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Energy Infrastructure and Community Resilience

A Spatiotemporal Data Analysis of the Social Impact of Power Failures in the Southeast United States

Presented by:
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Research Team and Collaborators

Core Team	GT Department
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External Partners	Organization
Stephen Kelley	Southern Company

Southern Company

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Study Overview and Objectives

- ***Problem***: Southeast especially sensitive to severe weather-related outages, e.g., Hurricanes Irma in 2017, Michael in 2018
- ***Goal #1***: Examine the local impact of power outages caused by extreme weather events and the contributors to community resiliency using micro-data at scale from Southeast.
- ***Goal #2***: Bring together knowledge in **electrical engineering** on incidence and duration of weather-induced power outages with knowledge in **social sciences** on the costs of power failures on businesses, households, and communities.

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Data Analysis: Hurricane Michael in GA and AL

- **Power outage data in Georgia and Alabama:** When/where failure occurred and time to recovery at the device level of power distribution
- **Weather-related risk factors:** Hourly weather data on rain and wind by zip code
- **Commercial activity:** Concentration of businesses by size and type, e.g., healthcare, construction, manufacturing, agriculture
- **Community factors:** Socio-economic and demographic data, e.g., income, age, population density, race

Hurricane Michael's Path

- Source: Weather.com, "Hurricane Michael Recap: Historic Category 4 Florida Panhandle Landfall; Swath of Wind Damage and Flooding Into the Carolinas, Mid-Atlantic." 13 October 2018.

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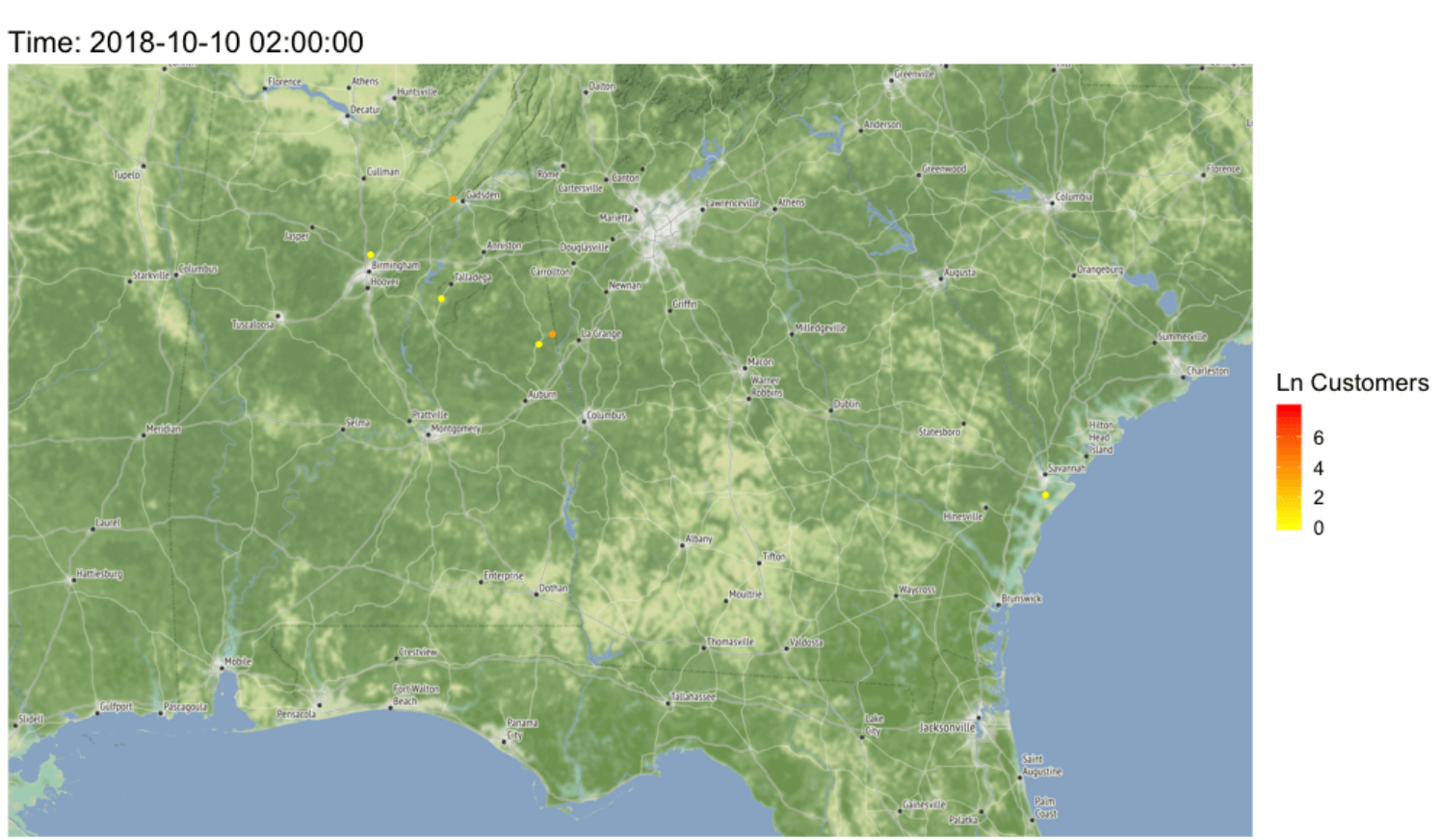
Power Failures: Oct 10 to Oct 12



➢ Source: Weather.com, "Hurricane Michael Recap: Historic Category 4 Florida Panhandle Landfall; Swath of Wind Damage and Flooding Into the Carolinas, Mid-Atlantic." 13 October 2018.

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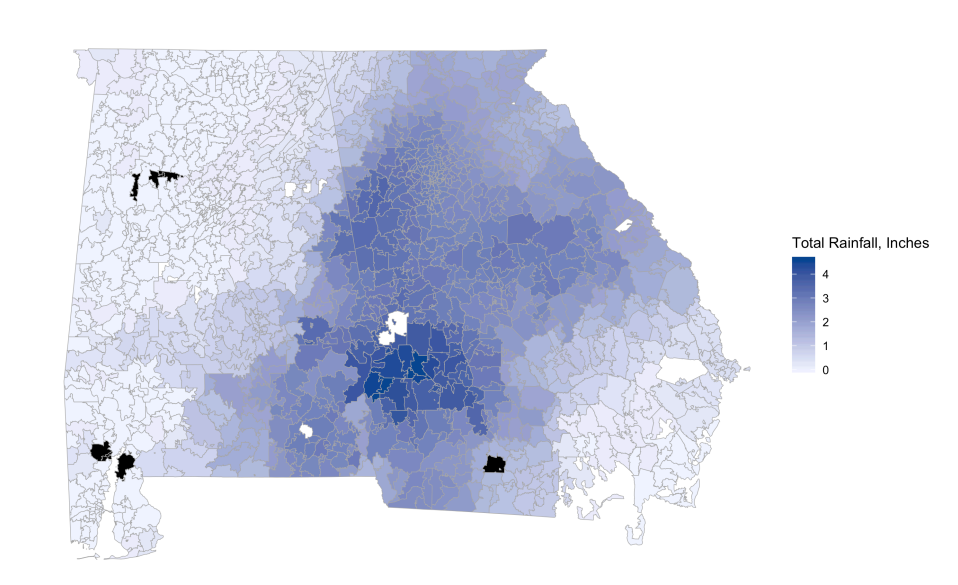
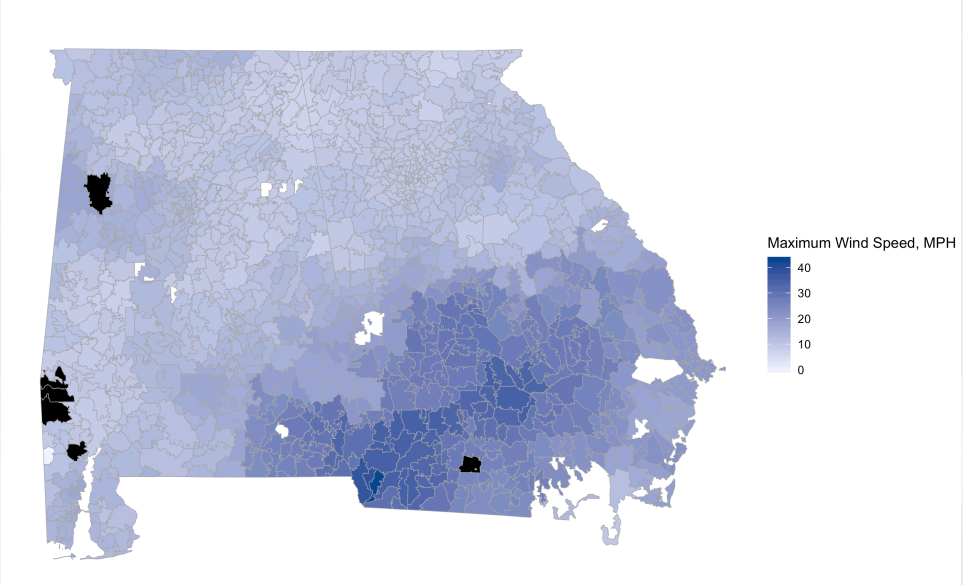
Weather-related Risks: Oct. 10 to 15

Total Rainfall



Wind Speed



➢ Source: Dark Sky API

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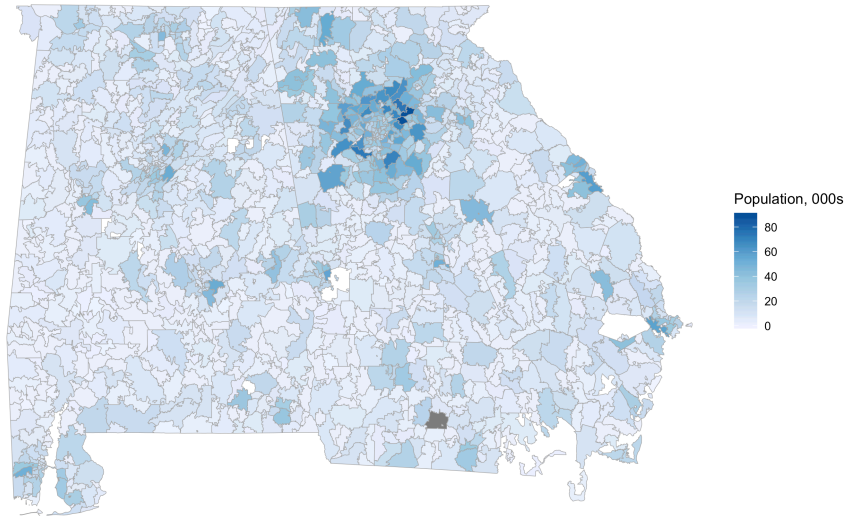
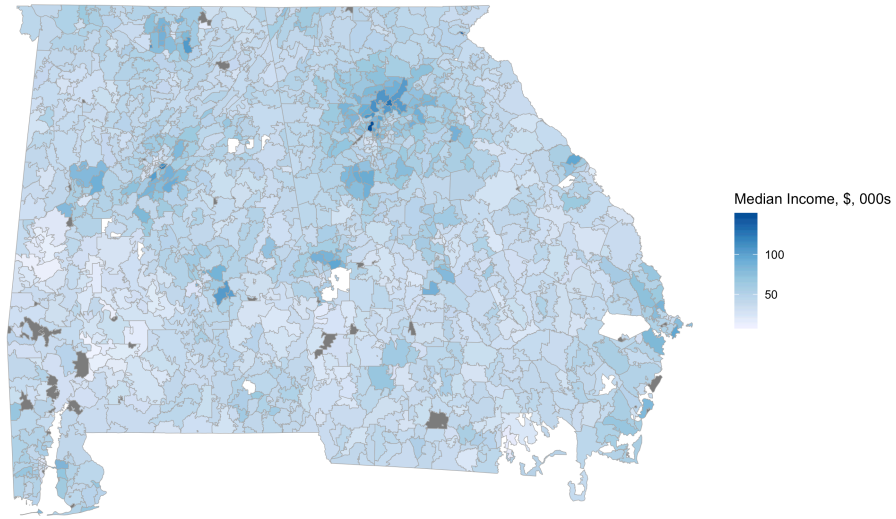
Community Characteristics

Total Population



Median Income



➢ Source: US Census

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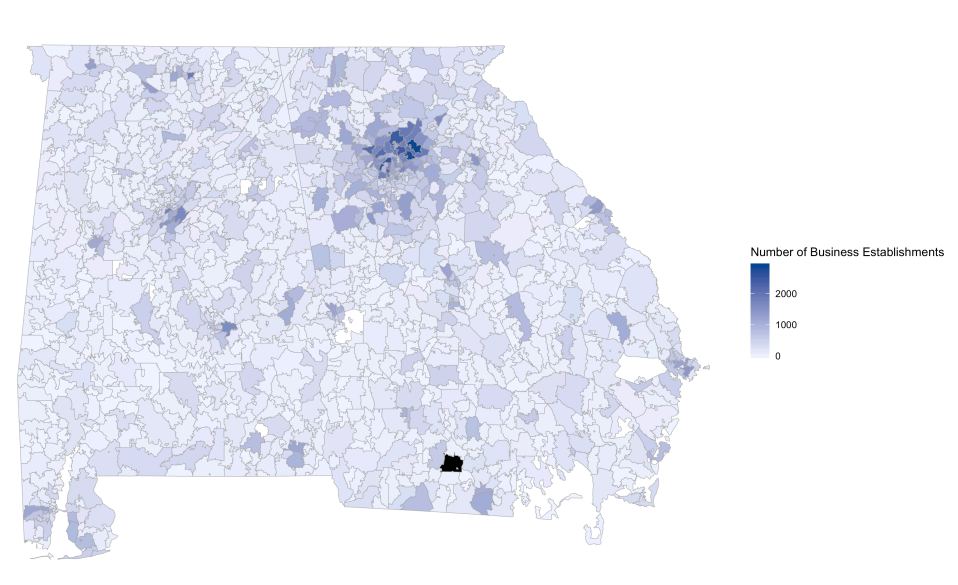
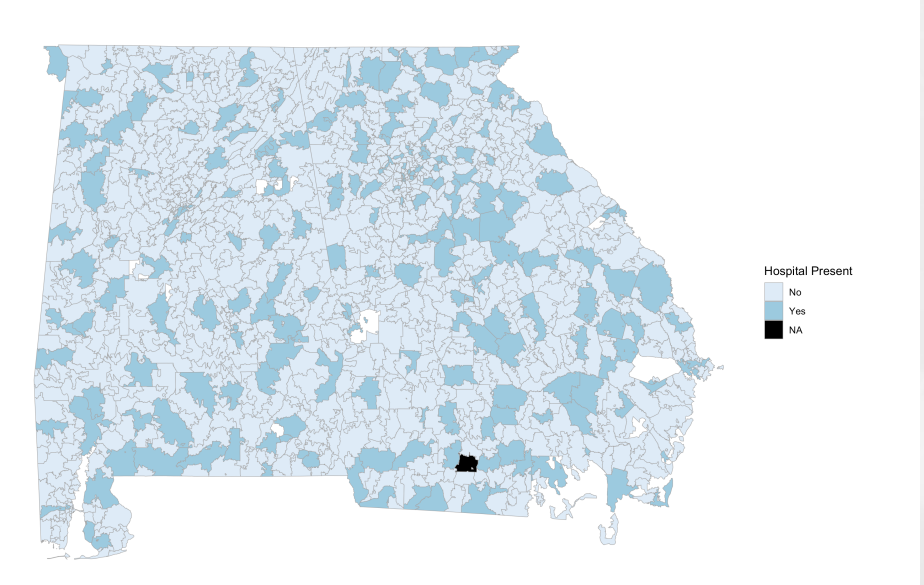
Business Characteristics

Total Establishments



Hospital Locations



➢ Source: US Census

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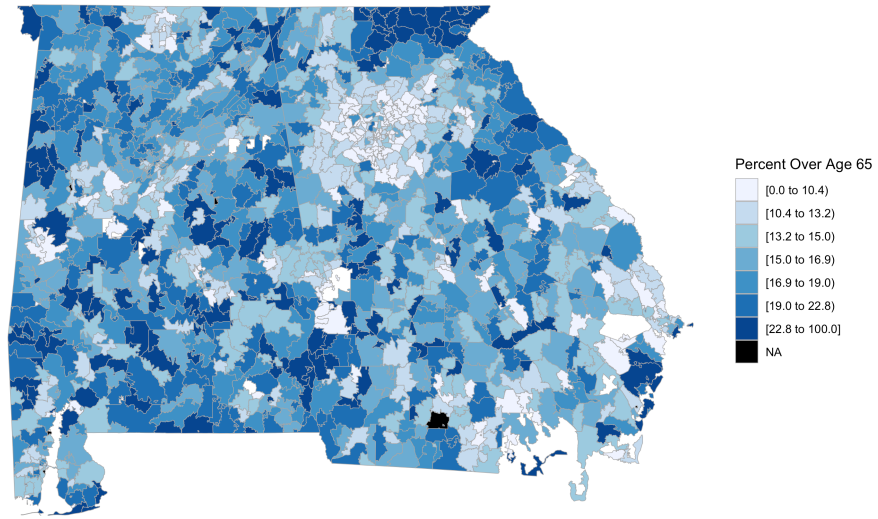
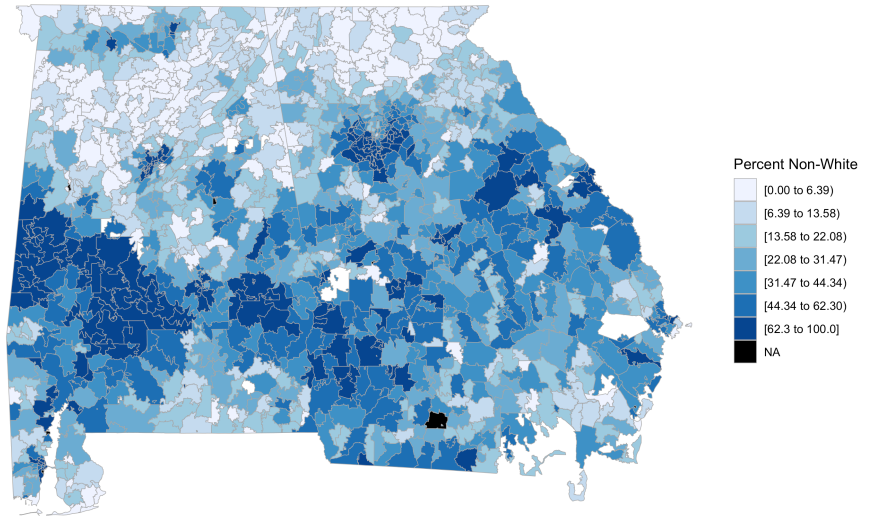
Demographic Characteristics

Share of Population Over 65



Share of Population Non-White



➢ Source: US Census

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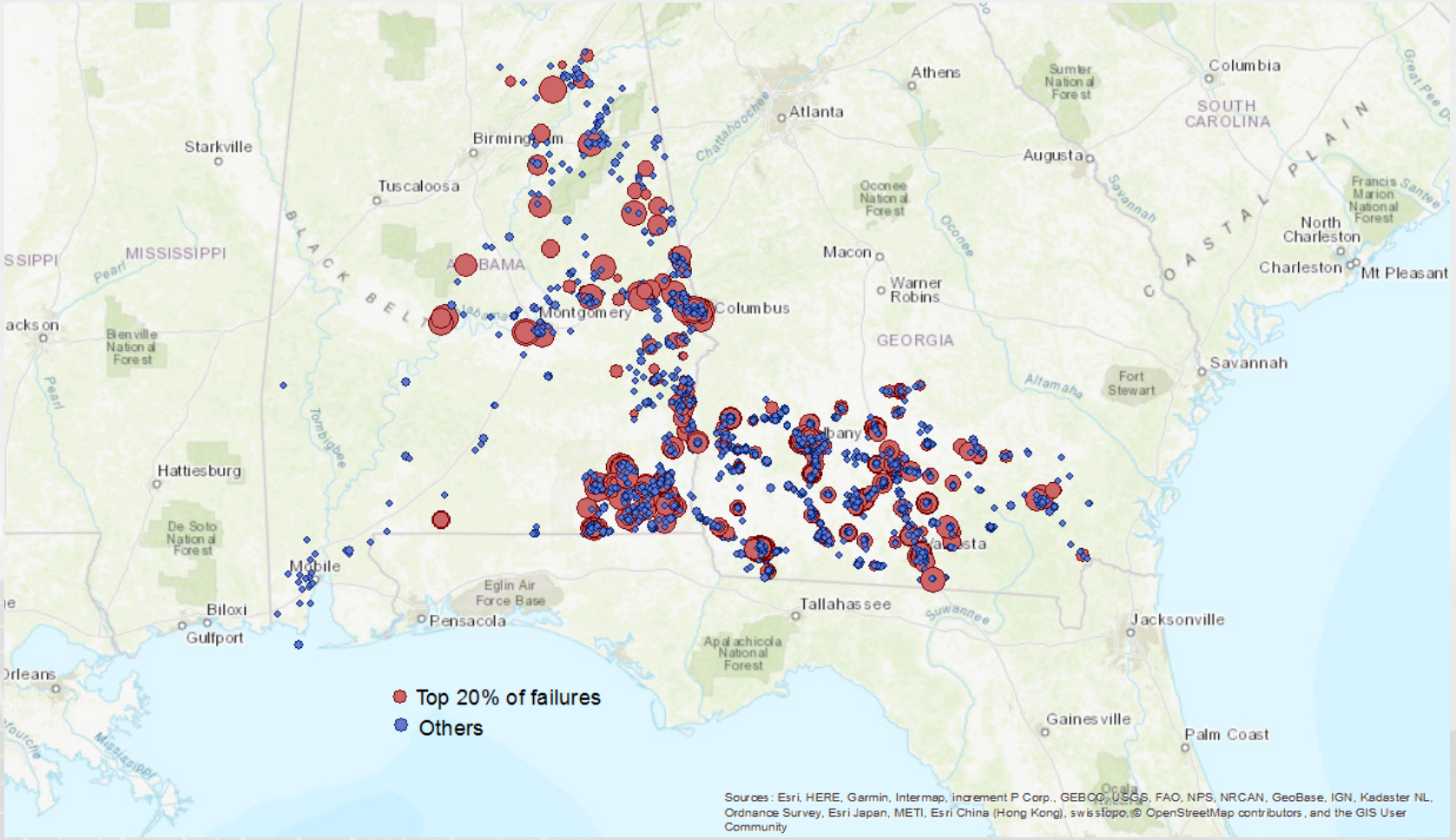
➢Preliminary Results: Top 20% of failures created 90% of outages.



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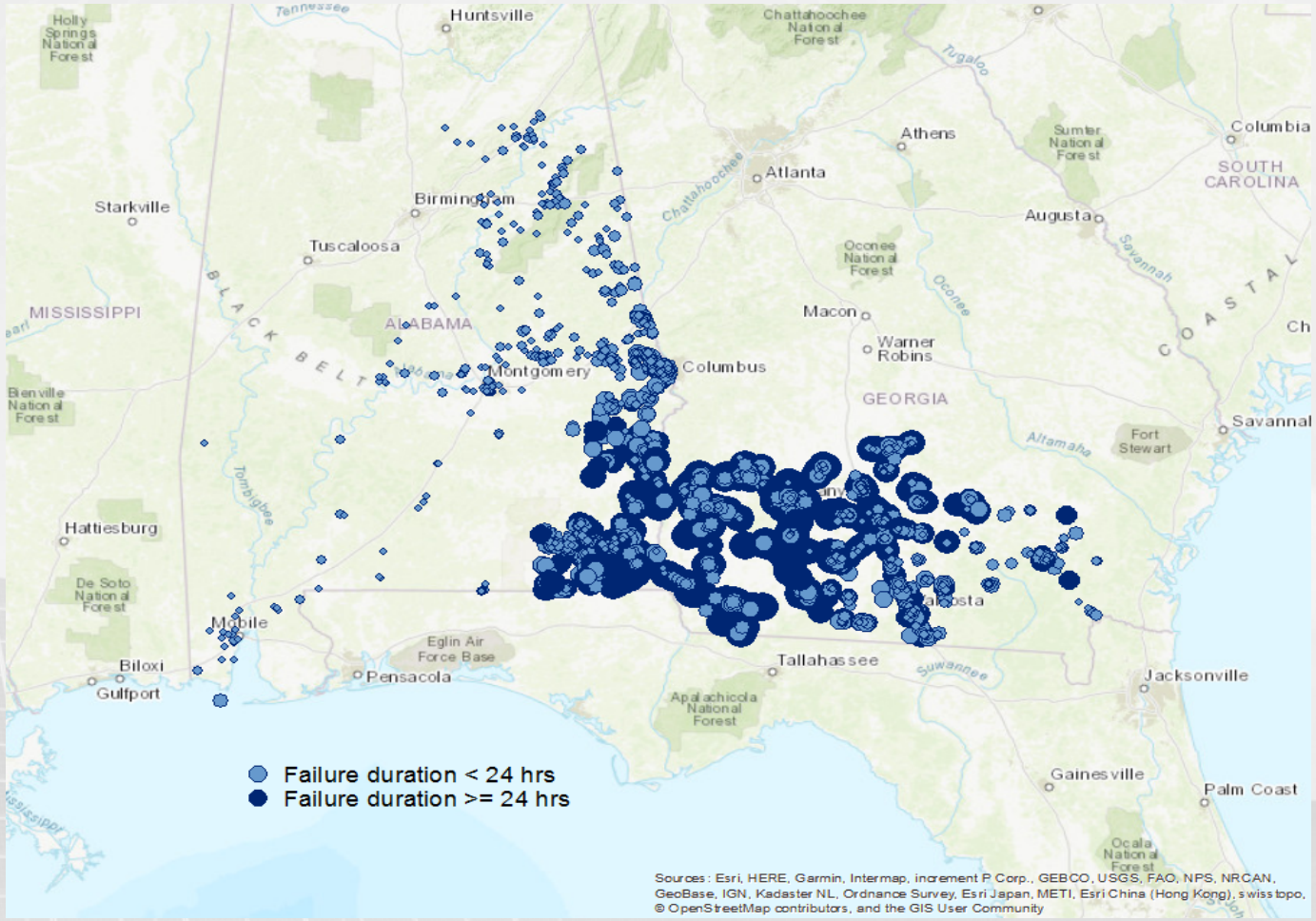
Preliminary Results: Longest outages occur in hurricane's path



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Next Steps

- Extensive data analysis on grid resilience and community impact
- Identify unique regional characteristics of the grid and communities in the Southeast
- Use analysis to inform operations and community relations surrounding power outages in the region.

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Acknowledgements

- GT students: Amir Afsharinejad and Jessica Copenhaver
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Thank You

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