

DECODING COMMUTING DISTANCE PATTERNS

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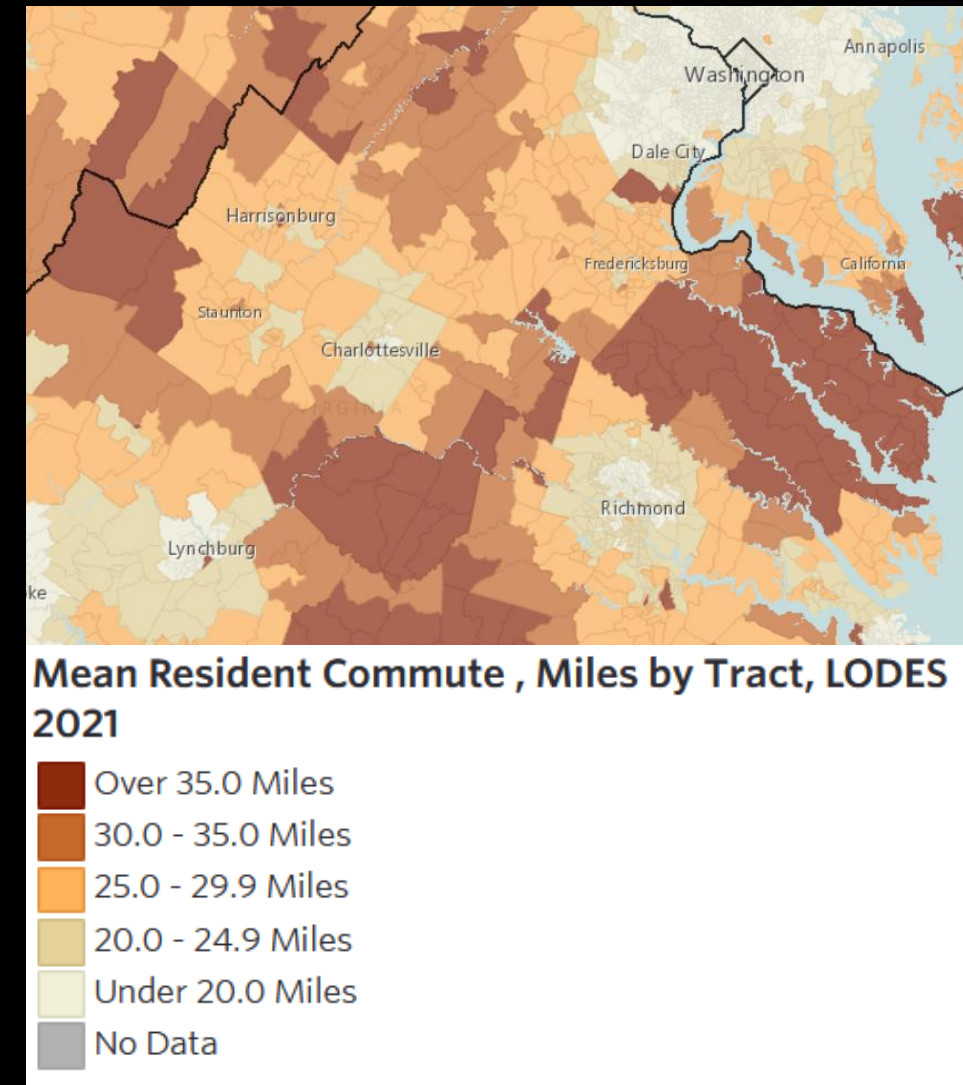


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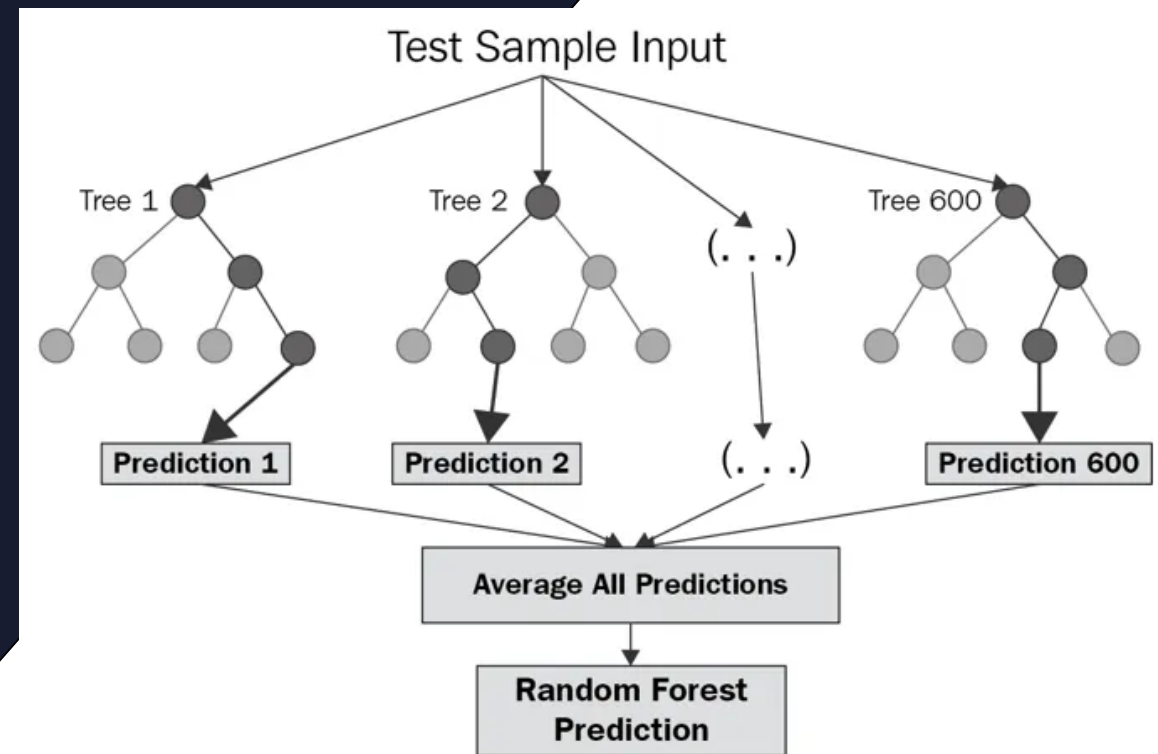
Previous Work

- Calculating mean commute distance
 - Straight line distance between blocks
 - Capped at 125 miles
 - Averaged to various geography levels
- Grouping Commuters by Distance Travelled
 - ie number of commuters with short/moderate/long commutes
- Quantifying Commuters going in/out of an area
- Mapping Workplace Area Characteristics



Predicting Commuting Distance

- Research Questions:
 - What factors are the most important in determining how far people commute?
 - Where are the areas where the predicted commute substantially differs from the actual commute?
- Model: Random Forest
 - Machine Learning method
 - Takes subset of input variables and predicts value to make a single tree. Combine all trees and 'vote' on a prediction. The combined trees, or forest, provide a more accurate prediction than any single one.



Input Variables

County Metro status – 2020

Size of the County

Origin-Destination Age Variables (x3)

Origin-Destination Earnings Variables (x3)

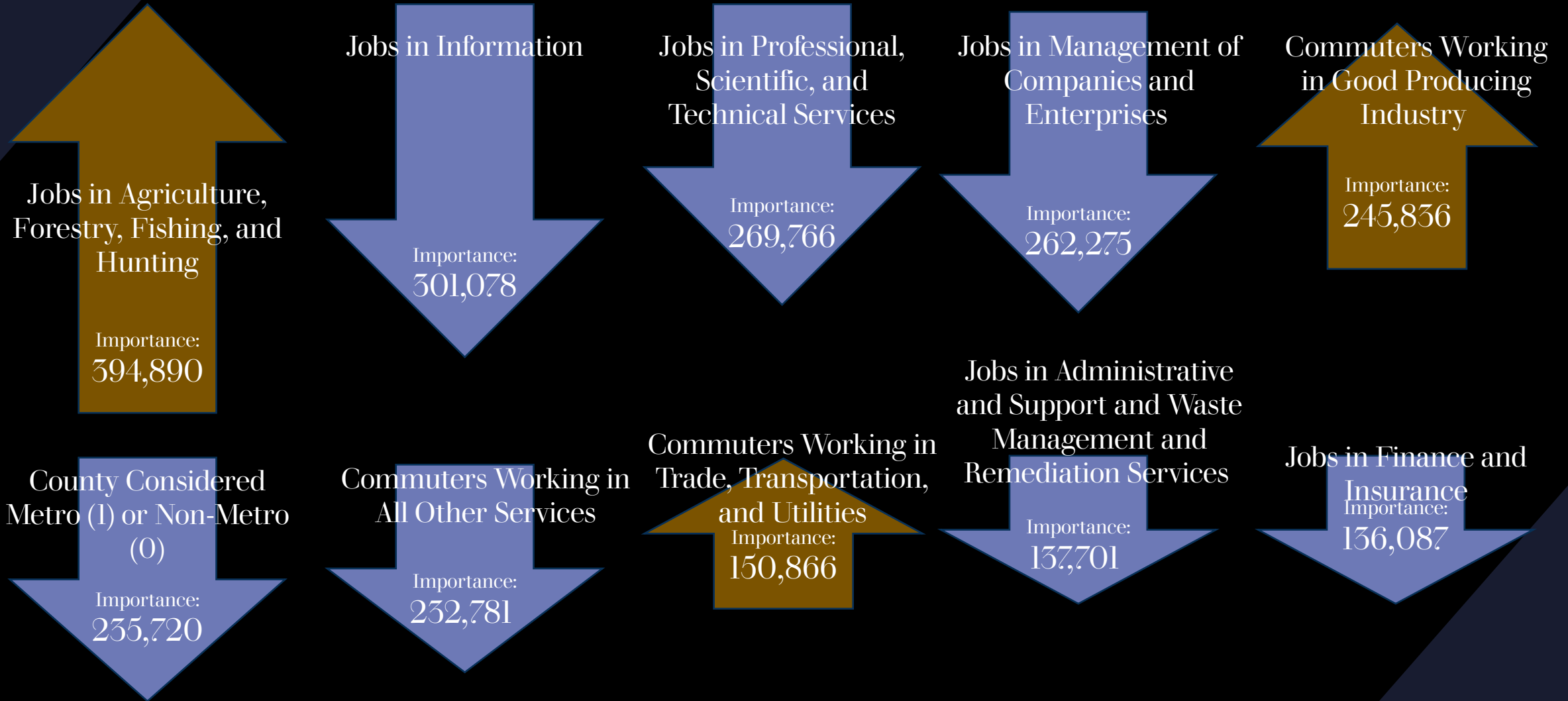
Origin-Destination Job Sectors (x3)

County Level Workplace Area Characteristics (x20)

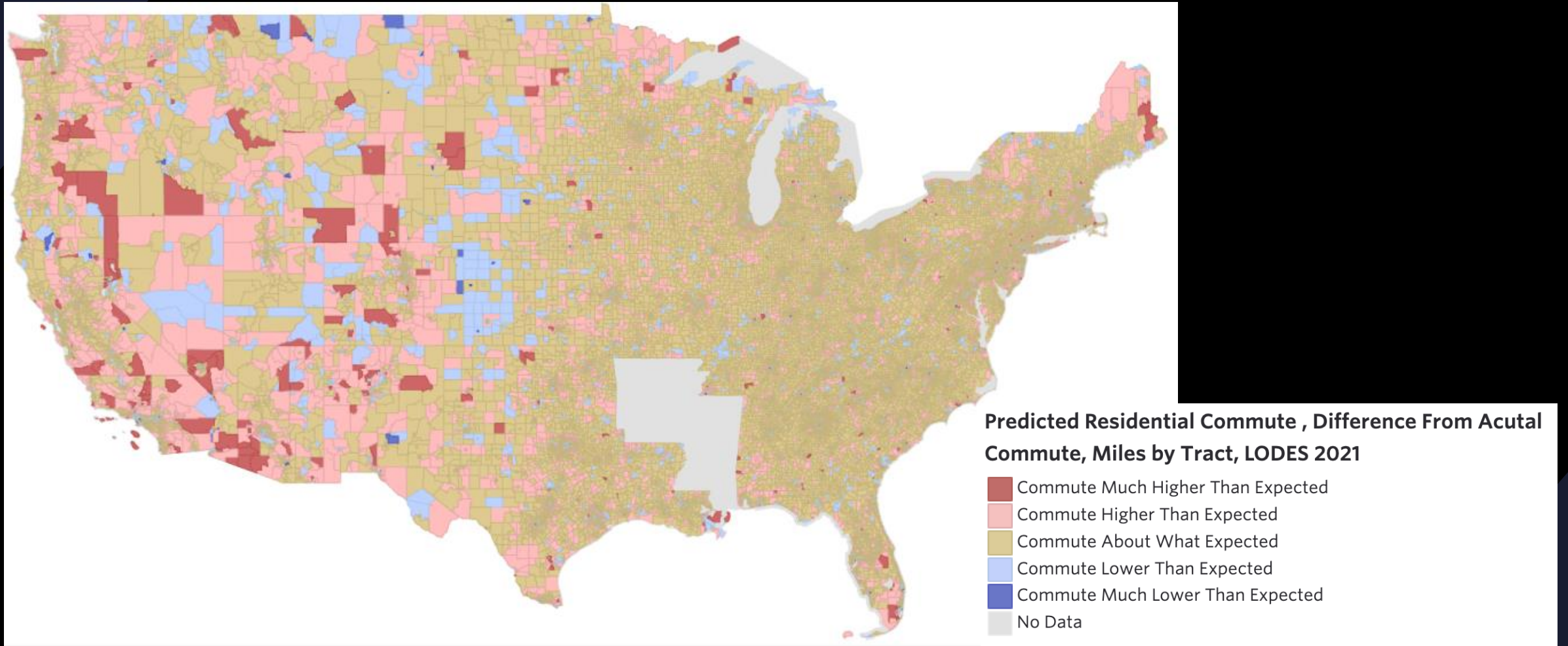
Model Results

- Split data into training and testing data
 - After training, tested the model on the remaining testing data set
 - $R^2 = 0.79$ (Very good!)
 - Mean Absolute Error: 2.2 Miles
 - Most important Variable: Percent of Jobs in the County in Agriculture, Forestry, Fishing, and Hunting
-

Top 10 Most Important Variables and their correlation

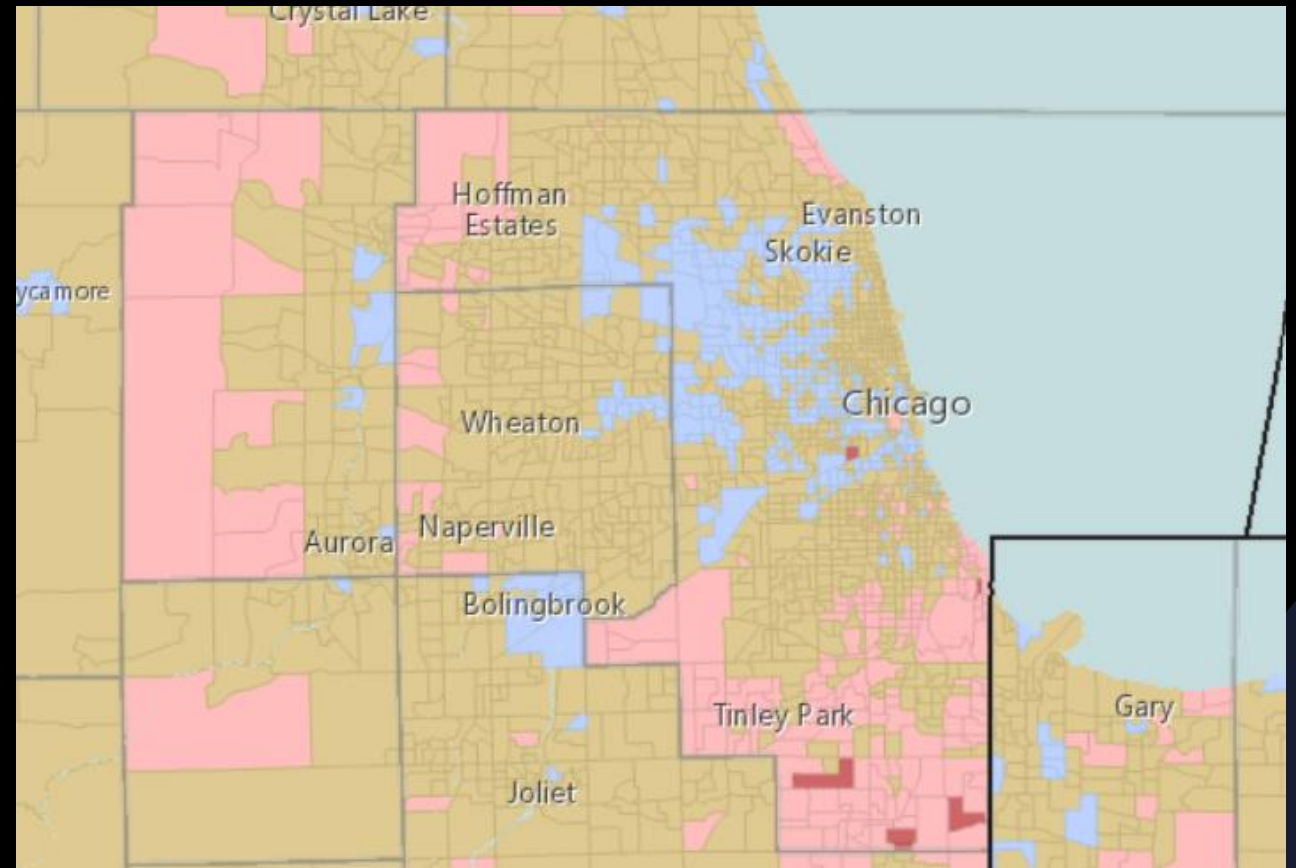


Predicted Distance vs Actual Distance



Predicted Distance vs Actual Distance

- 64,074 census tracts (110,387,396 commuters) had a predicted average commute distance within 10% of the actual average commute values
- 10,311 tracts (15,573,182 commuters) had a lower-than-expected average commute
- 7,822 tracts (11,483,577 commuters) had higher than expected average commute



What now?

- The hope is the data can provide insight into either:
 - a) Areas where people are commuting farther than expected
 - b) Areas where people are not commuting as far as expected
 - c) Areas where the LEHD data isn't precisely catching commuting patterns

Explore the data:

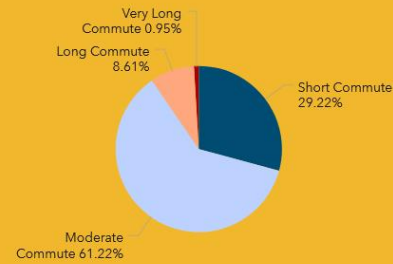
<https://apps.cares.missouri.edu/portal/apps/dashboards/90a7908968ec45bcbfccf1b63125d5a1>

Sample: Cook County, IL

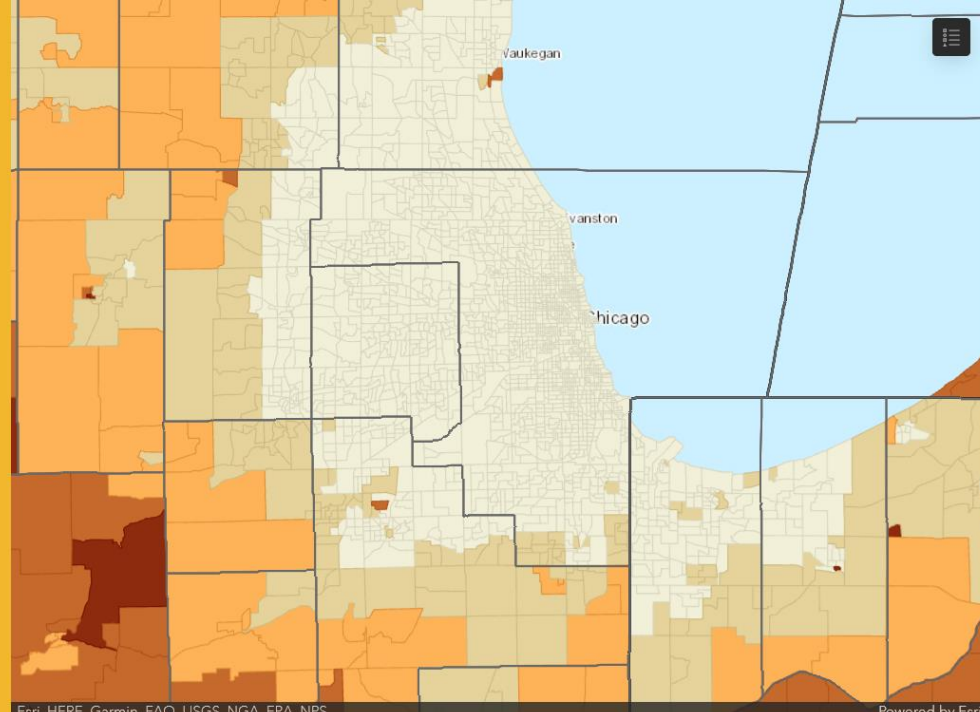
Average Commute for Residents of Cook County

12.0
Miles

Commuting Distance Breakdown



Short Commute: < 5 Miles
Moderate Commute: 5 - 25 Miles
Long Commute: 25 - 75 Miles
Very Long Commute: 75 - 125 Miles



Esri, HERE, Garmin, FAO, USGS, NGA, EPA, NPS

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Based on 2021 Census Origin-Destination data, 44% of people living in metro areas and 54% of people living in non-metro counties commute. On average, Americans spend 27 minutes commuting to work one way. The statistics in this dashboard allow you to see the average commuting distance, number of commuters, and percentage of residents who commute for counties throughout the United States.

Total Commuters Who Live in Cook County

2,204,192

Commuters Leaving Cook County for Work

22.7%

Tracts With Higher Than Expected Commutes

202

Total Commuters: 328,535

Tracts With Lower Than Expected Commutes

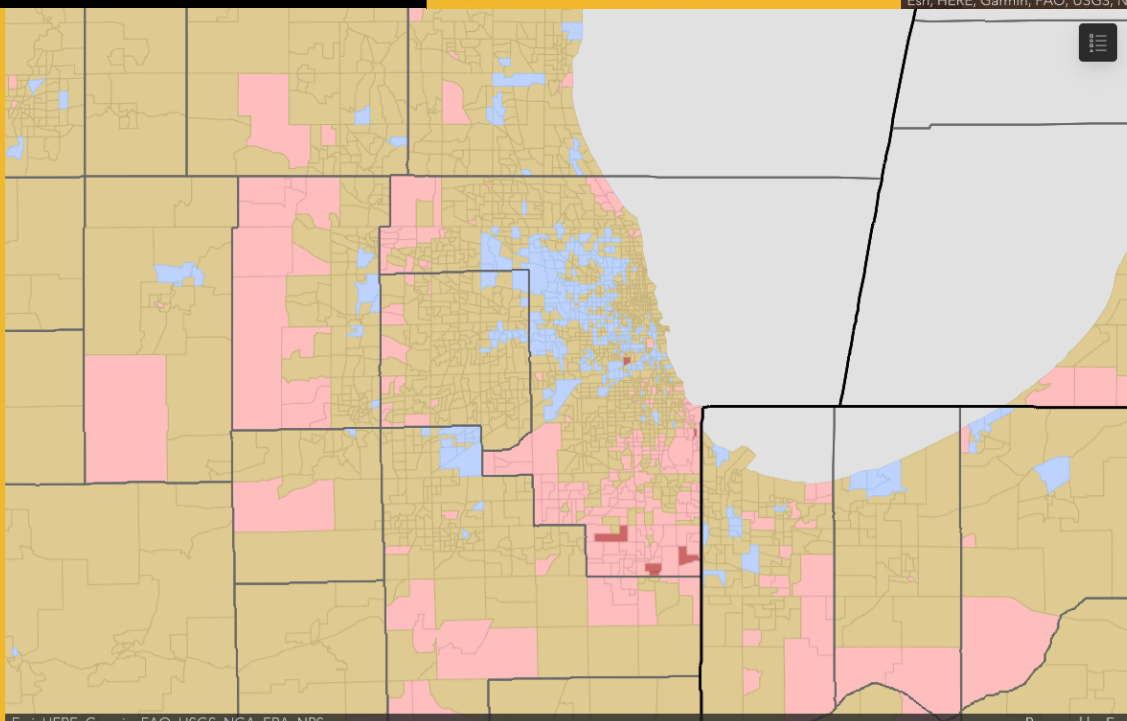
246

Total Commuters: 380,836

Tracts With About Expected Commutes

883

Total Commuters: 1,494,821



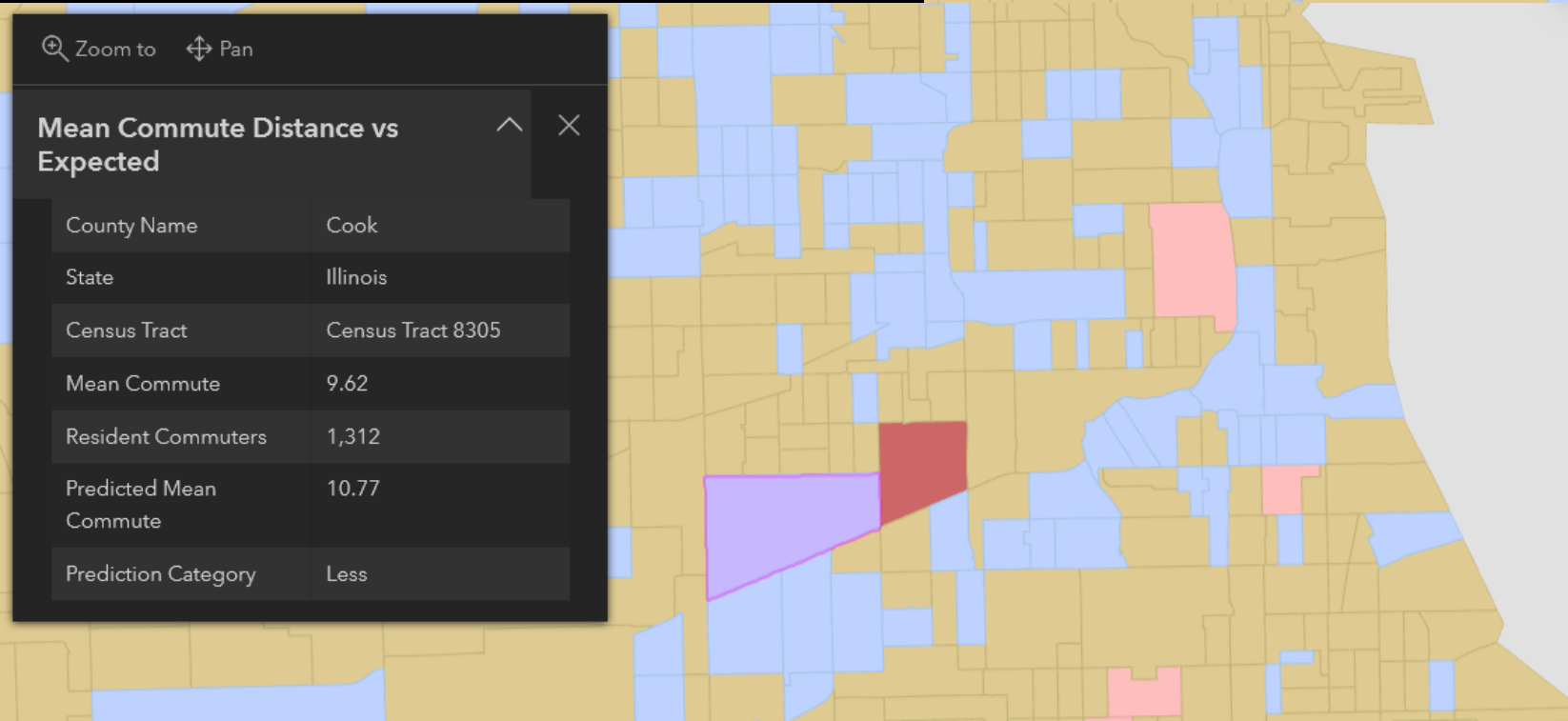
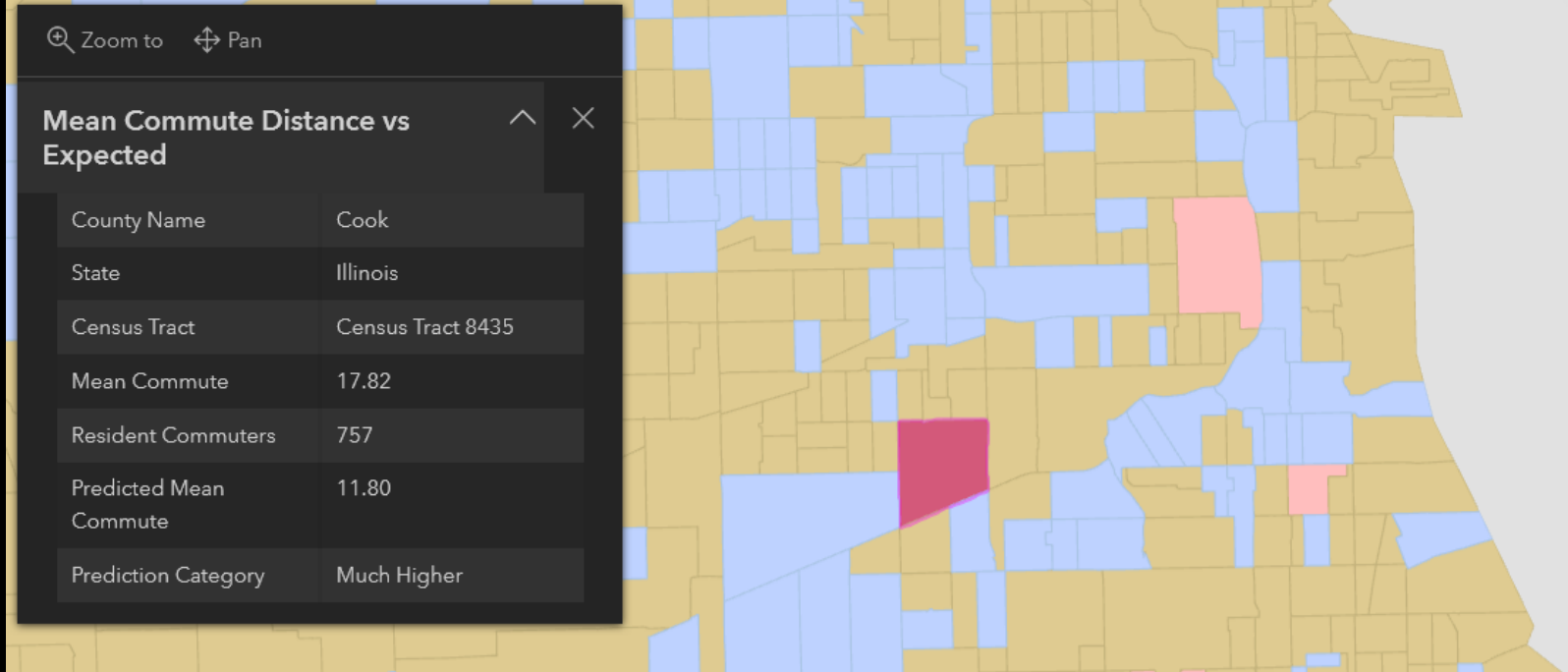
Esri, HERE, Garmin, FAO, USGS, NGA, EPA, NPS

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Mean distance is a useful metric to establish expectations for commute time. However, we wanted to take it a step further to see how mean distance of commute for a census tract compares to tracts of similar size and makeup. To that end, we built a model to predict the average commute distance for each census tract in the country. This map shows how the actual average commute distance differs from the predicted distance. The census tracts in red are those that have an average commute higher than predicted, whereas those in blue have an average commute lower than predicted. Check out your census tract. If it is different than what is predicted, what might make your census tract similar to and different from other comparable tracts?

Much Higher: Actual commute > 40% higher than predicted
Higher: Commute >10% and <= 40% higher than predicted
About: Commute between 10% higher or lower than predicted
Lower: Commute > 10% and <= 40% lower than predicted
Much Lower: Actual commute < 40% lower than predicted

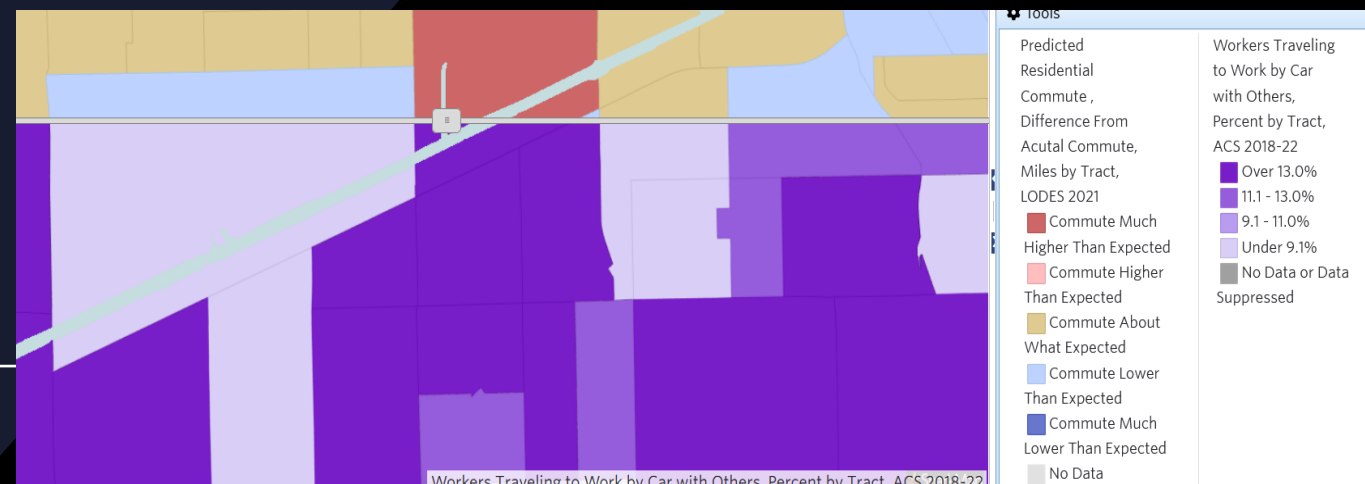
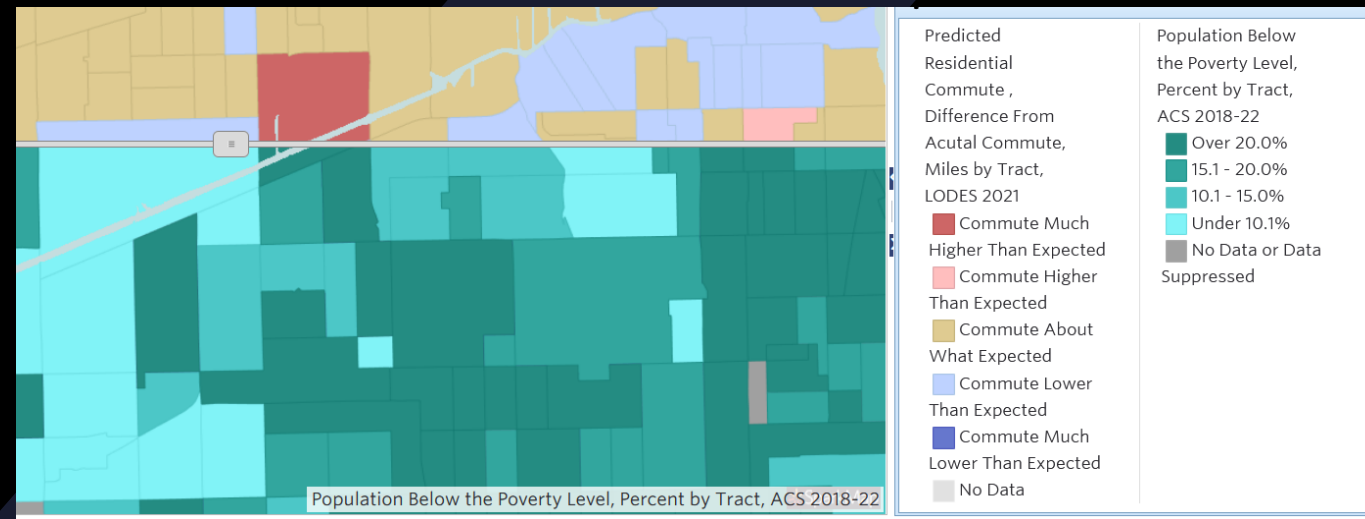
Sample: Cook County, IL



Census Tract 8435 has an average commute much higher than expected, however right next door, Census Tract 8305 has a commute distance lower than expected. Why?

Using SparkMap to gain additional insights

- The dashboard itself doesn't attempt to answer the why, instead it focuses on visualizing the data
- SparkMap.org/Map-Room – Free Product from CARES with over 28,000 data layers that can be mapped including:
 - Poverty
 - Housing Characteristics
 - Unemployment
 - So much more!!
- SparkMap.org/report– Tiered subscription tool where you can select individual tracts and see snapshots of a wide variety of indicators

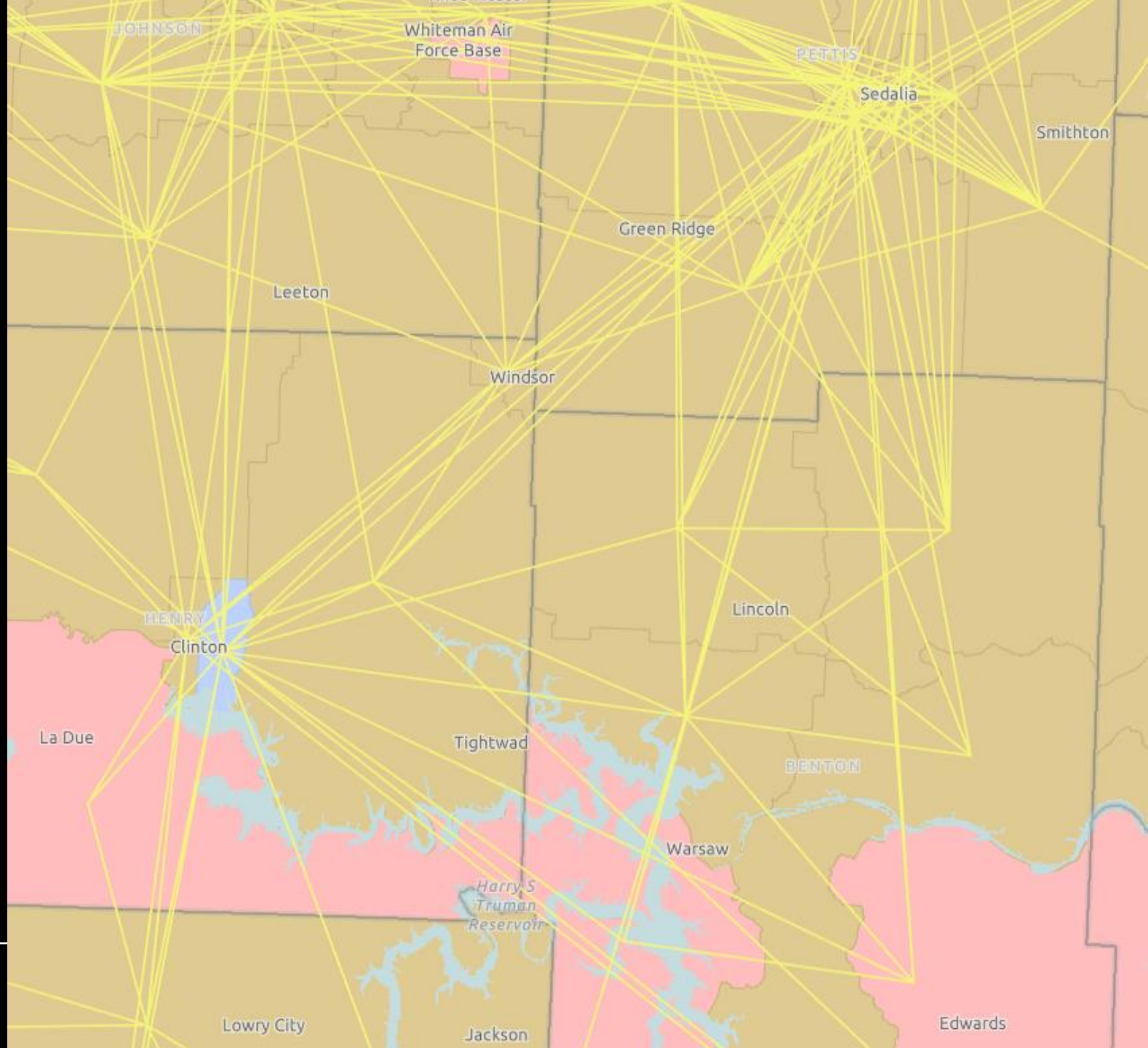


Additional Analysis Ideas:

Create enhanced product to select a tract of interest and see:

- a) Where are people commuting to/from in the tract
- b) Types of jobs people in the tract have
- c) Additional Indicators like poverty, housing, access to broadband, etc.

Open to suggestions for other analysis!



Thank you!

- Read the blog post at:
<https://sparkmap.org/data/decoding-commuting-distance-patterns/>
- Please send any additional questions, comments, or suggestions to:
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