

Predicting Fire Risk in Atlanta

Data Science for Social Good Atlanta Fire Rescue Department



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Summary

Hundreds of buildings have fires in Atlanta every year. The Atlanta Fire Rescue Department (AFRD) attempts to reduce fire risk by inspecting buildings for potential hazards and fire code violations, but they currently only inspect a subset of the total buildings needing inspection. Our project aims to reduce fire risk in Atlanta by identifying and prioritizing buildings that should be inspected by AFRD.

Our final deliverable will be a web-based user interface that AFRD can use to interact with 1) the lists of buildings to inspect, and 2) information visualizations of fire-related Atlanta data.

Goals

1. Use fire permit criteria and data about currently inspected buildings to identify new properties that should be inspected.
2. Use data about fires from the past five years to develop a predictive model for fire risk based on a property's characteristics.
3. Prioritize the list of properties that should be inspected based on our fire risk prediction model, to help AFRD use their resources more effectively.

Approaches

Geographic Information System (GIS)

We used GIS to join and merge various datasets. The merged datasets can help us to identify the type of businesses that require permits and understand the building features that may explain the occurrence of fires.



Machine Learning Algorithms

We are using several machine learning algorithms to predict fire incidents. Currently we have used both linear regression and logistic regressions. Our next step is to apply more complex algorithms to determine whether the predictive power can be further improved.



Data Visualization

We will be using a variety of tools to visualize the model and analysis results, such as the d3.js library, ArcGIS, R, Plot.ly, and other visualization software.



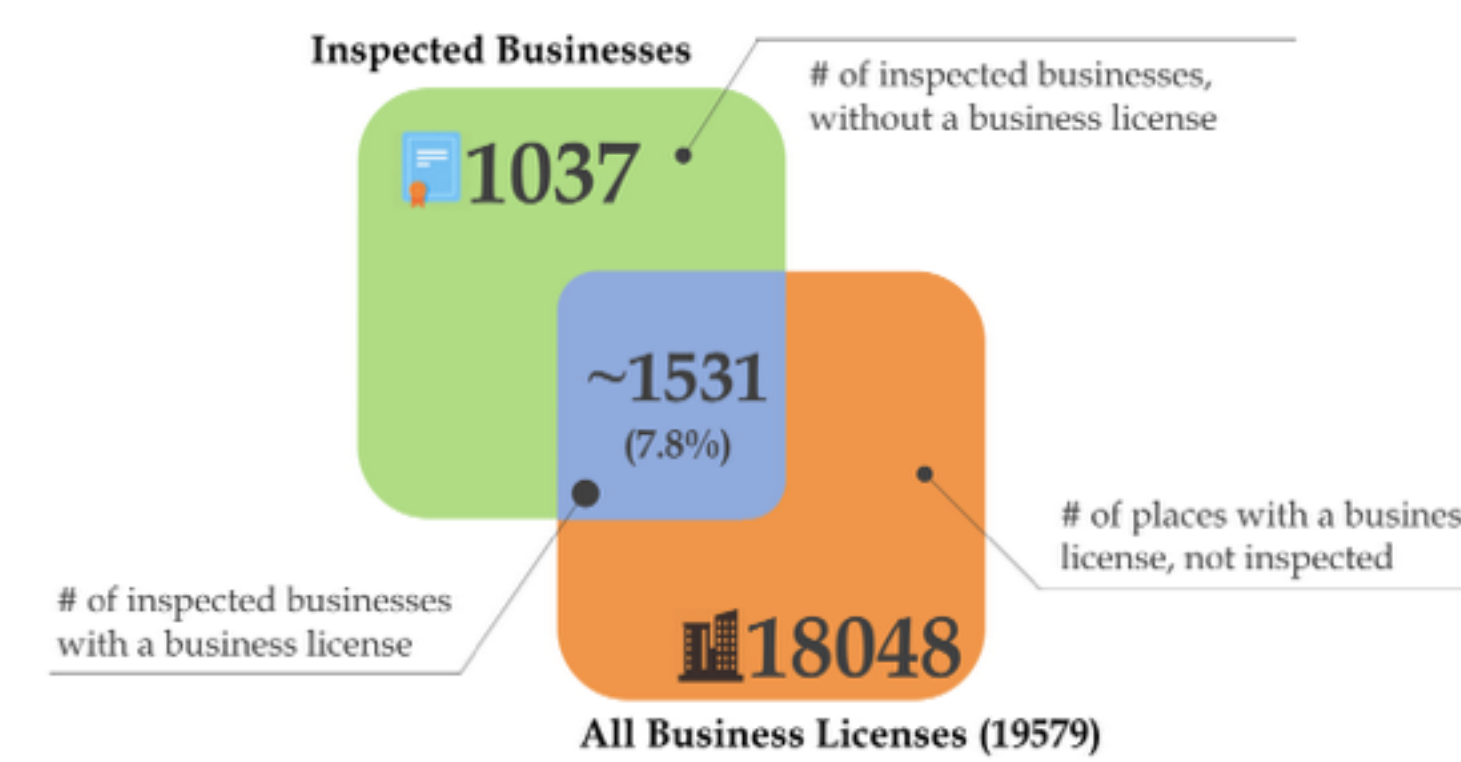
Data

SIZE: >2 GB, ~160,000 Building Records

Data	Source
Fire Incidents (AFRD)	Atlanta Fire Department
Fire Permits Data (FSAF)	Atlanta Fire Department
CoStar Data	Atlanta Fire Department
Neighborhood Planning Unit	Atlanta Regional Commission
Parcel Data	City of Atlanta
Atlanta Business License	City of Atlanta
SCI Data	City of Atlanta
Business Location Data	Google Places API
Address Based Coordinates	Google Geocode API
Demographic Data	U.S. Census Bureau
Socio-economic Data	U.S. Census Bureau

Preliminary Results

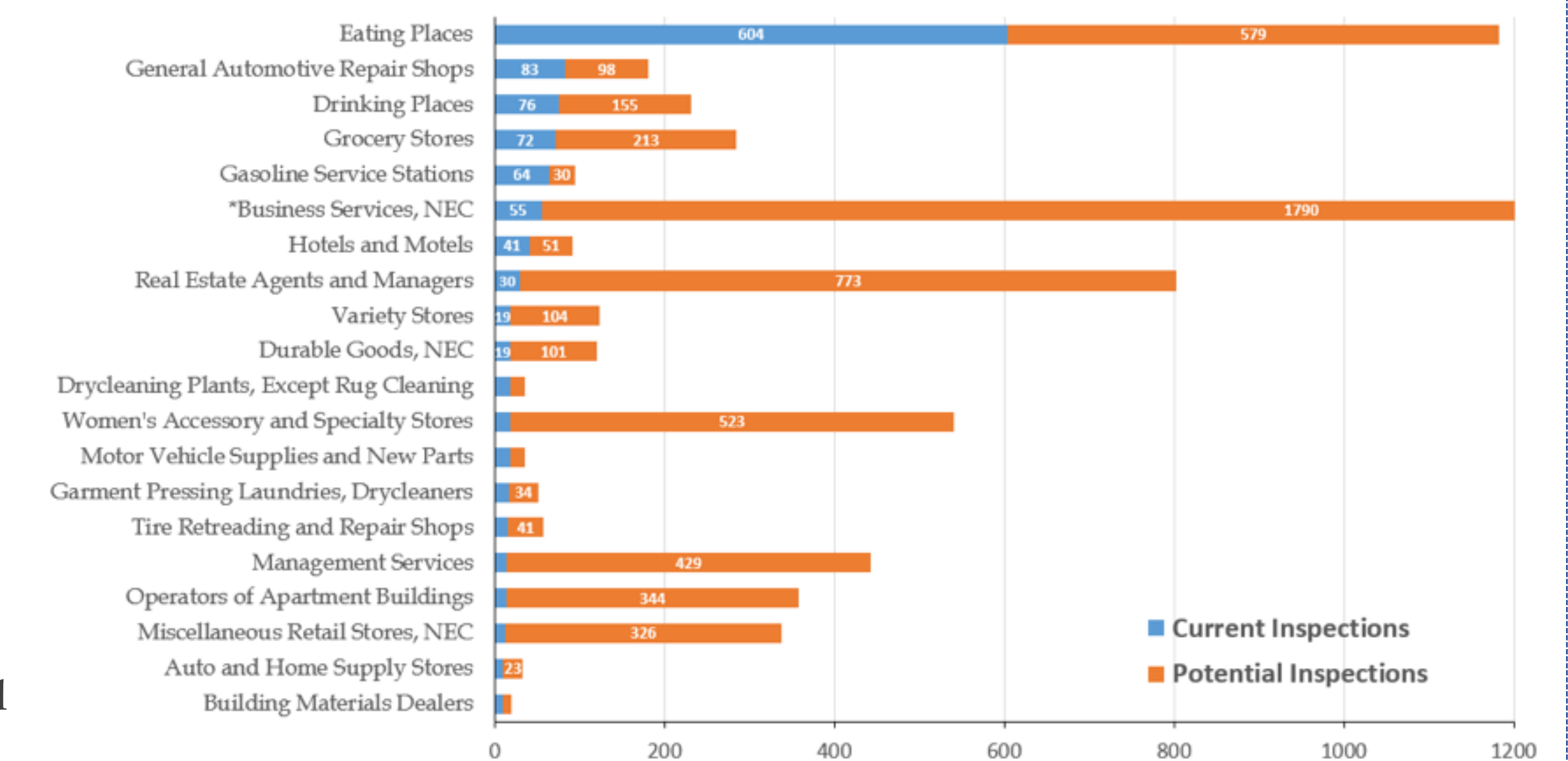
Identify Businesses that Require Permits (Deliverable 1)



We joined the **inspection** data with the latest Atlanta **business license** datasets, based on business name, address, and coordinates.

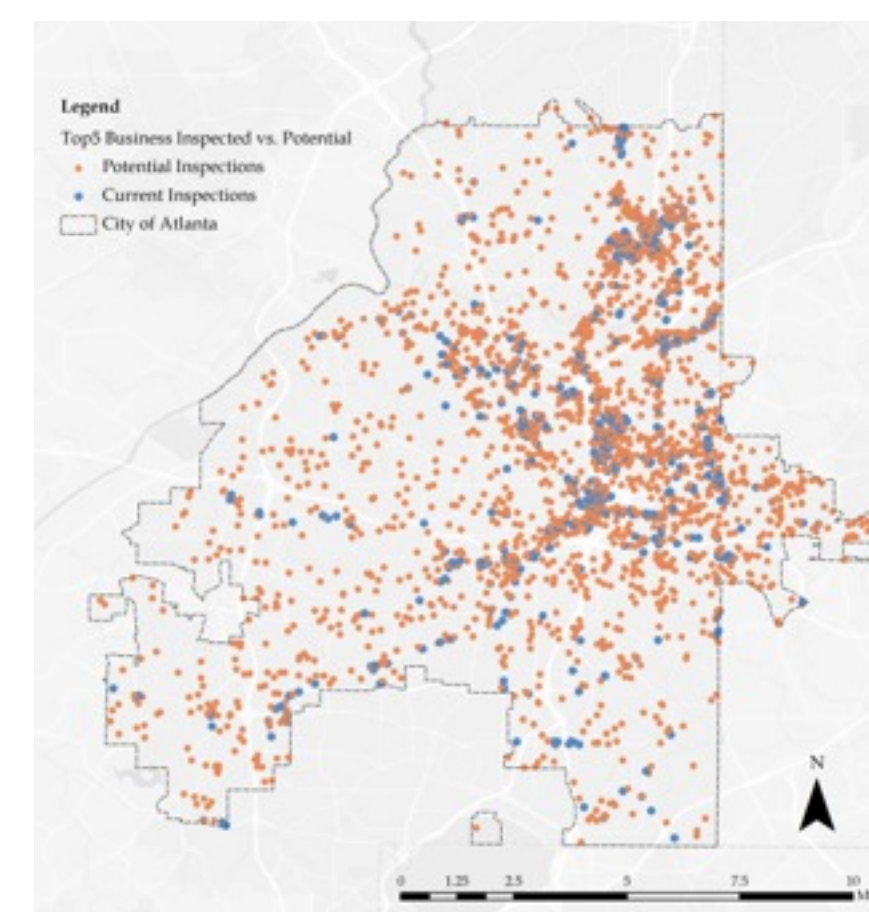
7.8% percent of all business have been inspected, some of which have multiple business licenses, while some inspected buildings (schools, hospitals) have no business license.

Top 20 Business Types - Currently and Potentially Inspected

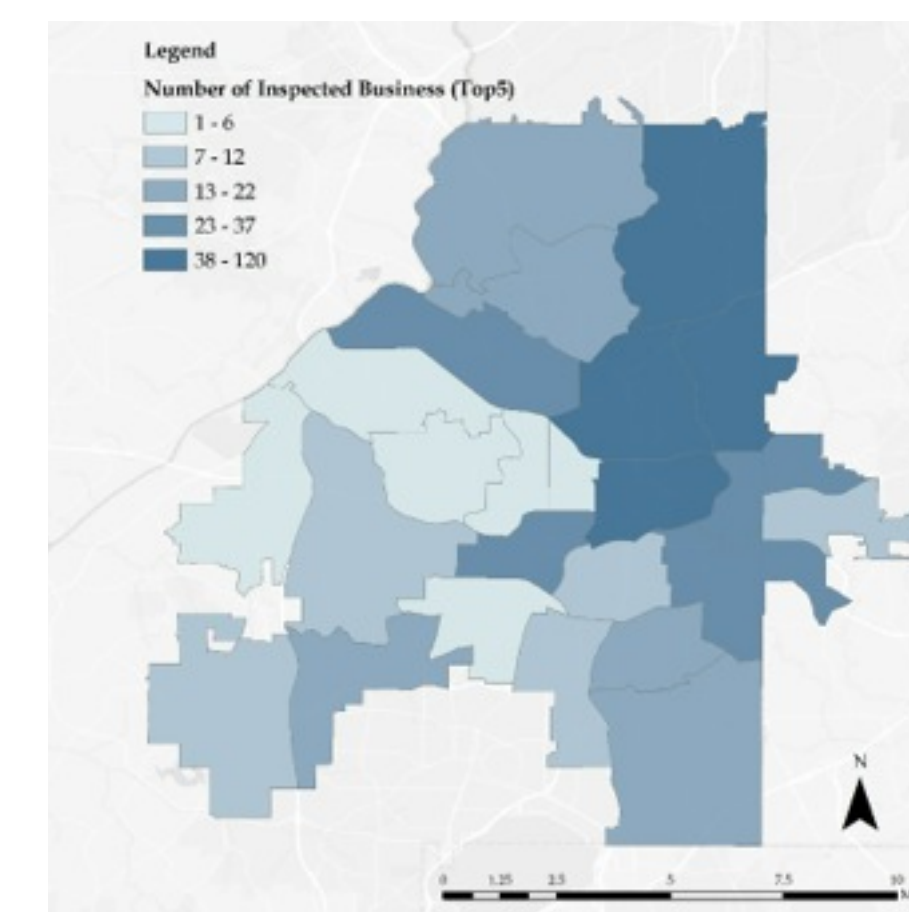


Spatial Distribution of Top 5 Inspection Types

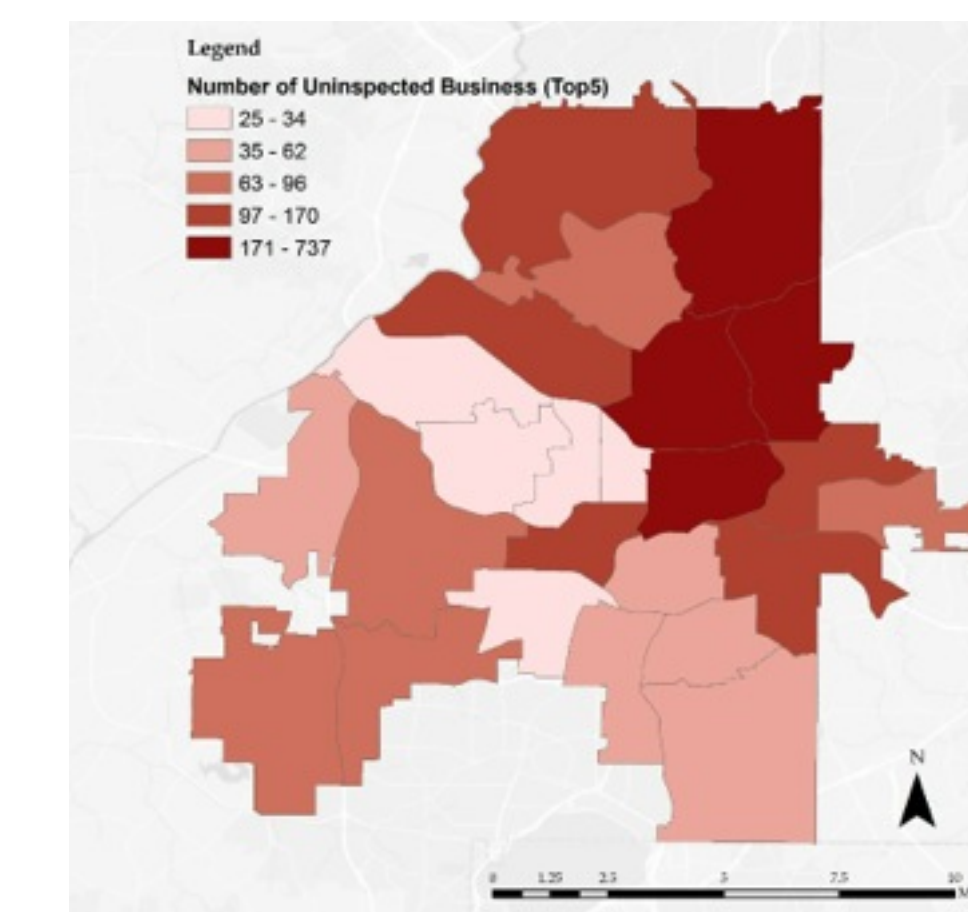
Current and Potential Inspections



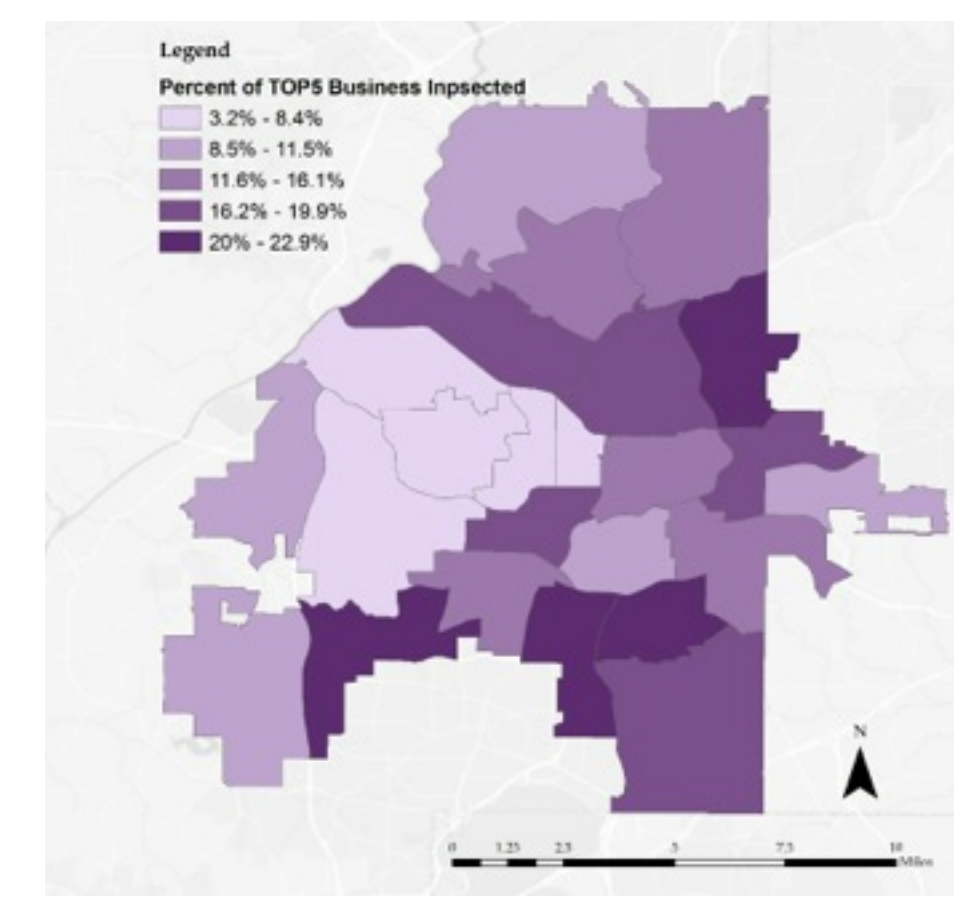
of Inspected Businesses by NPU



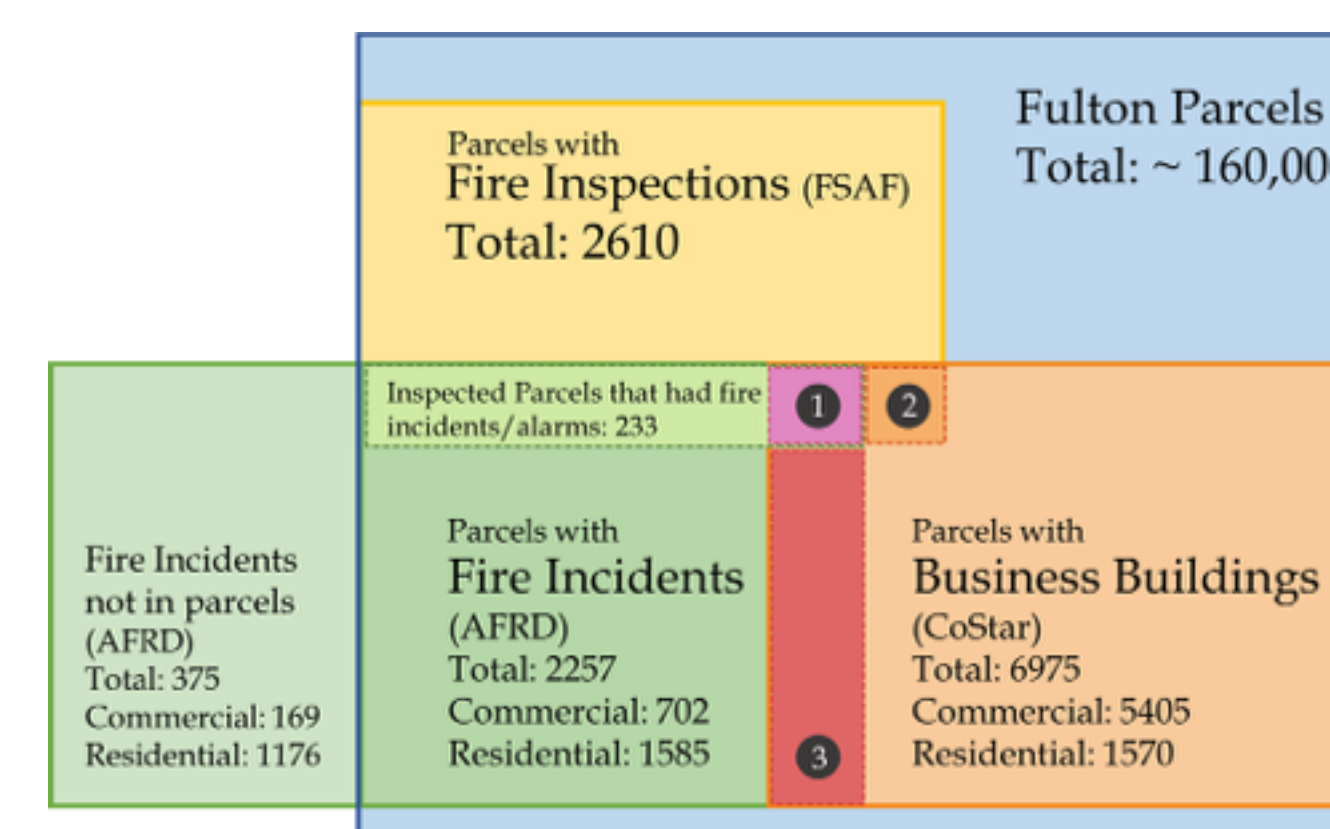
of Non-inspected Businesses by NPU



% of Inspected Businesses by NPU



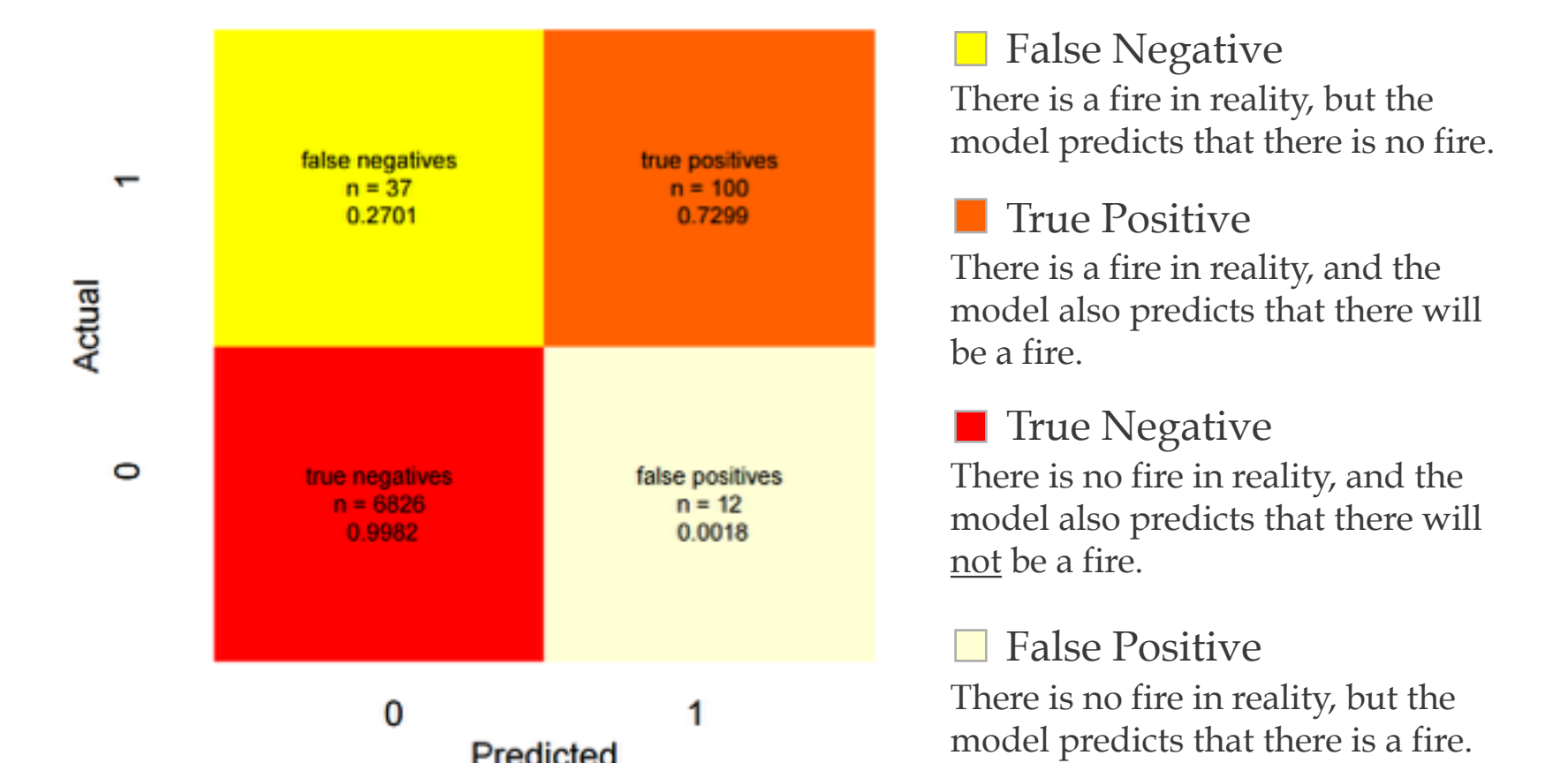
Predictive Fire Risk Model (Deliverable 2)



1. Business Buildings with Inspections AND Fire Incidents (not yet known)
2. Business Buildings with Inspections (not yet known)
3. Business Buildings with Fire Incidents (371 total)

We merged data from Fulton County Parcels, Fire Inspection records (FSAF), Fire Incident records (AFRD), and a commercial property evaluation (CoStar) to develop a preliminary fire risk predictive model.

Current Logistic Regression Model Results



Potentially predictive factors:
Size / number of units, building condition, region of the city, owners (Buildings owned by the City of Atlanta are less likely to catch fire)