



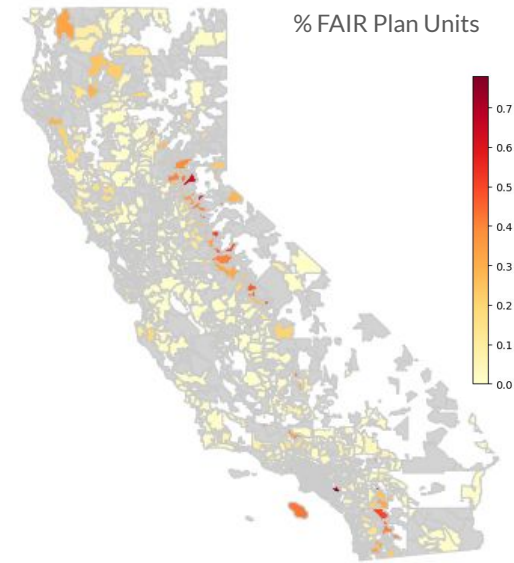
Who's Being Priced Out of Protection?

Predicting FAIR Plan Enrollment in California

Leo Barleta, Abhay Chaudhary, Allison Lucas, and Tiana Townsend

<https://github.com/Abhay-Chaudhary/Climate-Insurance-Redlining>

Erdős Institute Summer 2025 Data Science Bootcamp



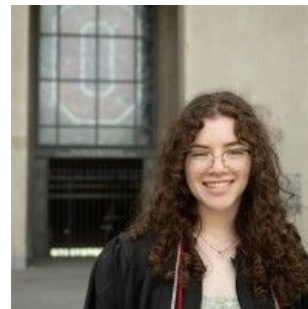
The Team



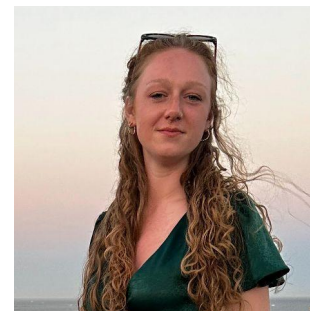
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Project Goals



Who's Being Priced Out of Protection? Predicting Fair Access to Insurance Requirements (FAIR) Plan Enrollment in California

- Measure how property insurance coverage is changing across California, mapping out risks of loss coverage due to climate disasters.
- Forecast future FAIR Plan usage and total exposure to show where gaps will grow and how big the financial risk may be.
- Value to Stakeholders:
 - Identify the impact of loss of coverage in low income and socially vulnerable areas.
 - Support policymakers with data-driven insight to plan ahead and protect at-risk communities.

Data



Demographics & Housing:

- American Community Survey - reported income, race, and housing conditions.
- Important for identifying vulnerable populations.

Zillow Housing Value Index

- Measures the typical home value and market changes across a given region and housing type.
- Enables comparison between housing values and insurance premiums.

Environmental Disaster Data

- Governor-proclaimed disasters from 1991 to present.
- Allows for better understanding of how recency and frequency of disasters affect insurance in specific ZIP Codes.

Insurance Market Conditions

- California Department of Insurance residential policy data, based on insurance company bi-annual reports.
- **Targets: 2022 FAIR Plan enrollment and value of properties covered by FAIR Plan policies.**

Feature Engineering and EDA

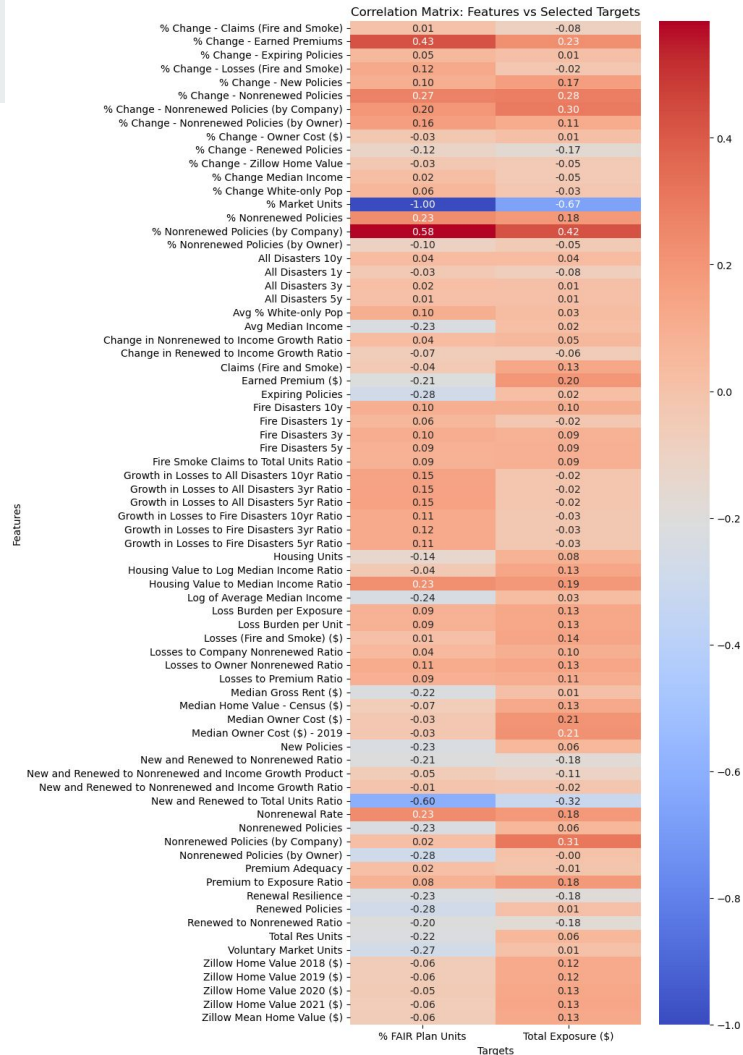
Targets:

- **% FAIR Plan Units:** Percentage of residential units enrolled in the FAIR Plan within a ZIP Code
- **Total Exposure (\$):** Monetary value of properties covered by FAIR Plan policies

1. Data loading and preprocessing
2. Feature Engineering
3. Correlation Analysis
4. Feature importance via Random Forest
5. **Feature filtering** and sorted export
6. Visualizations

Main Features:

- **Renewal Resilience:** Proportion of policies successfully renewed
- **% Change - Earned Premiums:** Percentage change in premiums paid to insurance companies in a given ZIP Code



EDA Visualization



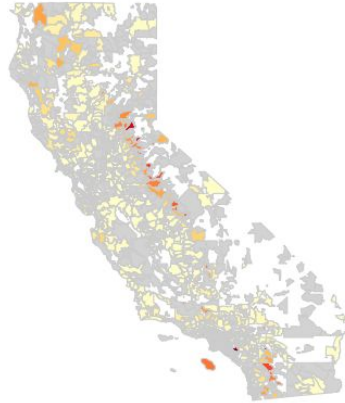
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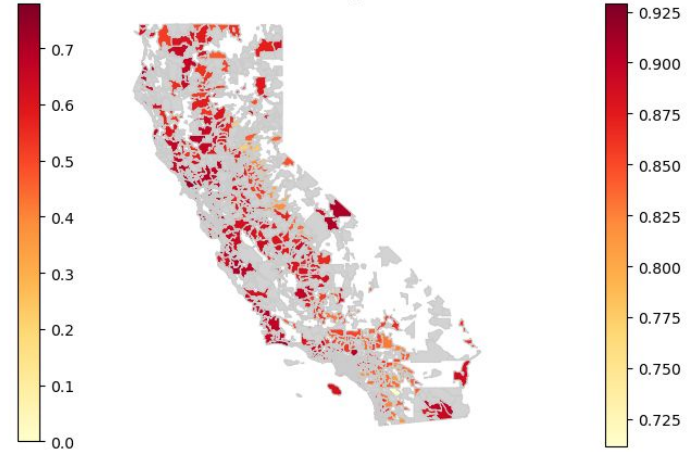
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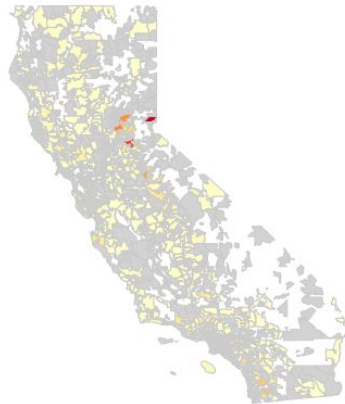
% FAIR Plan Units by ZIP Code



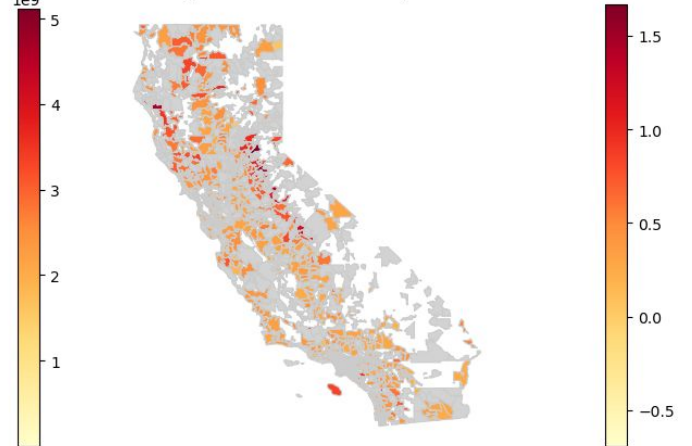
Renewal Resilience by ZIP Code



Total Exposure (\$) by ZIP Code



% Change - Earned Premiums by ZIP Code



Model Selection

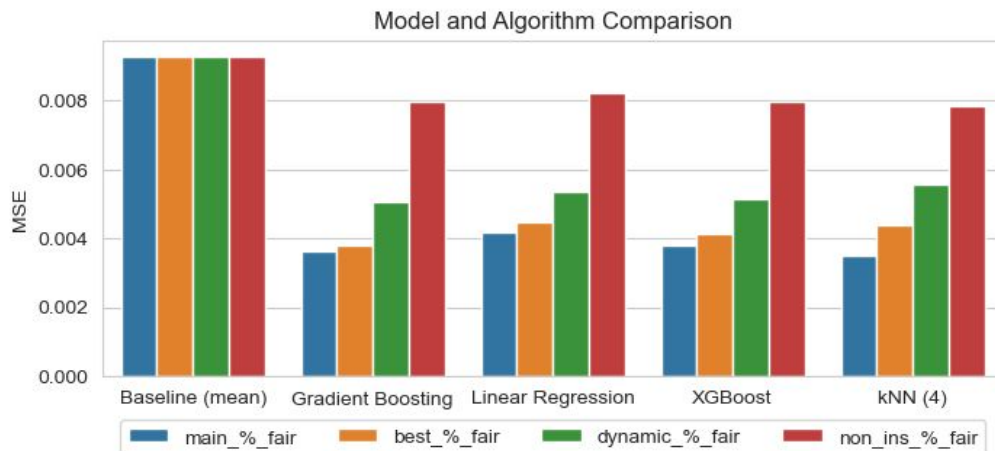
Feature Sets

main_features: most important features detected in exploratory data analysis

dynamic_features: features that capture changes over time and/or past events

best_predictors: top 2 predictors ('Renewal Resilience', 'Change in Premiums')

non_ins_%_fair: features *not* derived from information provided by insurance companies



Total Exposure (2022)

Covered under FAIR Plan policies (true value):

\$164 billion

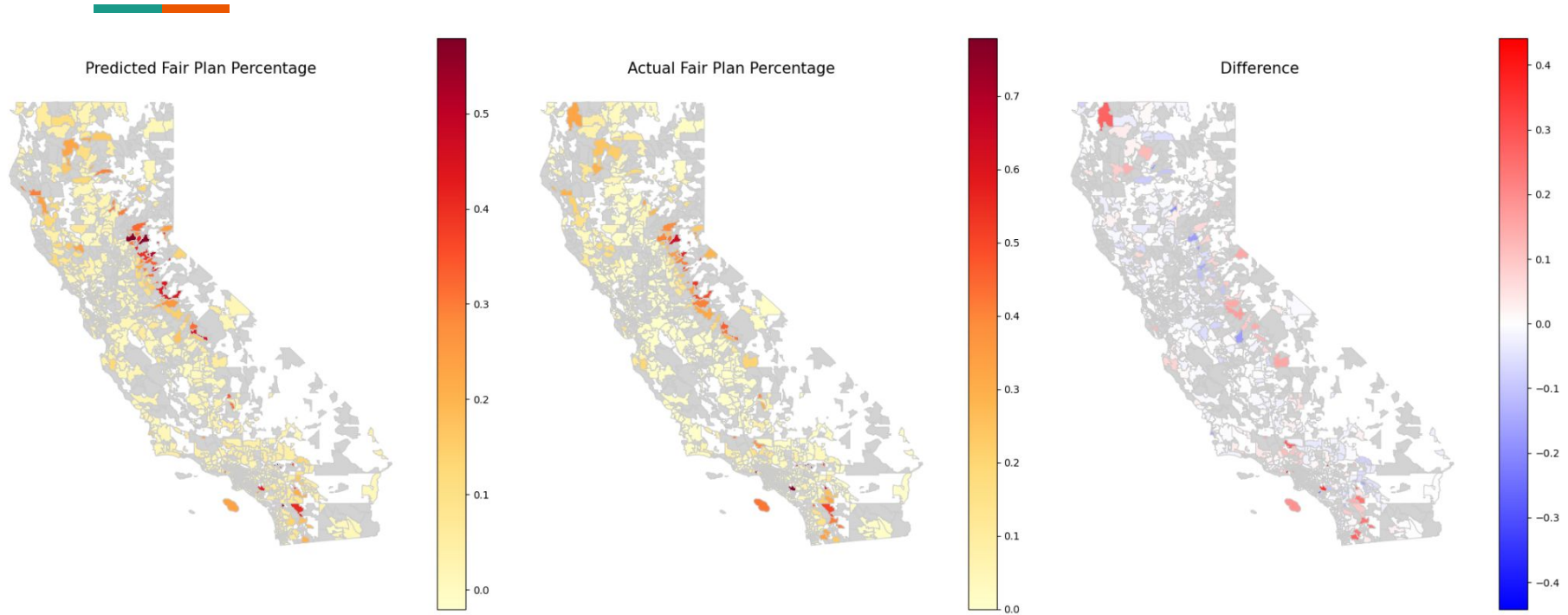
Baseline prediction error:

\$35.15 billion

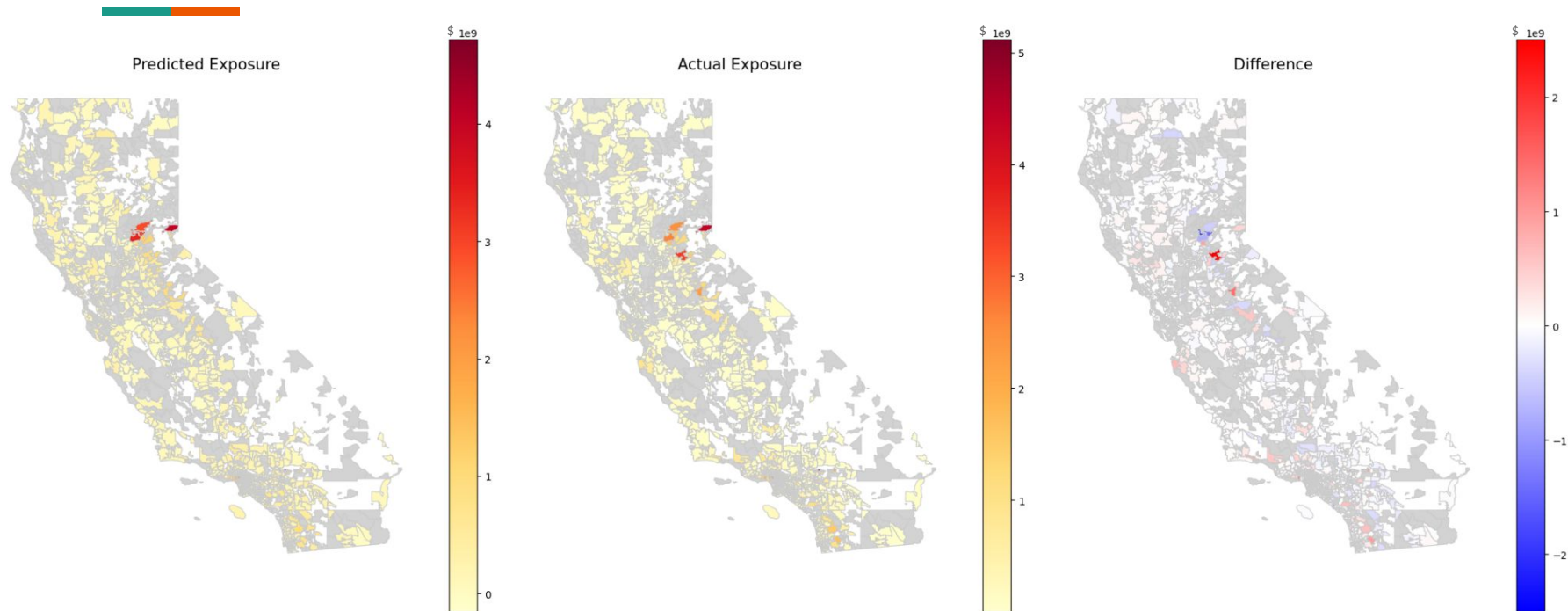
Our prediction error:

\$19.22 billion

2022 FAIR Plan Percent Enrollment Prediction



Exposure Prediction



Prediction Success and Impact



- Improvement over baseline with easily accessible public data
- Limited resolution in Environmental Disaster and Demographic data (only available by **county**) may have limited their prediction utility.
- California's publicly available data made these predictions possible, but they heavily rely on data provided by insurance companies mandated by Senate Bill No. 824 - not standard practice in all states.
- Policy Utility: Different stakeholders could use these models to anticipate demand surges and prioritize subsidies, market interventions, or FAIR Plan capital planning, including:
 - Regulators and policymakers
 - Community organizations and homeowners
 - Insurance companies and Real Estate Speculators
- [Recent Press Release](#): California is improving FAIR Plan rules, data, and financial tools - however,

Proactive localized forecasting remains a gap our project helps fill!

Future Work

- **Residual bias Analysis:** Are certain groups systematically underserved?
- **Temporal Modeling:** Evaluate whether lag effects—e.g., disaster years ago—drive FAIR uptake today.
- **Indexing:** Develop a “Insurance-Climate Stress Index” based on predicted FAIR Plan reliance.
- **Initial Findings:**

