Cynthia-Njambi /
City-of-Chicago-Traffic-Crashes-Project

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Phase 4 Group Project

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index pdf.pdf	updated pdf	yesterday
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ppt presentation.pdf	Add files via upload	yesterday

README

CITY OF CHICAGO TRAFFIC CRASHES

This project attempts to identify the primary causes of accidents in the City of Chicago in order to help city planners, traffic safety boards, and policymakers take proactive measures to reduce accidents and improve road safety. The dataset used in this project, provided by the City of Chicago, includes detailed information about accidents, vehicles, and the people involved, offering a rich resource for understanding the underlying causes of crashes.

Project Goals

The goal of this project is to build a model that predicts the **primary contributory cause** of a car accident based on factors such as road conditions, vehicle characteristics, and the people involved.

Development Tools

- Python

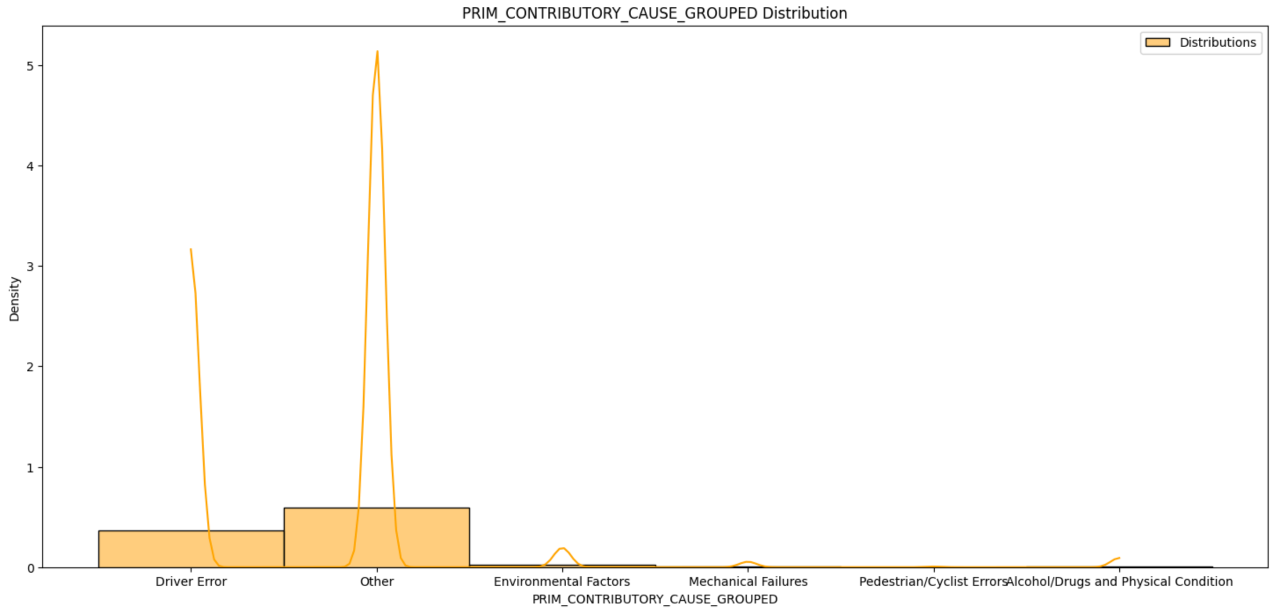
- Pandas
- Numpy
- Matplotlib
- Seaborn
- scikit-Learn
- TensorFlow

EXPLORATORY DATA ANALYSIS

Selecting the Target Variable

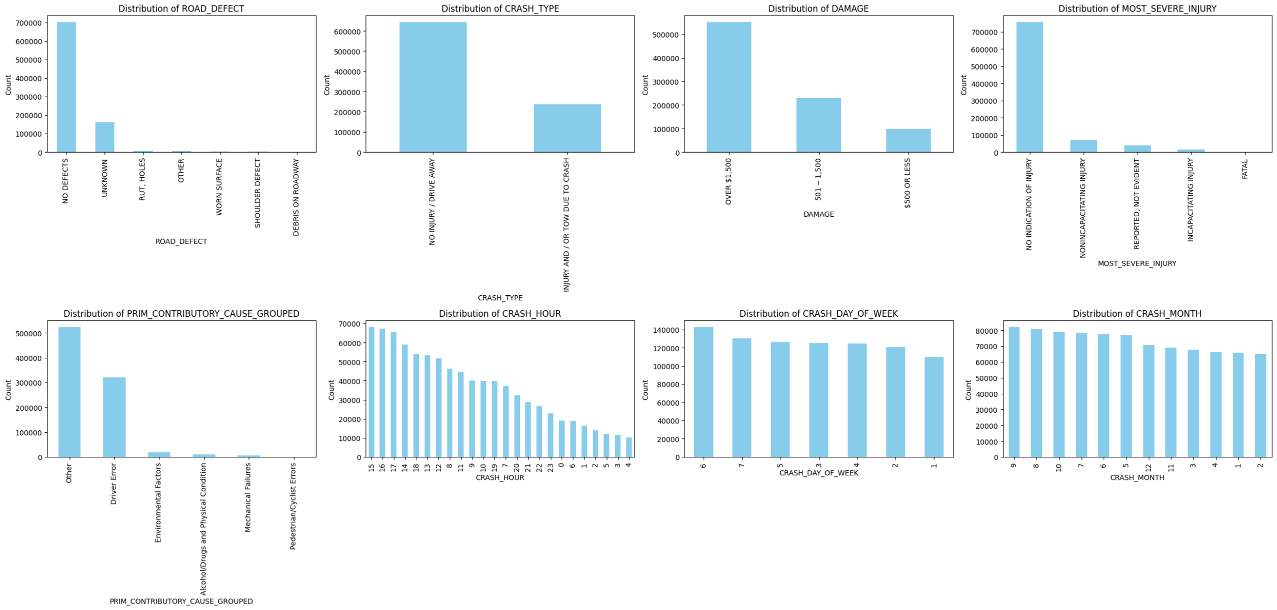
- `PRIM_CONTRIBUTORY_CAUSE` was used as the target variable since it represents the main reason for each accident. The 40 unique values of the `PRIM_CONTRIBUTORY_CAUSE` column were grouped into 5 broad categories.

Primary Contributory Cause Groupes

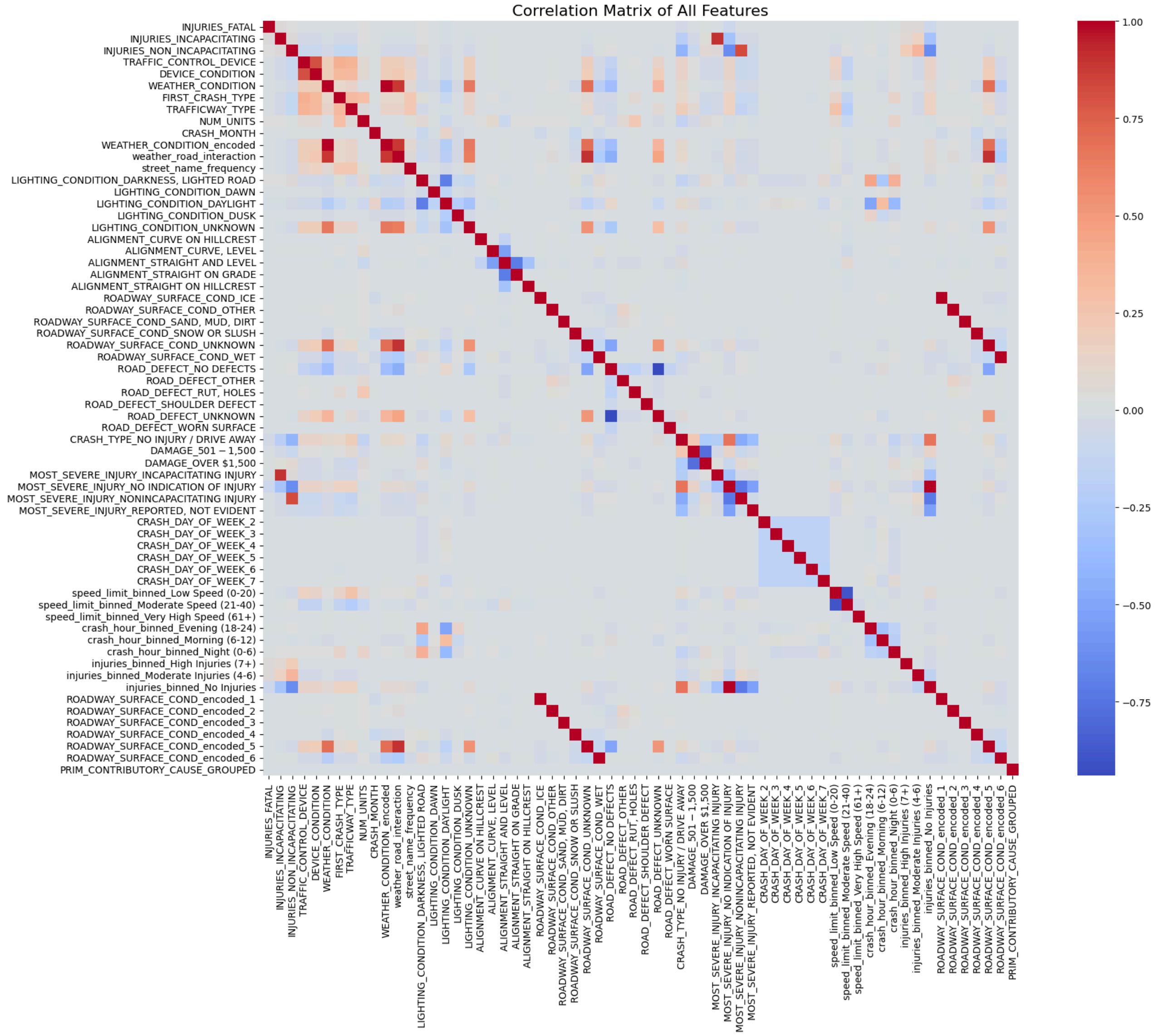


Analsysis Visualizations

Distribution of Categorical Columns



Correlation Matrix for all Features

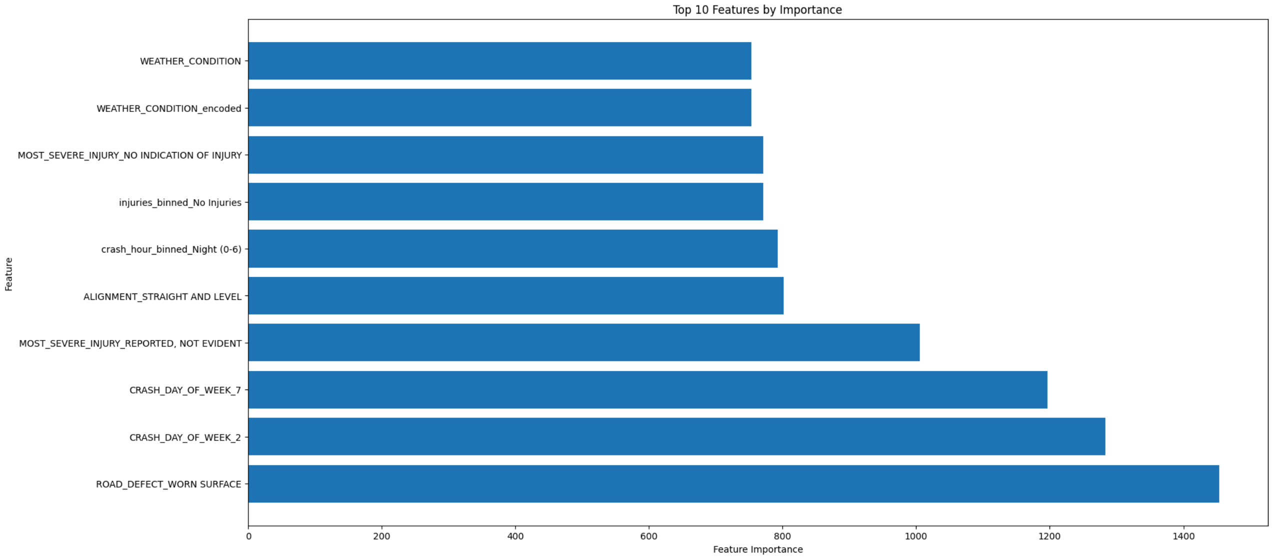


Feature Engineering

- Continous variables were normalized and categorical variables were one-hot encoded.

- Principal Componet Analysis(PCA) and SMOTE (Synthetic Minority Over-Sampling Technique) were used to reduce the dimensionality of the feature space and to address class imbalance respectively.

Top ten most important features



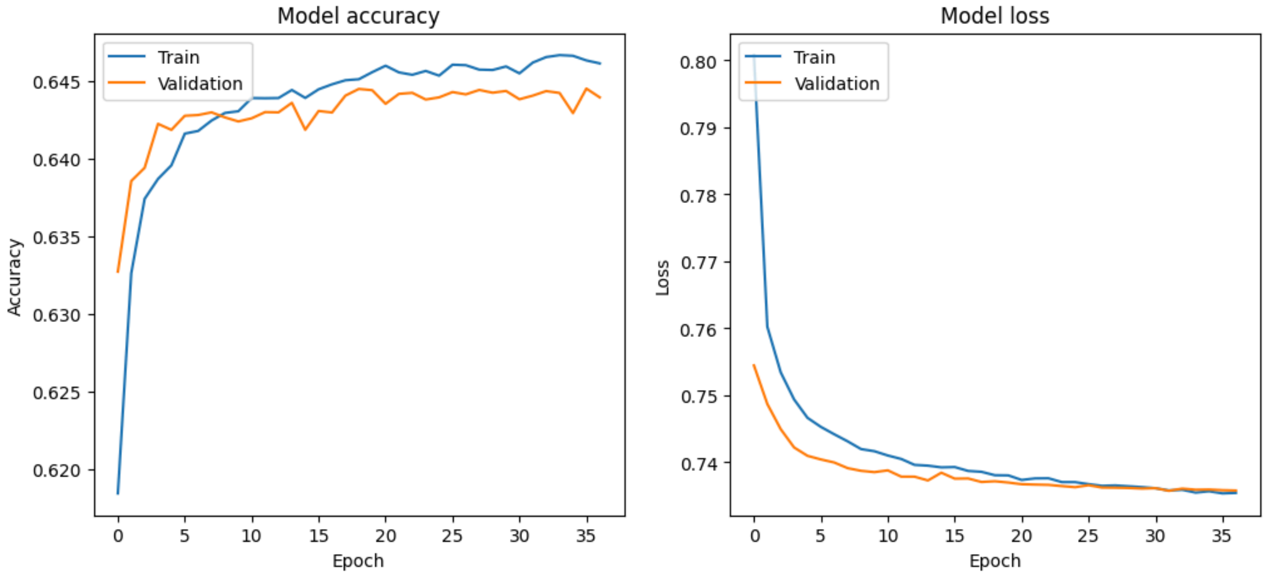
MODELLING

The models used in this project are:

- Dummy Classifier
- Logistic Regression
- Random Forest
- XGBoost
- Neural Networks

MODEL VALIDATION

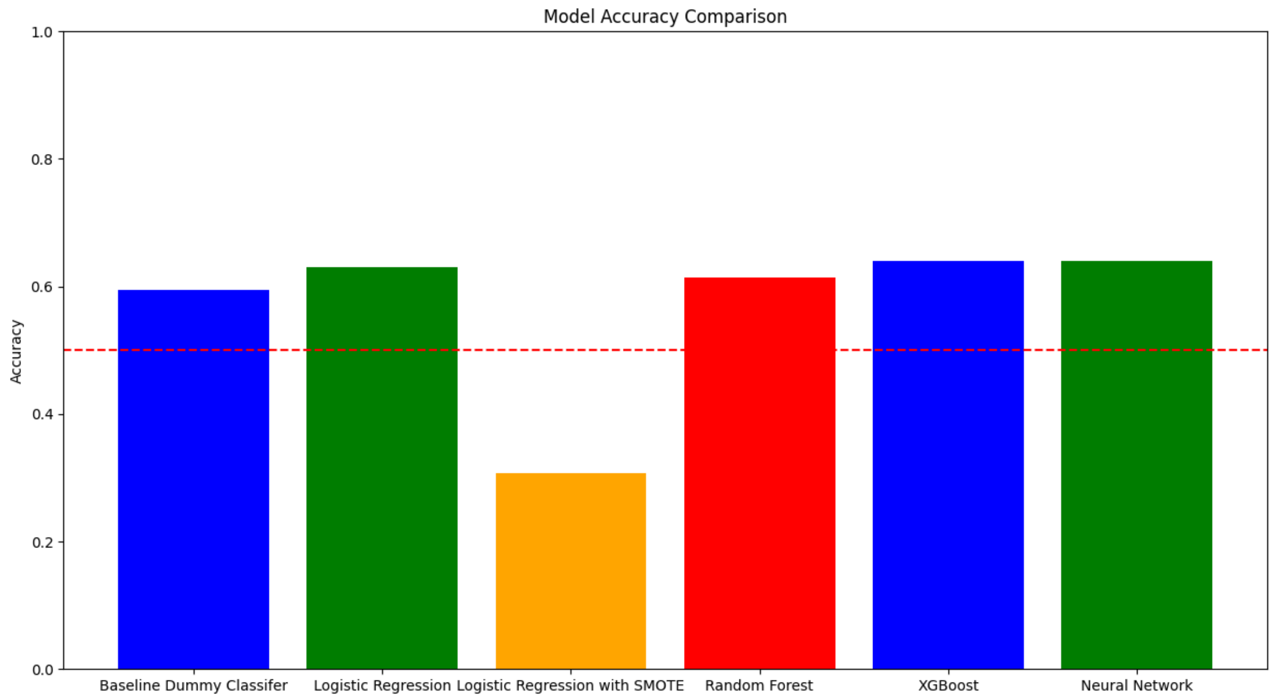
ROC Curve for Neural Networks



Comments on Model Performance

1. **Top Performer**: The **Neural Network** achieved the highest accuracy (0.6429) among all models and demonstrated strong performance in classifying key categories. However, it exhibits some signs of overfitting.
2. **Close Contender**: **XGBoost** closely follows with an accuracy of 0.6393, showcasing resilience against overfitting and robust classification capabilities.
3. **Next Best**: **Logistic Regression** (0.6303) displayed reasonable performance but lacked robustness across other classes.
4. **Random Forest** (0.6140) effectively identified **Pedestrian/Cyclist Errors** but struggled with minority classes.
5. **Logistic Regression (SMOTE)** performed poorly (0.3066), indicating that SMOTE did not effectively resolve class imbalance.

Model Accuracy Comparisons



Conclusion and Recommendations

Conclusion

1. **Addressing the Problem with Predictive Models**:
   - The project's objective was to **predict the primary causes of accidents** to help traffic planners and policymakers design targeted interventions. Both the **Neural Network** and **XGBoost models** effectively captured critical accident causes, such as **road conditions, time of day, and human behavior**, aligning with the stakeholders' need for actionable insights.
   - **Neural Network** achieved the highest accuracy (**0.6429**) by learning complex, non-linear patterns from the data, helping identify nuanced relationships between variables. However, it exhibited **overfitting**, suggesting that further tuning is needed for consistent performance.
   - **XGBoost** followed closely with an accuracy of **0.6393**, providing robust performance without significant overfitting, making it a reliable alternative for practical applications.
2. **Insights on Contributory Causes**:

    - Key features identified by the models, such as **road defects** and **day of the week**, align with real-world safety concerns. This demonstrates that the models are not only predictive but also relevant to stakeholder needs.
    - These insights help city planners and safety boards focus on high-impact areas such as **infrastructure repair** (road defects) and **time-based interventions** (e.g., weekend traffic management).

3. **Handling Data Challenges**:

Releases

No releases published

Create a new release

Packages

No packages published

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Contributors 5

Languages

● **Jupyter Notebook** 100.0%