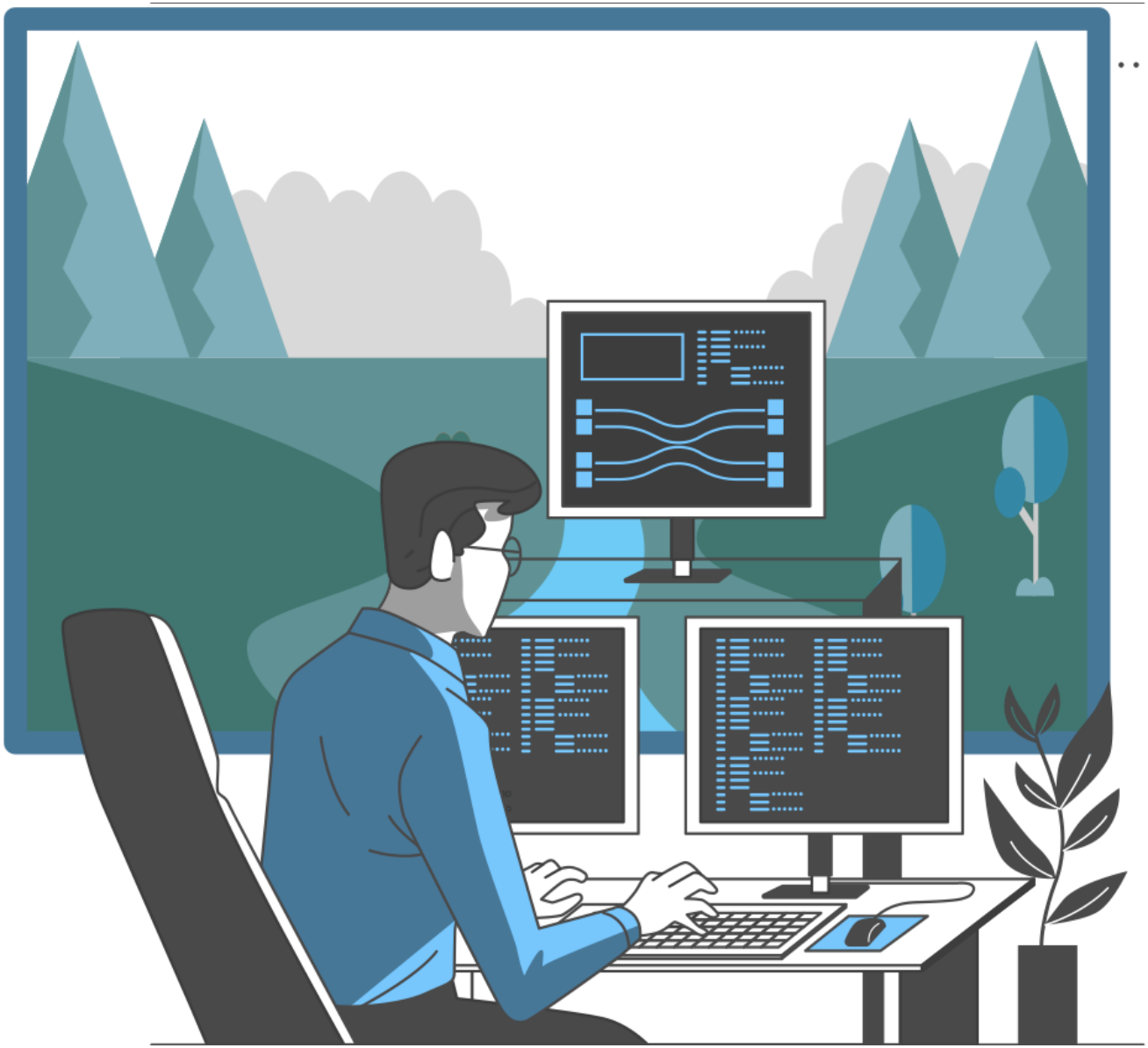

Flood Insurance in the US

Exploring New Market Opportunities

Who We Are

florita Inc.

Flood Risk Task Force

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The Why, the Who, the What

01

Why?

Stronger and more frequent natural disasters are breaking records in destruction, increasing demand for flood insurance.

02

Who?

Since there has been recent liberalisation in the flood insurance market, private insurers are looking into entering the market.

03

What?

As predicting reliably how much capital to allocate for each years' claims is core to a successful insurance strategy, we develop a claim approval classification model to facilitate this.

Stakeholder Goals

01

What does the current **distribution of flood insurance policies and claims** look like?

02

Are there currently **underserved markets**, that is, markets where flood insurance adoption rates are low, yet the flood risk is high?

03

For asset-liabilities risk management of our stakeholder, can we accurately **predict flood insurance claim approvals**?

Data Sources: Key Information

Policies

KEY

- Policy Start Date
- Flood Zone

Claims

KEY

- Claim Amount Paid on *Building* Damage
- Claim Amount Paid on *Contents* Damage

TIME

- Date of Damage
- Property Age

KEY

- Coverage Amount on *Buildings*
- Coverage Amount on *Contents*

GEO

- County/FIPS Code
- State

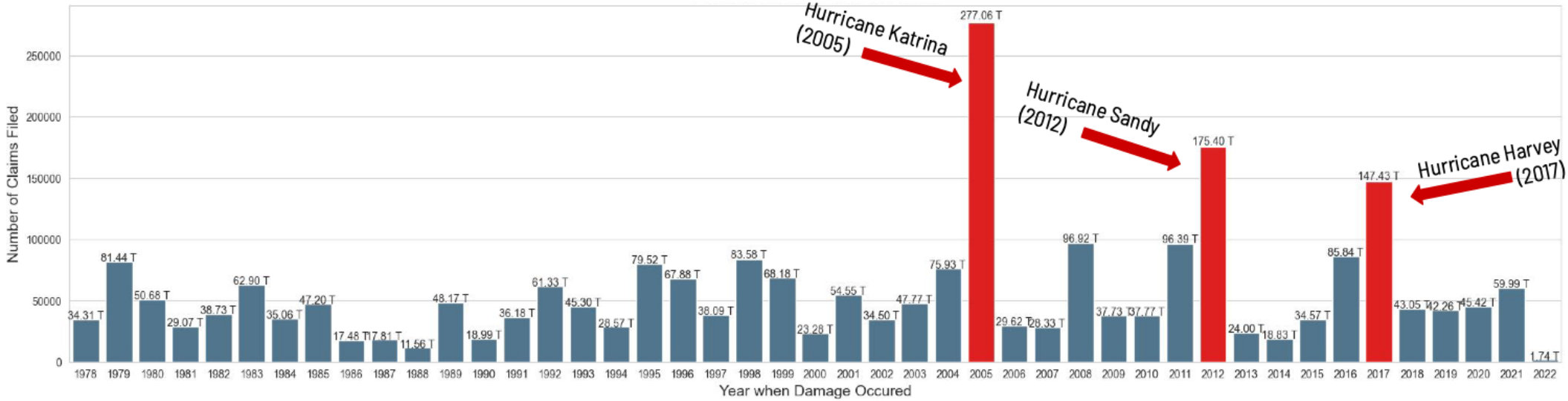
BUILDING-RELATED

- Occupancy Type
- Elevated Building
- Community Rating
- Condominium

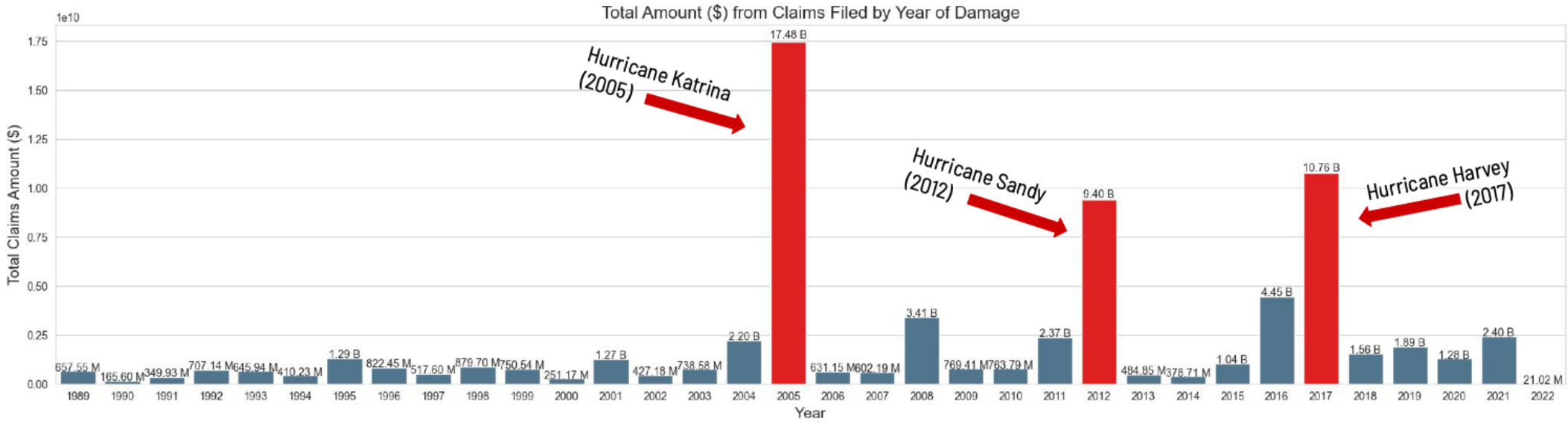
EXTERNAL: Census Data

- Number of Households per County
- Median House Price per County

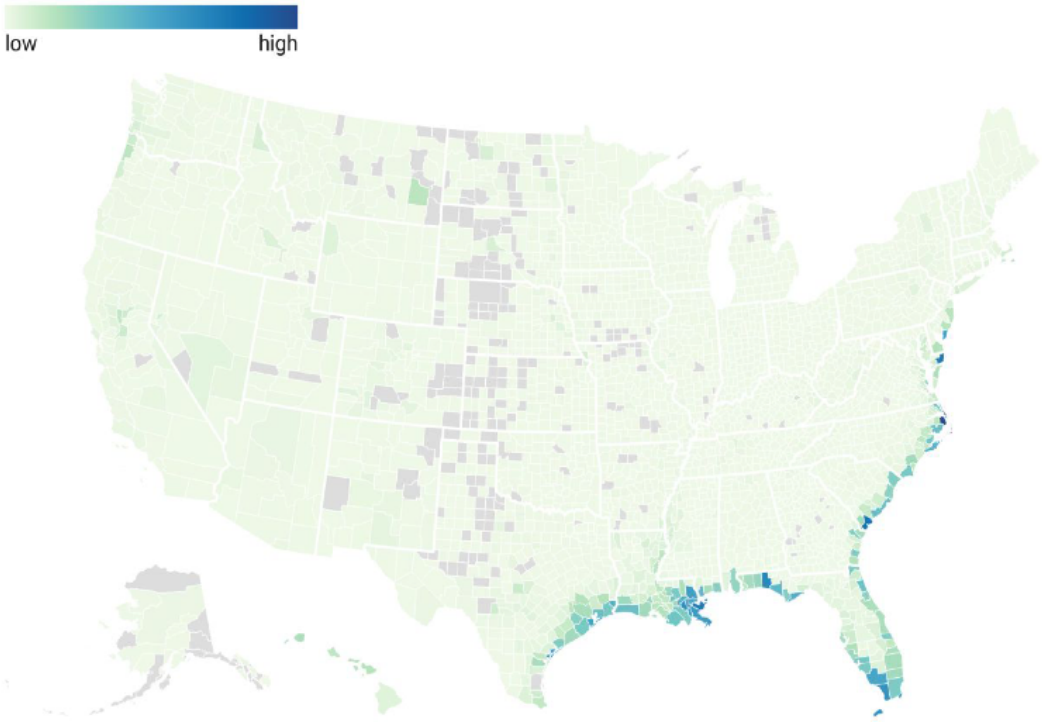
Number of Flood Damage Claims per Year



Total Amount of Damages Claimed per Year

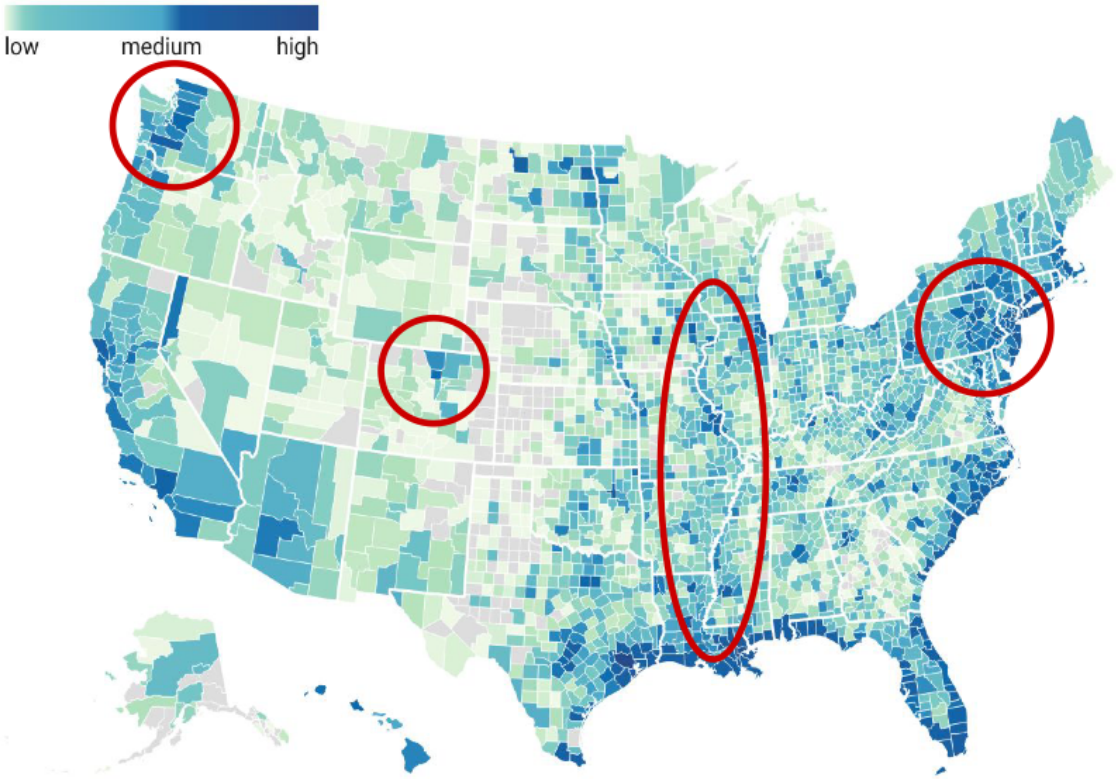


Voluntary Flood Insurance



- Adoption rates are high along the Gulf and Atlantic Coasts.
- The rest of the U.S. looks underinsured.

Identifying Underserved Markets



- Areas circled in red show a high amount of flood damage.
- Insurance adoptions are low, but payouts high.
- Insurance companies can increase revenue by selling policies in these areas.

Intermediate Results

- While the financial and economical impacts of floods are massive, esp. since they're on the rise,
- there are still underserved markets, which geo-analysis helped us identify.
- In order to serve those markets and ensure our stakeholder's capital planning, we need to predict claim rejections and approvals.

ML Classification Model—Claim Approvals

- We assume our insurance companies make capital decisions based on the predictions of the ML model.

- *Minimising false positives*
  - Claims that are predicted to be approved but are actually not-approved.
  - Hold too much money on balance sheet.
  - Could have invested this money in assets yielding higher return.

- *Minimise false negatives*
  - Claims that are predicted to be not-approved but are actually approved.
  - Pay out more claims than predicted.
  - Borrow money to pay out these claims.

- Given both false positives and false negatives are important, we focus on **weighted average F1-Score** as a measure of model evaluation/performance.

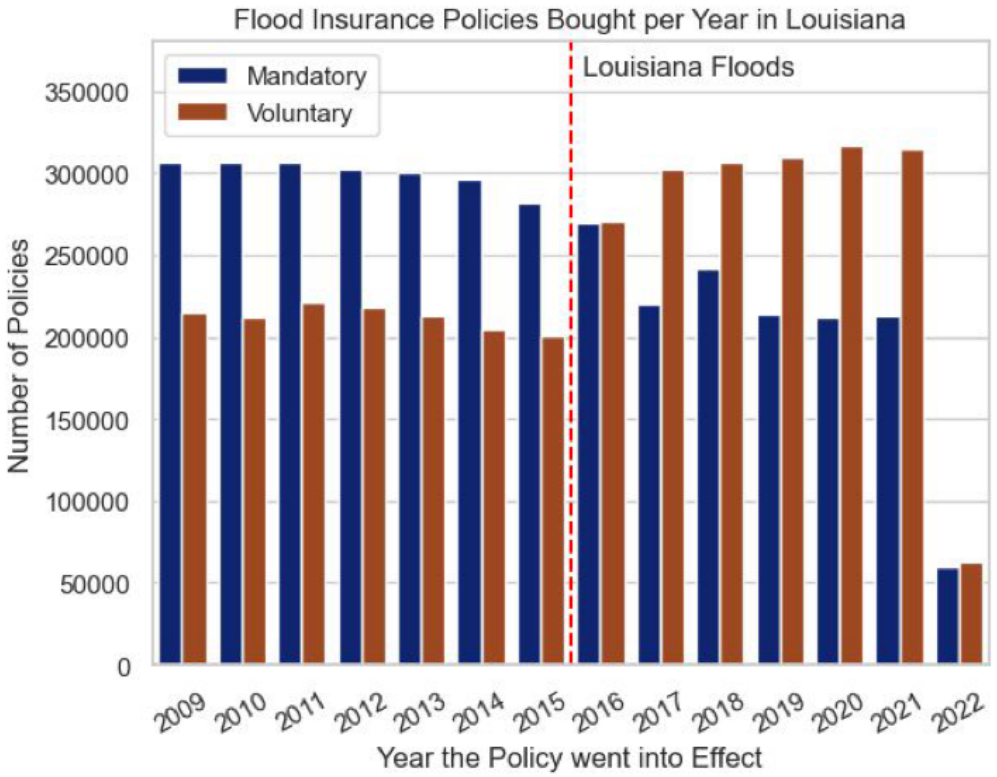
ML Classification Model—Model Results

- Proportion of Approvals/Non-Approvals (Baseline Model)
  - Weighted Average F1-Score = 0.635
  - Average $ Value of Misclassification (per year) = **$132.3 million**
- XGBoost with Hyperparameter Tuning (Chosen Model)
  - Weighted-Average F1-Score = 0.736
  - Average $ Value of Misclassification (per year) = **$77.3 million**
- Cost savings of chosen model ≅ **$54.9 million per year**

Outlook

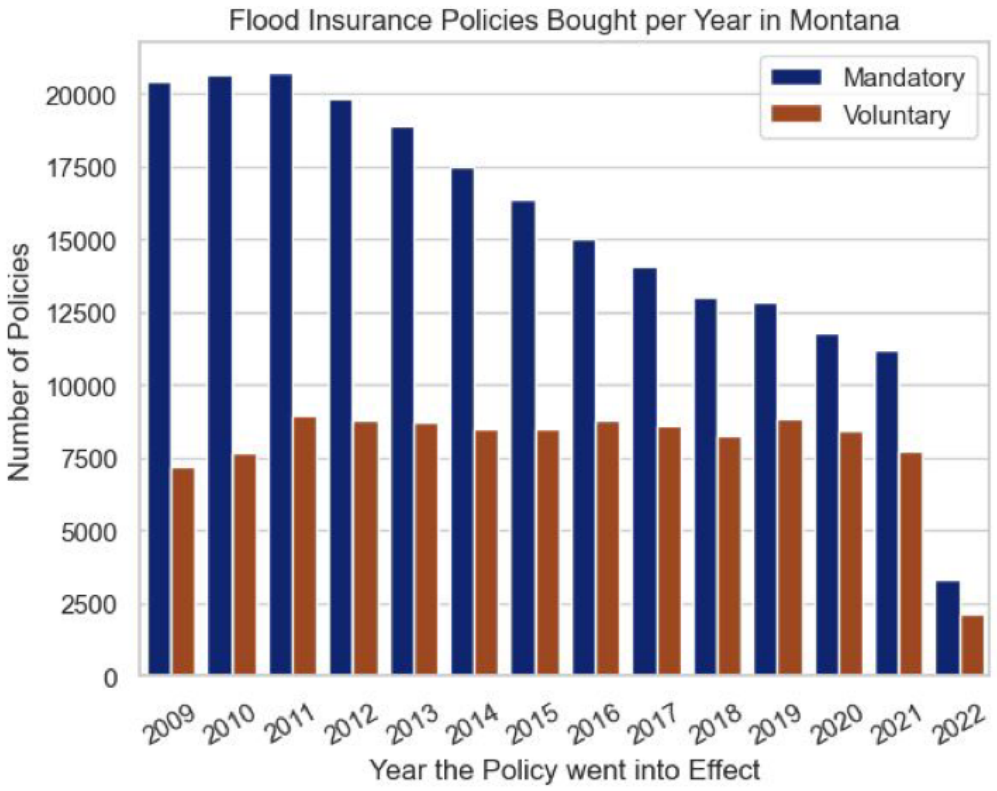
- **Causal ML**: calculate elasticity of flood insurance adoption.
- **Regression**: predict the number of insurance policies bought from past insurance claims.

Flood Insurance in Louisiana



- One further thing we would like to predict is rise in policies bought based on claims.
- Louisiana is an example of a state that experienced major flooding damage: the Louisiana Floods in 2016.
- The number of voluntary flood insurance policies increases sharply in 2016 and continues to rise (more slowly) in the following years.

Flood Insurance in Montana



- Contrast this with Montana, where no such disaster took place.
- The number of voluntary flood insurance policies stays almost the same between 2011 and 2021.

Thanks!

Project Repo:
https://github.com/sbuenker/florita

Any questions? Get in touch.

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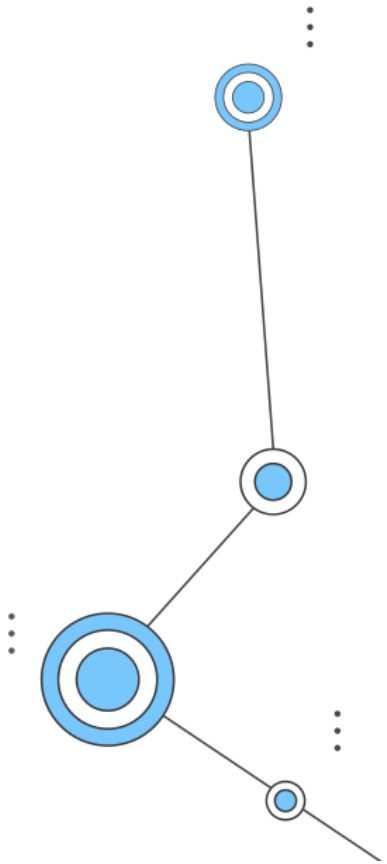

The End