Visualization and information design

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ITSI
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https://github.com/emilyfuhrman/ITSI

42, 12

Data is a representation, visualization is a representation of a representation.

Data is a collection of values.

A variable is a descriptive attribute.

Qualitative / Categorical
Finite values, buckets
(ex. the breed of a dog)

Quantitative
Measurable quantities
(ex. population of a city)

Qualitative variables
Categories, types, characteristics.

Nominal
Categorical, discrete; no logical sequence
(ex. property type; food groups)

Ordinal
Observations can be ordered or ranked
(ex. pain scale; grades)

Quantitative variables

How many, how much.

Continuous

Can take on any value between a minimum and a maximum

Discrete

Can take on any *integer* value between a minimum and a maximum

Visualization is a process of simplification.

Visualization has the potential to open up new modalities for engaging with information.

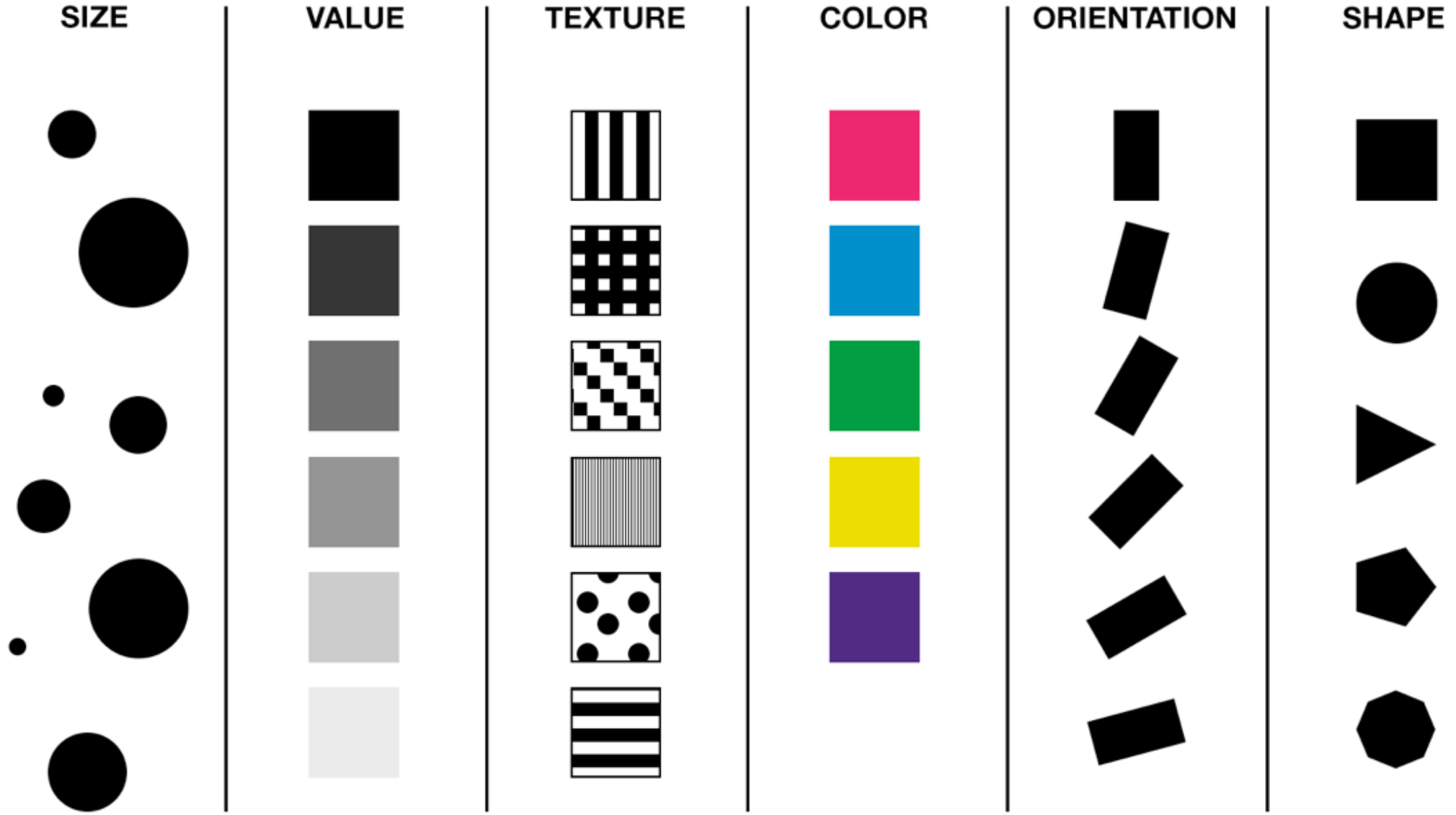
Encoding variables

Features

Points, lines, polygons

Attributes

Symbols, colors, etc.



Jacques Bertin — 6 retinal properties

Rather than focusing on quantities alone, focus on the **relationships between them**.

Visualization types

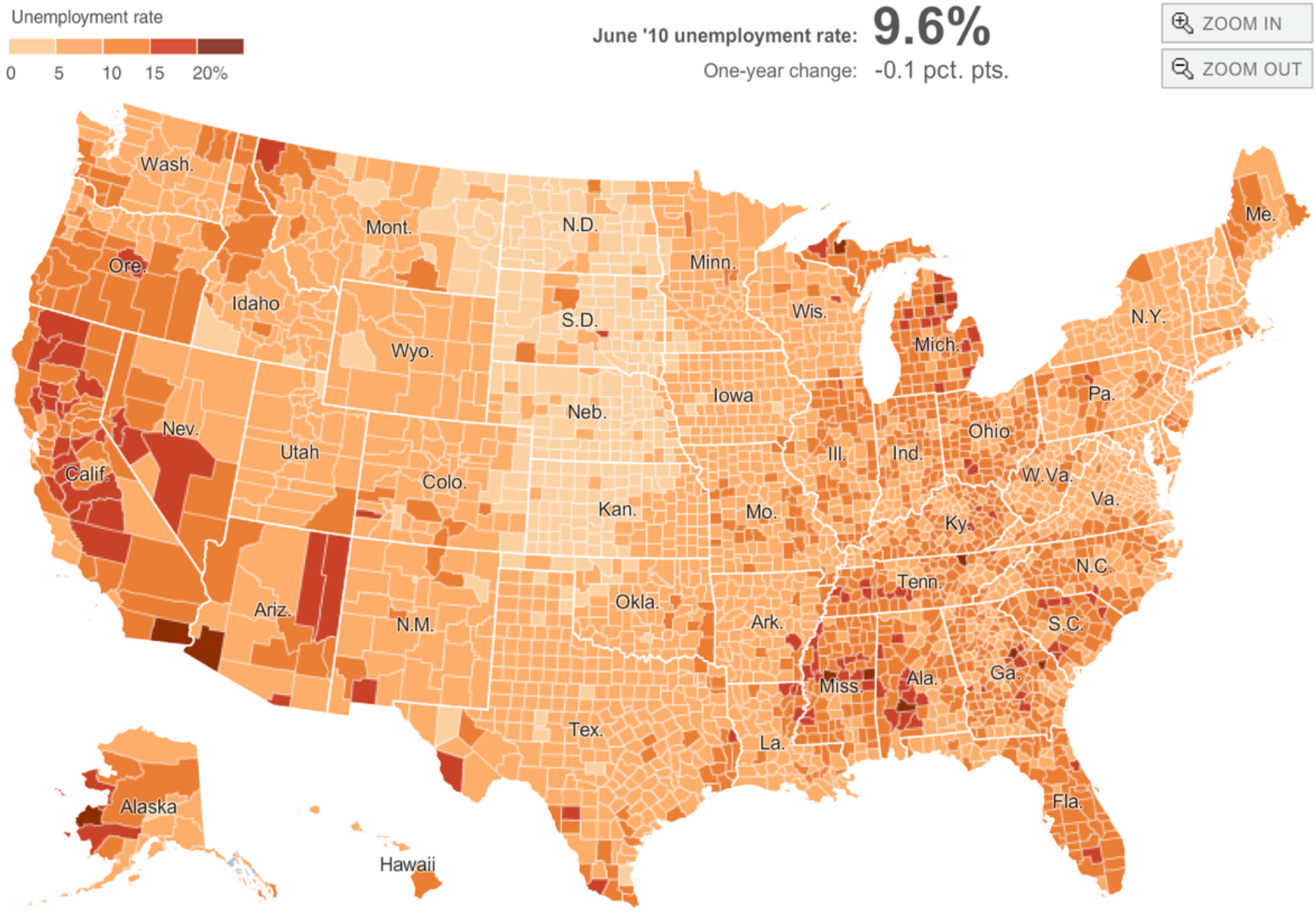
(NOT exhaustive!)

1D — Linear

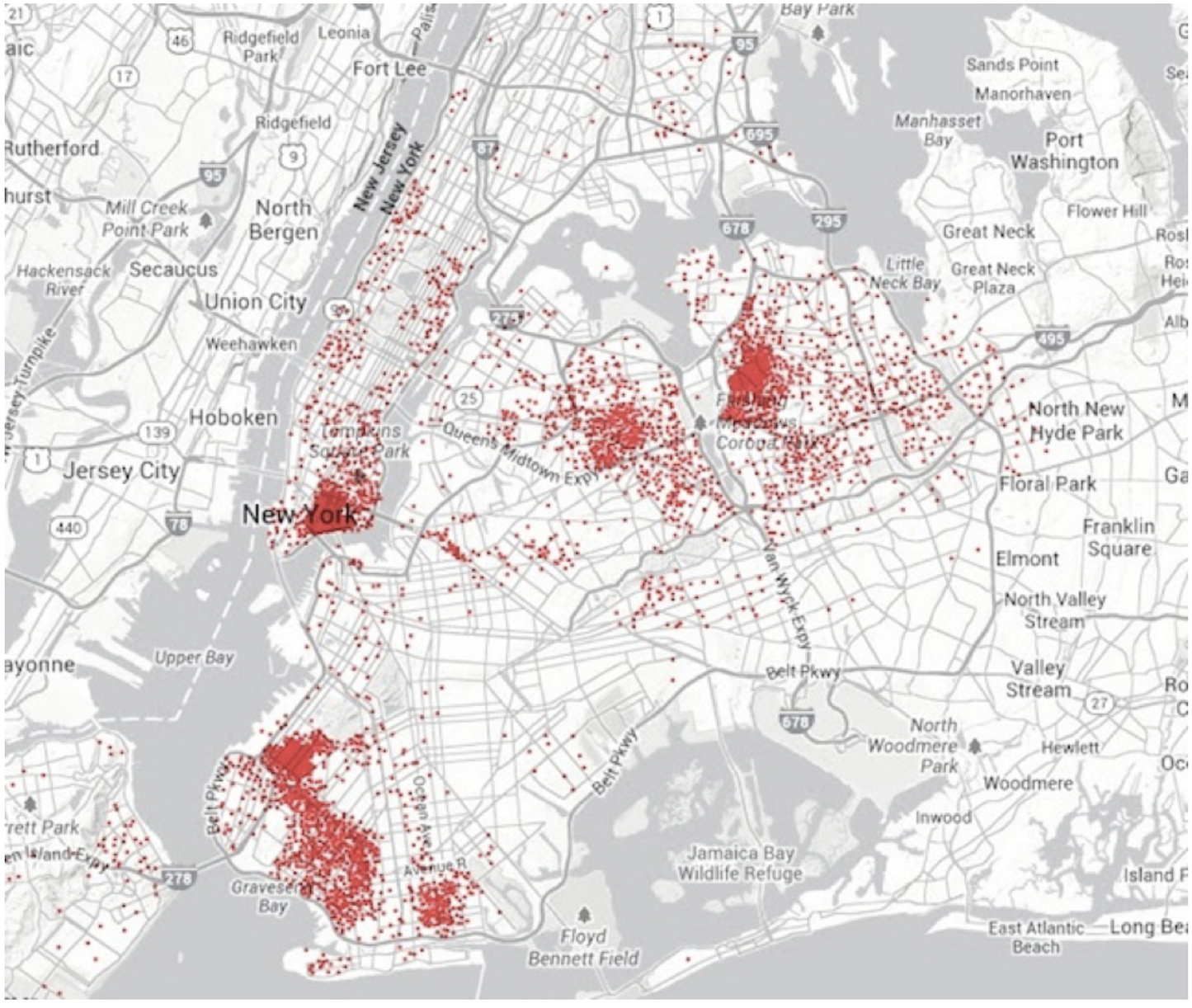
- Lists of data items, organized by a single feature (ex. alphabetical order)

2D — Planar

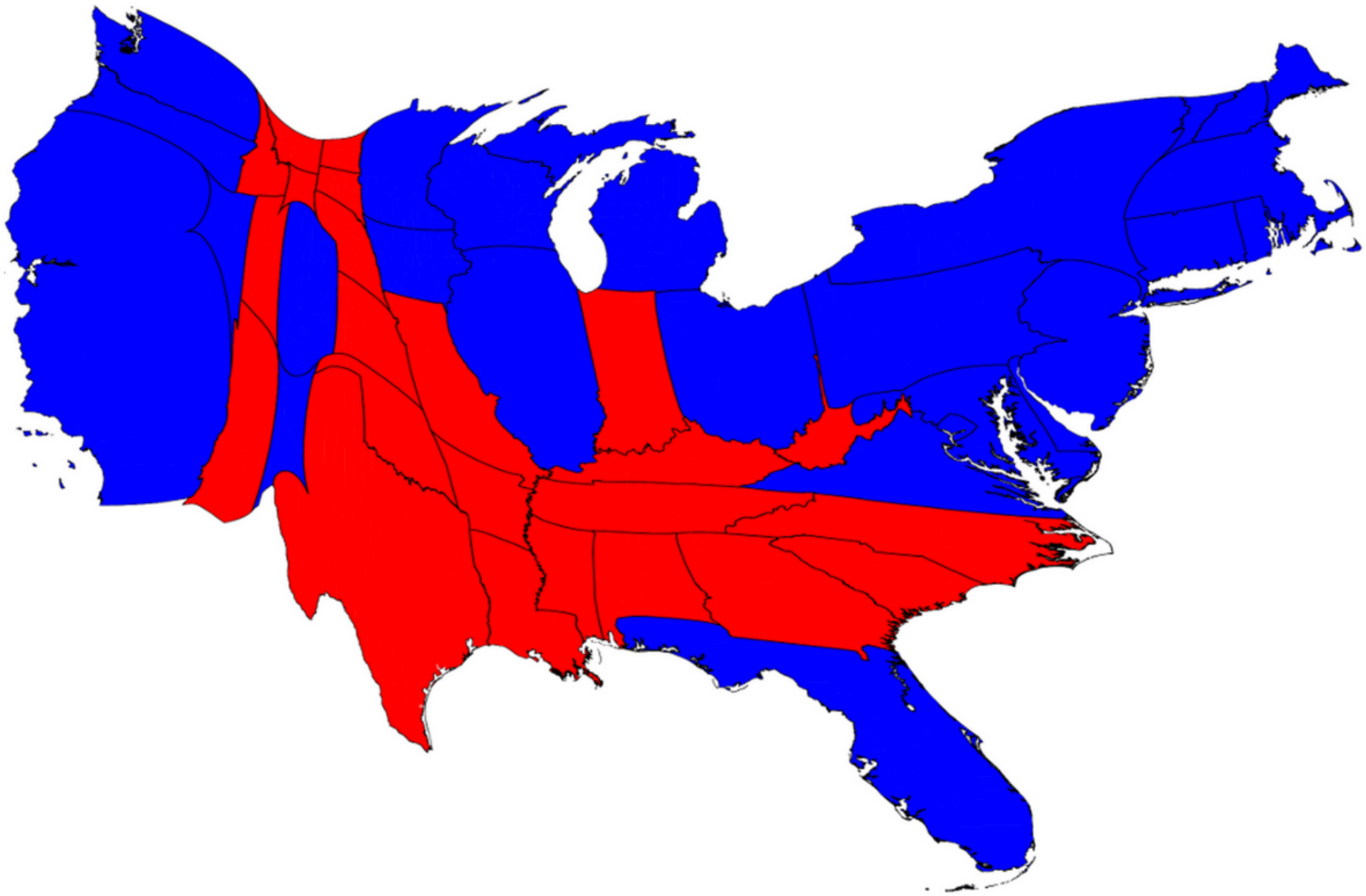
- Esp. geospatial — represents data items on a planar surface


Unemployment rate
0
5
10
15
20%
June '10 unemployment rate: 9.6%
One-year change: -0.1 pct. pts.
ZOOM IN
ZOOM OUT
Wash.
Ore.
Calif.
Idaho
Nev.
Mont.
Wyo.
Utah
Ariz.
Colo.
N.M.
N.D.
S.D.
Neb.
Kan.
Okla.
Tex.
Minn.
Iowa
Mo.
Ark.
La.
Wis.
Ill.
Mich.
Ind.
Ohio
Ky.
Tenn.
Miss.
W.Va.
Va.
N.C.
S.C.
Ala.
Ga.
Fla.
N.Y.
Pa.
Me.
Alaska
Hawaii

Choropleth


Ridgefield Park
Leonia
Fort Lee
Ridgefield
Rutherford
Mill Creek Point Park
North Bergen
New Jersey
New York
Hackensack River
Secaucus
Union City
Weehawken
Hoboken
Jersey City
New York
Bay Park
Sands Point
Manorhaven
Manhasset Bay
Port Washington
Flower Hill
Great Neck
Little Neck Bay
Great Neck Plaza
North New Hyde Park
Floral Park
Franklin Square
Elmont
North Valley Stream
Valley Stream
North Woodmere Park
Hewlett
Woodmere
Inwood
Jamaica Bay Wildlife Refuge
East Atlantic Beach
Upper Bay
Belt Pkwy
Floyd Bennett Field
Queens Midtown Expy
Van Wyck Expy

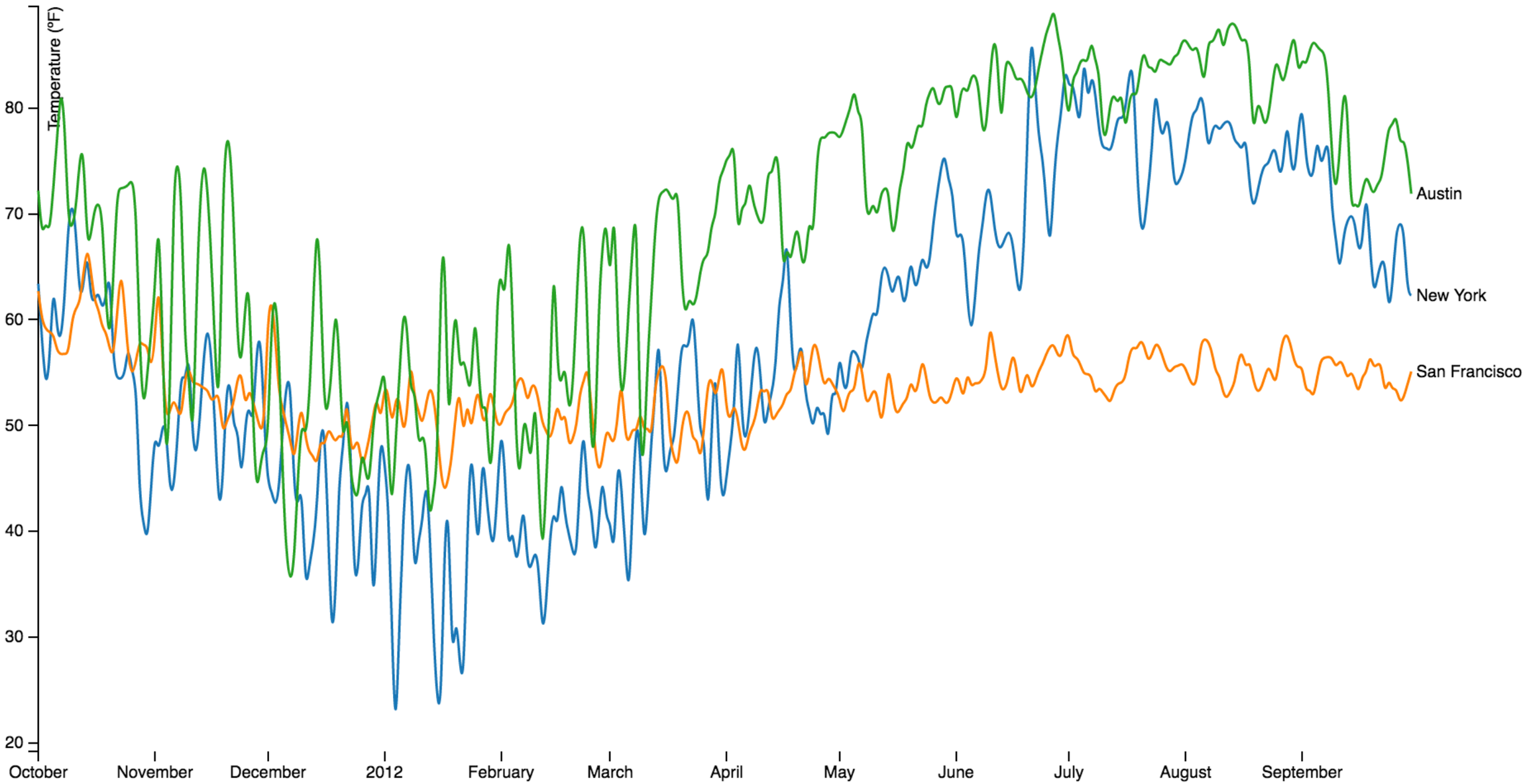
Dot



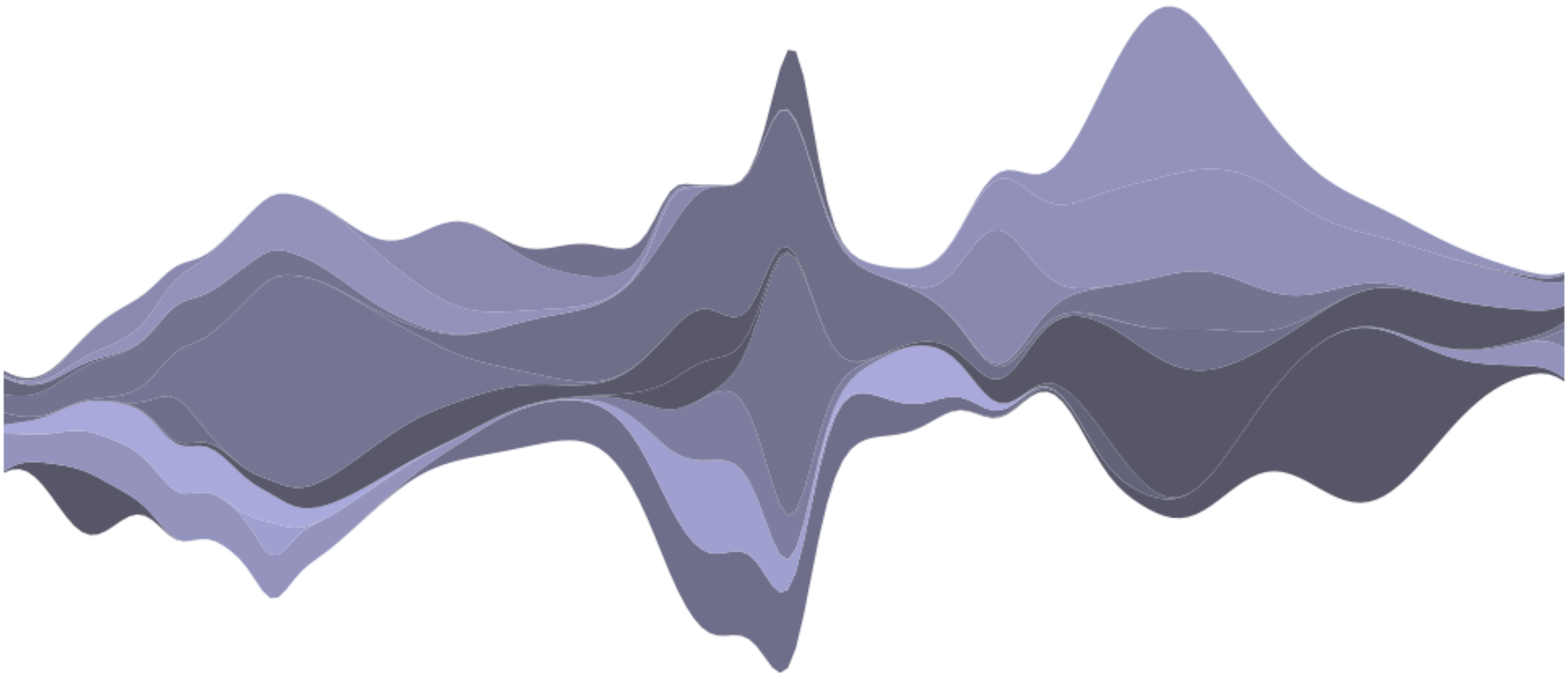
Cartogram

Temporal

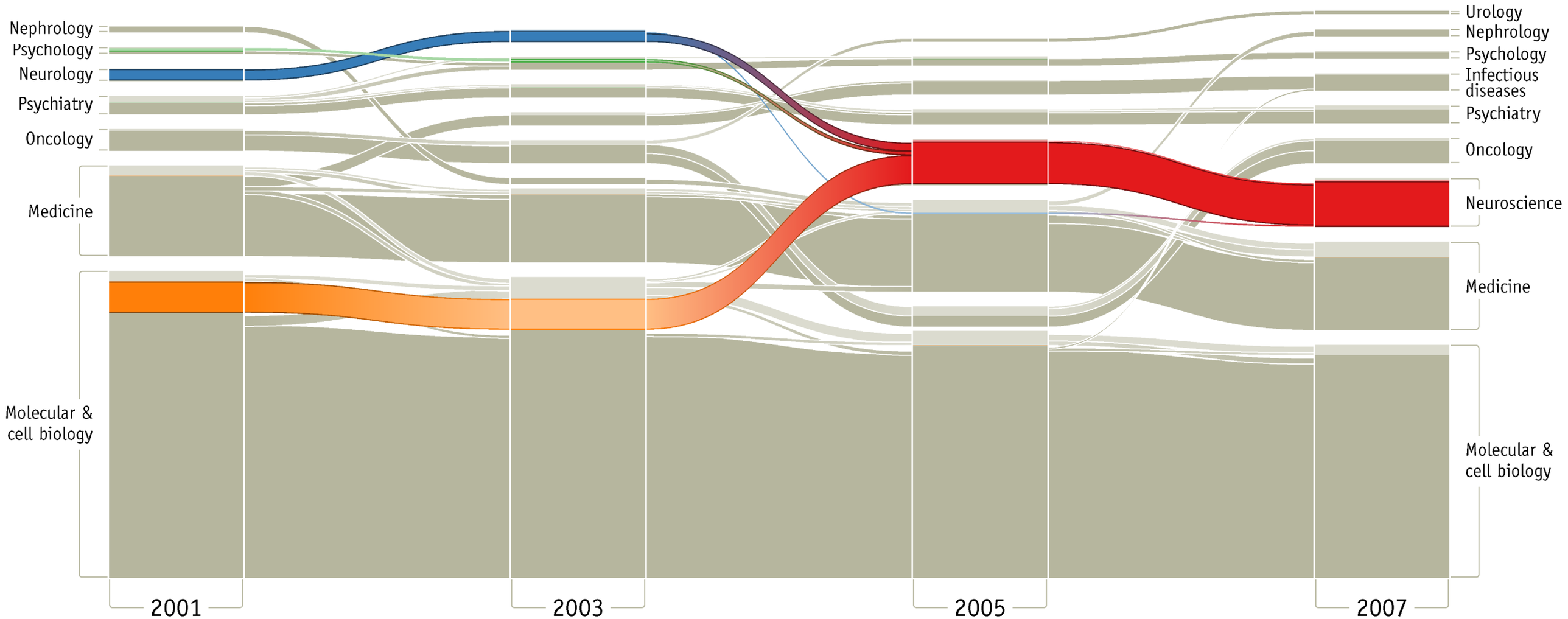
- Values over time


Temperature (°F)
80
70
60
50
40
30
20
October
November
December
2012
February
March
April
May
June
July
August
September
Austin
New York
San Francisco

Time series



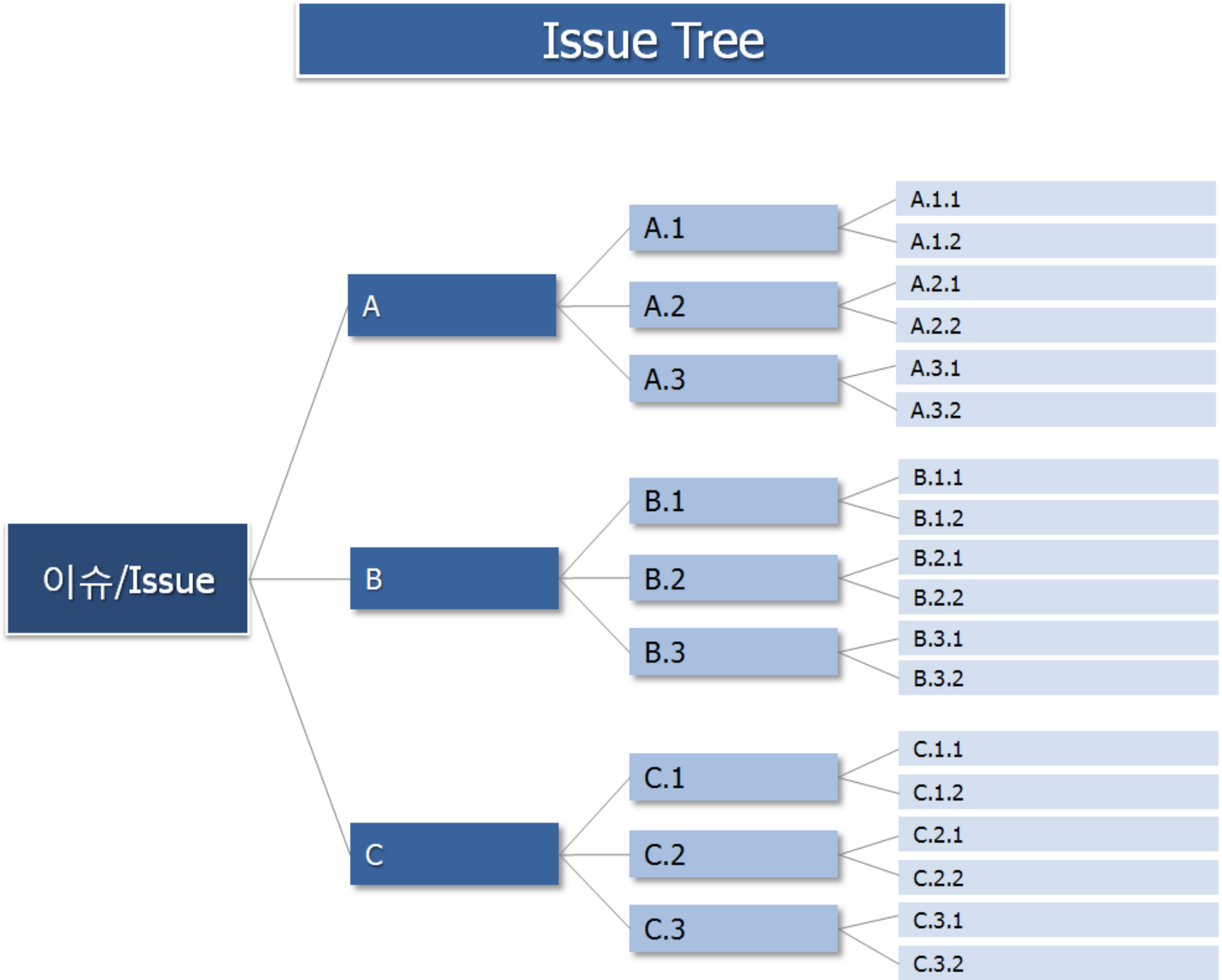
Streamgraph



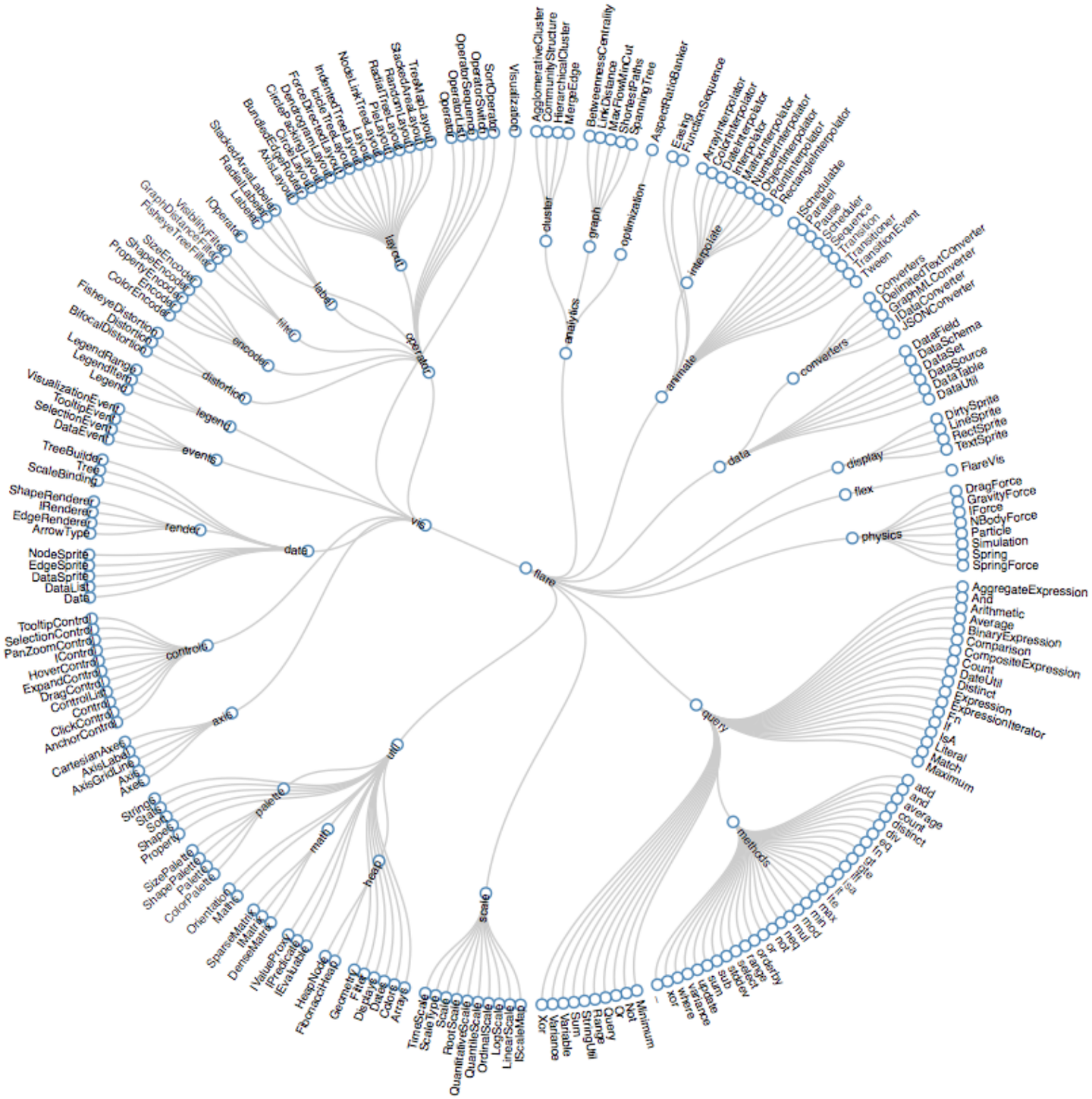
Alluvial diagram

Tree, hierarchical

- Dependencies
- Taxonomies
- Hierarchical relationships



General tree visualization



Radial dendrogram

Sunburst

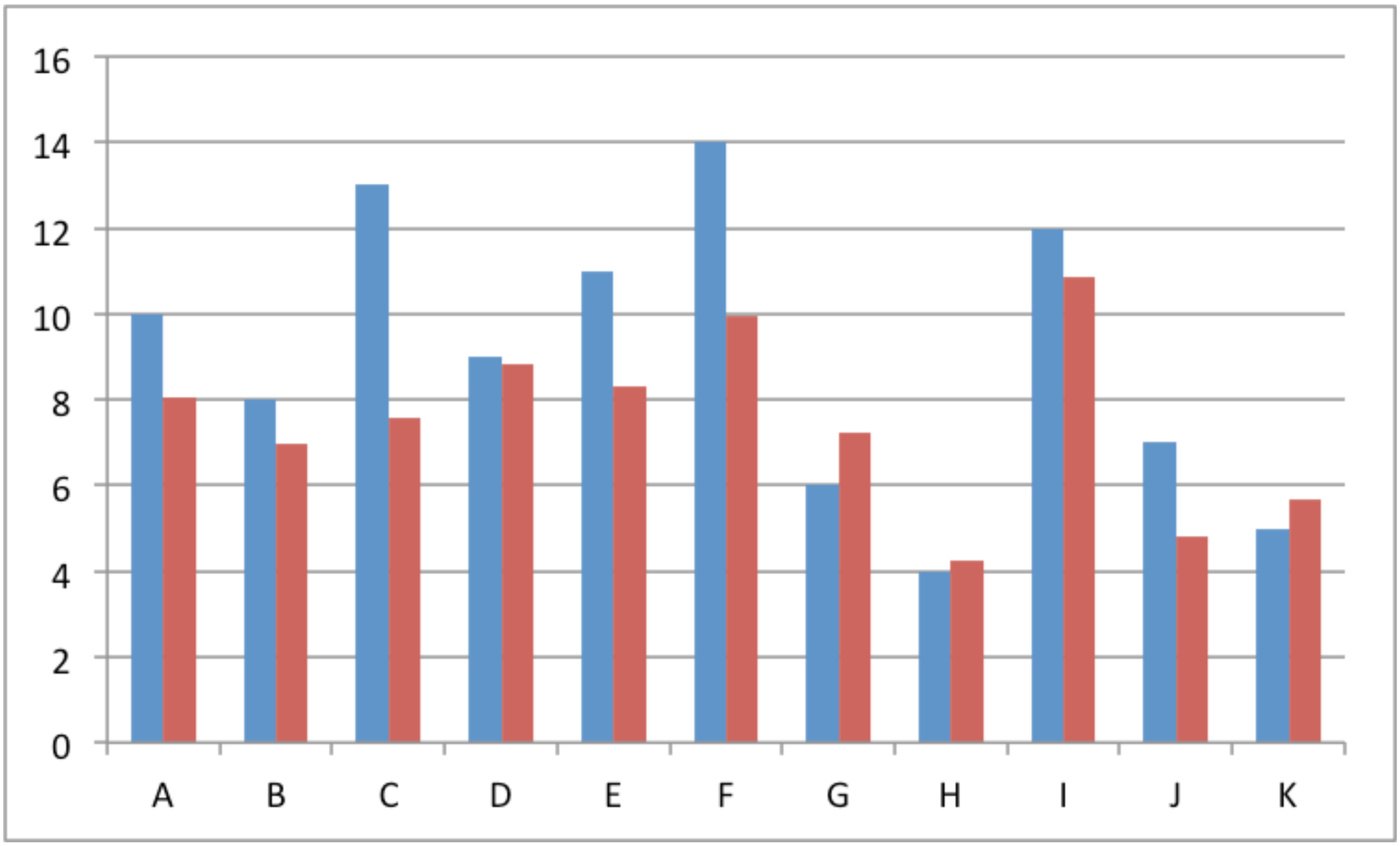
Network

- Interconnectivity

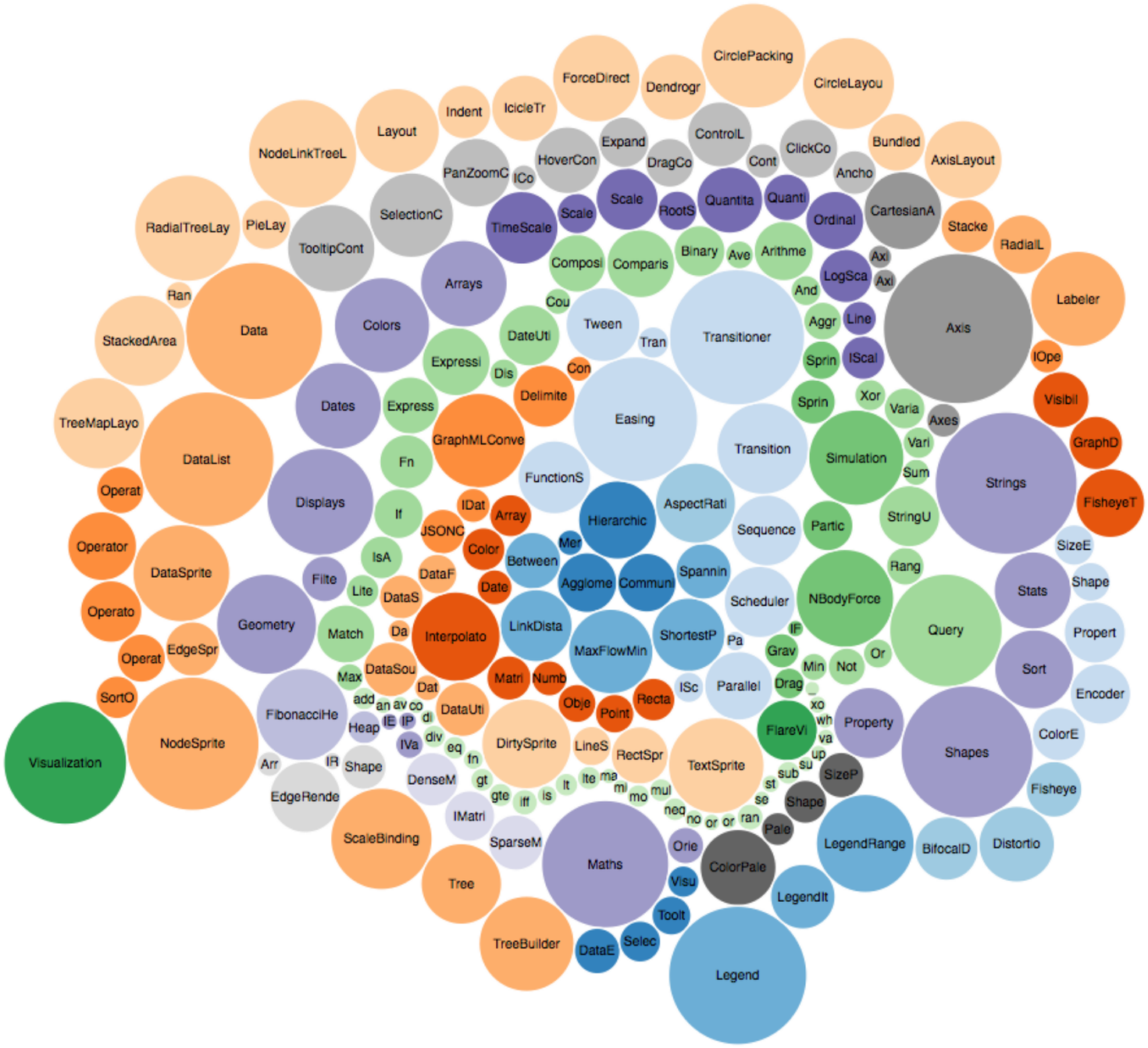
Node-link diagram

Multidimensional

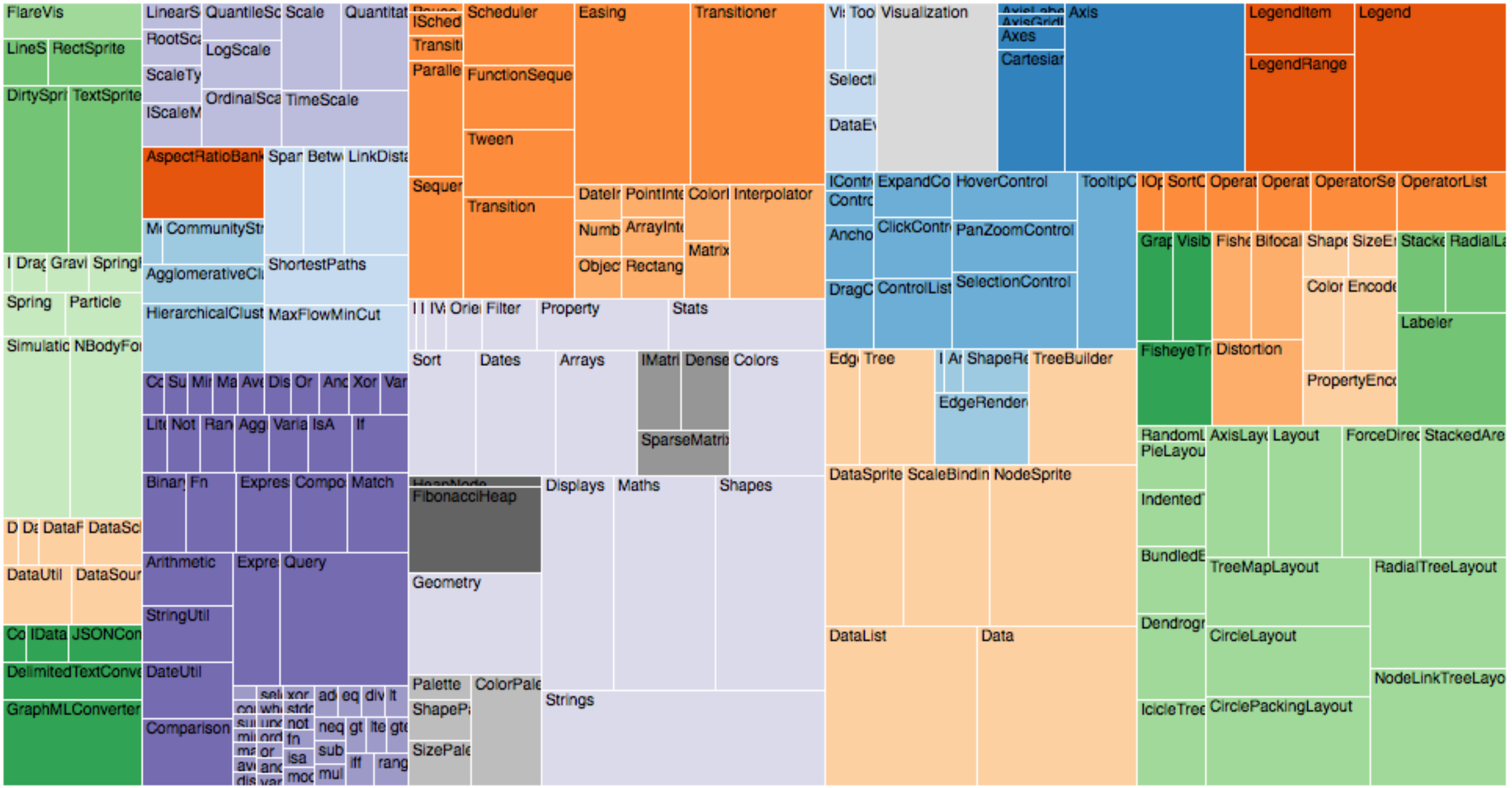
- Category proportions
- Counts



Bar chart



Bubble chart


FlareVis
LineS
RectSprite
DirtySpri
TextSprite
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Drag
Gravi
Springf
Spring
Particle
Simulatic
NBodyFor
D
Da
DataF
DataSc
DataUtil
DataSour
Co
IData
JSONCon
DelimitedTextConve
GraphMLConverter
LinearS
QuantileSc
Scale
Quantitat
RootSca
LogScale
ScaleTy
OrdinalSca
TimeScale
IScaleM
AspectRatioBank
Spar
Betw
LinkDista
M
CommunitySt
ShortestPaths
AgglomerativeCl
HierarchicalClust
MaxFlowMinCut
Co
Su
Mir
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Ave
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Or
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Xor
Var
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Not
Ran
Aggl
Varia
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If
Binar
Fn
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Arithmetic
Expre
Query
StringUtil
DateUtil
Comparison
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Easing
Transitioner
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Dense
Colors
SparseMatri
HeapNode
FibonacciHeap
Geometry
Palette
ColorPale
ShapeP
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LegendItem
LegendRange
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TooltipC
Ancho
ClickContr
PanZoomControl
DragC
ControlList
SelectionControl
IOp
SortC
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OperatorSe
OperatorList
Grap
Visib
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Bifocal
Shape
SizeEr
Stacke
RadialLa
Color
Encode
Labeler
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Tree
Ar
ShapeRe
TreeBuilder
EdgeRender
FisheyeTr
Distortion
PropertyEnco
DataSprite
ScaleBindin
NodeSprite
RandomL
AxisLay
Layout
ForceDirec
StackedAre
PieLayou
Indented
BundledE
TreeMapLayout
RadialTreeLayout
Dendrogr
CircleLayout
NodeLinkTreeLayo
DataList
Data
IcicleTree
CirclePackingLayout

Tree map

Visualization process

- Start with a question
- Identify dimensions that help you answer it
- Choose a method of representation
- Determine which differences to make visible
- Visually encode the differences

	A	B	C
1	state	numActive	numVictimsAdjust
2	WI	2	2
3	WA	2	11
4	OR	2	2
5	UT	1	7
6	FL	1	3
7	CO	1	5
8	ID	1	2
9	IL	1	1
10	CA	1	1

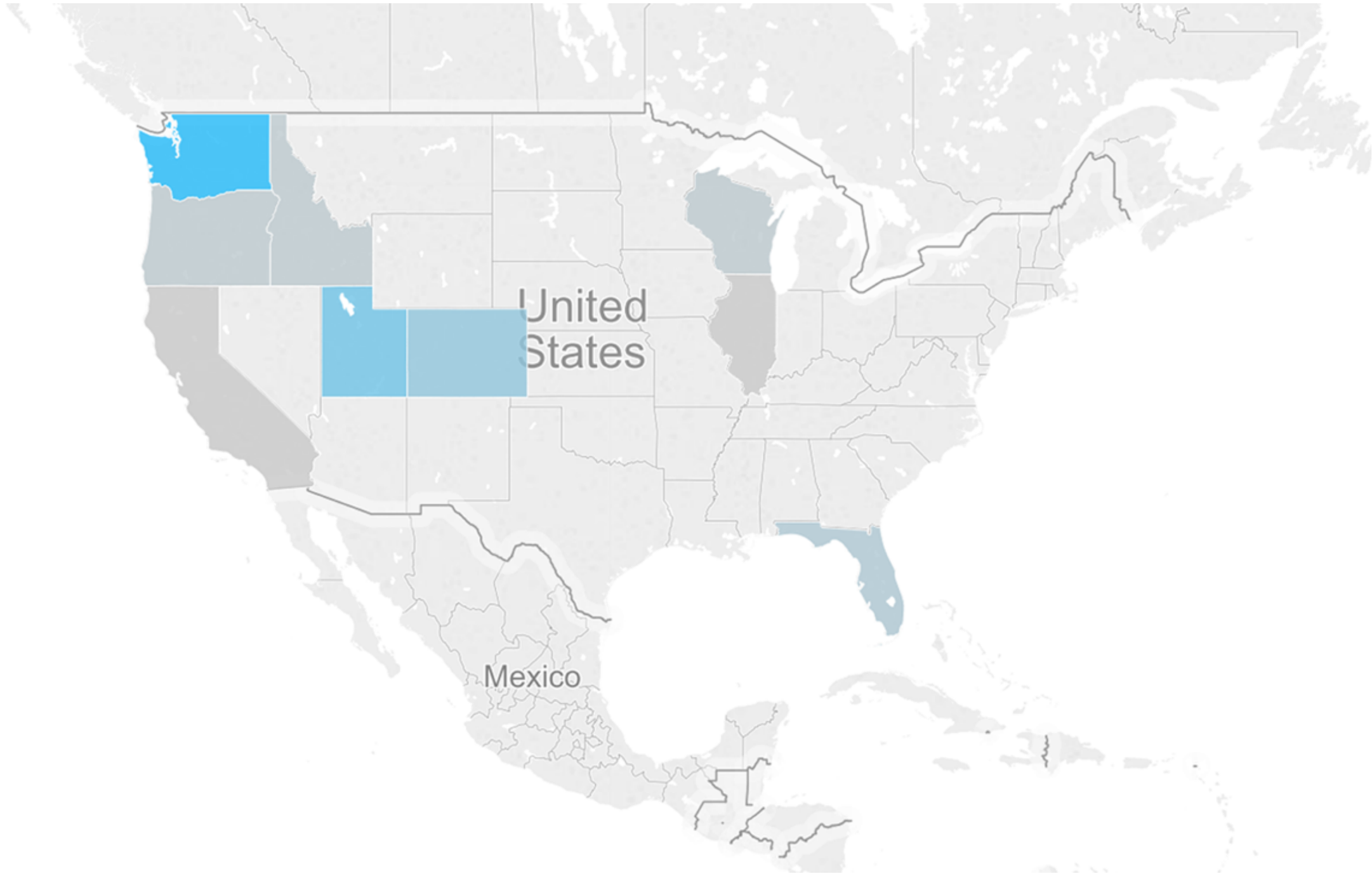
Data

Within the context of this dataset, which state had the **most victims**?

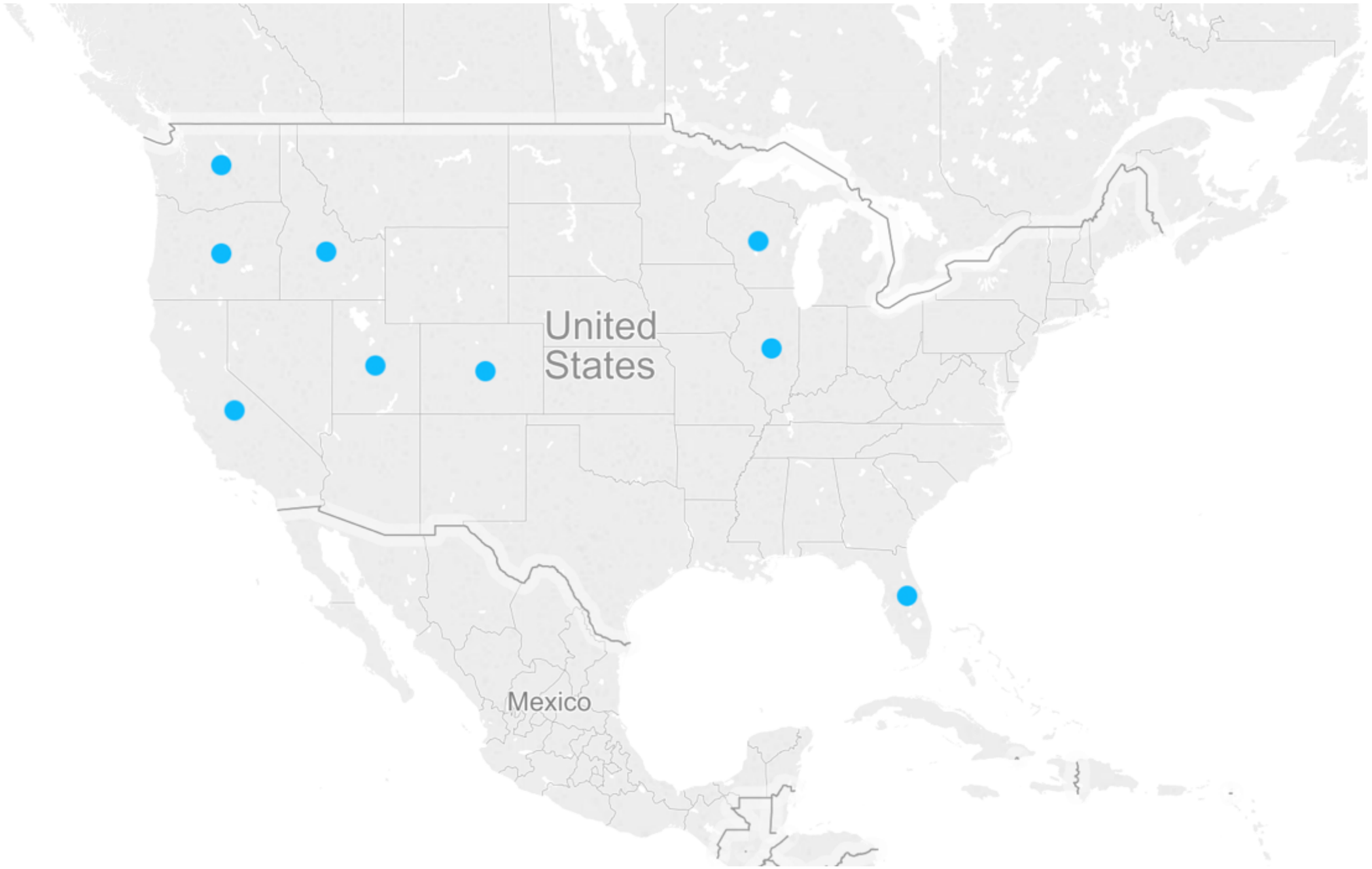
	A	B	C
1	state	numActive	numVictimsAdjust
2	WI	2	2
3	WA	2	11
4	OR	2	2
5	UT	1	7
6	FL	1	3
7	CO	1	5
8	ID	1	2
9	IL	1	1
10	CA	1	1

Relevant dimensions

Points, lines, or polygons?

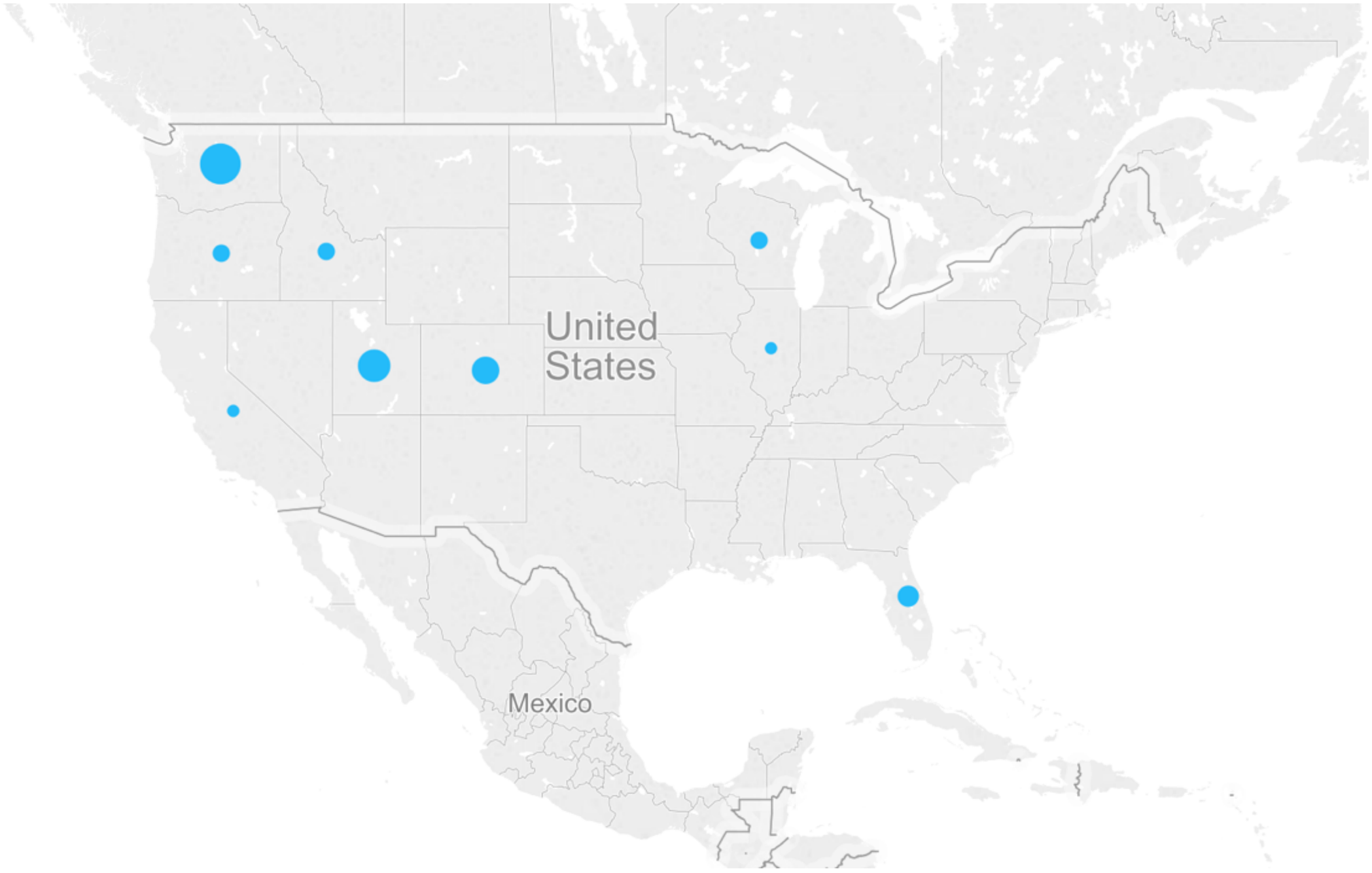


Polygons



Points

What differences do I want to make visible?



Differentiation — Number of victims

What type of variable am I working with?

What type of relationship do the values have to one another?

Color

- How many data classes?
- Nature of data?
  - Sequential
  - Diverging
  - Qualitative
- Multi- or single-hue?

- **Resource**
  ColorBrewer — http://colorbrewer2.org/

- Data can be reformatted
- One degree of separation
- Design last
- Include a legend

Lab

Resources

No coding skills necessary:

- Tableau Public — https://public.tableau.com/s/
- Datawrapper — https://datawrapper.de/
- Plot.ly — https://plot.ly/
- CartoDB — https://cartodb.com/

Coding skills required:

- D3.js — d3js.org
- Leaflet — http://leafletjs.com/
- Chart.js — http://www.chartjs.org/
- R — https://www.r-project.org/
- Python — https://www.python.org/

Fuzzy questions:

- Where to stop on the ladder of abstraction?
  http://worrydream.com/LadderOfAbstraction/

- What type of color scheme to use?
  http://colorbrewer2.org/