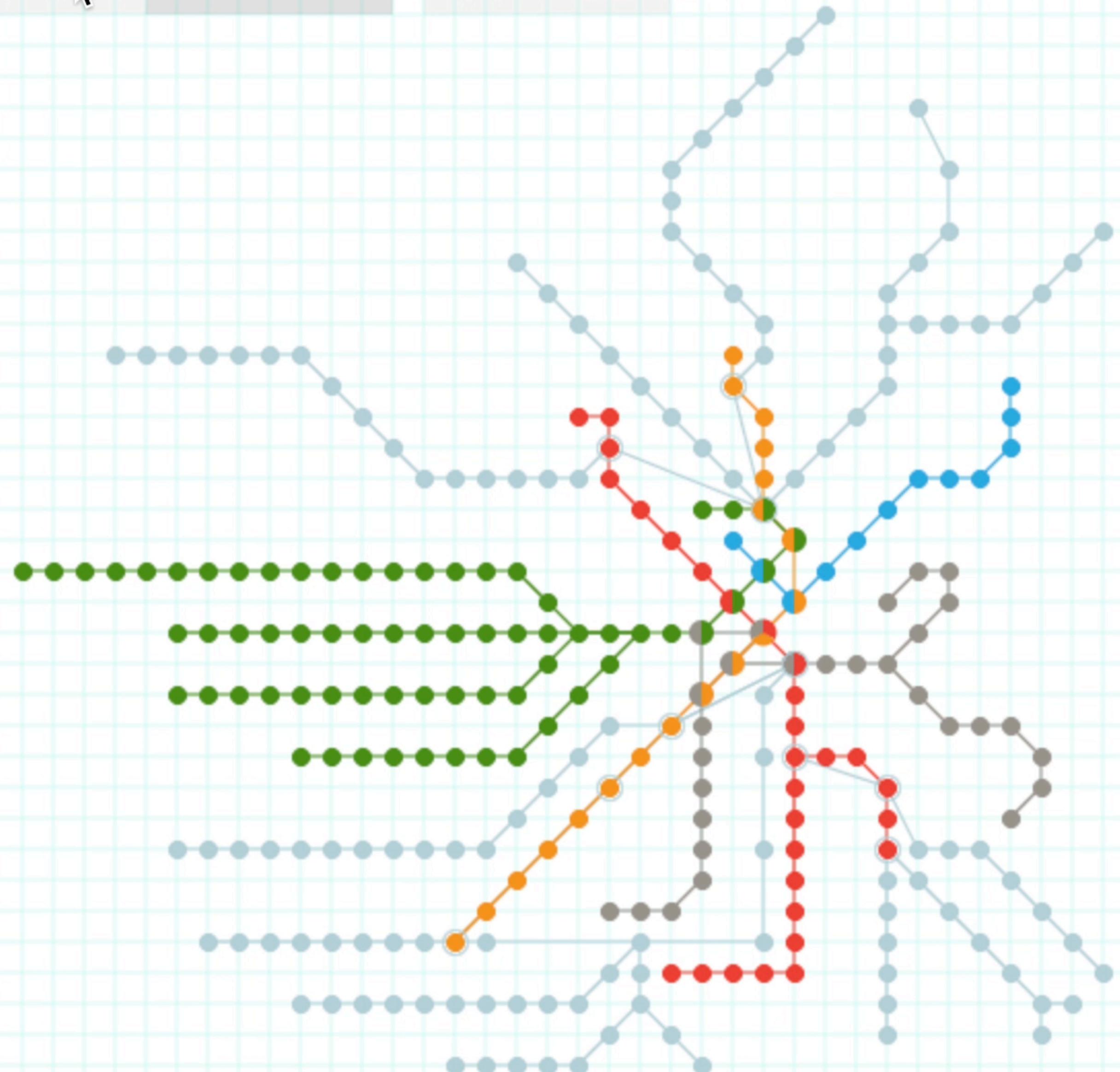
Beck's London tube diagram, 1970

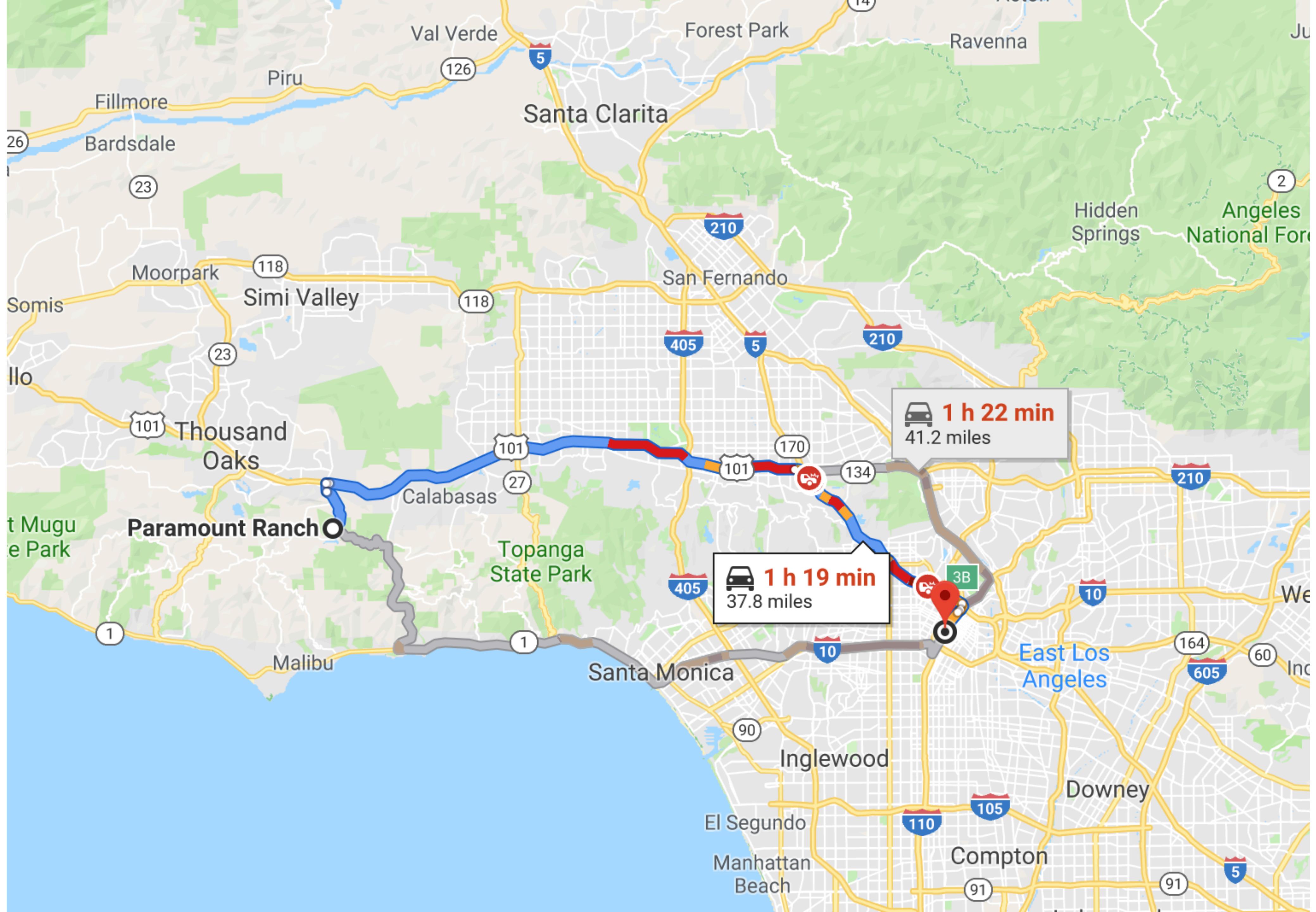


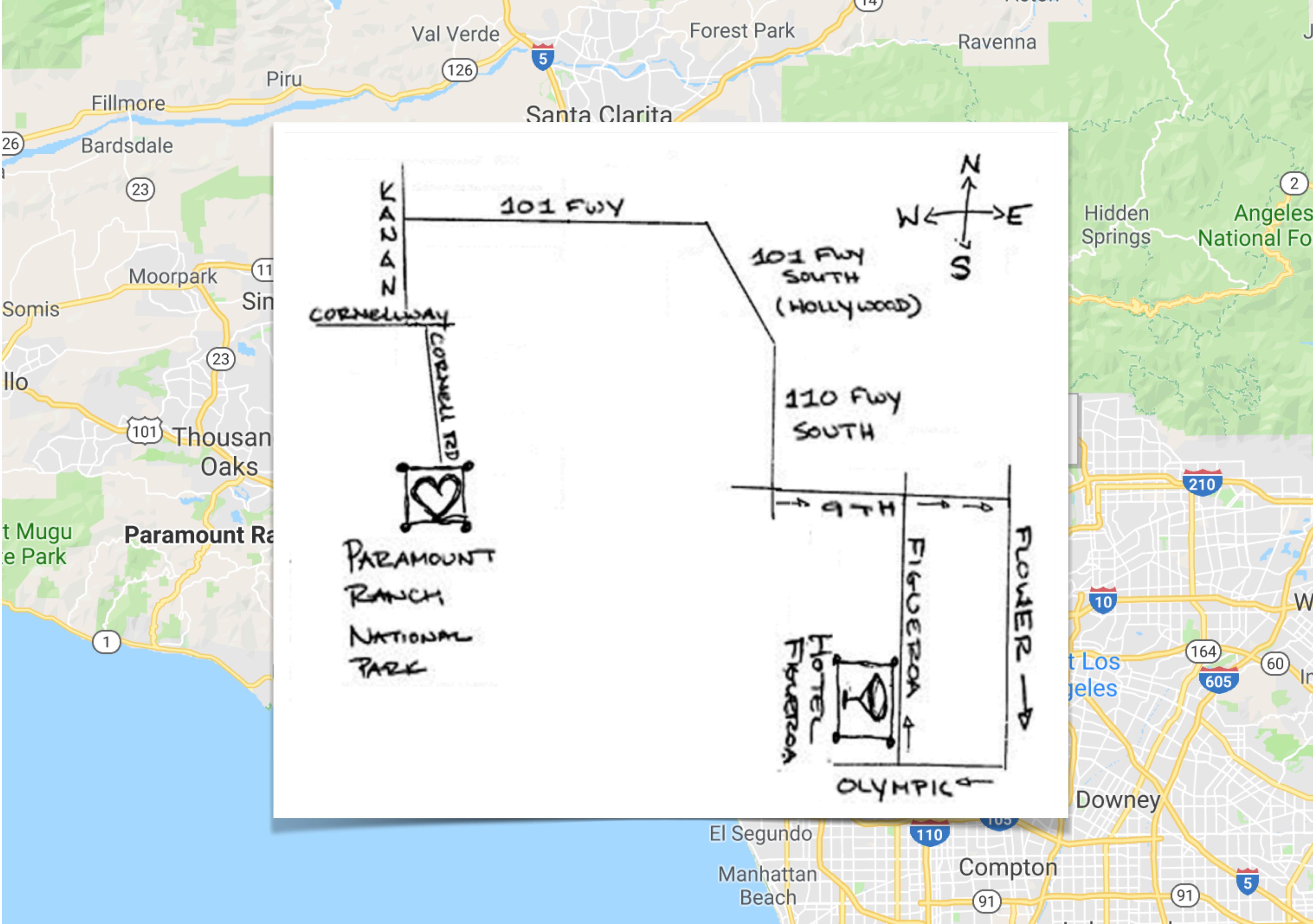
Geographic

Grid

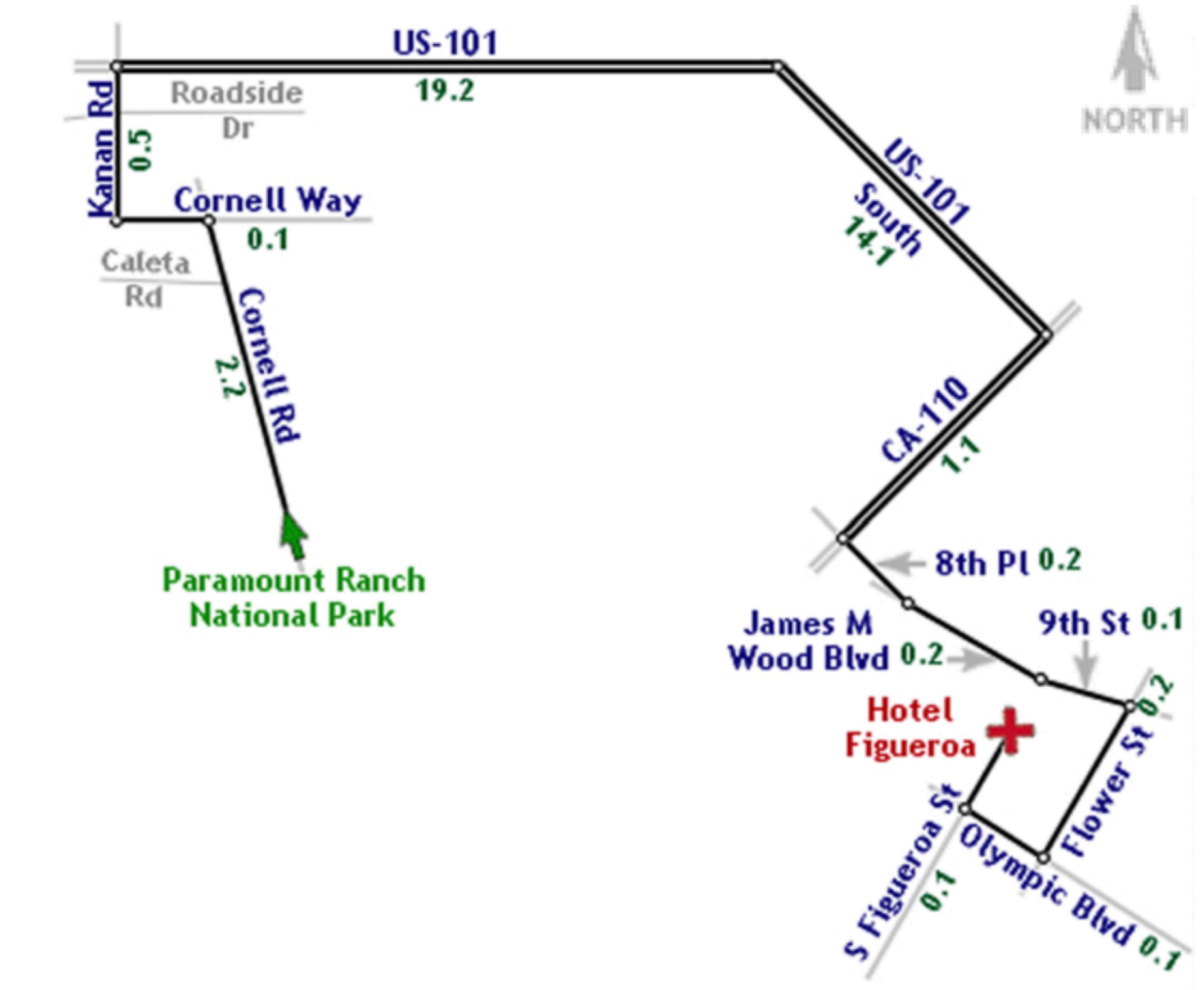
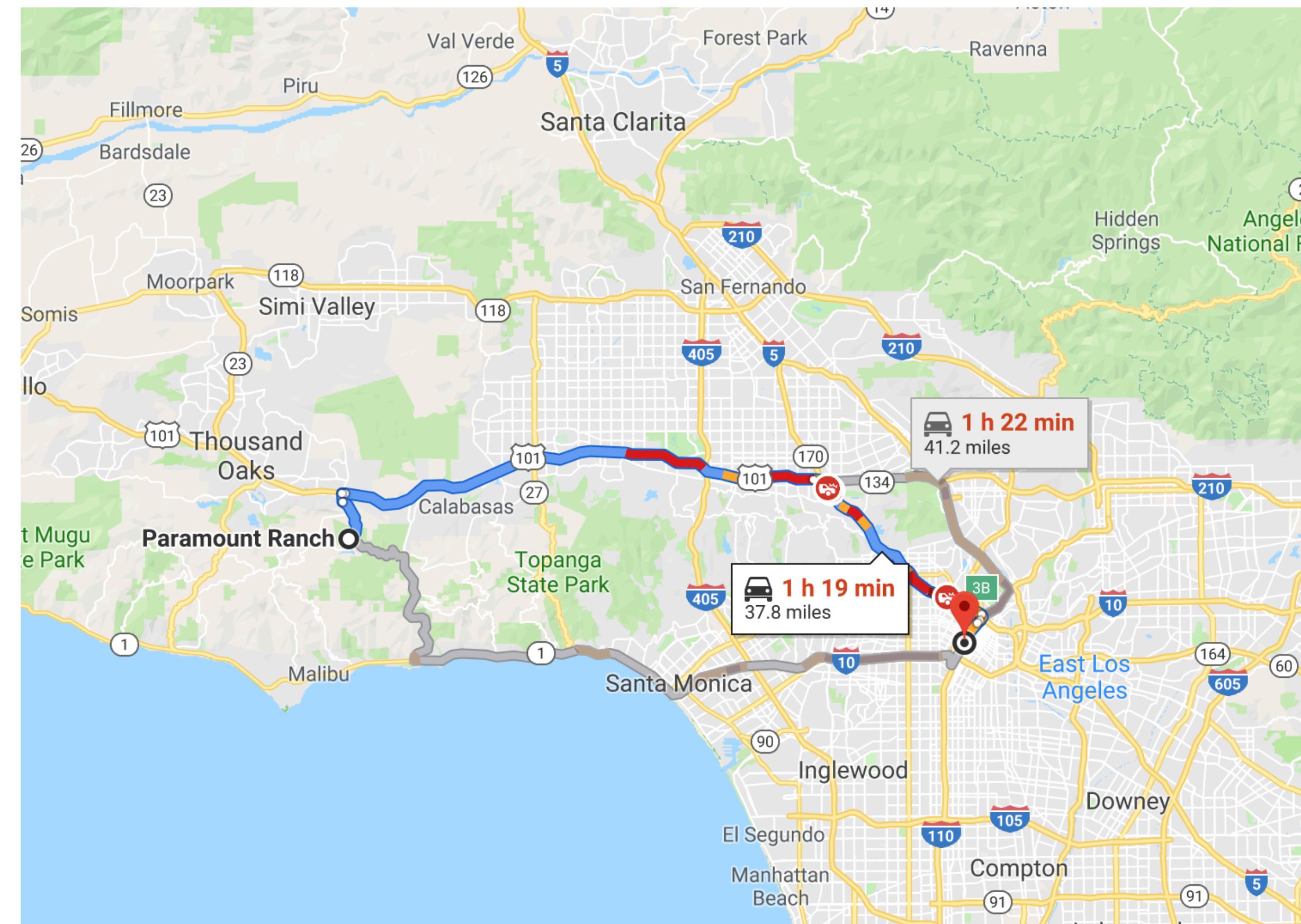
Commuter Rail On







Line Drive



Tooling for Maps

Web Tools

D3: Projections, paths, graticules

GeoJSON: JSON format for geo data.

TopoJSON: Topology → compressed GeoJSON.

Leaflet: open-source, customizable map tile system.

Mapbox: commercial map tile system

Which you will use for Lab 7!

Data Resources

Natural Earth Data: naturalearthdata.com

OpenStreetMap: openstreetmap.org

U.S. Government: nationalatlas.gov, usgs.gov

Tutorials

Command Line Cartography, by Mike Bostock

<https://medium.com/@mbostock/command-line-cartography-part-1-897aa8f8ca2c>



Mike Bostock
Jan 23, 2017 · 5 min read

Command-Line Cartography, Part 4

A tour of d3-geo's new command-line interface.

[This is Part 4 of a tutorial on making thematic maps from the command line using d3-geo, TopoJSON and ndjson-cli. Read Part 3 here.]

450

5 responses



Mike Bostock
Dec 12, 2016 · 5 min read

Command-Line Cartography, Part 3

A tour of d3-geo's new command-line interface.

[This is Part 3 of a tutorial on making thematic maps from the command line using d3-geo, TopoJSON and ndjson-cli. Read Part 2 and Part 4 here.]



Mike Bostock
Dec 10, 2016 · 6 min read

Command-Line Cartography, Part 2

A tour of d3-geo's new command-line interface.

[This is Part 2 of a tutorial on making thematic maps from the command line using d3-geo, TopoJSON and ndjson-cli. Read Part 1 or Part 3 here.]

365

15 responses



Mike Bostock
Dec 9, 2016 · 5 min read

Command-Line Cartography, Part 1

A tour of d3-geo's new command-line interface.

[This is Part 1 of a tutorial on making thematic maps. Read Part 2 here.]

1.5K

30 responses