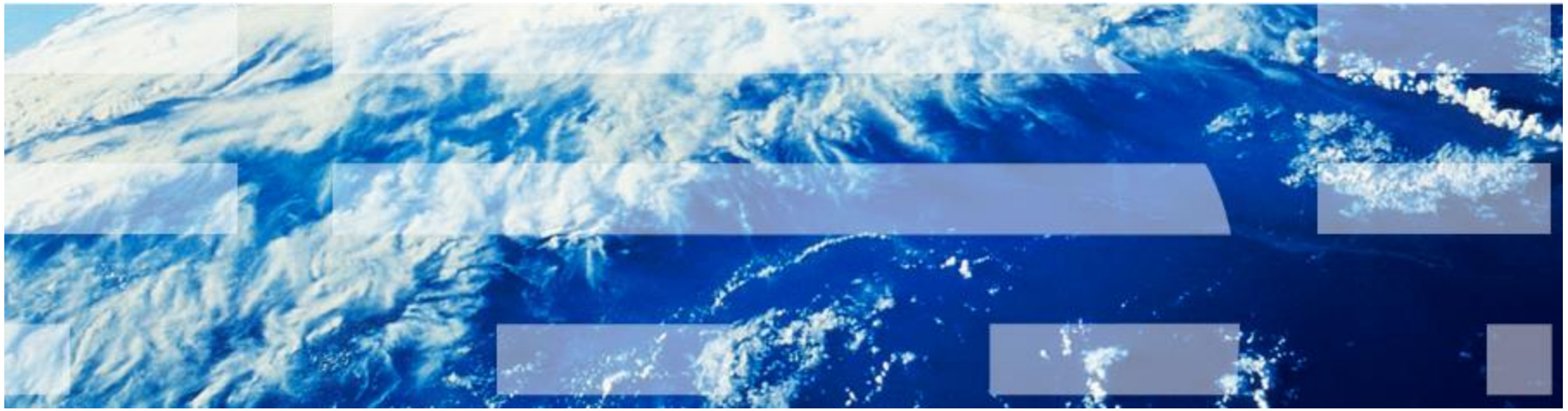
COLUMBIA UNIVERSITY

E6893 Big Data Analytics:

Geographic and Financial Impact of Carbon Tax in the United States

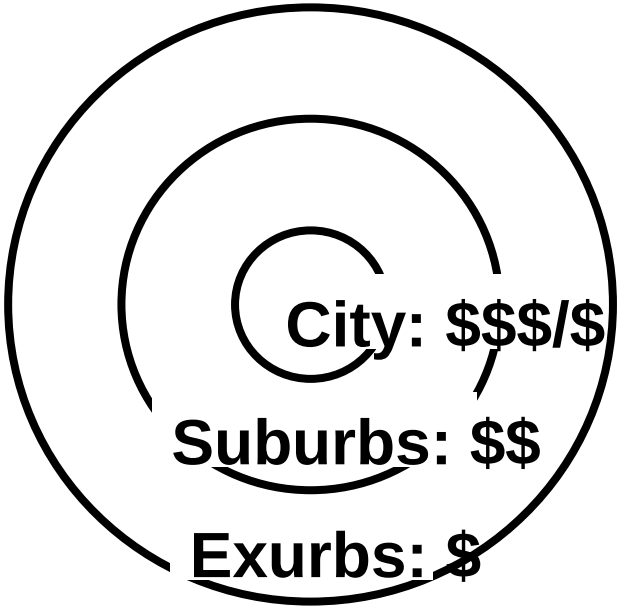
Team Members: **Keir Lauritzen (kcl2143)**
Adam Owens (ao2595)
Kosta Andoni (ka2604)



December 14, 2016

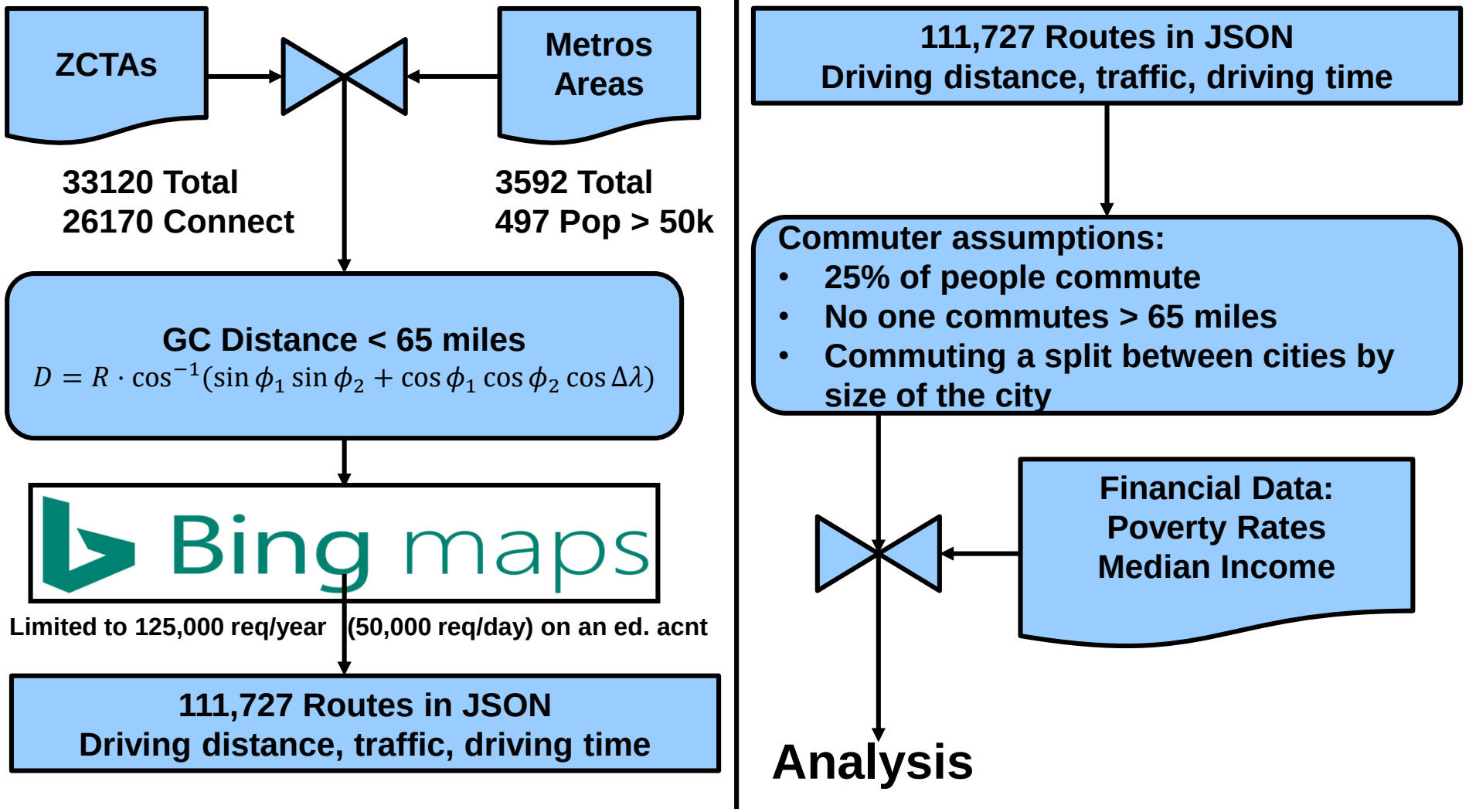
Overview

- **Carbon taxes have been proposed to address climate change**
  - **Washington State's Initiative 732 called for $100 per ton[1]**
  - **IEA suggests $125 to $140 per ton[2]**
- **Financial cost of carbon tax will vary geographically**
  - **Commuters who travel long distances for work in cities will have higher costs**
  - **Generally, incomes vary as you move away from city centers**
- **Cost relative to income may fall disproportionately on certain areas.**
  - **Challenging to find solutions (you cannot move most houses)**



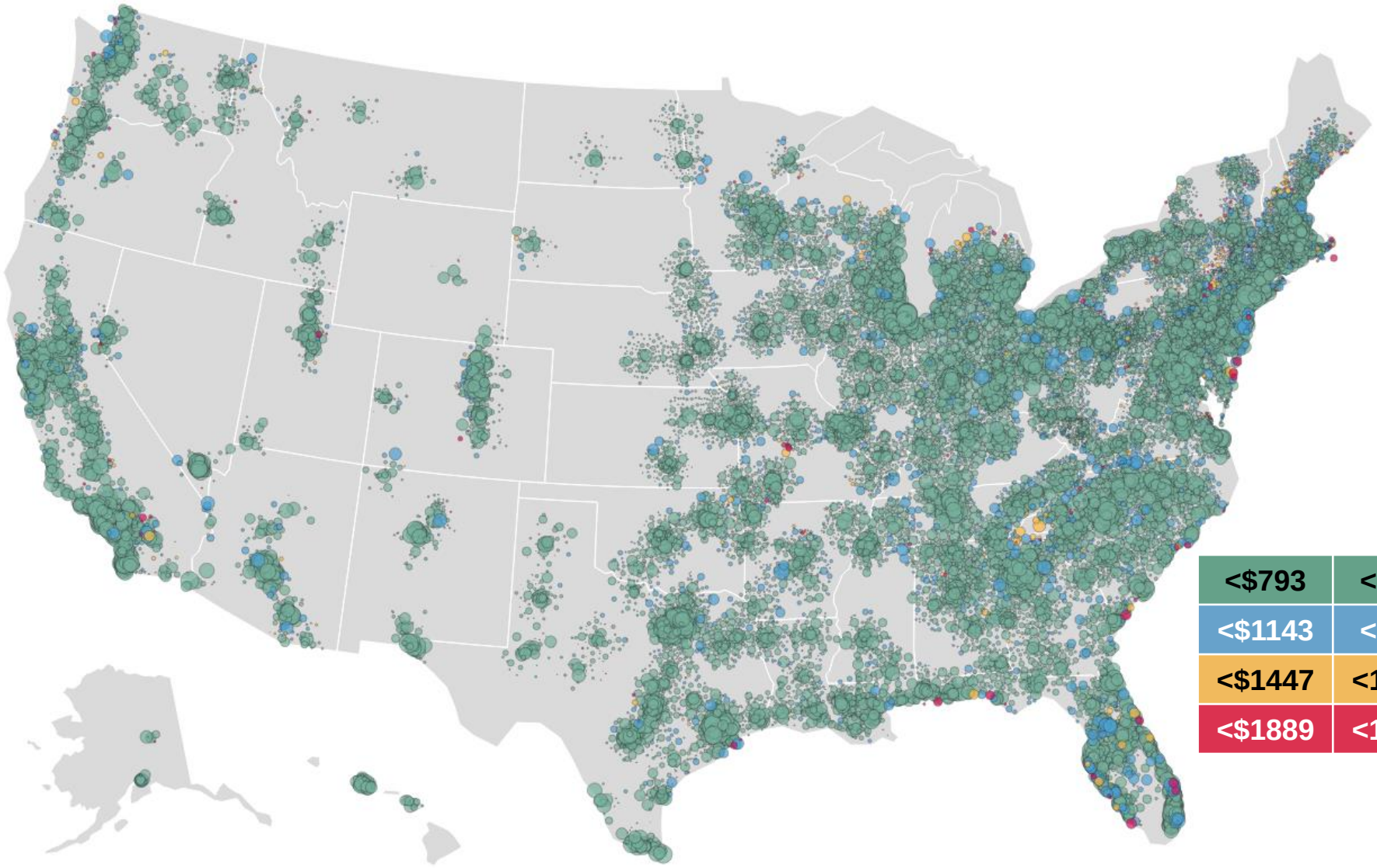
Understanding distribution of costs helps illuminate likelihood of any potential implementation (in future)

Data Set Gathering

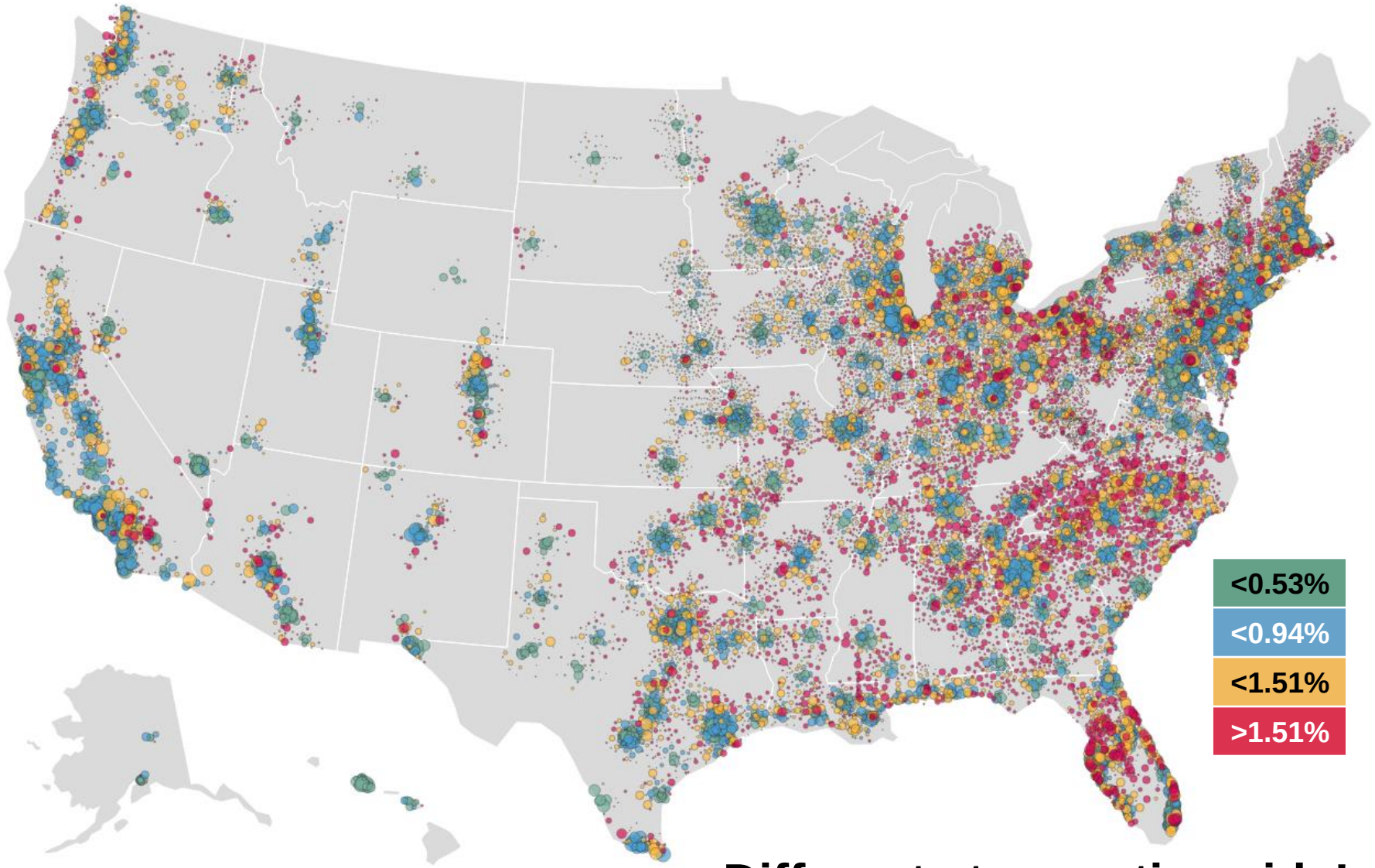


ZCTA = Zip-Code Tabulated Area, Census bureau designation that mostly aligns with actual zip codes

Estimated Carbon Tax from Commuting

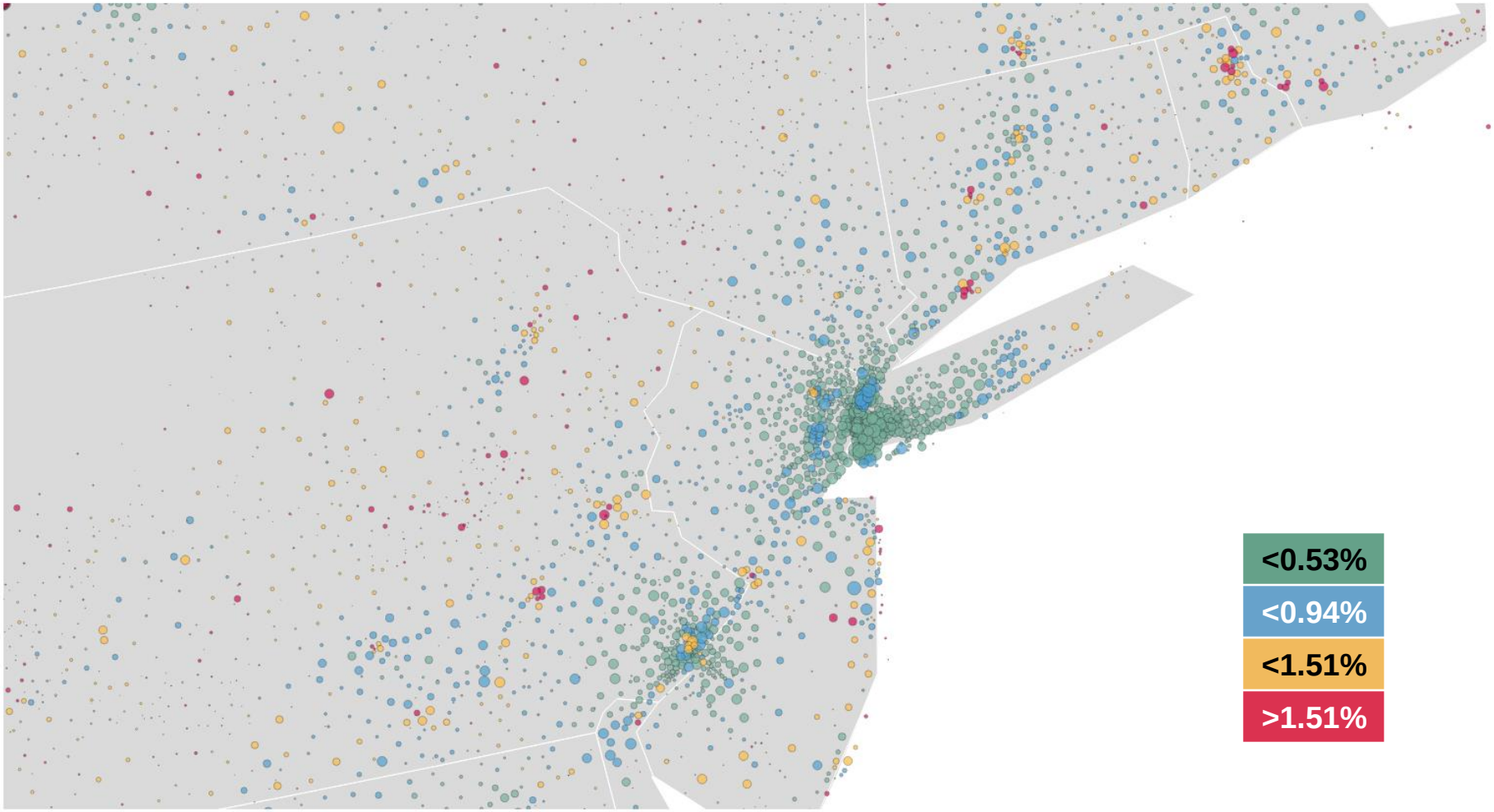


Carbon Tax as Percentage of Income



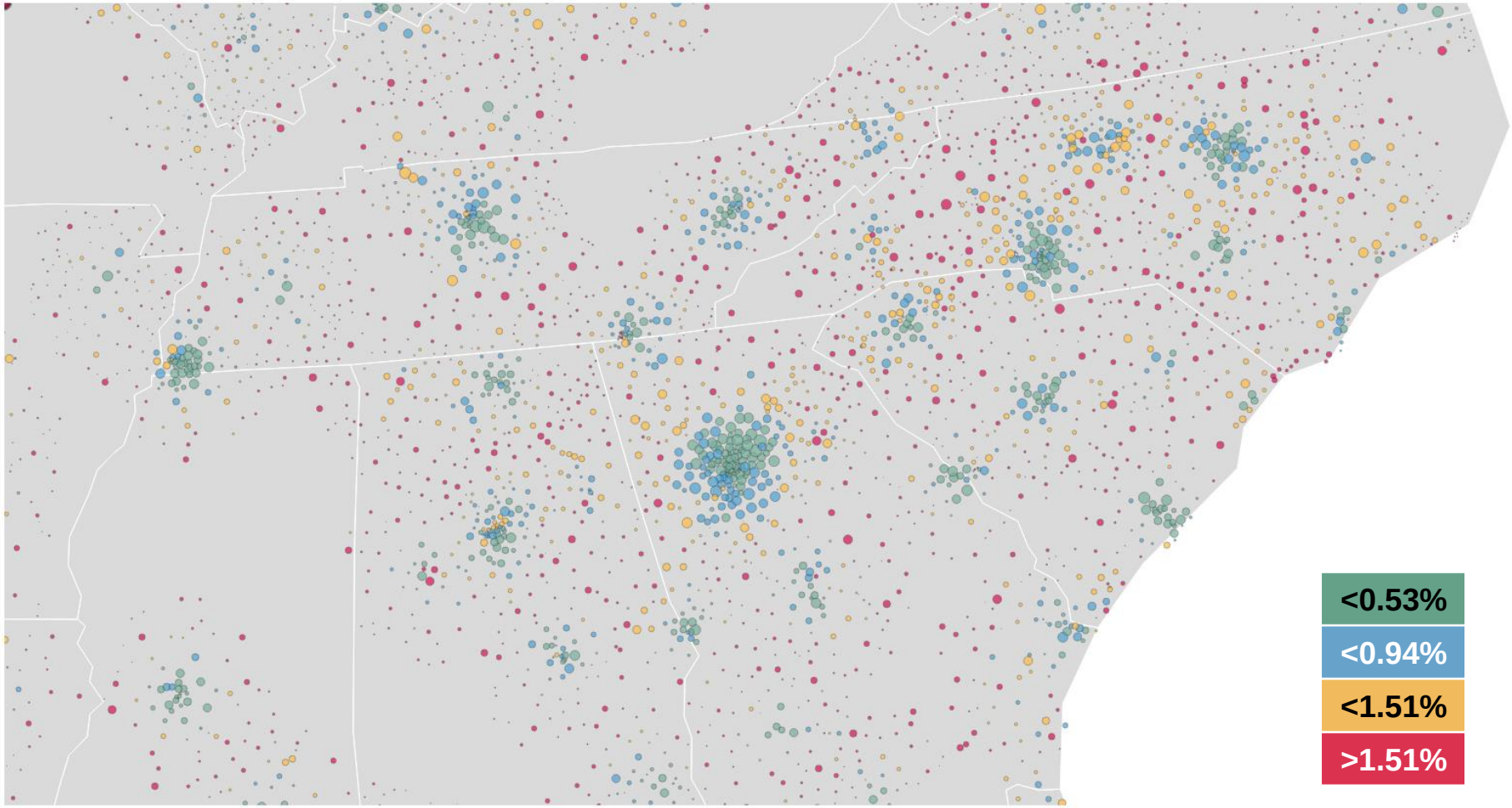
Different story nationwide!

Carbon Tax as Percentage of Income



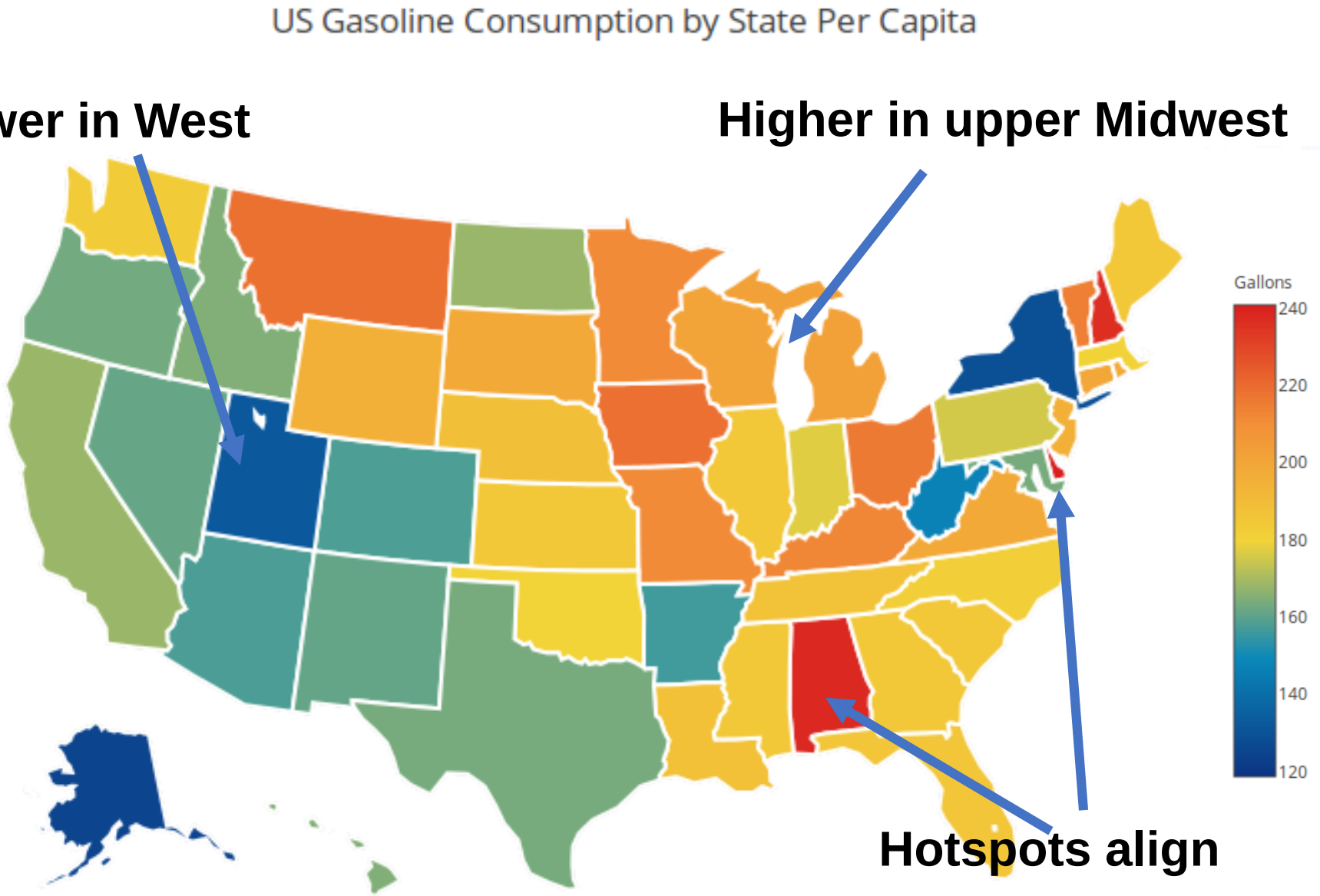
Not really an NYC Problem…

Carbon Tax as Percentage of Income



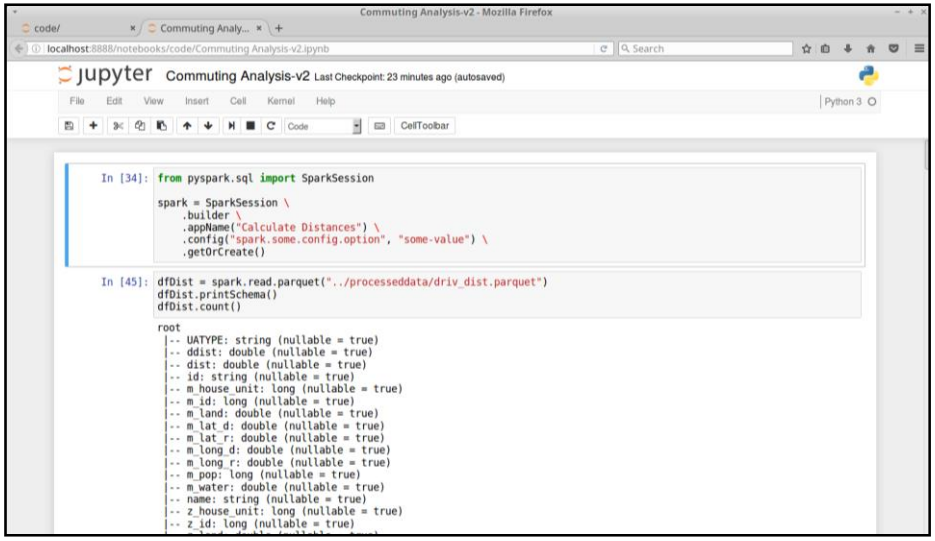
Especially in the South.

Model Validation: Alternative source



Technology

- **Route Data: Bing Maps**
- **Main tools: PySpark/SparkSQL, Jupyter Notebook**
- **Visualization tools: Plotly, System G**
- **Storage: Amazon S3**
- **Computing: Google Cloud**



http://104.196.172.98:9080/systemg/visualizer/#

Conclusion and Next Steps

- **Conclusions:**
  - **Median carbon tax on commuting would be $1143 (using $140 as the rate per ton)**
    - **Preference for larger vehicles could make this worse in rural communities**
    - **Carbon tax is evenly spread outside of city centers**
  - **Relative to income, the tax would hit rural areas heavily.**
  - **Model validation aligns**

- **Next Steps:**
  - **Continue to review other data and see if it conflicts with conclusions**
  - **Explore the data with System G**

- **Future Work:**
  - **Improve the model:**
    - **Look at transit time as the cutoff**
    - **More complicated weighting**
  - **Cross reference with political representation**

References

1. Voter's Guide, https://weiapplets.sos.wa.gov/MyVoteOLVR/OnlineVotersGuide/Measures?language=en&electionId=63&countyCode=xx&ismyVote=False&electionTitle=2016%20General%20Election%20#ososTop, retrieved December 11, 2016.
2. Stéphane Dion, "A World Price for Carbon: A Necessary Condition for an Effective Global Climate Agreement," Harvard International Review, May 5, 2015, http://hir.harvard.edu/a-world-price-for-carbon-a-necessary-condition-for-an-effective-global-climate-agreement/.