Bike and Pedestrian Traffic Incidents in Chicago

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Background

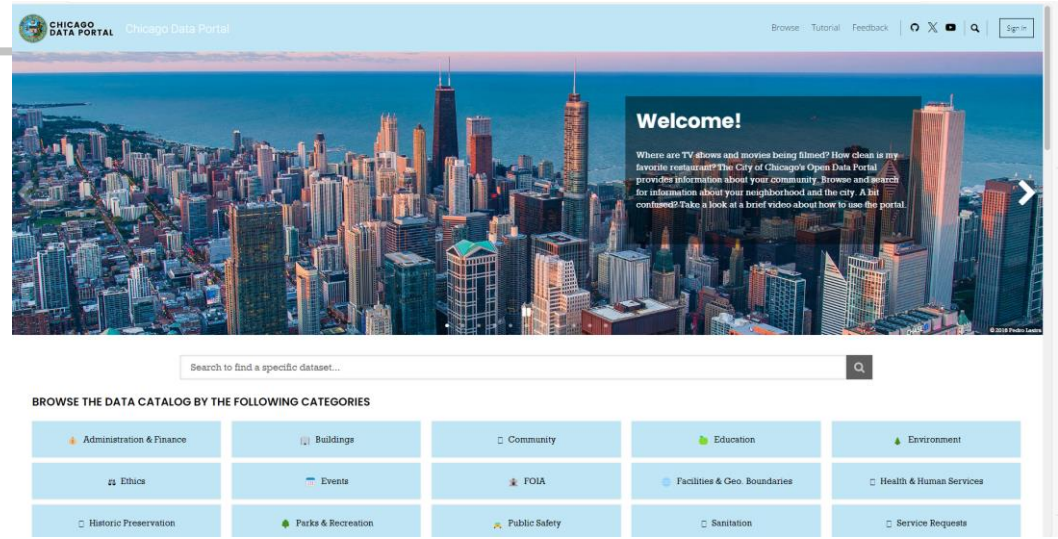
- City of Chicago faces challenges in mitigating traffic accidents and improving road safety
- Our goal is to understand and prevent traffic accidents by identifying patterns and key factors contributing to three categories of crashes
  - No Injury
  - Non-incapacitating Injuries
  - Incapacitating Injury/Fatalities

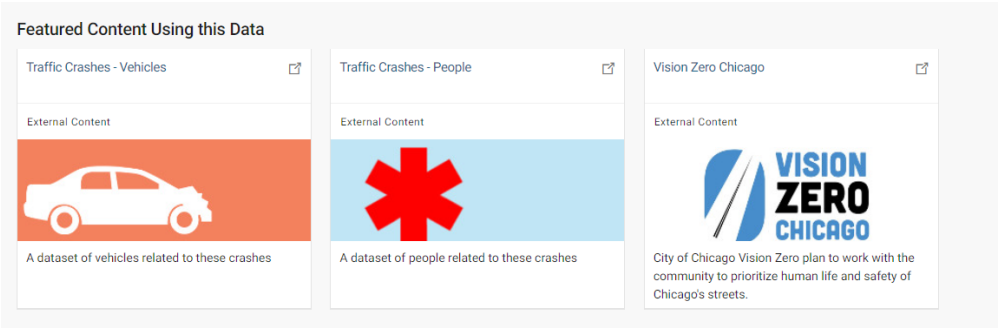
Goals of Analysis

- Classifying accident can help us:
  - Prioritize emergency response allocation
  - Identifying high-risk areas and times to increase/decrease surveillance teams
  - Informing City of Chicago residents of traffic safety issue and plan to alleviate stress

Data Acquisition

- Utilized the Chicago Data Portal SOCRATA API
- Queried all people affected by traffic accidents in the last 5 years that were classified as pedestrians or cyclists.
- Joined with crash event features and the associated vehicle information.
- This resulted in over 22,000 records.
- ~1,500 resulted in fatalities or incapacitating injuries



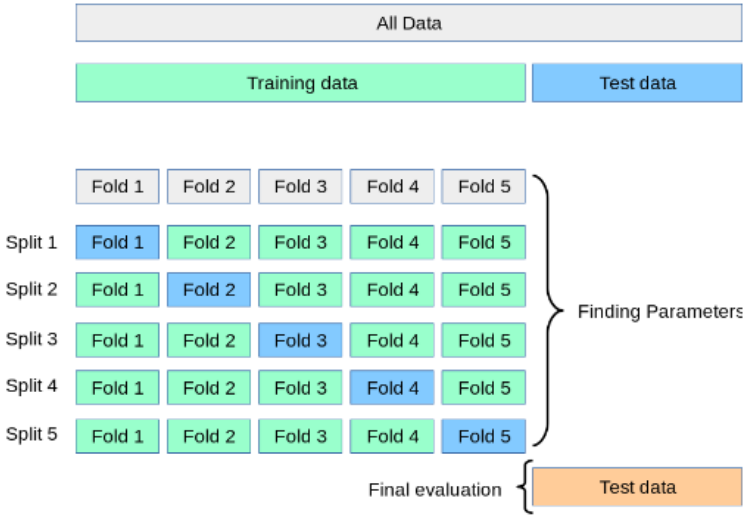


Model Preparation

- Remove unnecessary columns
- Impute Nulls to no values
- Engineer target variable
  - 0 – No injury
  - 1 – Non-incapacitating injury
  - 2 – Incapacitating injury/ Fatal
- Encode text categorical features into integers

Methodology

- Feature Selection
  - Principal Component Analysis (PCA
  - K-mean clustering
  - t-Distributed Stochastic Neighbor Embedding (t-SNE)
  - Latent Class Analysis (LCA)
- Model
  - Cross-validation: Repeated k-Folds
- Algorithms
  - Naïve Bayes (baseline)
  - Logistic Regression
  - Support vector machines
  - Random Forest
  - Gradient Boosting
  - Poisson Regression



Class	Naïve Bayes	Logistic	SVM	Random Forest	Gradient Boosting
No Injury	0.182162	0.001079	0	0.297126	0.020105
Non Incapacitating	0.775907	0.999246	1	0.645137	0.984083
Fatal/Incapacitating	0.091884	0	0	0.085145	0.005513

Model Interpretation

- Logistic regression was best for predicting non incapacitating features
- When combining incapacitating and non incapacitating into one variable (1), Random Forest accuracy was still strong and we identified the following key features

Accuracy: 68.41%

	precision	recall	f1-score	support
0	0.56	0.14	0.22	1470
1	0.70	0.95	0.80	3053
accuracy			0.68	4523
macro avg	0.63	0.54	0.51	4523
weighted avg	0.65	0.68	0.61	4523

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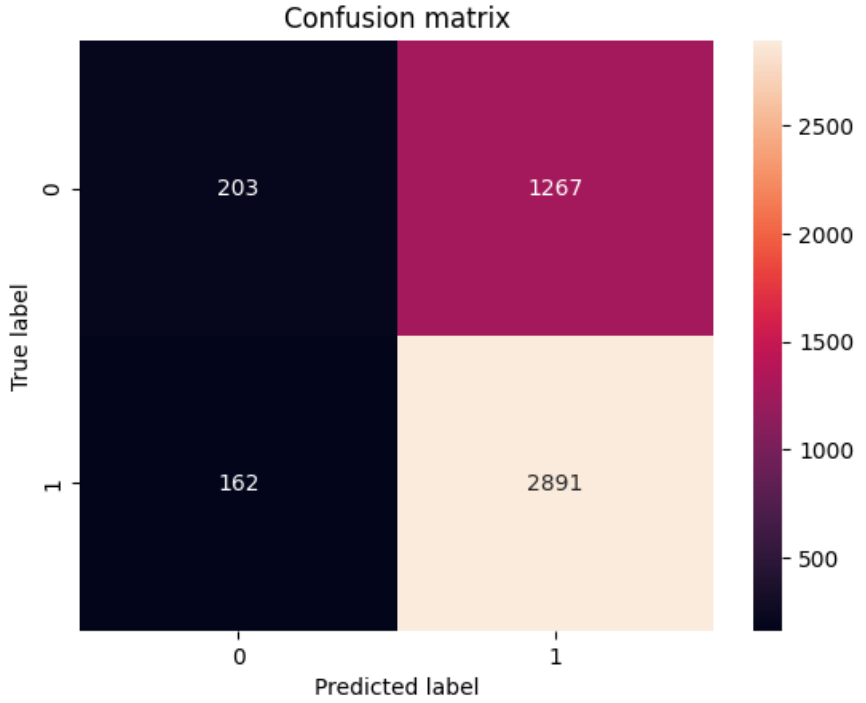
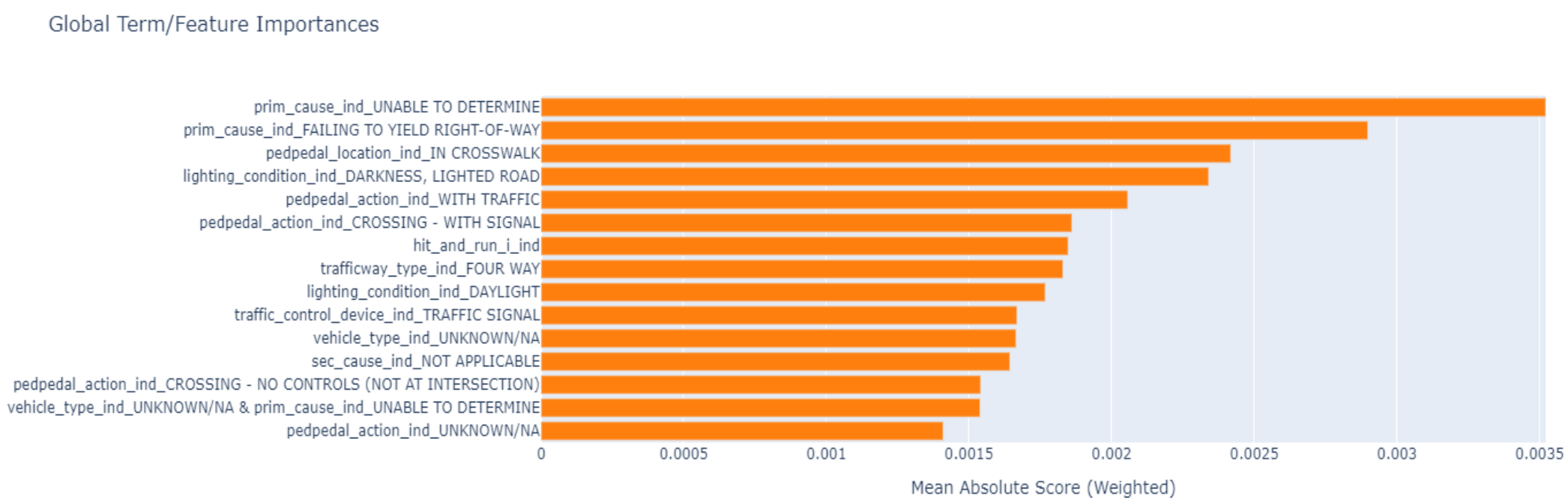


InterpretML- Explainable Boost Classifer



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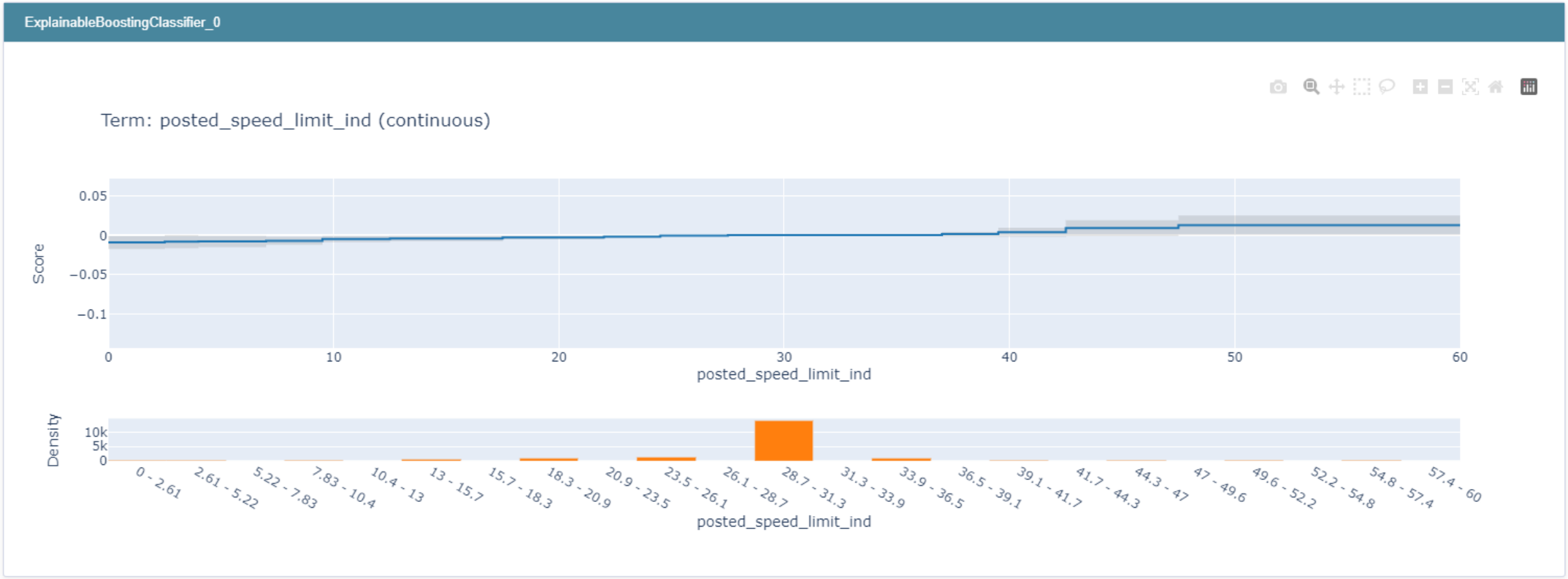
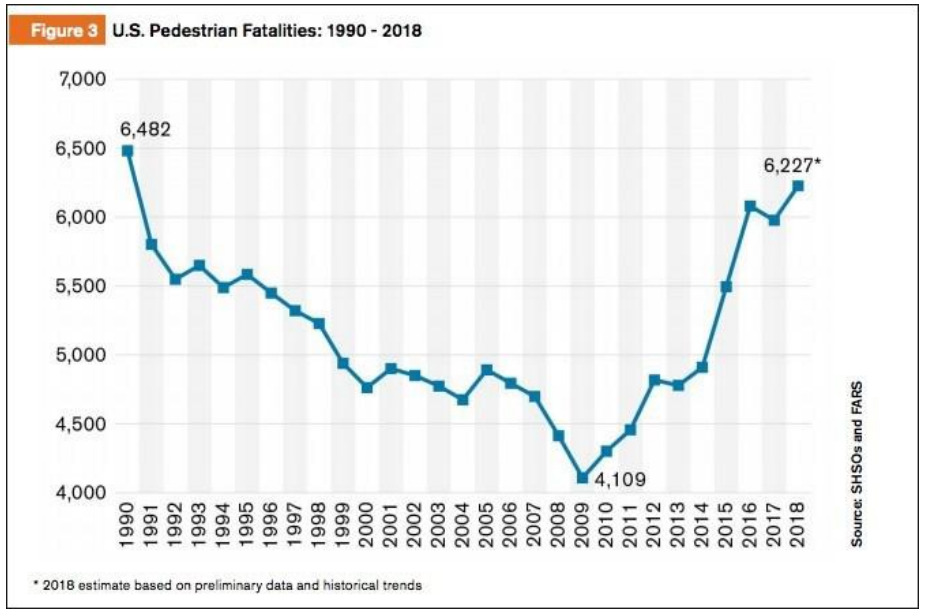


Improvements and Call to Action

- Enhance **Data Collection & Completeness**:
- Implement **Advanced Technologies**:
- Incorporate **Research Insights**:
- Foster **Cross-Disciplinary Partnerships**:
- Advocate for **Policy Changes**:



Cyclist and Pedestrian Deaths Skyrocket in 2018 as Motorists Stay Safe — Streetsblog USA