Hurricane Damage Assessment

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The Cost of Catastrophes

- Hurricanes cost billions in insured and economic loss

- Better pre and post event planning could significantly reduce loss of life and resources

Consumers of the Product

1. Disaster Relief Agencies
    a. Evacuations
    b. Relief Supplies
    c. Economic Costs
2. Insurance Agencies
    a. Loss Mitigation
    b. Capital Management
    c. Claims Operations
3. Capital Market
    a. Live CAT Trading
    b. Dead CAT Trading

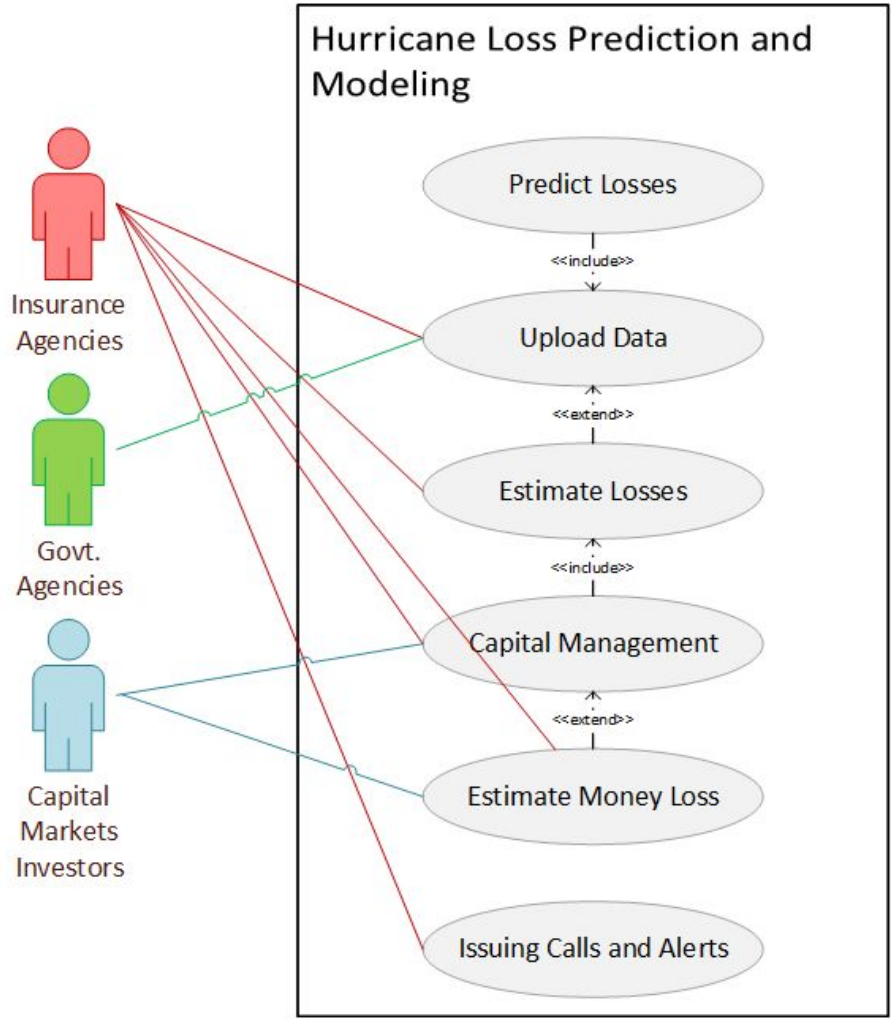
The Goal State

- Monitor NHC for Hurricane Alerts (Jun through November)
- Consume Location and Building Characteristics
- Provide periodic Location Level Damage Assessment

The Powertrain

- A Bot to Monitor NHC
- GUI for Client Interaction
- API for BULK Uploads
- Hazard Model To Create Wind-fields
- Vulnerability Model to Turn Winds and Building Characteristics to Losses

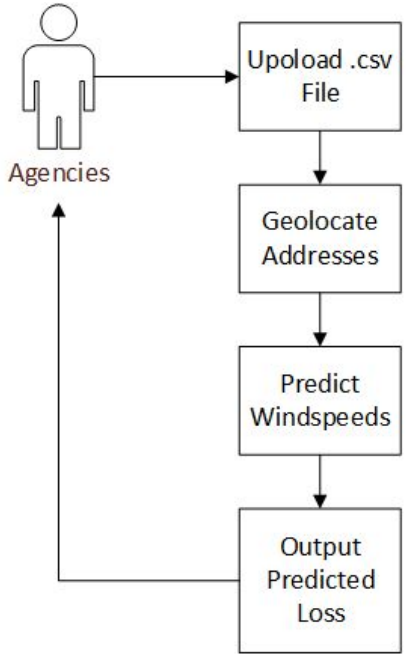
Use Case Diagram



Design

The process flow is:

1. The user uploads a .csv file containing necessary information.
2. The system geolocates any addresses without latitude and longitude information
3. The system then feeds the data into a R model that predicts the wind speeds at that location.
4. A 3-layer dense neural network then predicts the losses for each building.
5. The results are returned to the user.



Data

The input data contains the following:

- Policy Number: Policy # of insurance.
- Street Name: Street-level address.
- City: City of address.
- State Code: State of address.
- Postal Code: Zip code of address.
- Country Code: Country of address.
- Occupancy Type: How many families are in an address.
- Building Class: Construction type of address.
- Number of Floors: Number of floors at address.
- Year Built: Year address was built.
- Floor Area: Square footage of address.

The initial dataset was 30,000 addresses. 70% (21,000 rows) was used as a training set, 15% (4,500 rows) was set aside as a validation set, and 15% was set aside as a test set.

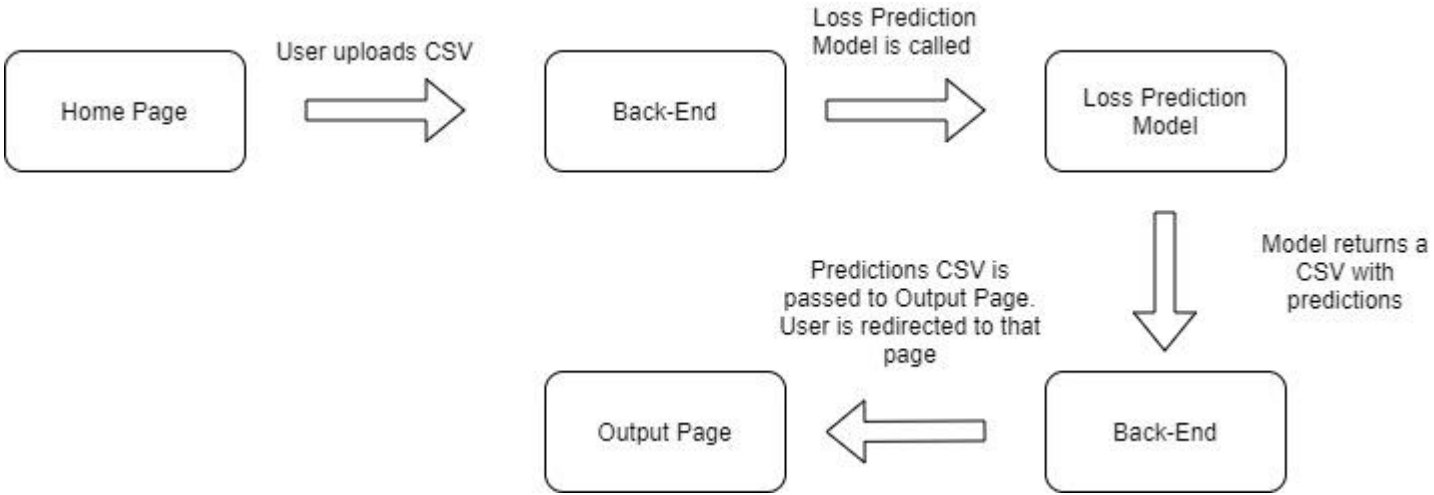
The data was generated by the field expert Syed Ali.

Model Training and Selection

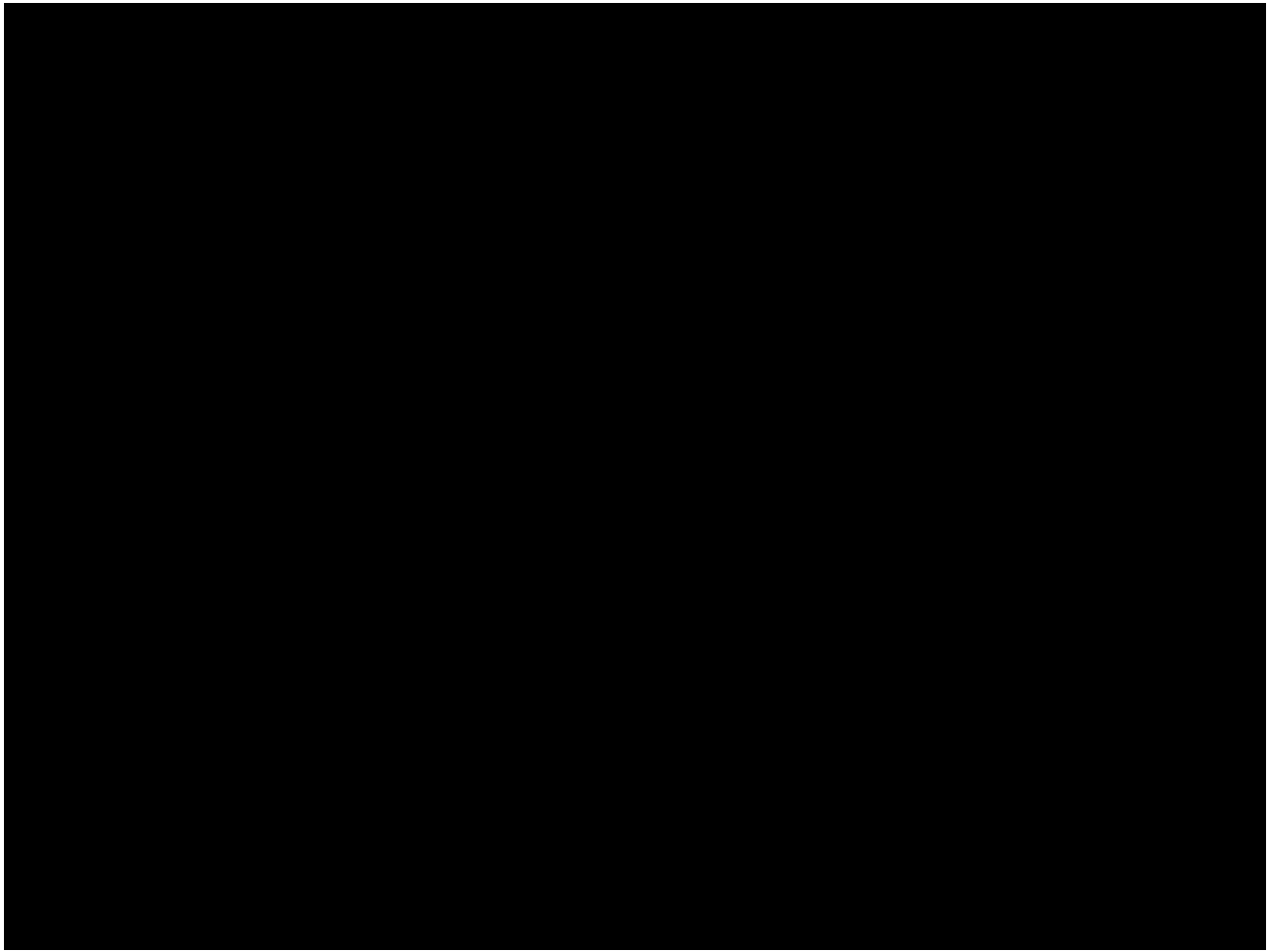
Four models were trained and evaluated using mean absolute error (MAE) as the evaluation scale.

- SVR: 5.151
- 1-Layer NN: 3.648×10^{-4}
- 2-Layer NN: 2.793×10^{-4}
- 3-Layer NN: 2.646×10^{-4}

Website Design



Demo



Into the Future

- NHC Monitoring BOT
- API Development
- Scale to Enterprise Requirements

References

- Tropical cyclone - Wikipedia
- Storm Wind Model
- scikit-learn
- TensorFlow