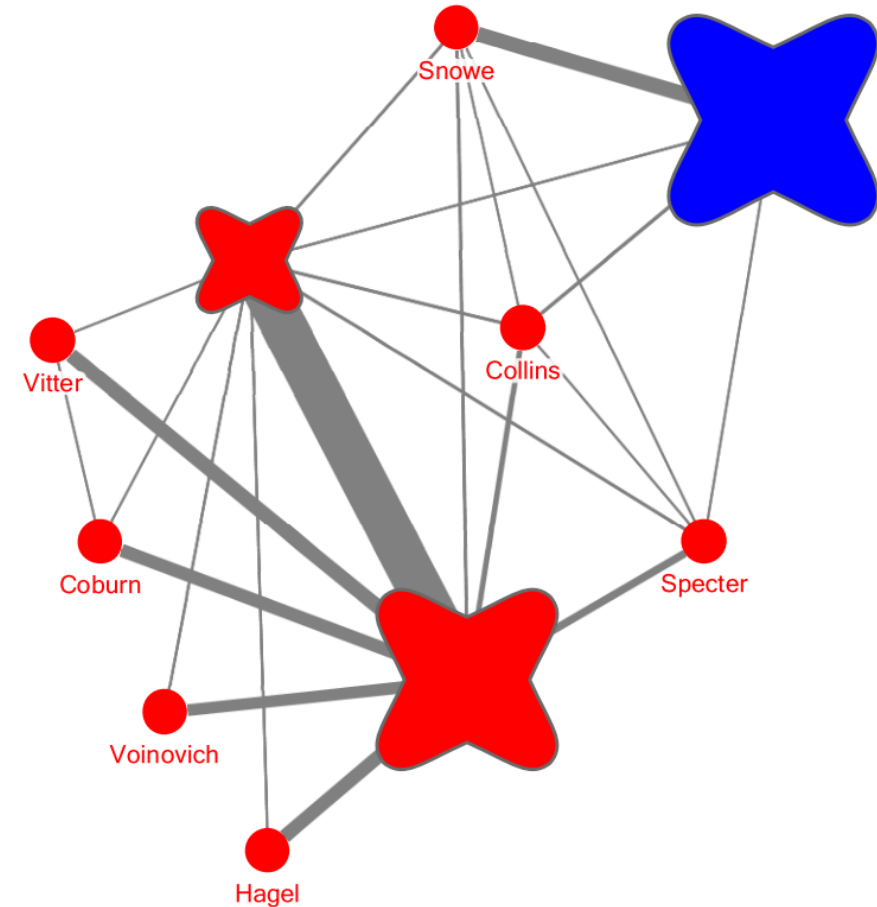
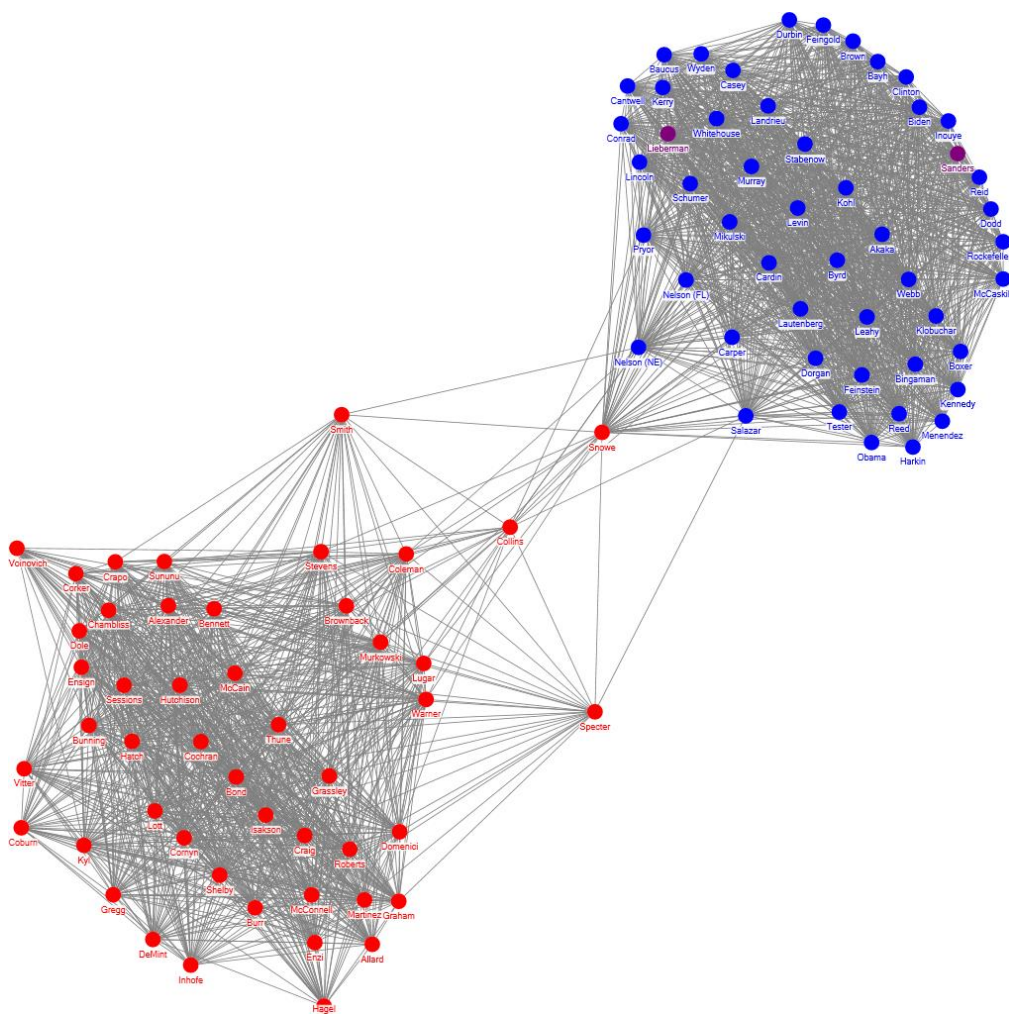


# CS 7295-01 Special Topics on Visualization in Network Science



**Professor Cody Dunne**

<https://codydunne.github.io/cs7295-f17/>

c.dunne@northeastern.edu

# Upcoming Deadlines

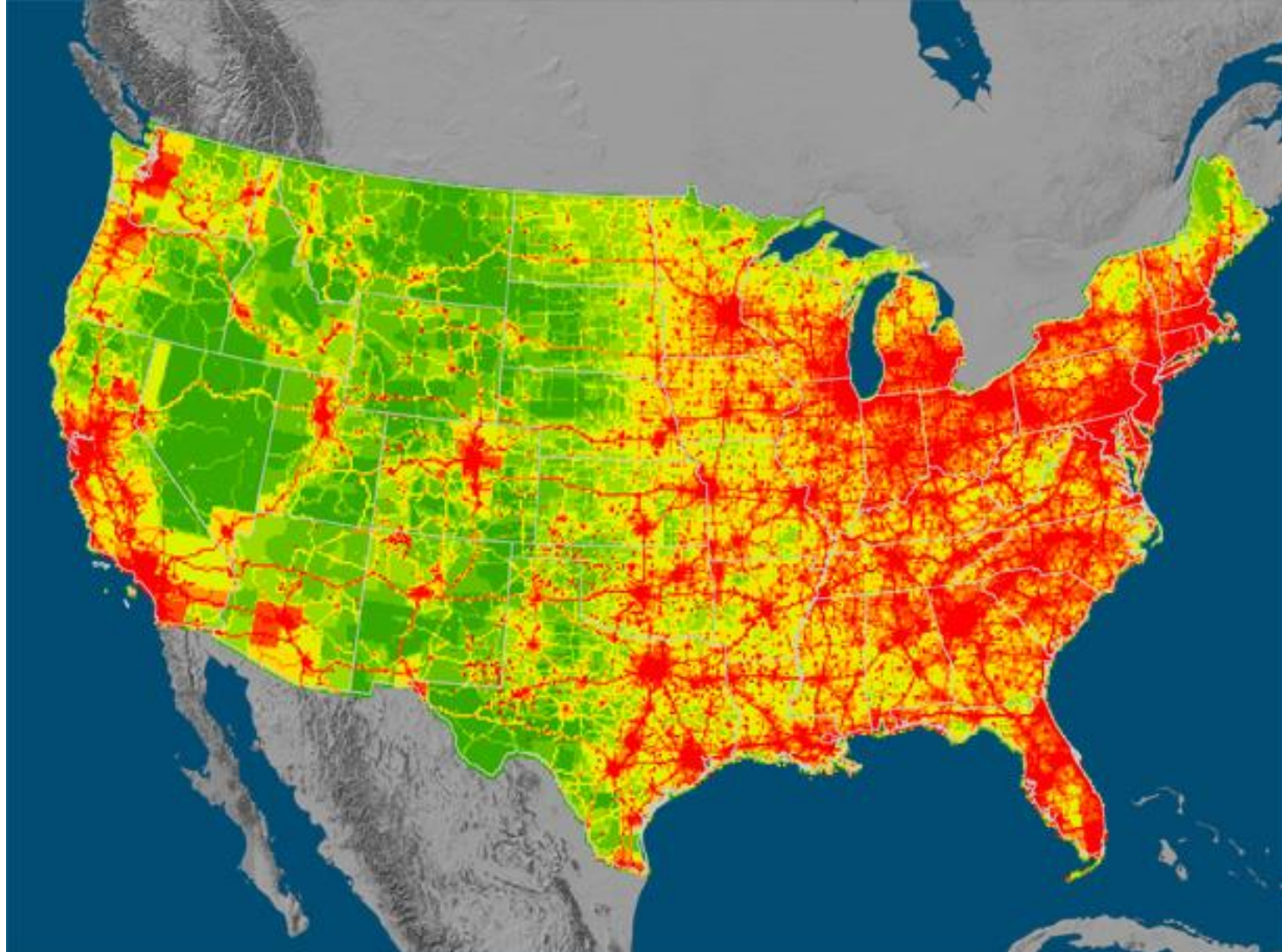
<https://codydunne.github.io/cs7295-f17/schedule/>

**Final paper rubric**

# **Geospatial Network Nodes and Attributes (AKA Choropleth Maps and Beyond)**

# Heatmap

CO2 emissions in the USA, 2002



<http://grist.org/article/2010-03-17-if-it-does-matter-where-co2-is-released-cities-are-in-trouble/>

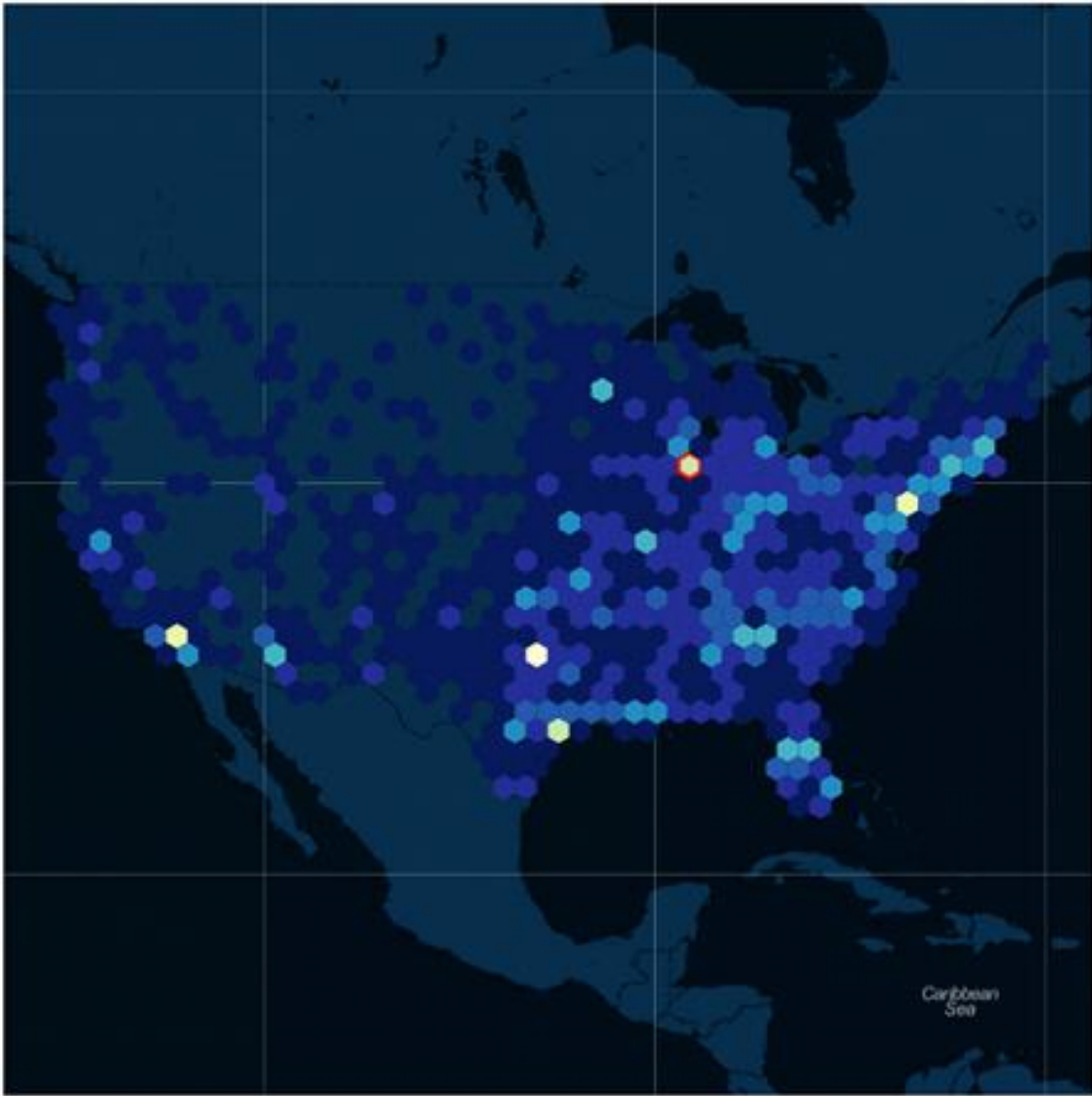
# Heatmap

## Trips around Boston



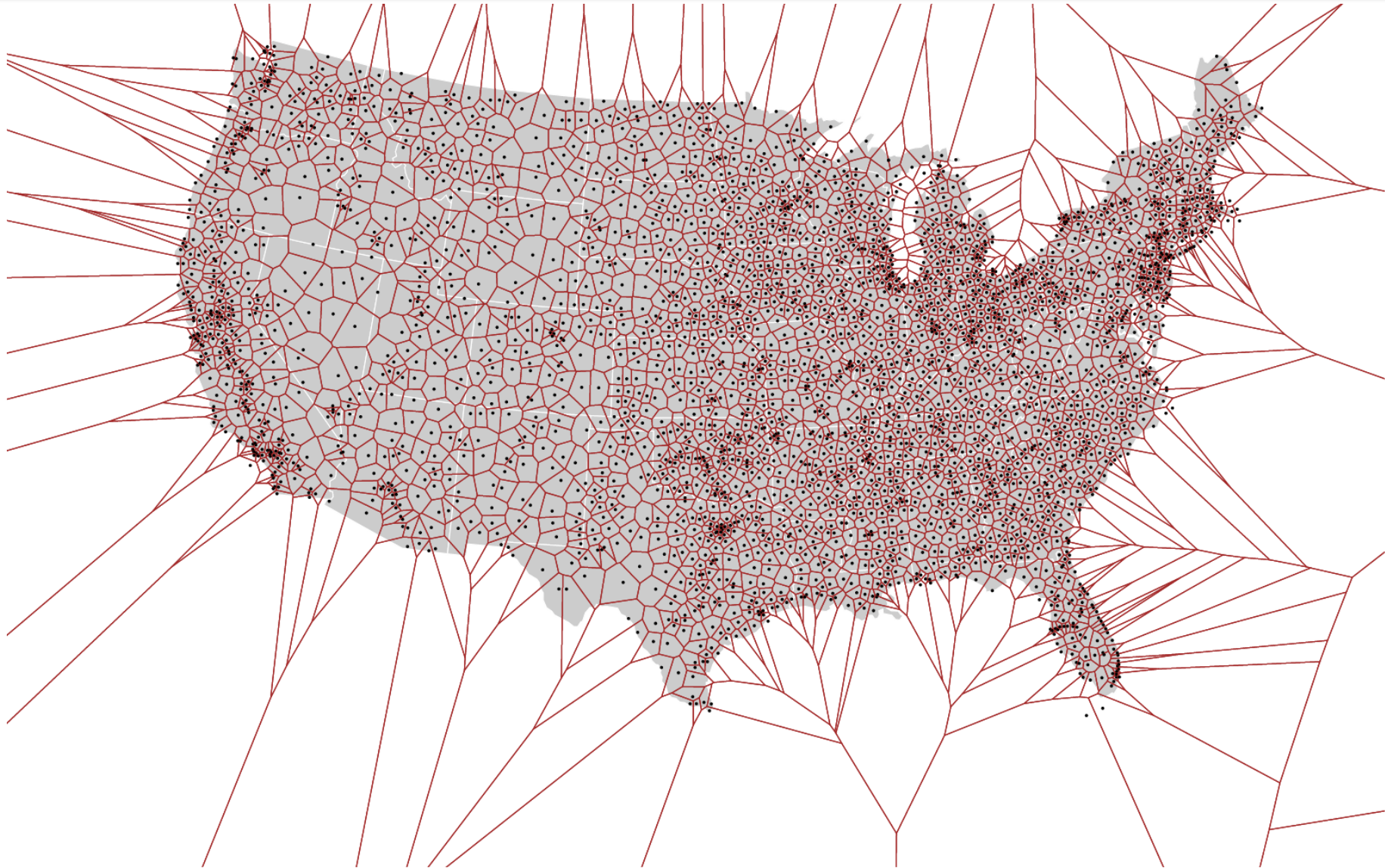
# Area Binning (Hexagon)

Walmart locations in USA



# Area Binning (Voronoi Tessellation)

USA Airports





# Chloropleth Maps

## USA 2012 Presidential Election



332 ✓

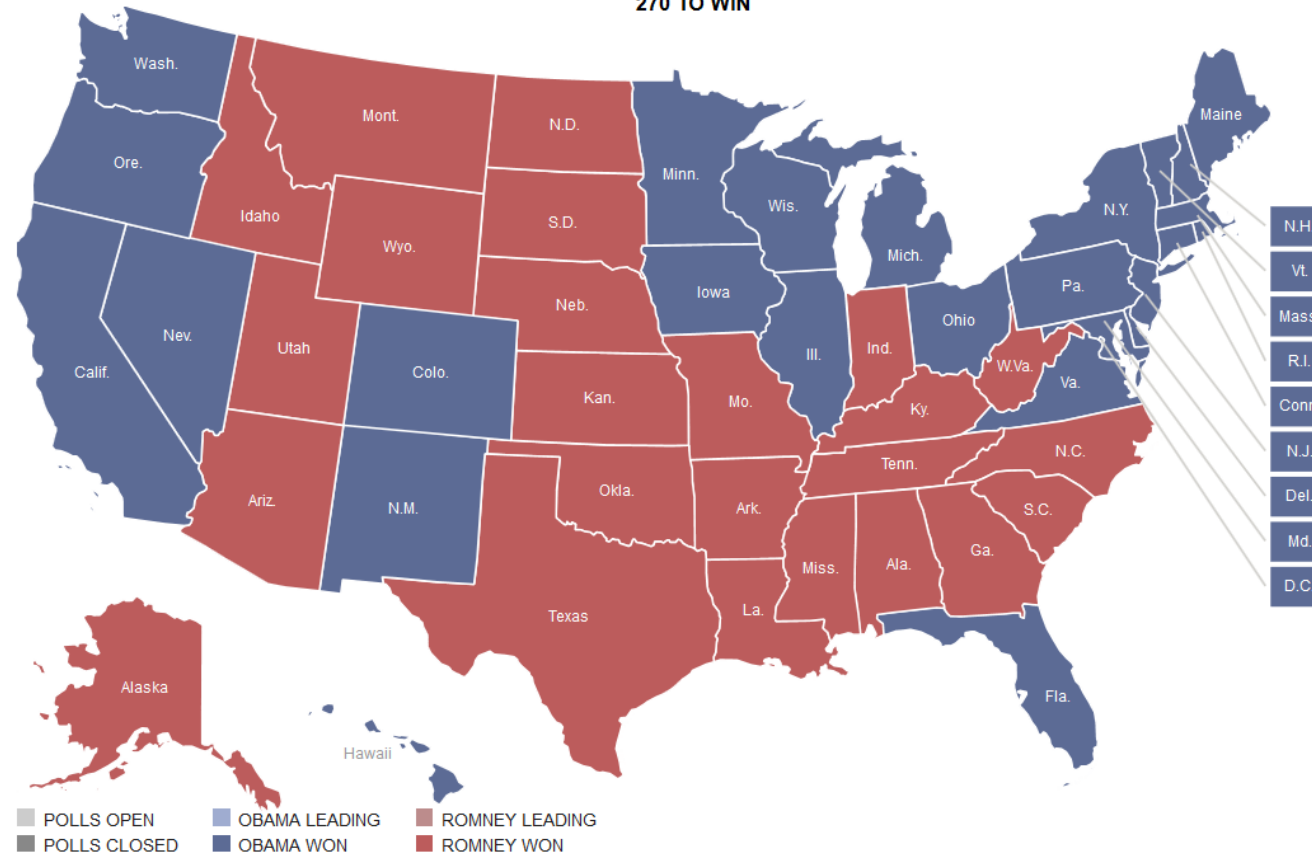
ELECTORAL VOTES

206

ELECTORAL VOTES

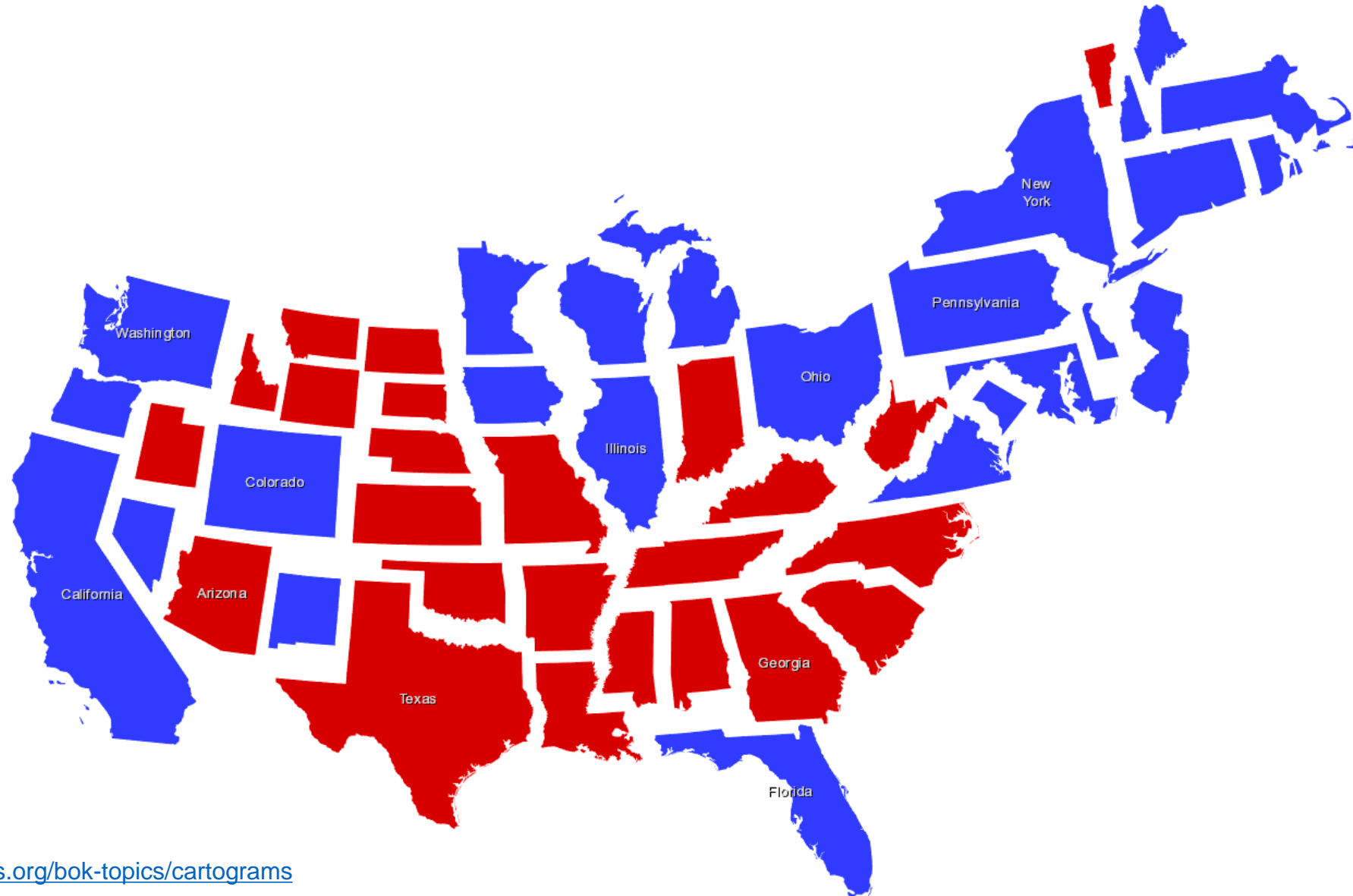


270 TO WIN



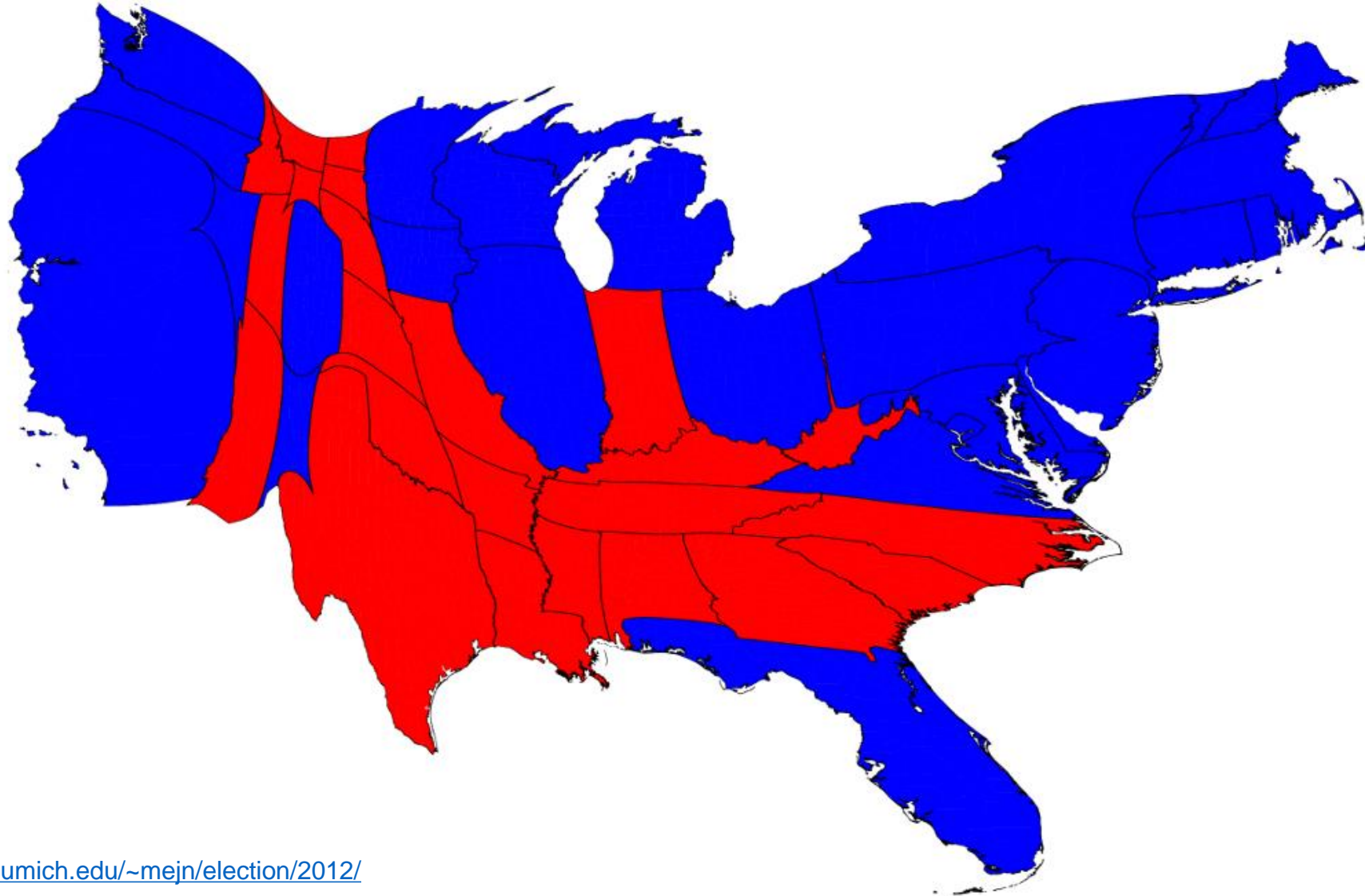
# Non-Contiguous Cartogram

USA 2012 Presidential Election



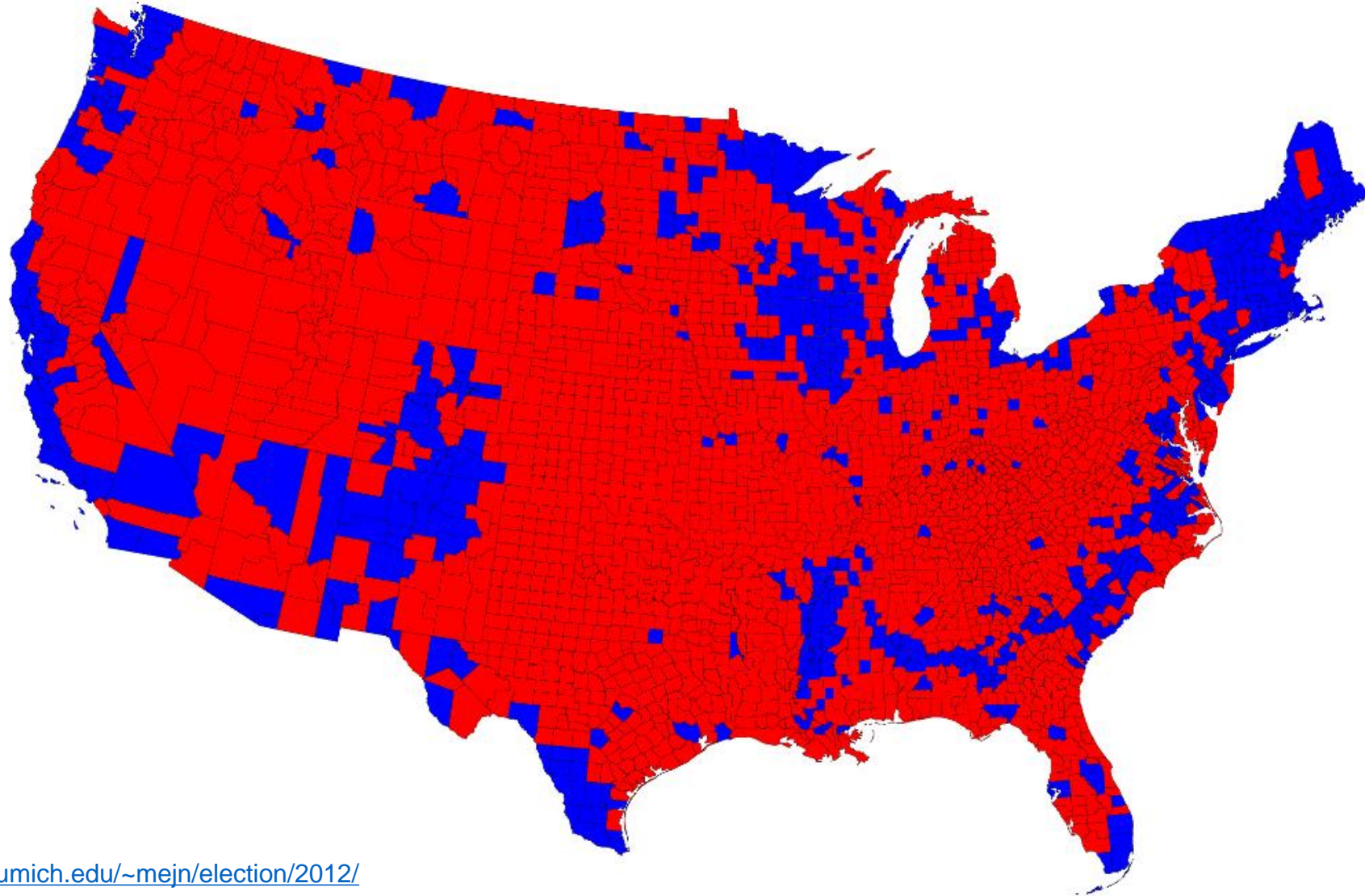
# Continuous Cartogram

USA 2012 Presidential Election



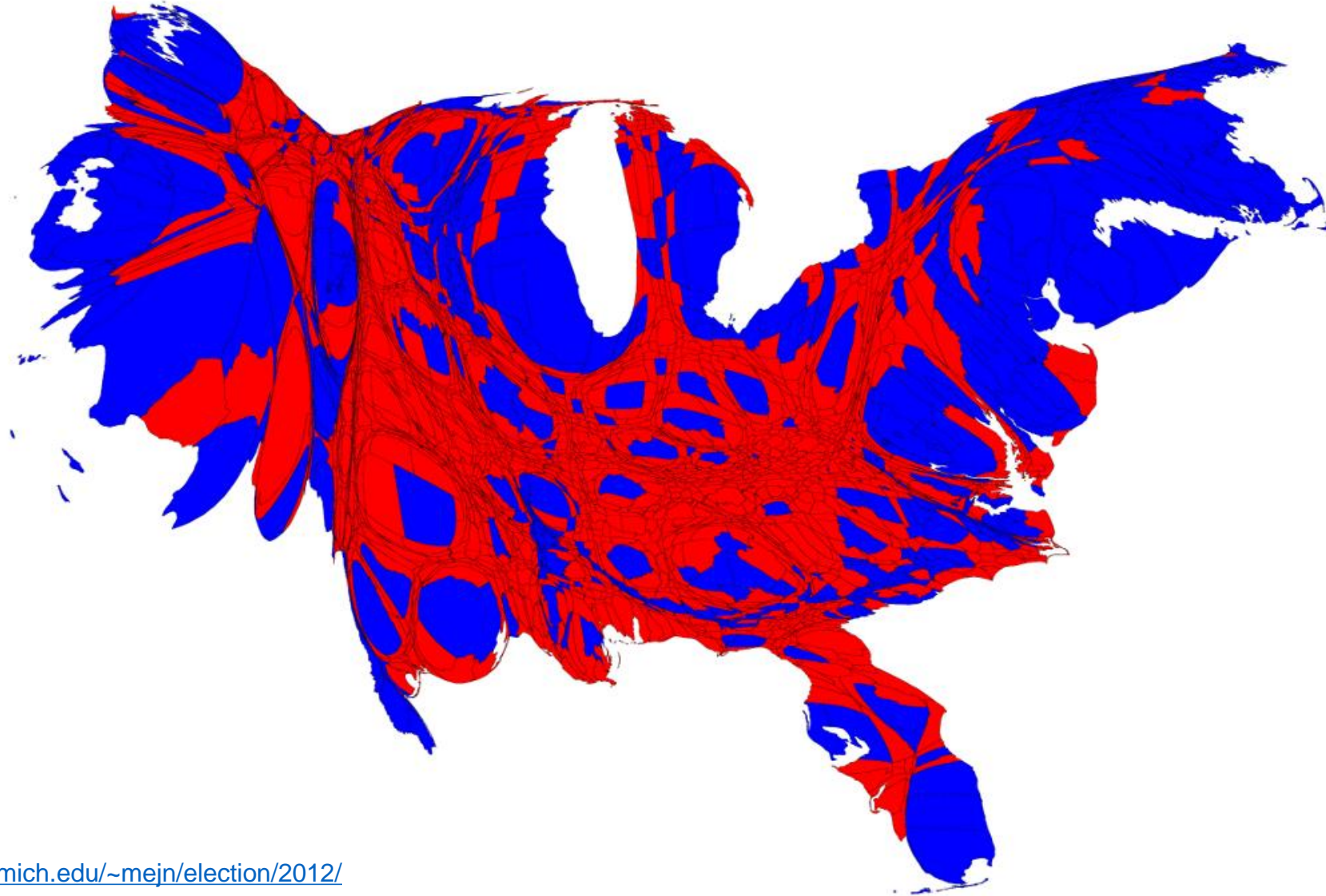
# Choropleth Map

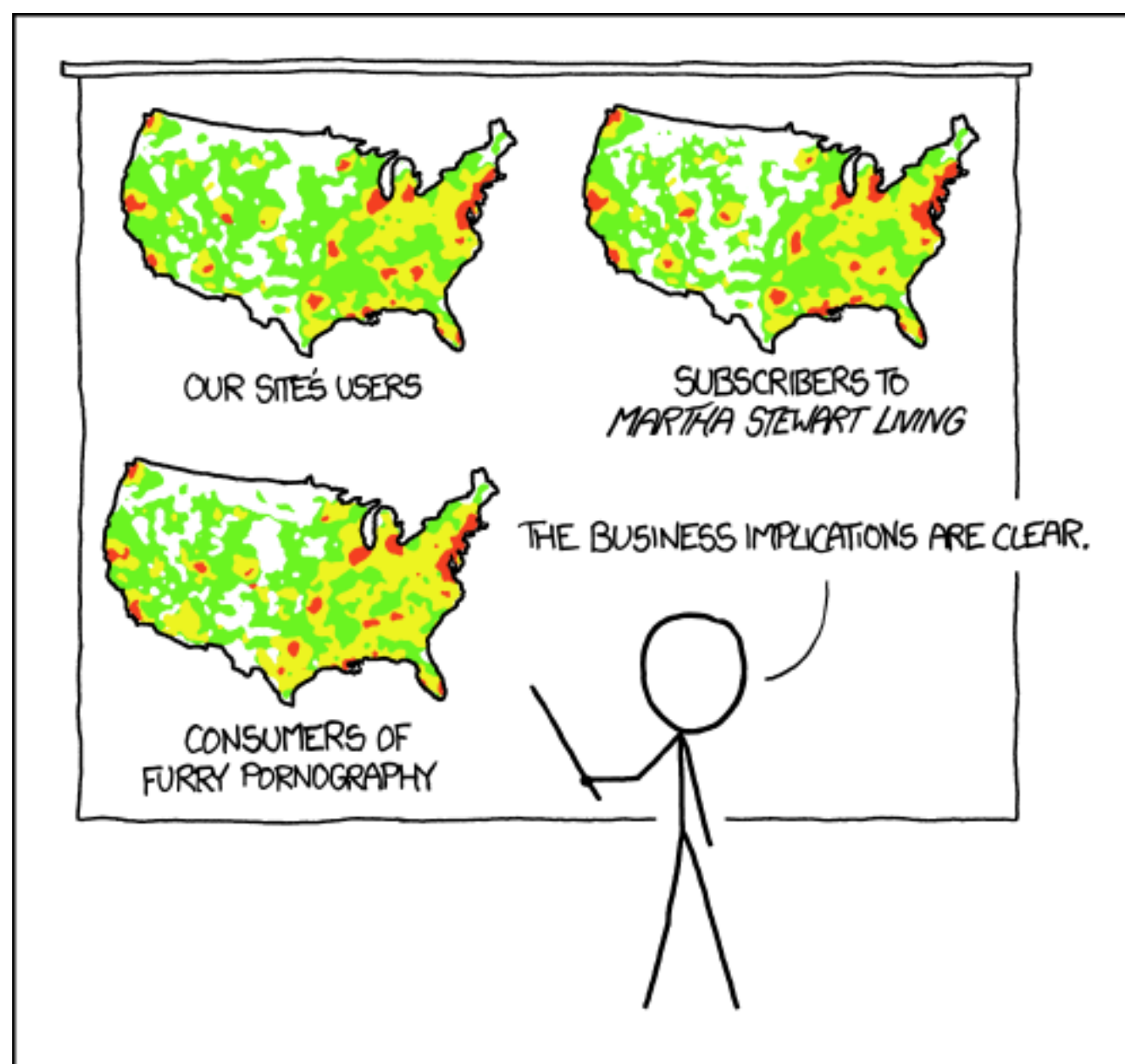
USA 2012 Presidential Election (by county)



# Contiguous Cartogram

USA 2012 Presidential Election (by county)

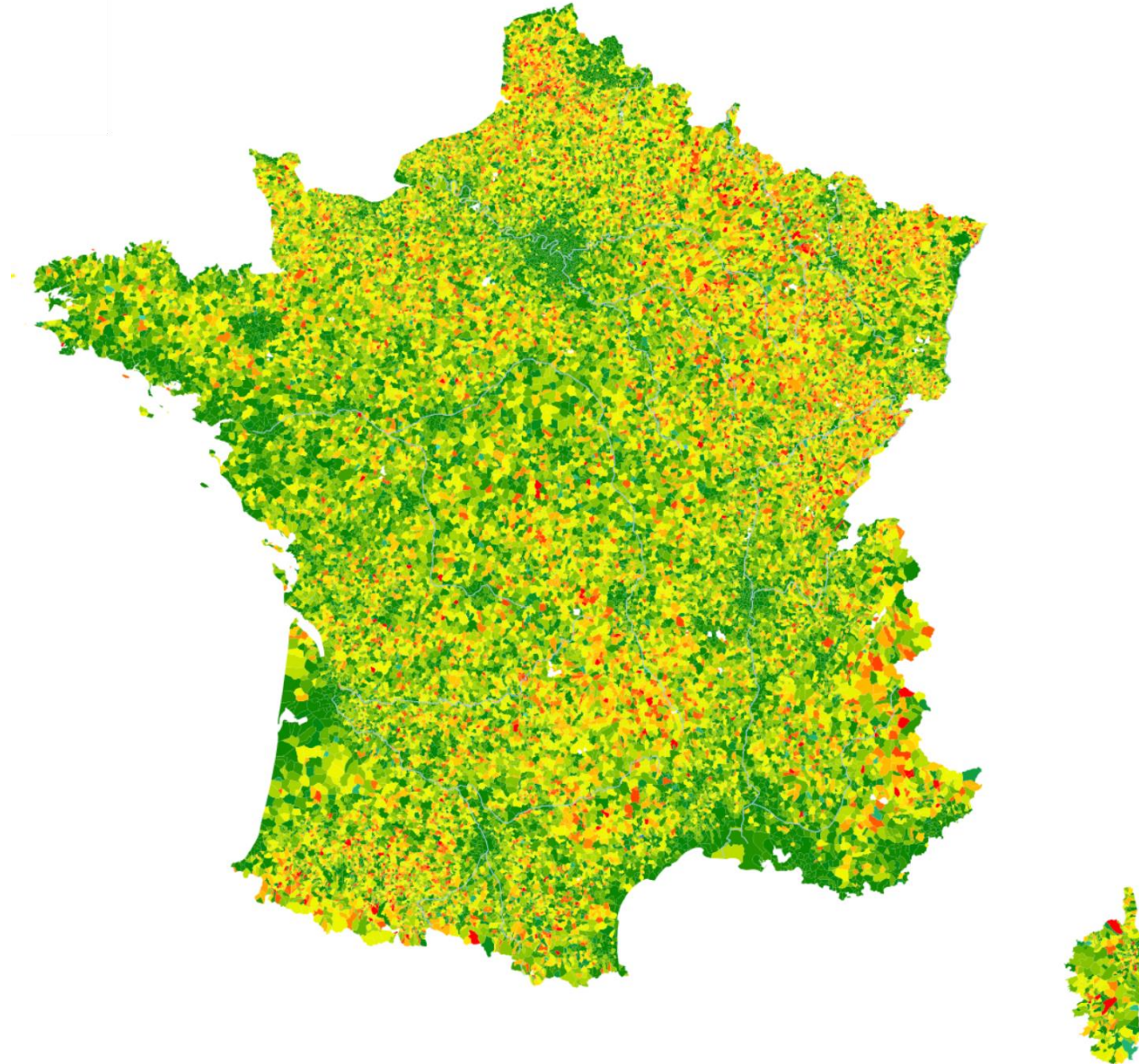




PET PEEVE #208:  
GEOGRAPHIC PROFILE MAPS WHICH ARE  
BASICALLY JUST POPULATION MAPS

# Chloropleth Maps

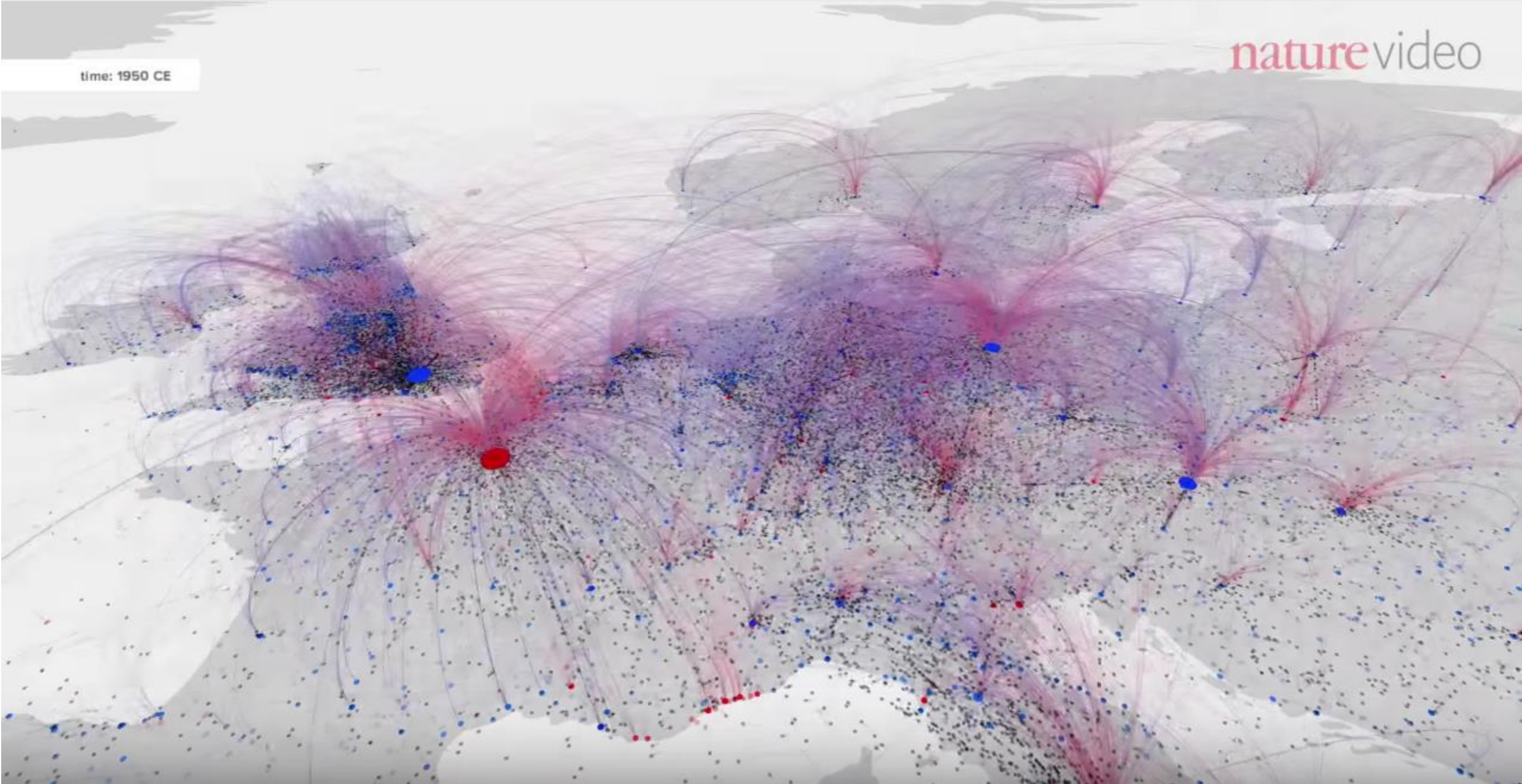
Percentage of women elected to French municipal councils, 2008

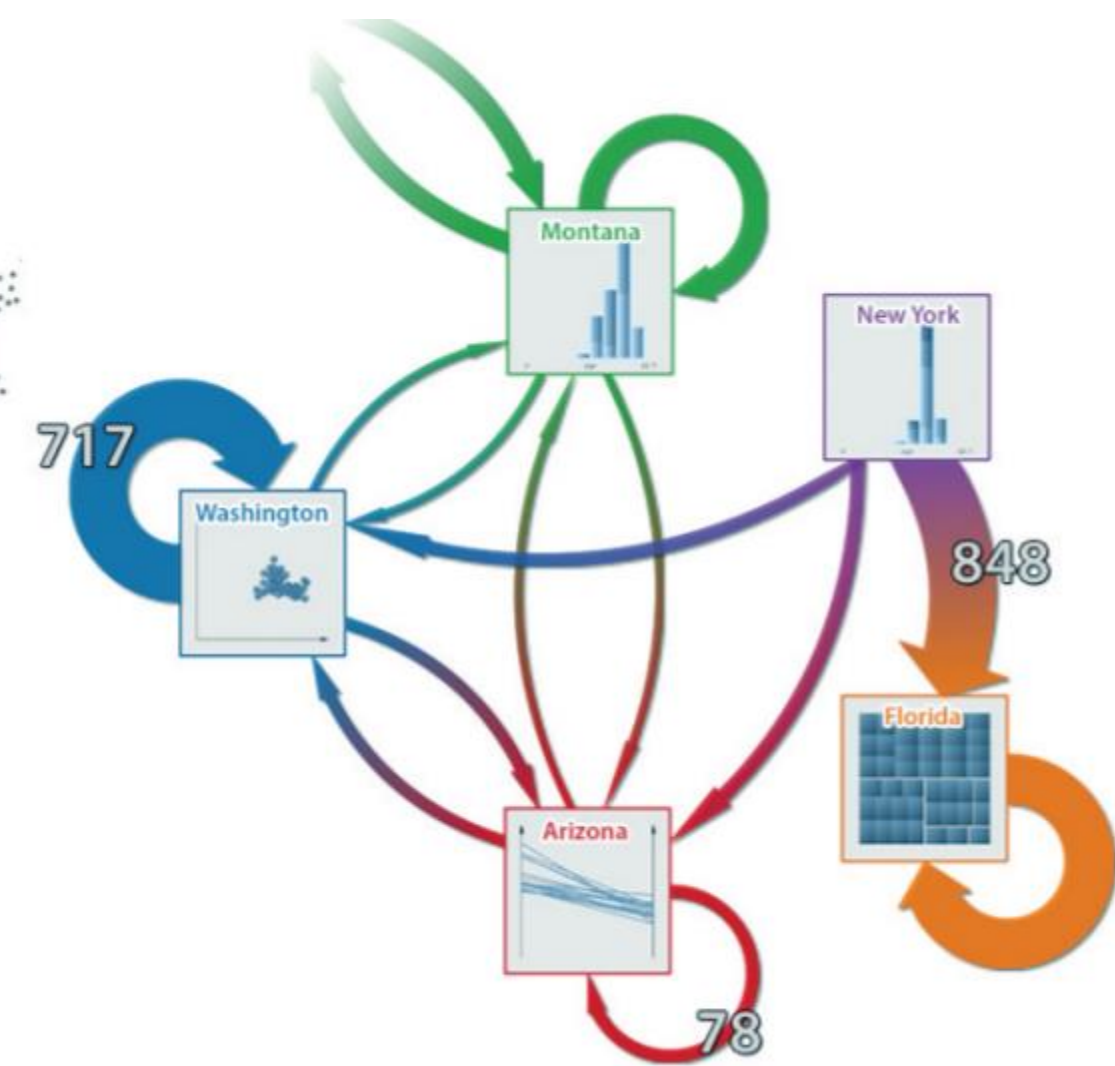


# **Geospatial Network Edges and Attributes, Including Time**



time: 1950 CE





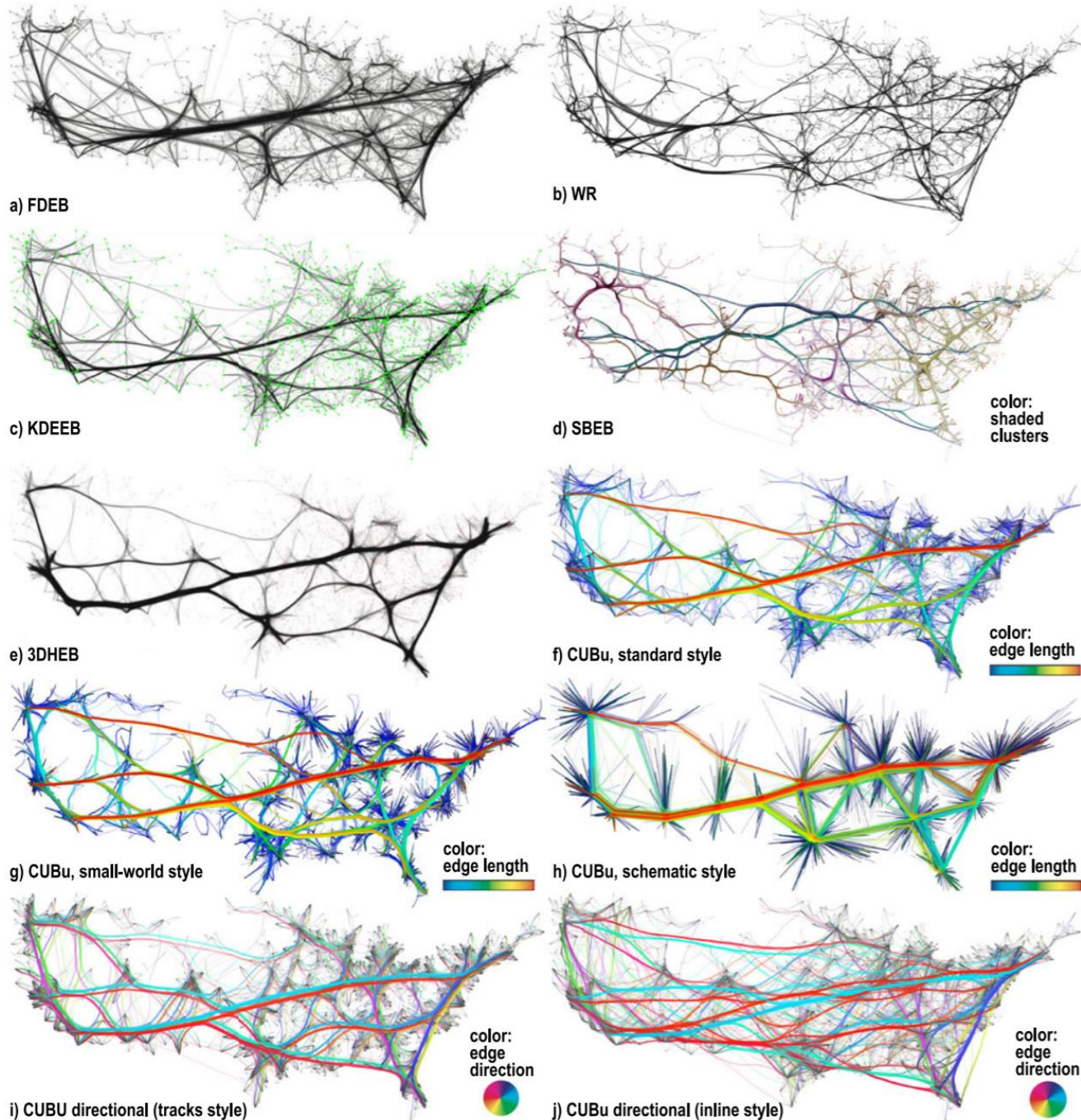
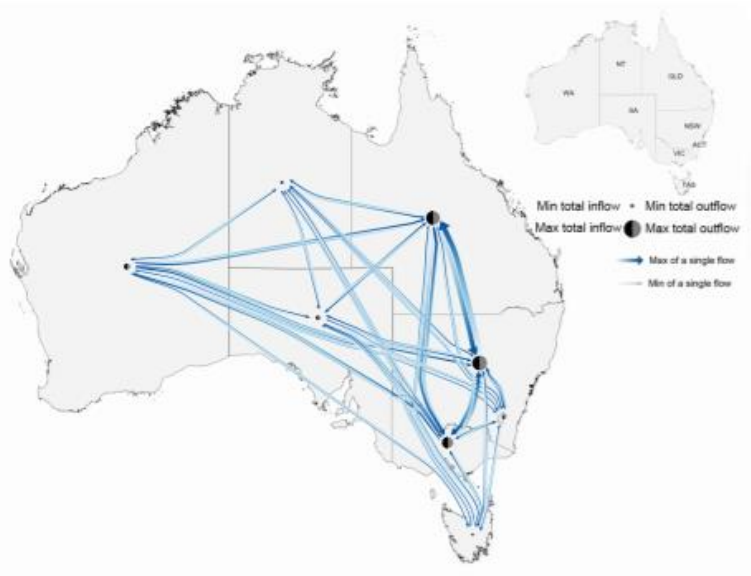
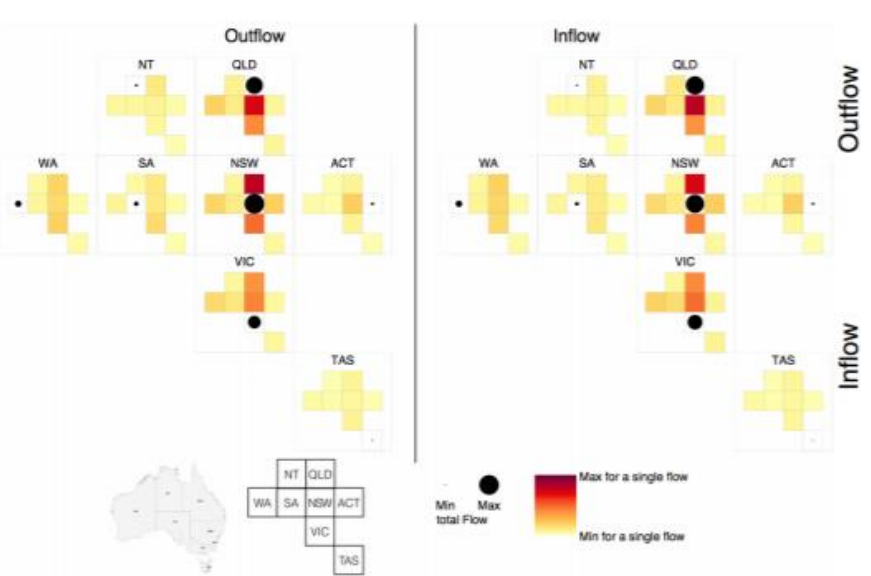


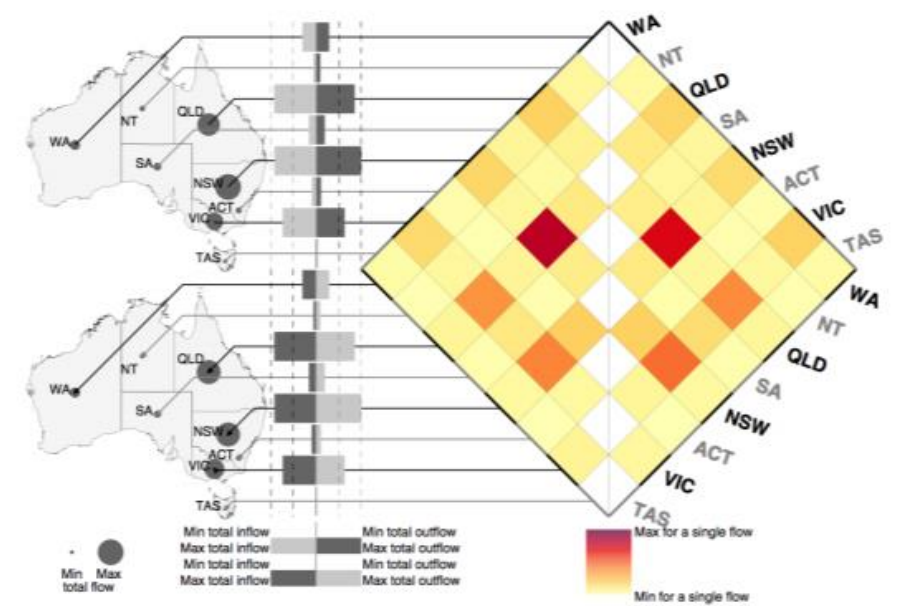
Fig. 2. Bundling styles for *migrations* graph. (a-e) Existing algorithms. (f-j) Styles produced by our single CUBu method.



(a) Bundled Flow Map



(b) OD Map

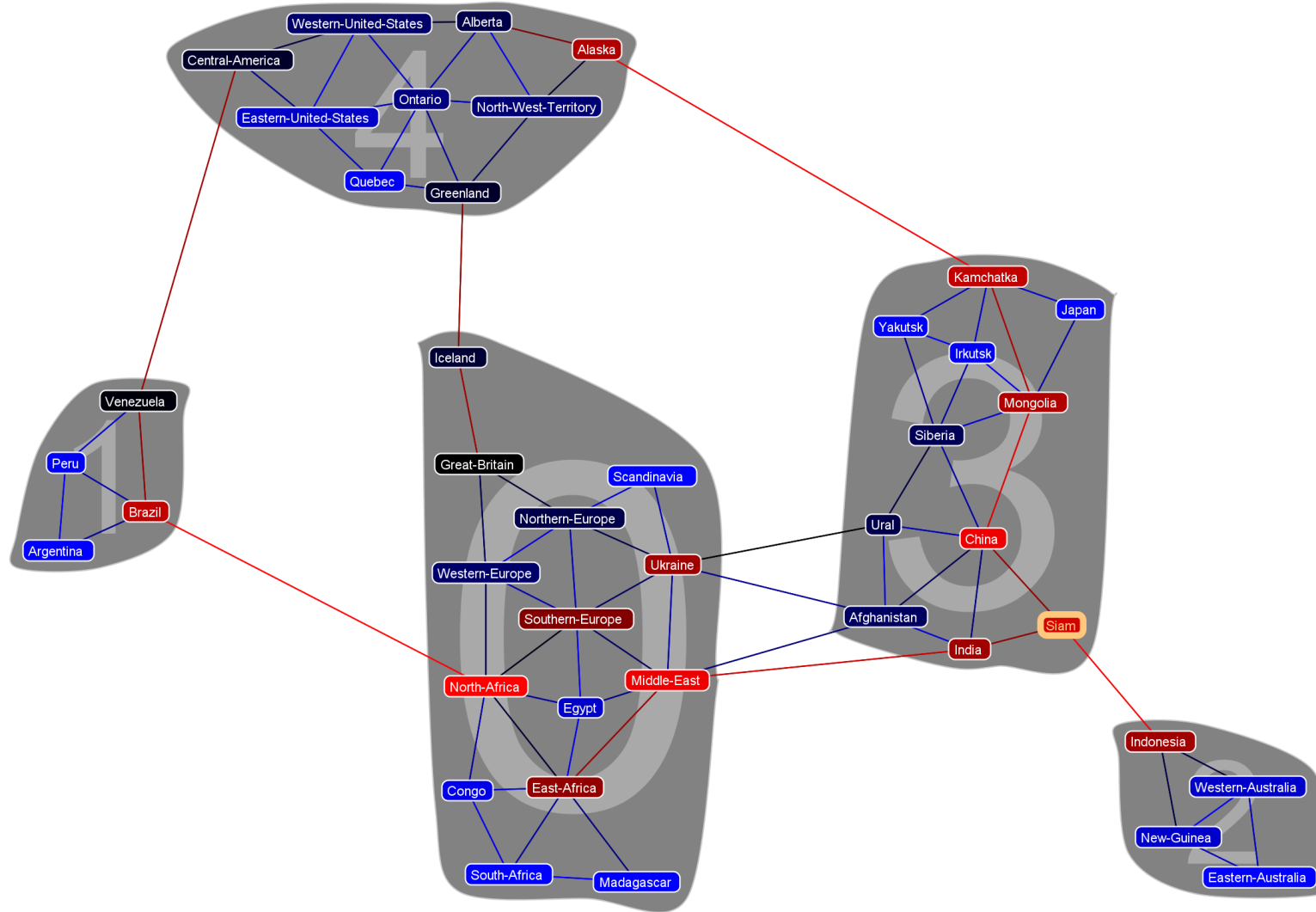


(c) MapTrix

**Showing Disjoint Node Groups**

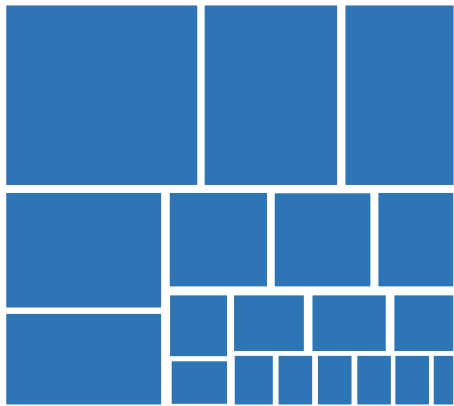
# Convex Hulls

## Risk Board Game Territories

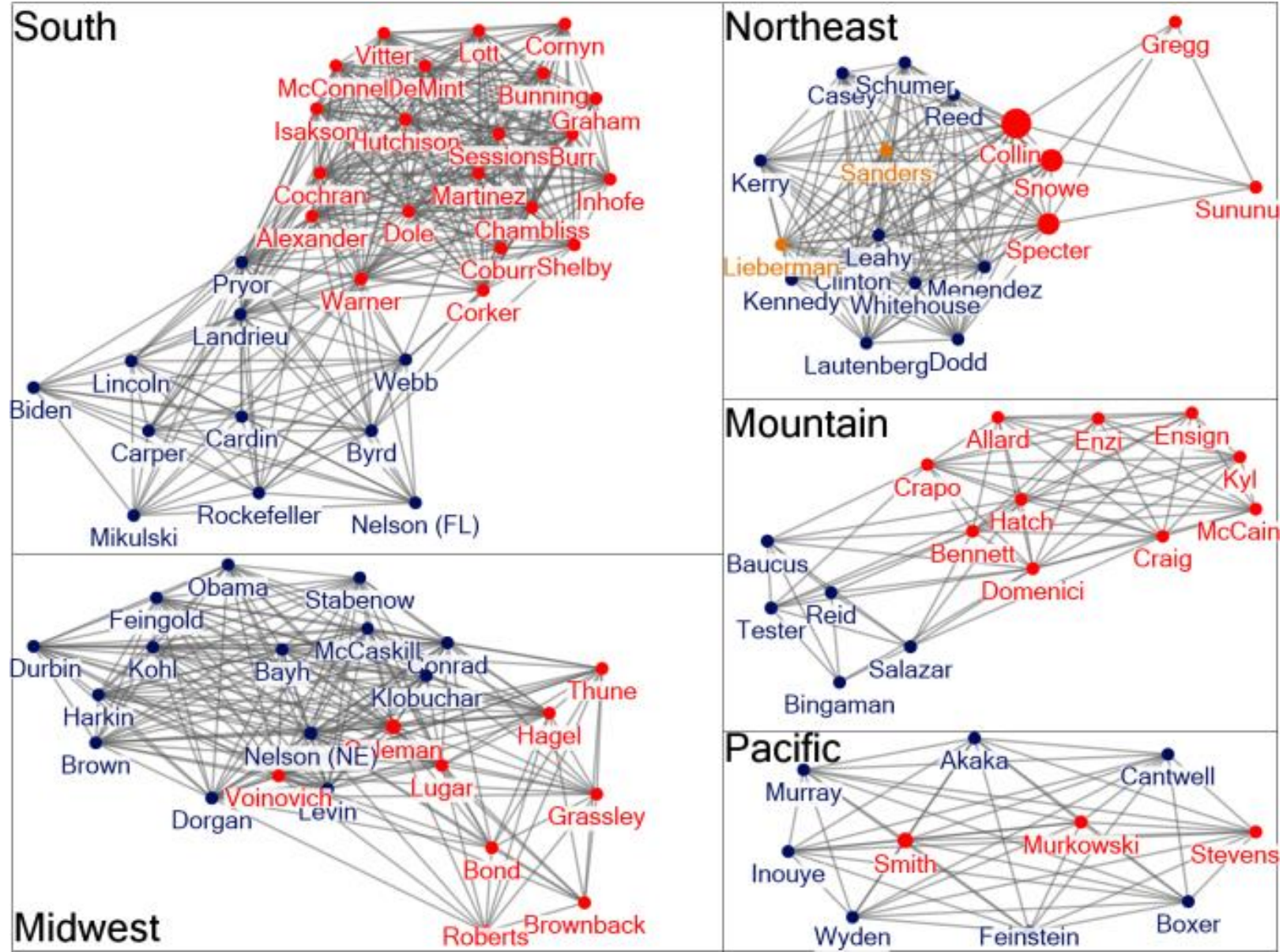


# Spatial Subdivision

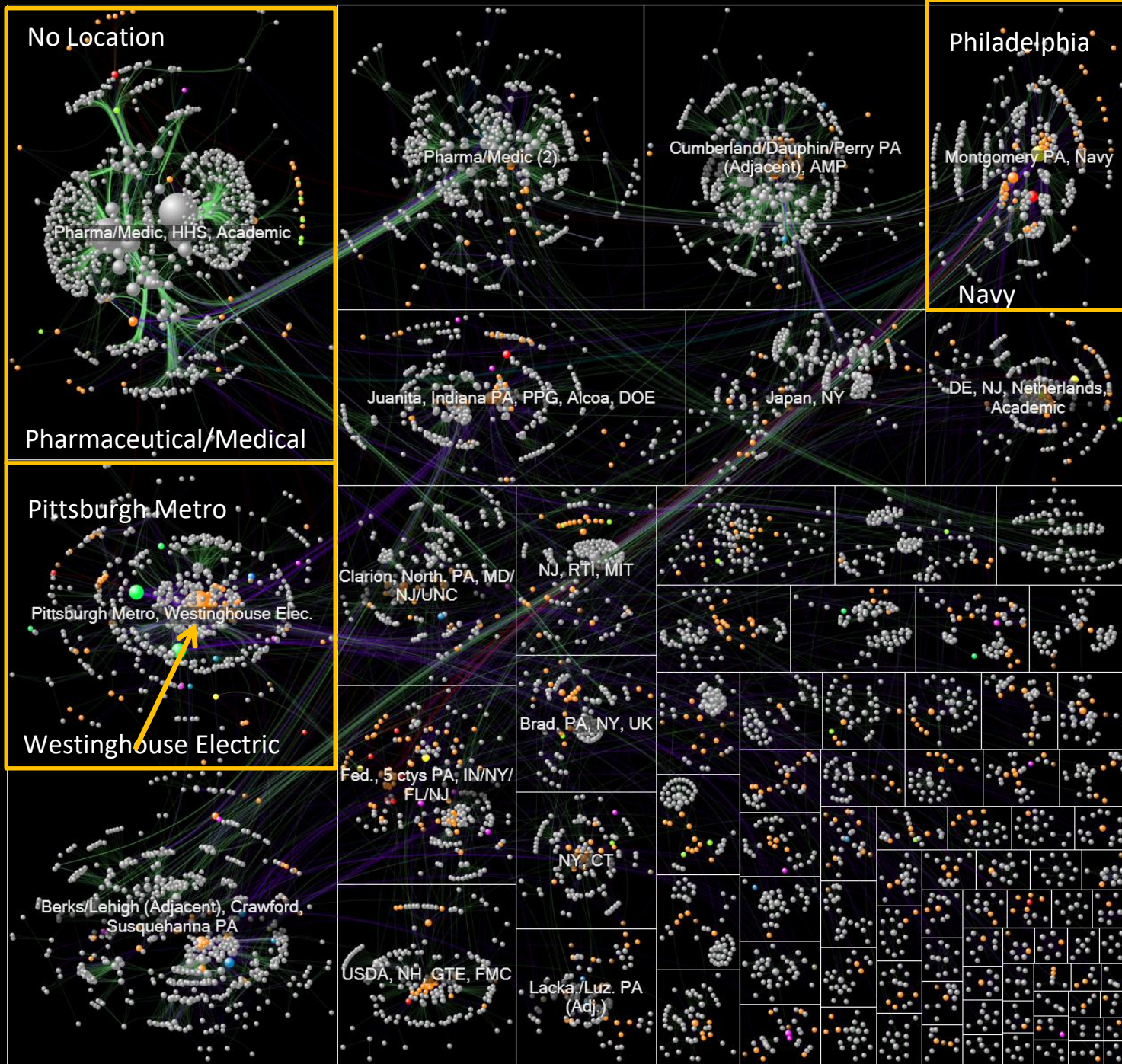
USA Senate Co-Voting Patterns, 2008



Squarified Treemap  
Group-in-a-Box  
(Rodrigues et al., 2011)



# Pennsylvania Innovation



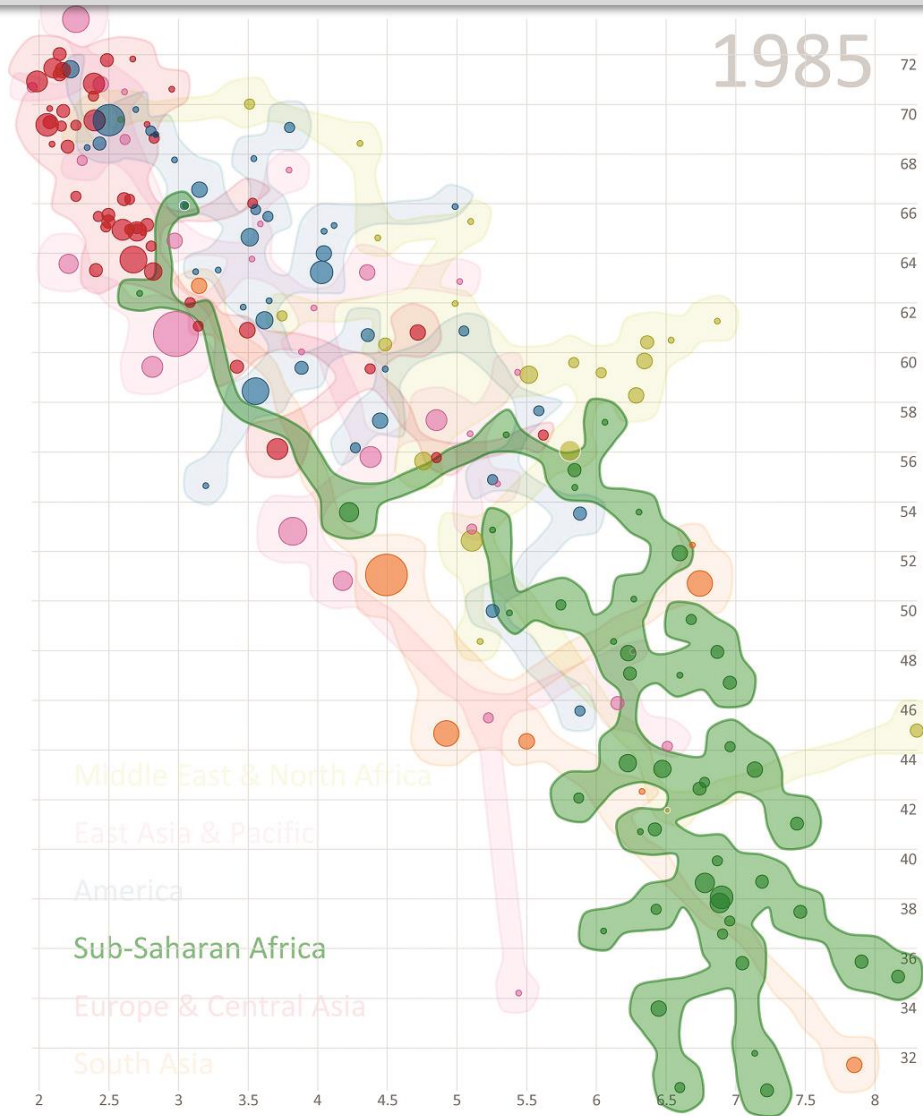
- Patent
- Tech
- SBIR (federal)
- PA DCED (state)
- Related patent
- 2: Federal agency
- 3: Enterprise
- 5: Inventors
- 9: Universities
- 10: PA DCED
- 11/12: Phil/Pitt metro cnty
- 13-15: Semi-rural/rural cnty
- 17: Foreign countries
- 19: Other states



# Showing Overlapping Node Groups

# Concave Hulls

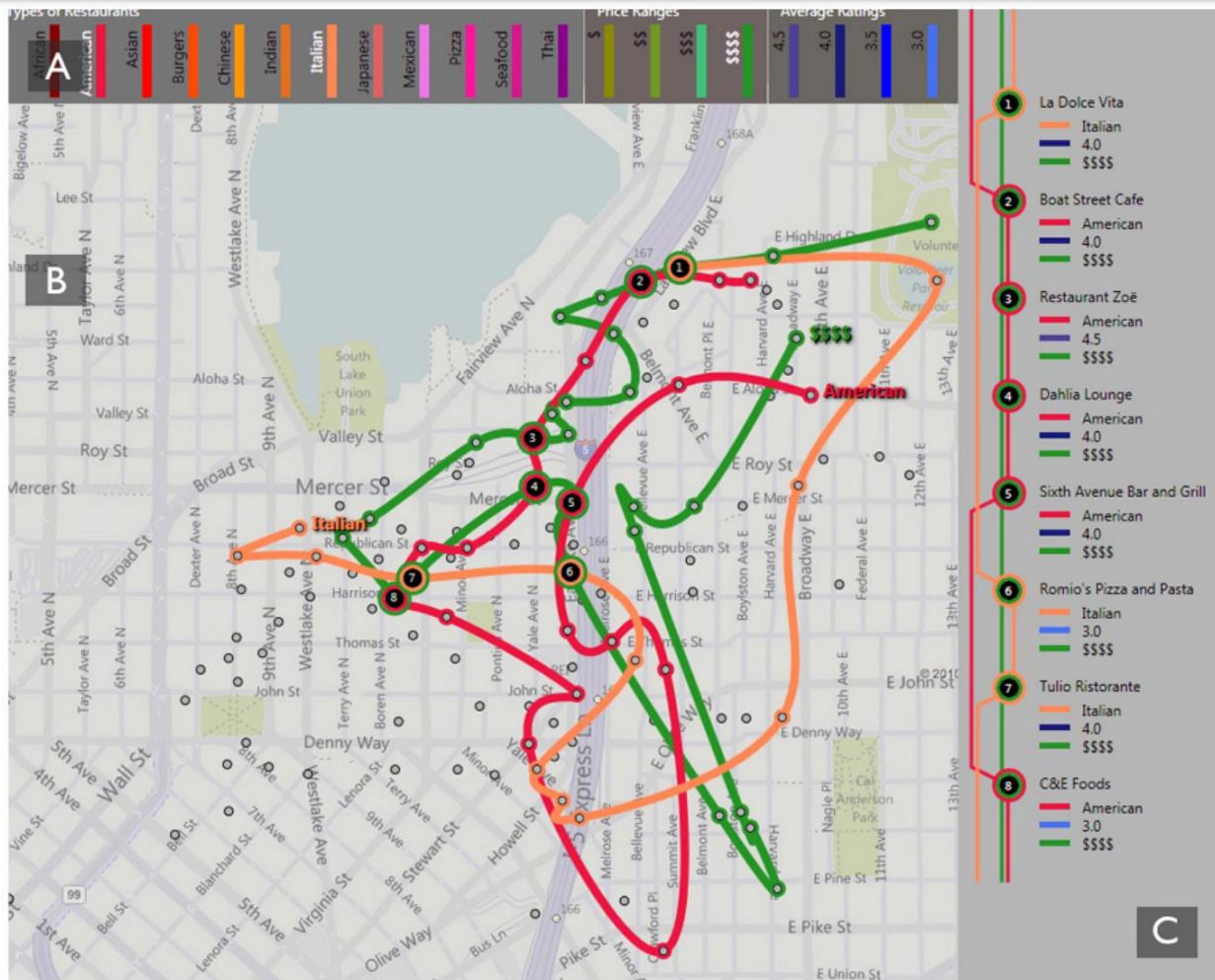
## Bubble Sets



[Collins et al., 2009](#)

[Muelemans et al., 2013](#)

# Line Sets



[Alper et al., 2011](#)

[Muelemans et al., 2013](#)

# Kelp Diagrams, Kelp Fusion



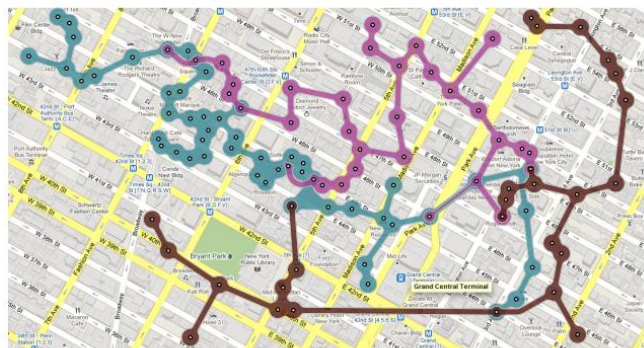
(d) KelpFusion (dense)



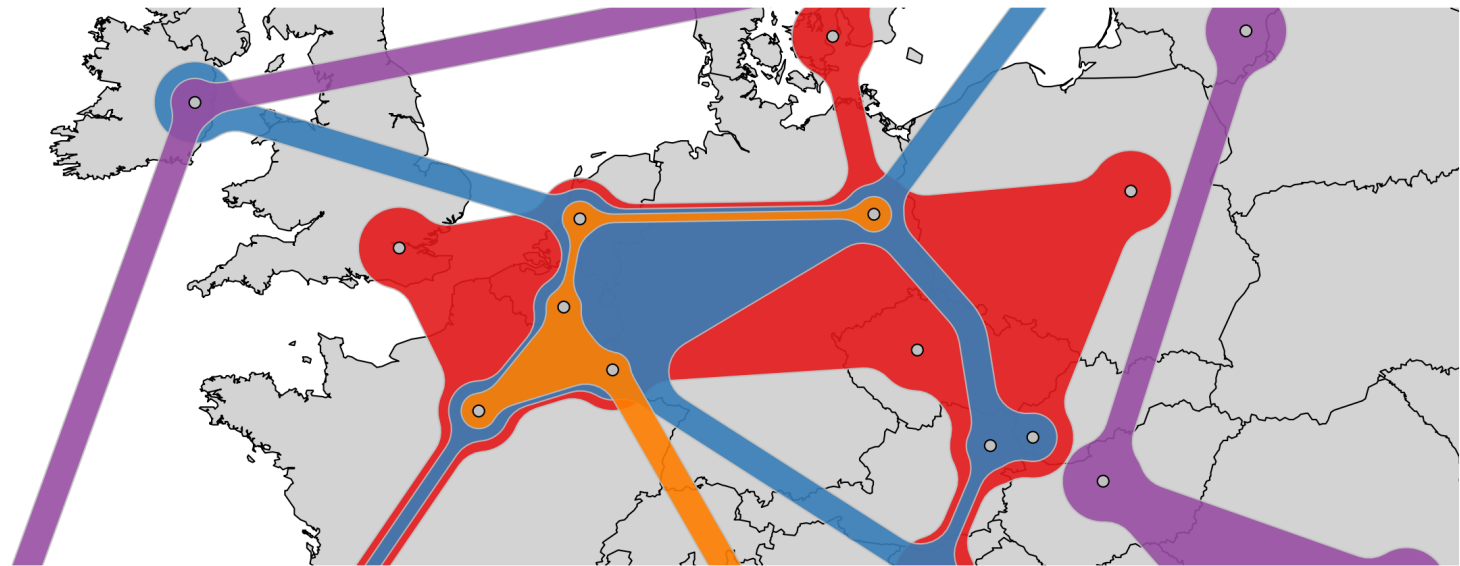
(b) Kelp Diagrams

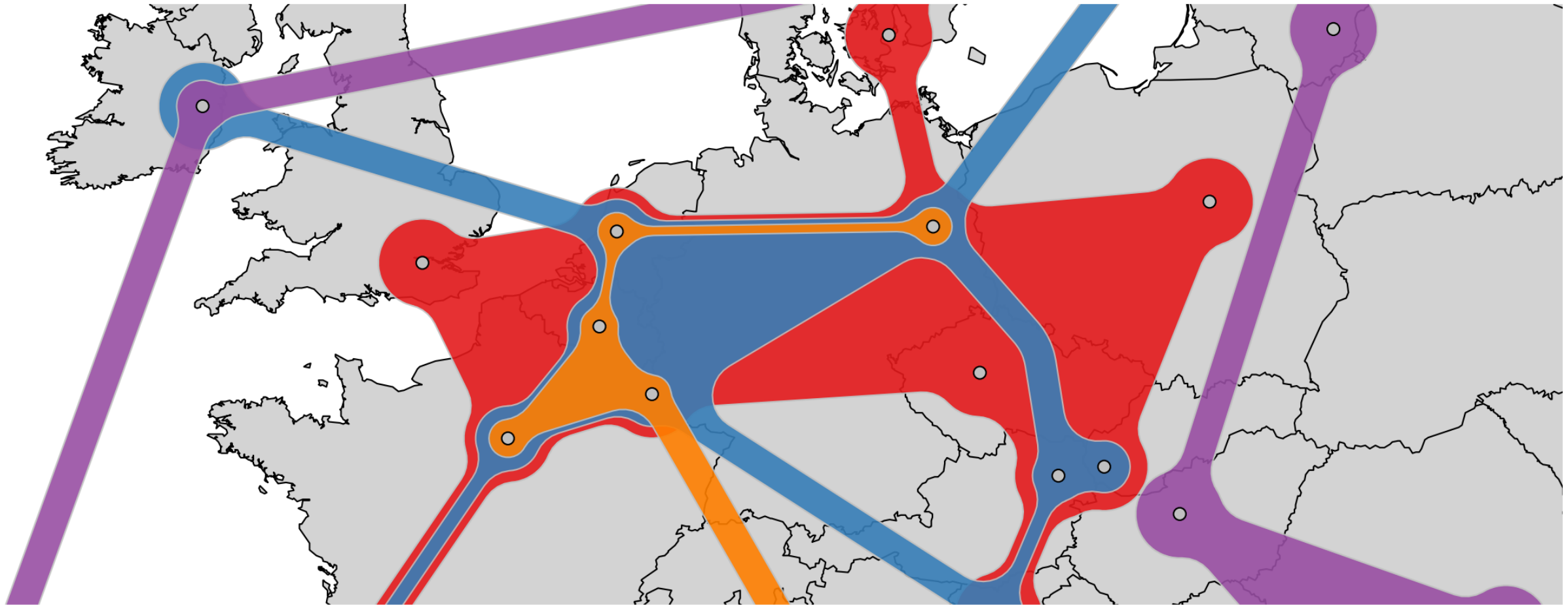


(e) KelpFusion (medium)



(f) KelpFusion (sparse)





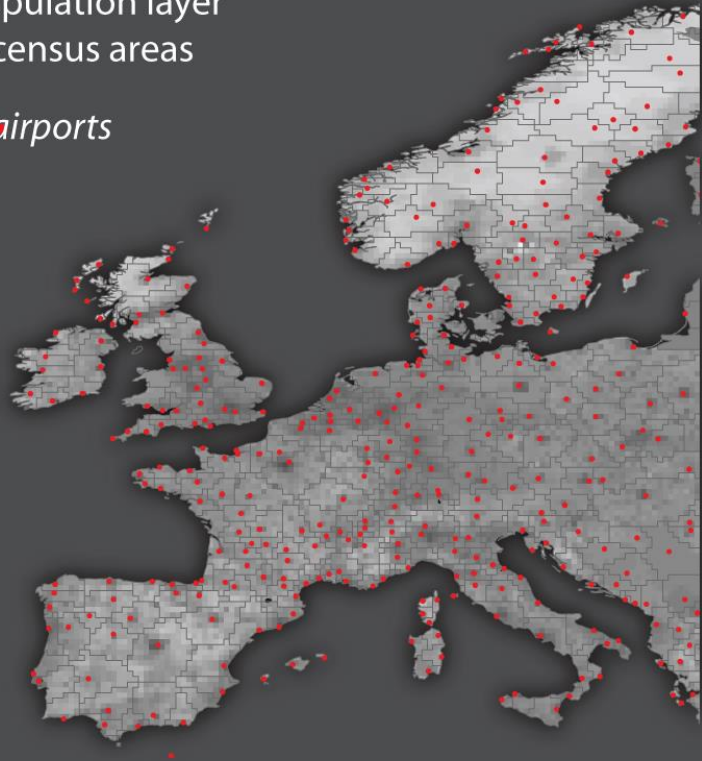
# Design Challenge

# GLEAM Epidemic Model

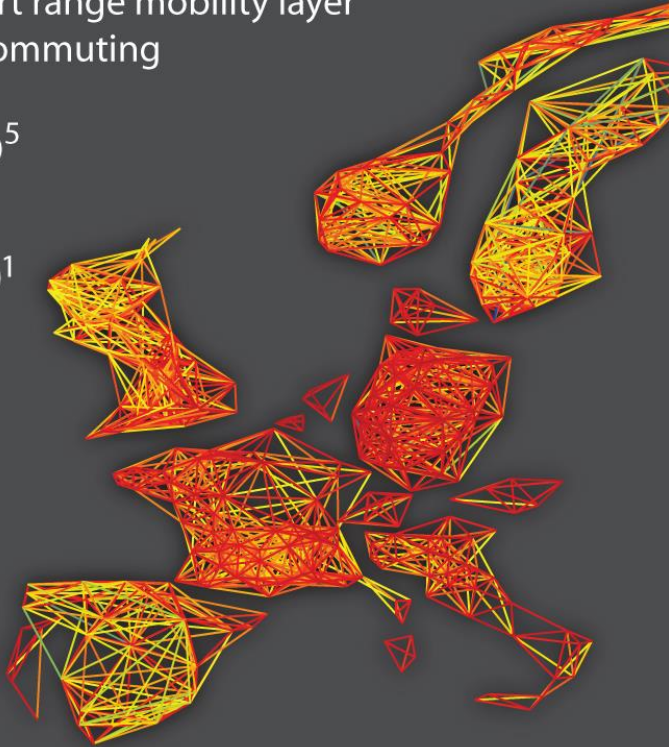
Population basins, local commuting, and global flights

population layer  
-- census areas

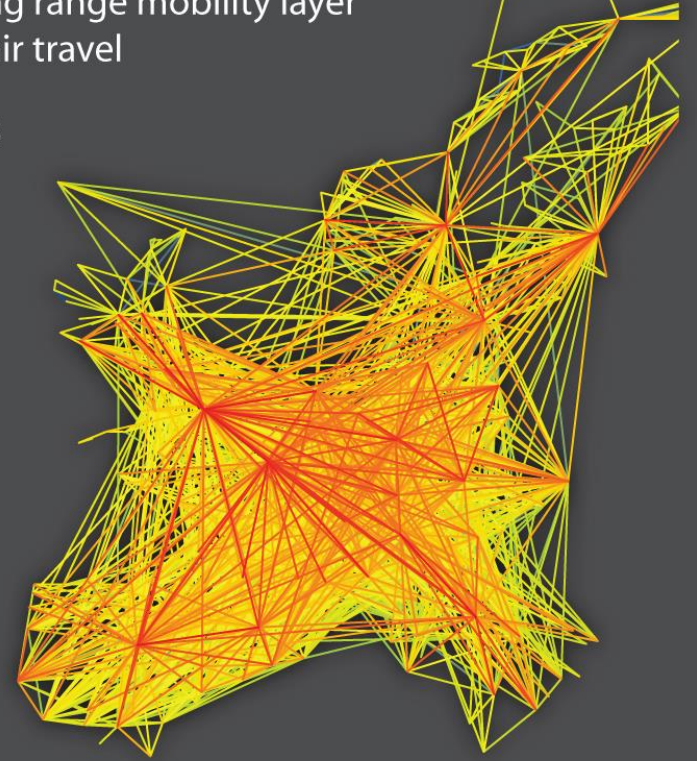
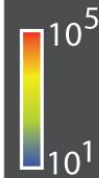
*airports*



short range mobility layer  
-- commuting

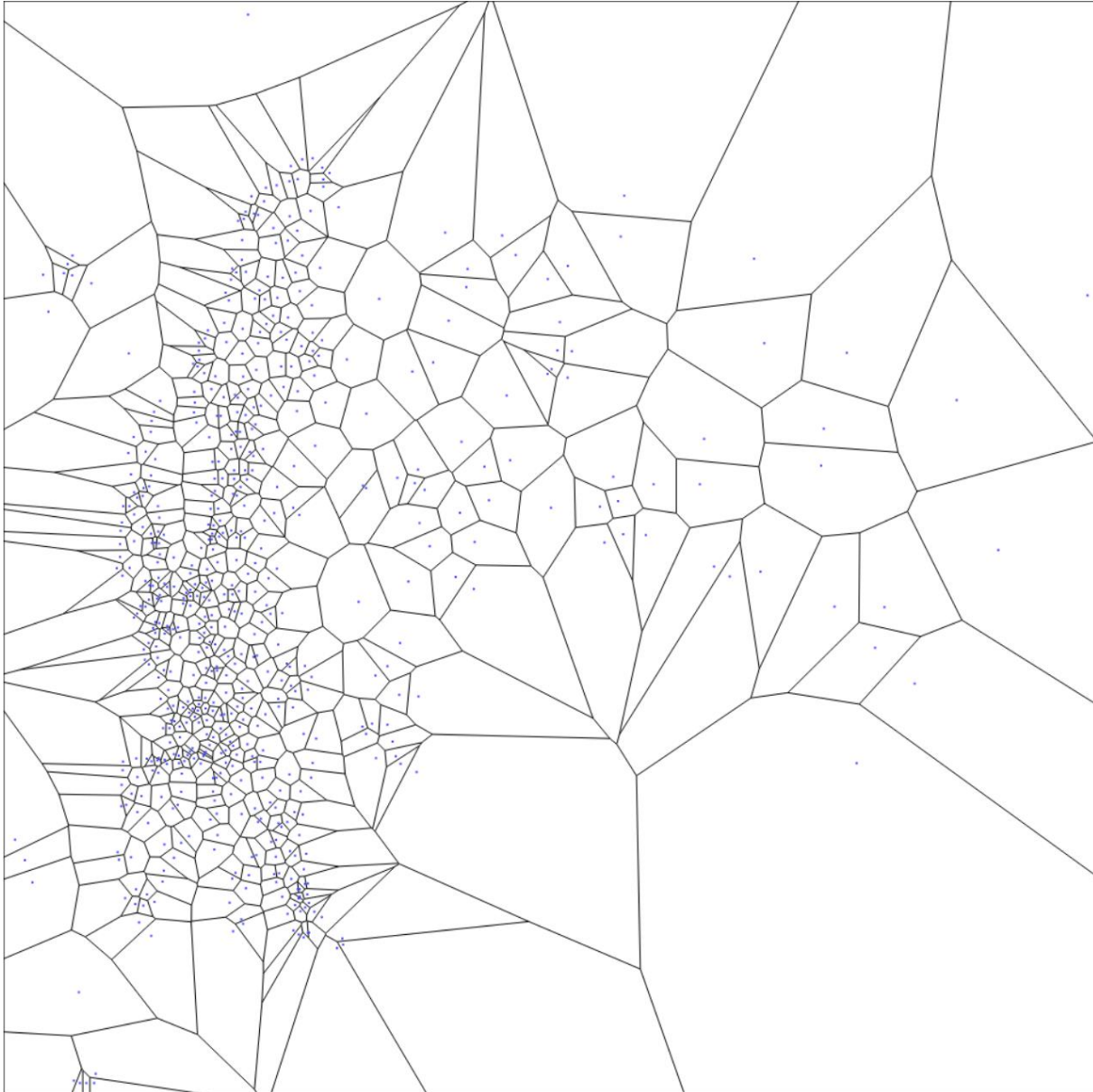


long range mobility layer  
-- air travel



# Voronoi Tessellation

Western Europe





# Centroidal Voronoi Tessellation – Animated!

Western Europe

