

A satellite image of a hurricane, showing a well-defined eye and spiral cloud bands over a dark blue ocean. A black rectangular text box is positioned on the left side of the image.

NATURAL DISASTERS

VULNERABILITIES, EFFECTS
AND RESPONSE CAPABILITIES
WITHIN MASSACHUSETTS

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Goal

For emergency preparedness and economic analysis, determine if data on Yelp can be used to:

- Categorize businesses in an affected area by FEMA Lifelines
- Estimate potential impact of a disaster on the area



Understanding the Public Assistance Responsibilities

FEMA	Recipient (State)	Subrecipient (Applicant)
<ul style="list-style-type: none">• Coordinates with all Federal, State, Local agencies• Establishes Joint Field Office• Collects project and cost data• Approves grants and obligates funds• Provides Technical Assistance	<ul style="list-style-type: none">• Educates subrecipients• Works with FEMA to manage Public Assistance Program• Collects project and cost data• Disburses grants to applicants (Ex: Community, county, local public entity)• Monitors and manages use of grants by subrecipients	<ul style="list-style-type: none">• Requests assistance• Identifies damaged facilities• Provides information to support request• Maintains accurate documentation• Performs necessary work (repairs, debris, etc.)

FEMA created Community Lifelines to:

- Reframe incident information
- Understand and communicate incident impacts using plain language
- Promote unity of effort across the whole community to stabilize the lifelines during incident response





What Data was used

- Yelp Business Listing
- Disaster Declarations Summaries (FEMA)
- 2016 MA Census by Counties (ATSDR)
- Electric Power Transmission Lines (HIFLD)
- MassGIS (Bureau of Geographic Information)



FEMA



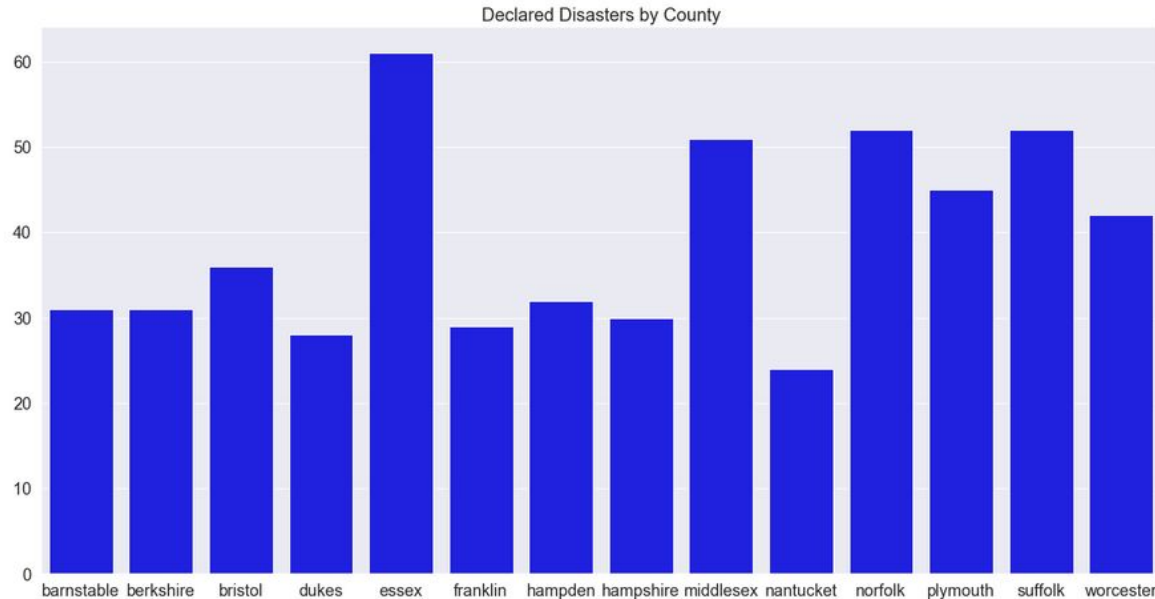
Data Preparation



- Yelp Fusion API
 - 25 Mile Radius of Boston, MA
 - 50 Results per request
 - Offset Limit 1000
 - Utilized by categories (police department, fire department) for accuracy
- Filtering & obtaining csv files from government and external database
- EDA includes
 - Removing duplicate & null values
 - Spot check for spelling errors
 - Matching lowercase columns

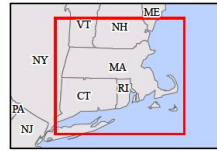
Disaster in Massachusetts: Effects, Resources and Response

Disasters Across Massachusetts: The Coast Hurts the Most



Counties along the Massachusetts coast have higher numbers of declared disasters.

FEMA-4214-DR, Massachusetts Disaster Declaration as of 04/14/2015

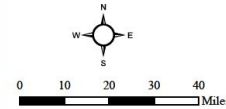


Data Layer/Map Description:
The types of assistance that have been designated for selected areas in the Commonwealth of Massachusetts.

All areas in the Commonwealth of Massachusetts are eligible for assistance under the Hazard Mitigation Grant Program.

Designated Counties

- No Designation
- Public Assistance



Data Sources:
FEMA, ESRI;
Initial Declaration: 04/13/2015
Disaster Federal Registry Notice:
04/13/2015
Datum: North American 1983
Projection: Lambert Conformal Conic

MapID 030851898de0414151001hprod

MA Severe Winter Storm, Snowstorm, & Flooding (DR-4214)

Financial Assistance

- Individual Assistance -Dollars Approved
 - Not reported
- Public Assistance - Dollars Approved
 - \$84,369,001.01
 - Total Public Assistance Grants (PA) - Dollars Obligated
 - \$75,022,744.99
 - Emergency Work(Categories A-B)
 - \$6,418,860.02
 - Permanent Work (categories C-G)

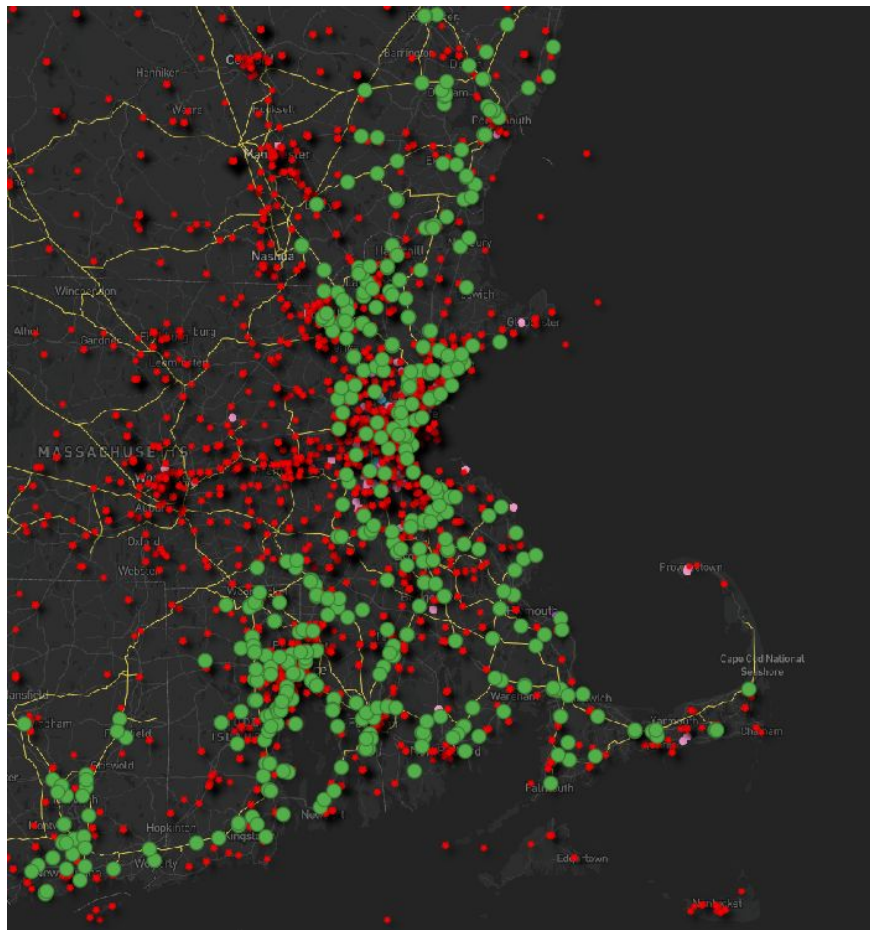
Our Location and Infrastructure are Vulnerabilities

- “The Hub” for more reasons than one
- We’re the nexus of regional infrastructure
- Our proximity to the coast makes us all the more vulnerable to natural disasters.

● Electrical Substations

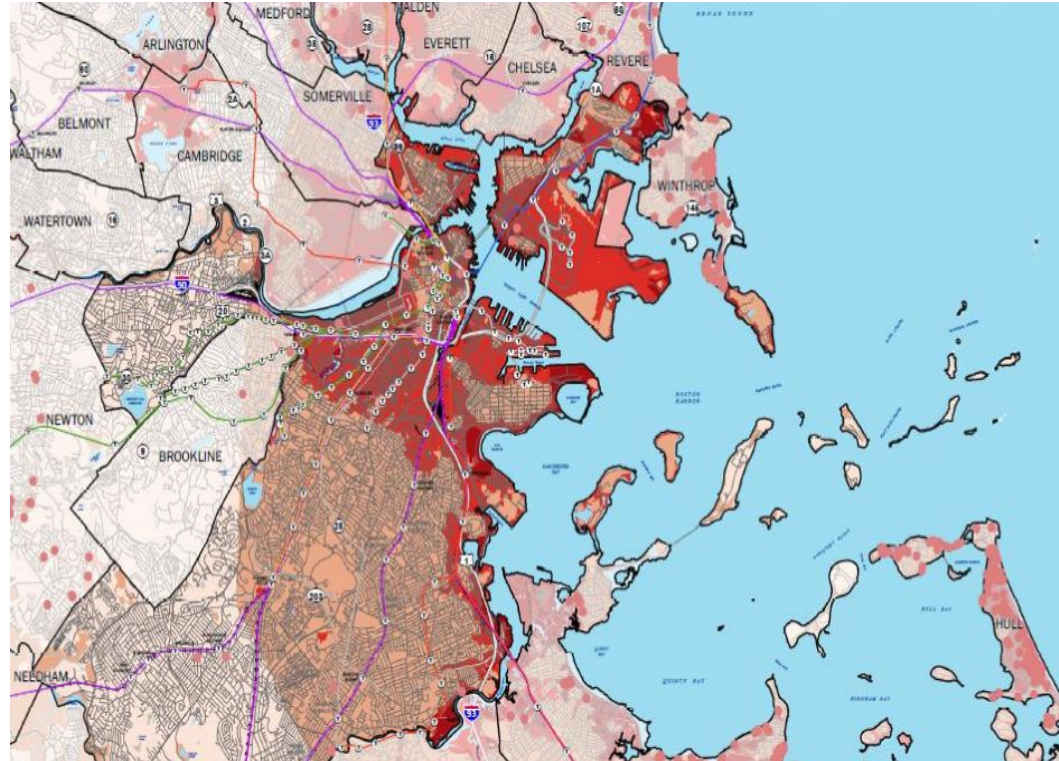
● Microwave Backbone

■ Major Electrical
Transmission Lines

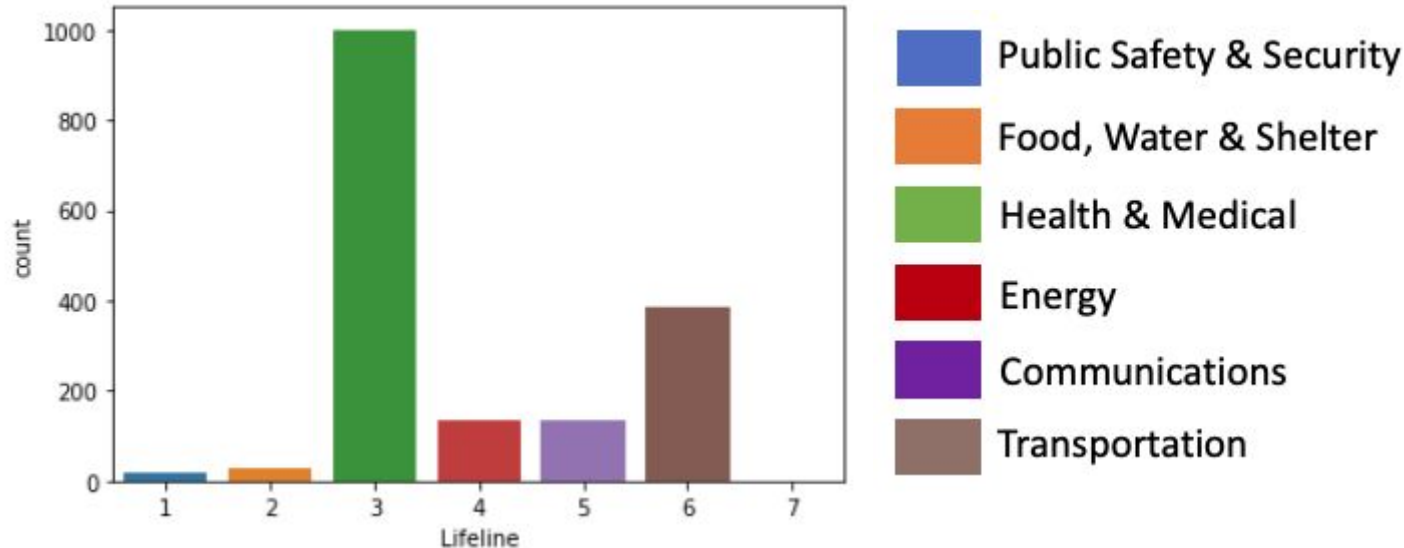


Metropolitan Risk as Assessed by FEMA:

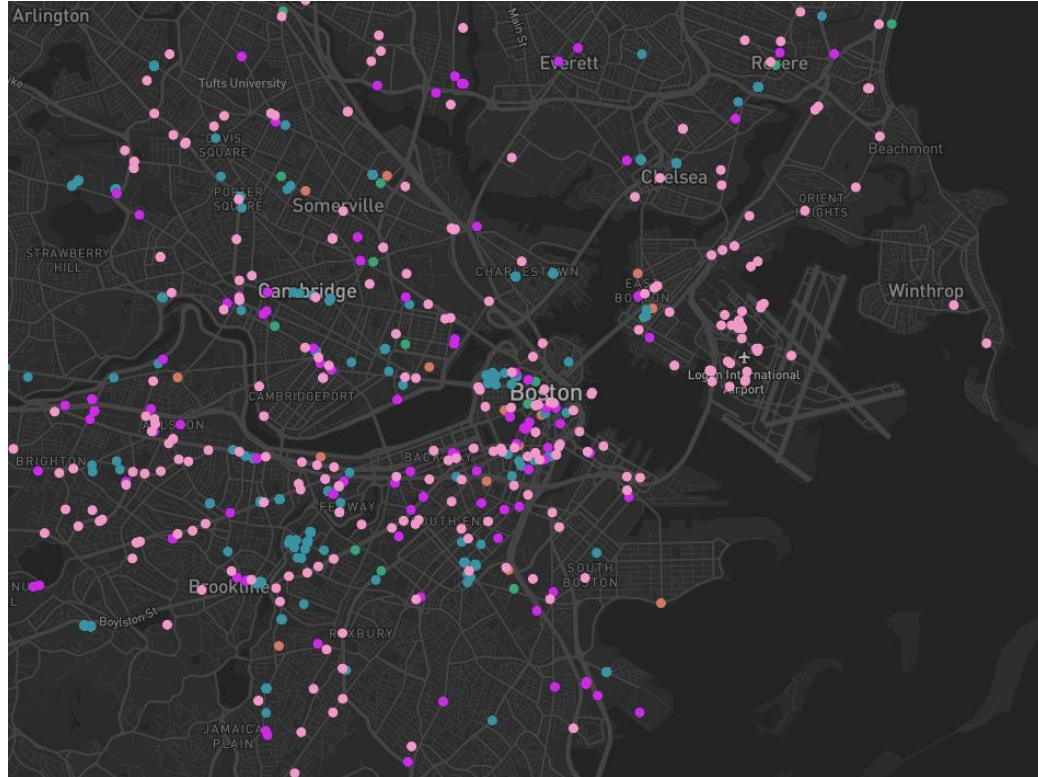
Major flood risks to key resources and transport arteries



Counts of Available Lifelines in the Metro Area



Resources in the Greater Boston Area



Public Safety & Security

Food, Water & Shelter

Health & Medical

Energy

Communications

Transportation

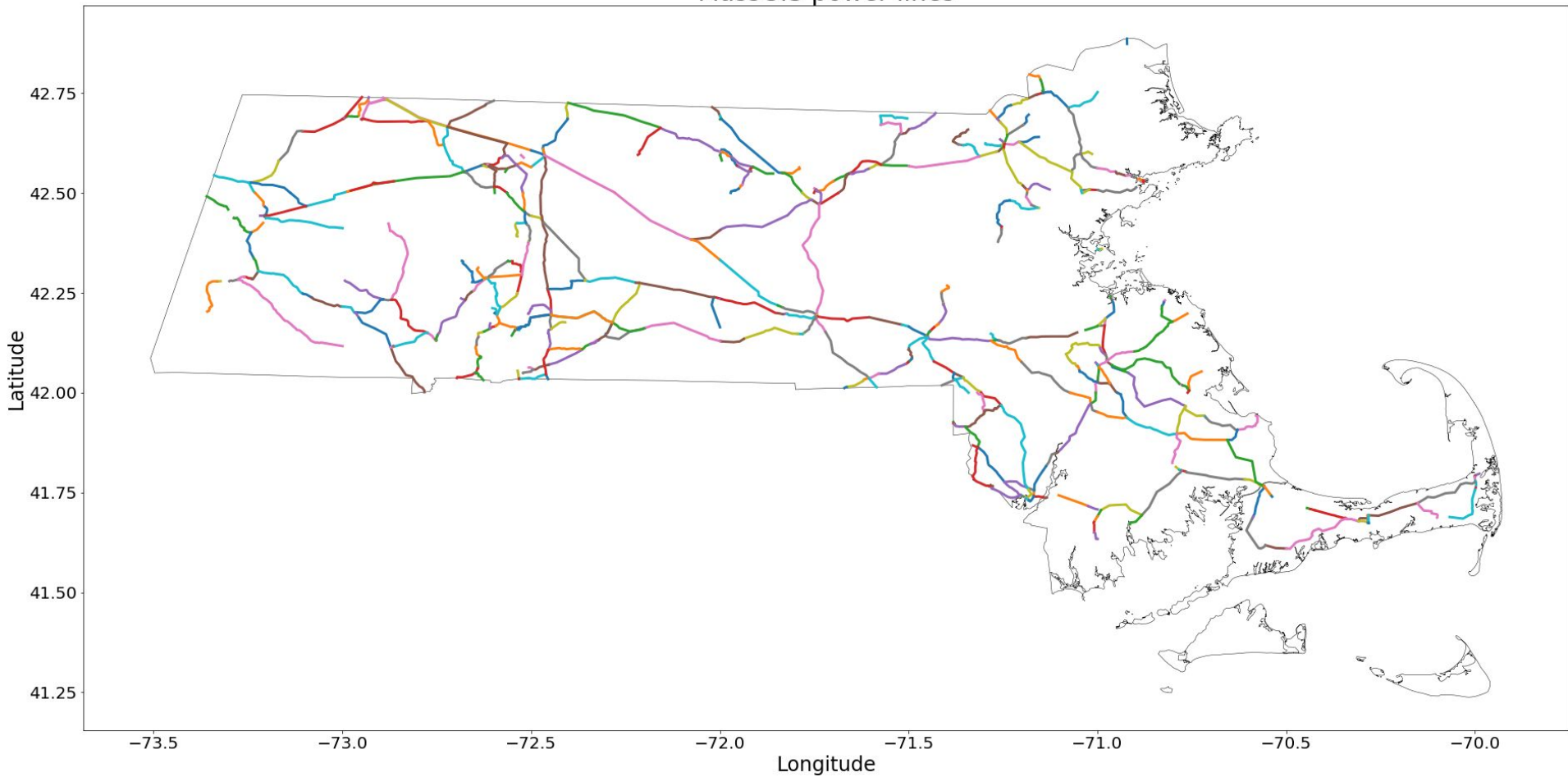
Joining with external data: Quantifying risk for power grids



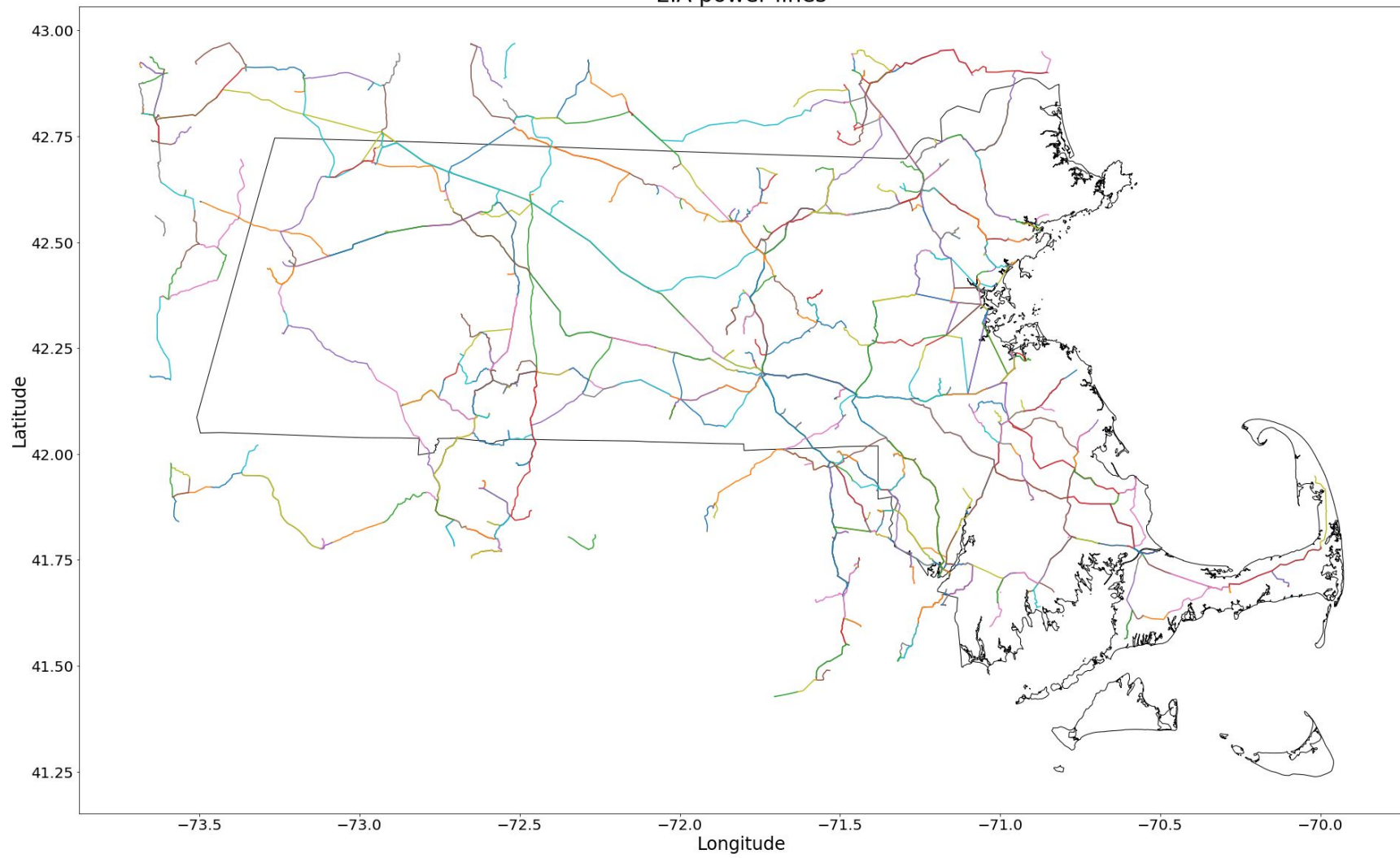
Data Sources and Packages used

- Massachusetts Bureau of Geographic Information (MassGIS)
- US Energy Information Administration (EIA)
- PyShp
- dbfread
- shapely

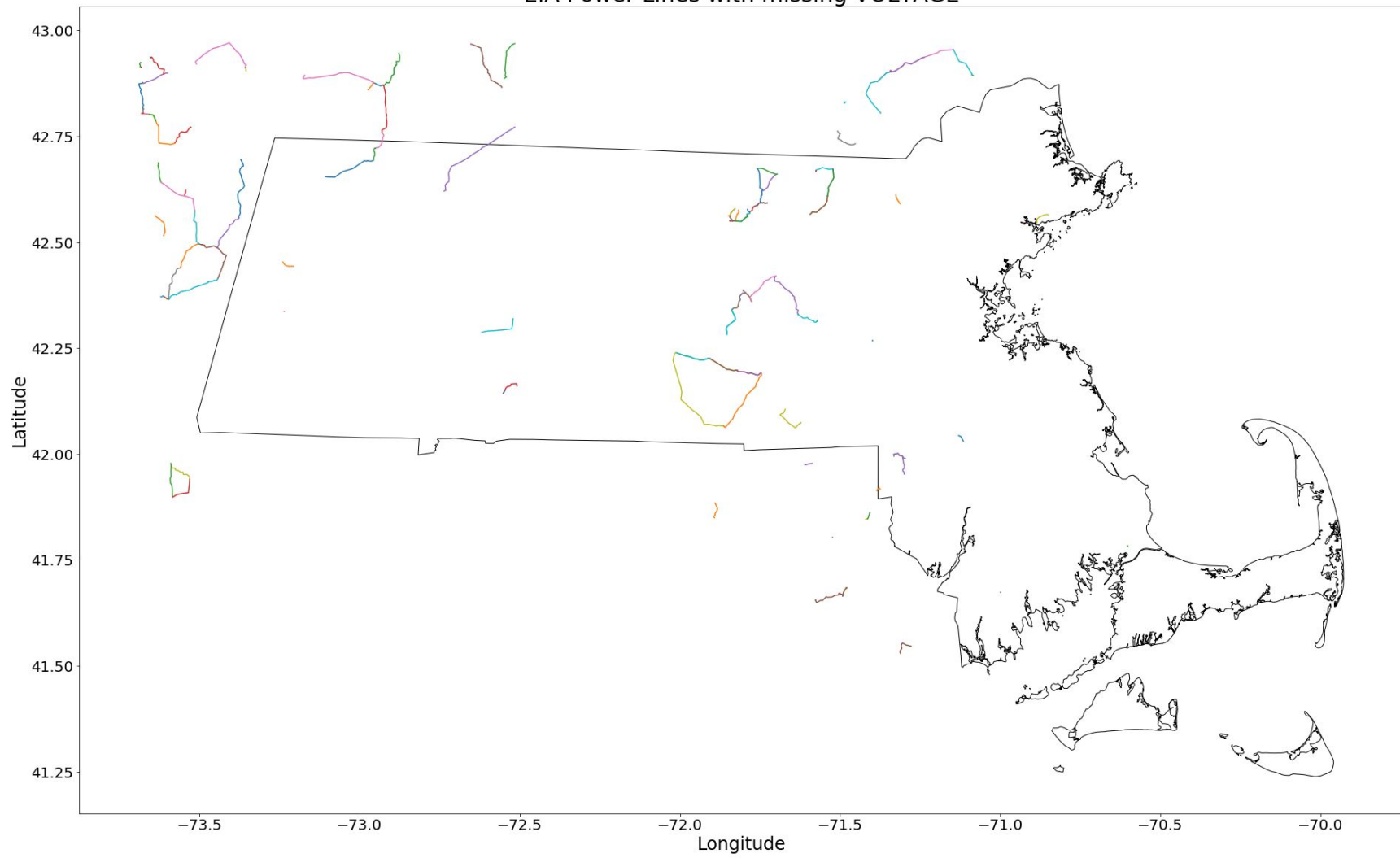
MassGIS power lines



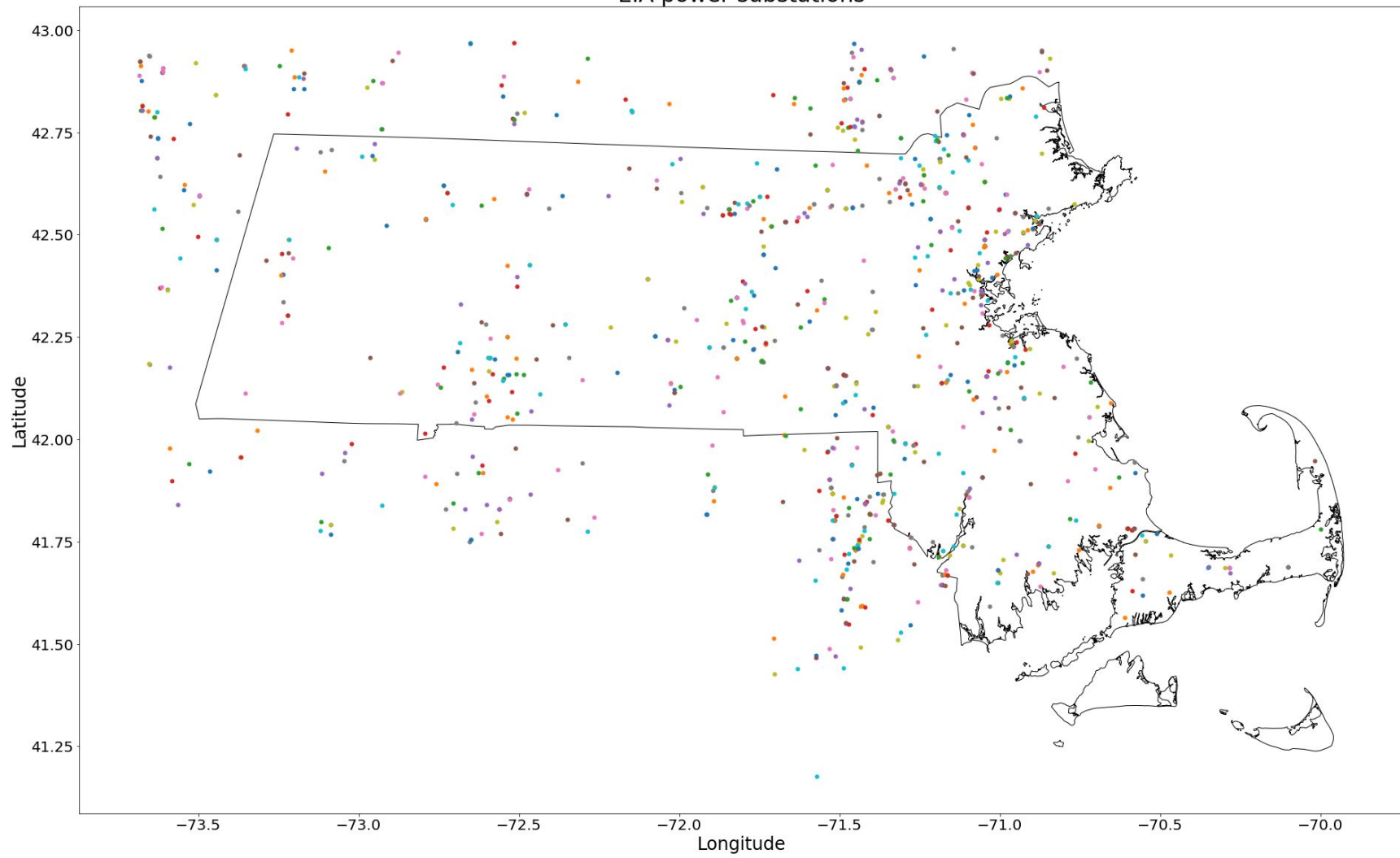
EIA power lines



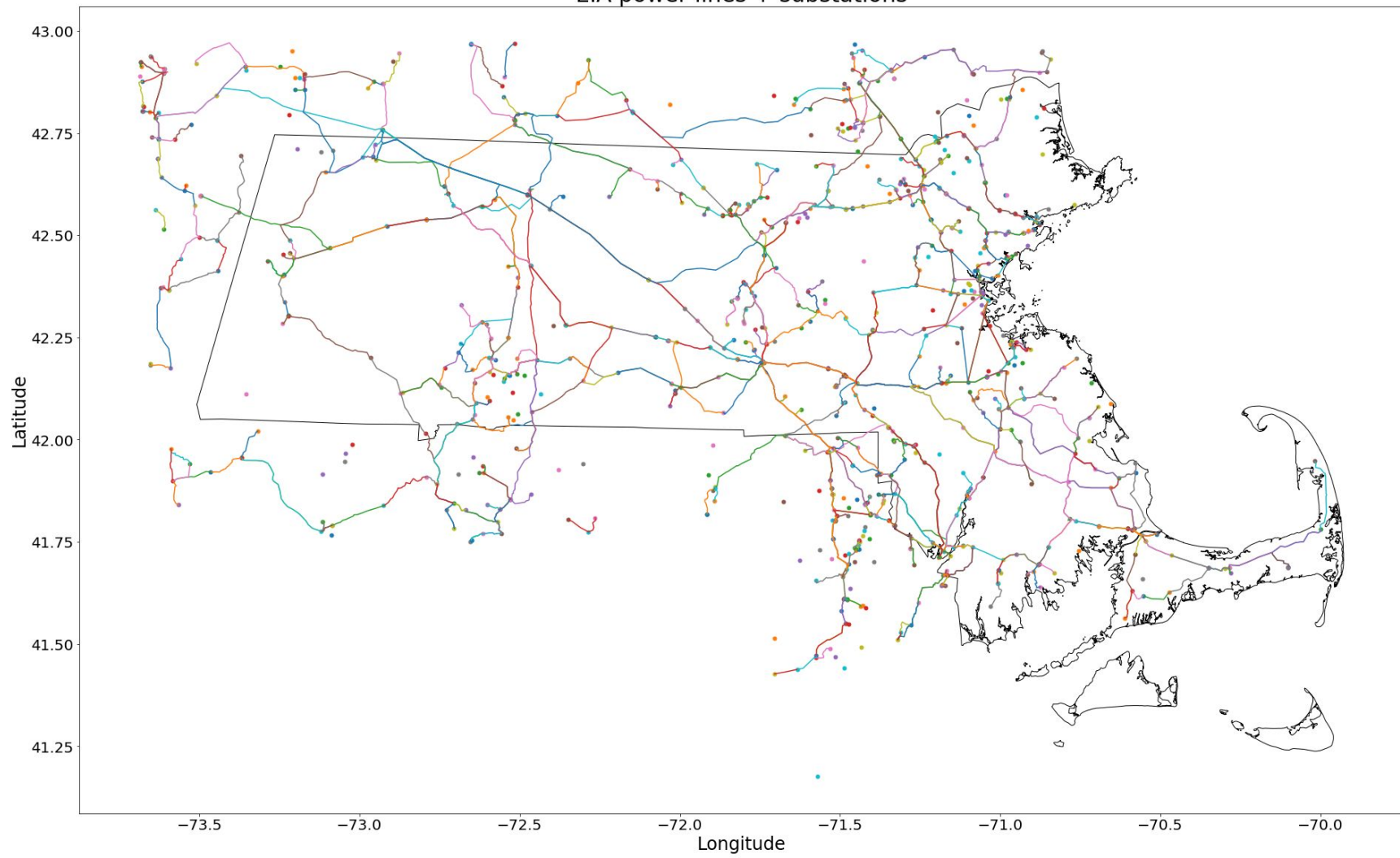
EIA Power Lines with missing VOLTAGE



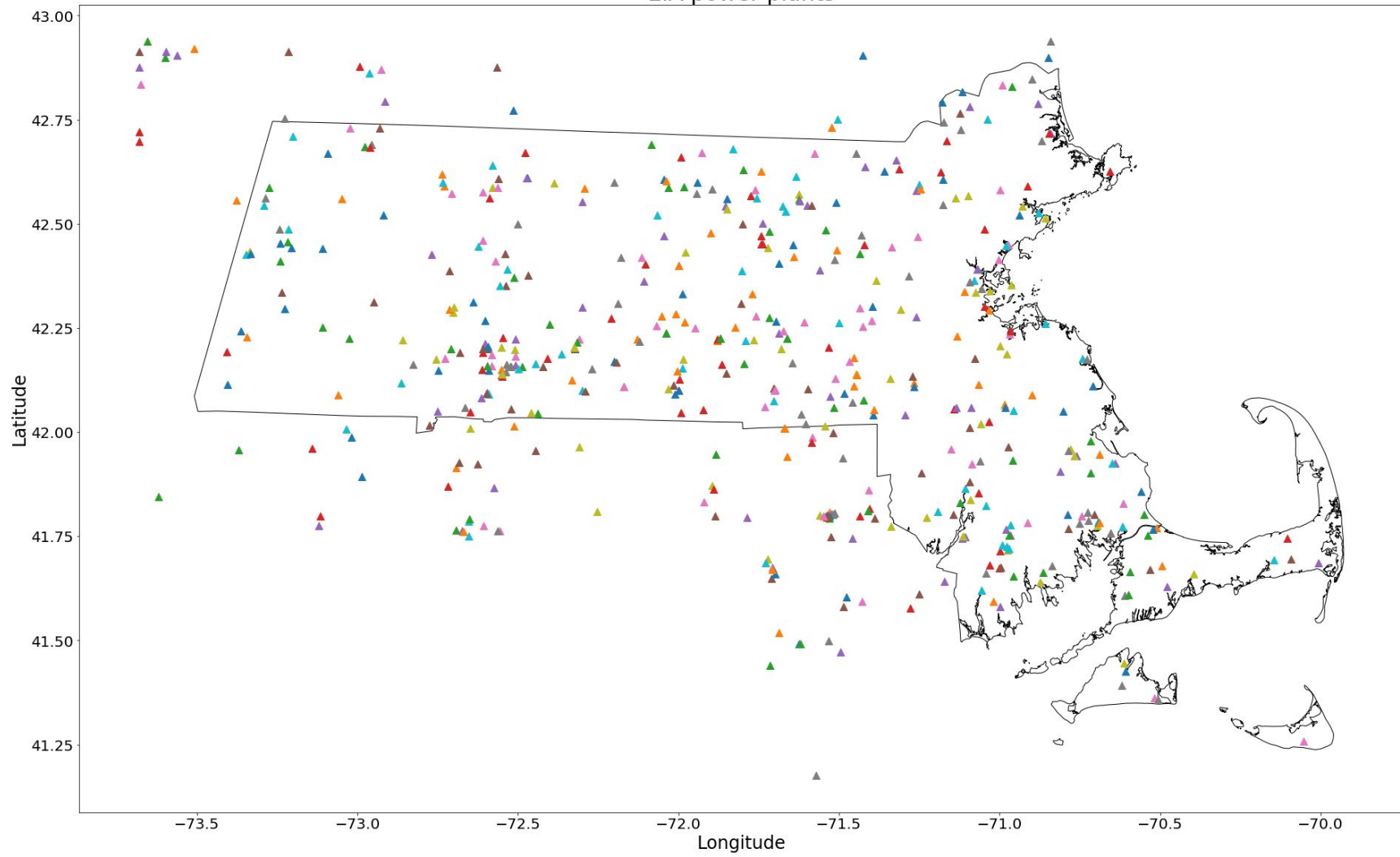
EIA power substations



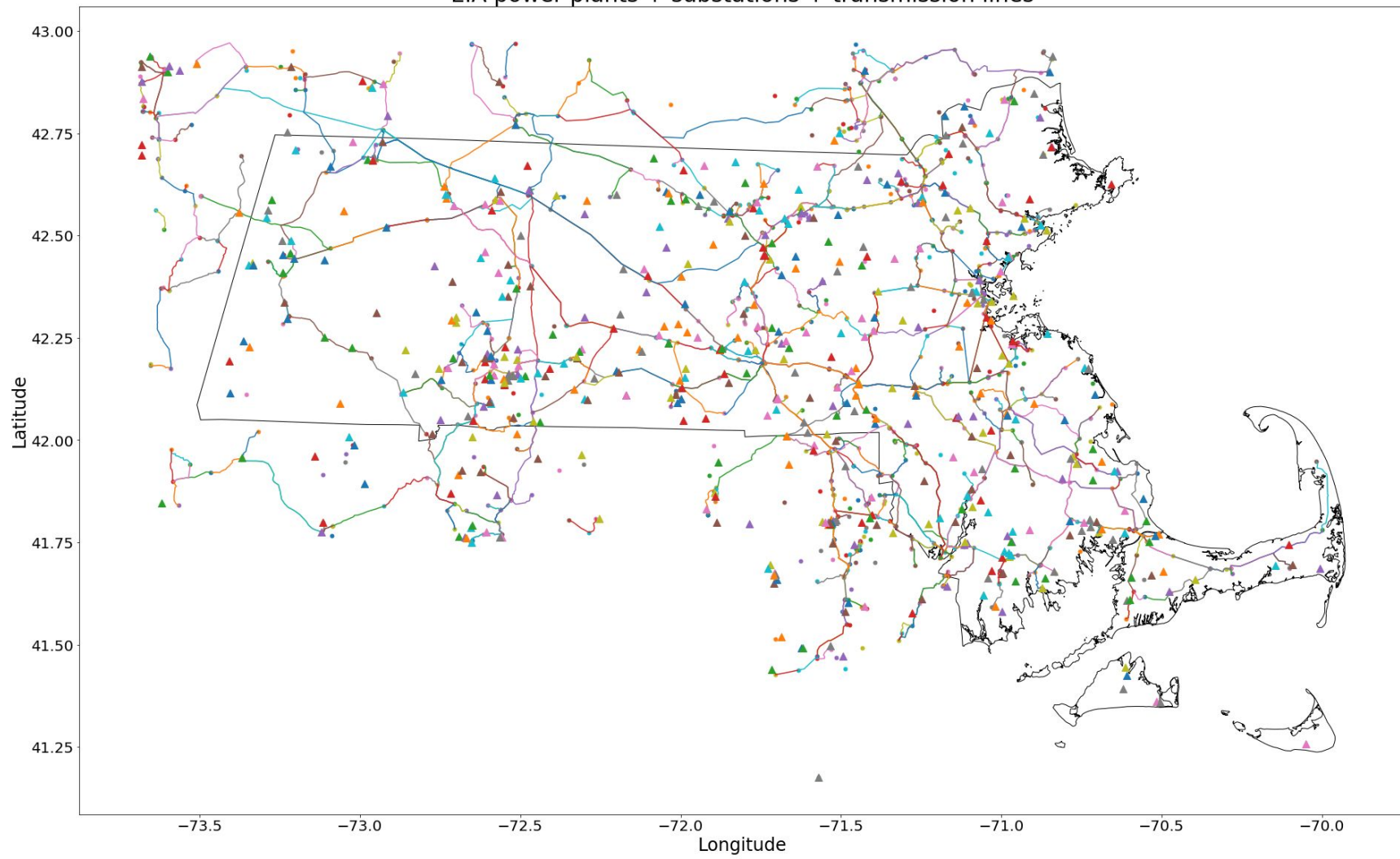
EIA power lines + substations



EIA power plants



EIA power plants + substations + transmission lines



Conclusions

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- The limited data from Yelp can only be collected by city, state, or zip code
- Whereas all of our supplemental data is available at the county level making us unable to cross reference the data



WeKnowMemes



Next Steps

If the goal is to have a tool that can categorize businesses by lifeline in a given state, city, or zip code by using Yelp data, that can be done.

However if a more tangible metric is desired for estimating impact beyond a count of businesses by lifeline, Yelp would have to make more information available such as:

- Revenue
- Number of Employees
- Specific services provided