ANALYZING TRAFFIC ACCIDENT TRENDS

Cofinanciado por la Unión Europea

Traffic Accident Prediction

ESTONIA TEAM

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Abstract

Objective

Analyze the distribution of traffic accidents by driver age and vehicle brand.

Method

J48 decision tree model applied to a traffic accident dataset.

Results

Key risk groups identified by age and brand.

Objective

This dataset was chosen for its comprehensive coverage of real-world traffic accidents in Estonia, offering the ability to analyze demographic patterns, particularly age-based accident risks.

Its relevance for road safety and environmental impact.

Dataset Justification

- Some classes are underrepresented (e.g. ages 0-12), and the ’Age’ attribute appears to be the target instead of accident occurrence, which may affect prediction quality.

- Original dataset contains only positive accident cases – no “non-accident” records for binary classification. No time-of-day or weather context is present. Potential underrepresentation of younger age groups.

Data Limitations

Data Processing and Formats

- The dataset was loaded into Weka in ARFF format.
- Date fields were converted using DateToNumeric where applicable.
- The “Age“ attribute was used as the target class, representing different age categories of drivers involved in accidents
- Preprocessing included attribute selection and 10-fold cross-validation.

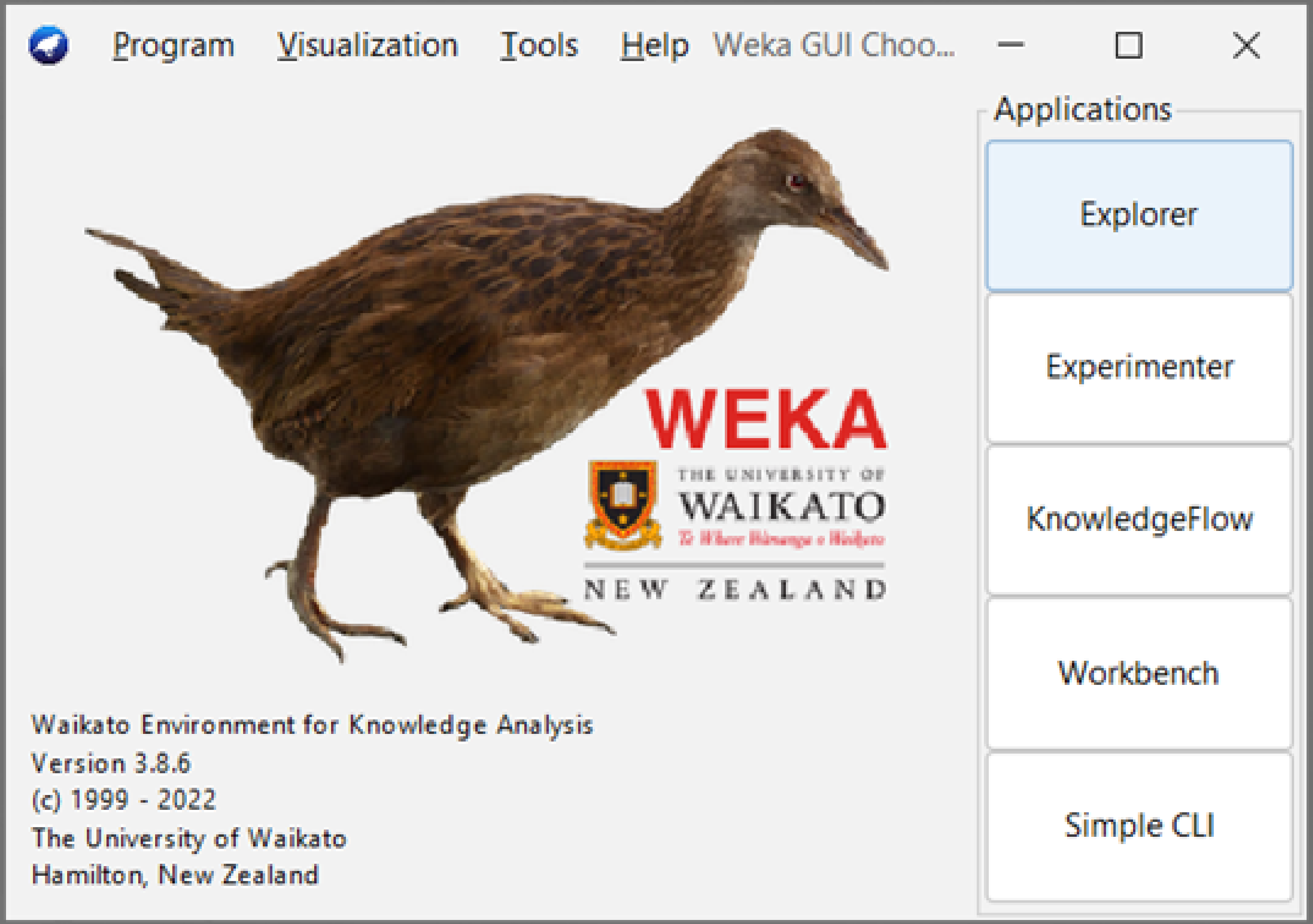
Three classifiers were compared:

- NaiveBayes: classified all into one class
- MultilayerPerceptron
- J48: interpreted patterns across vehicle type, brand, weekday, and city.
- RandomForest: tested on a reduced sample, performance similar to J48.

J48 was selected for its interpretability and logical structure.

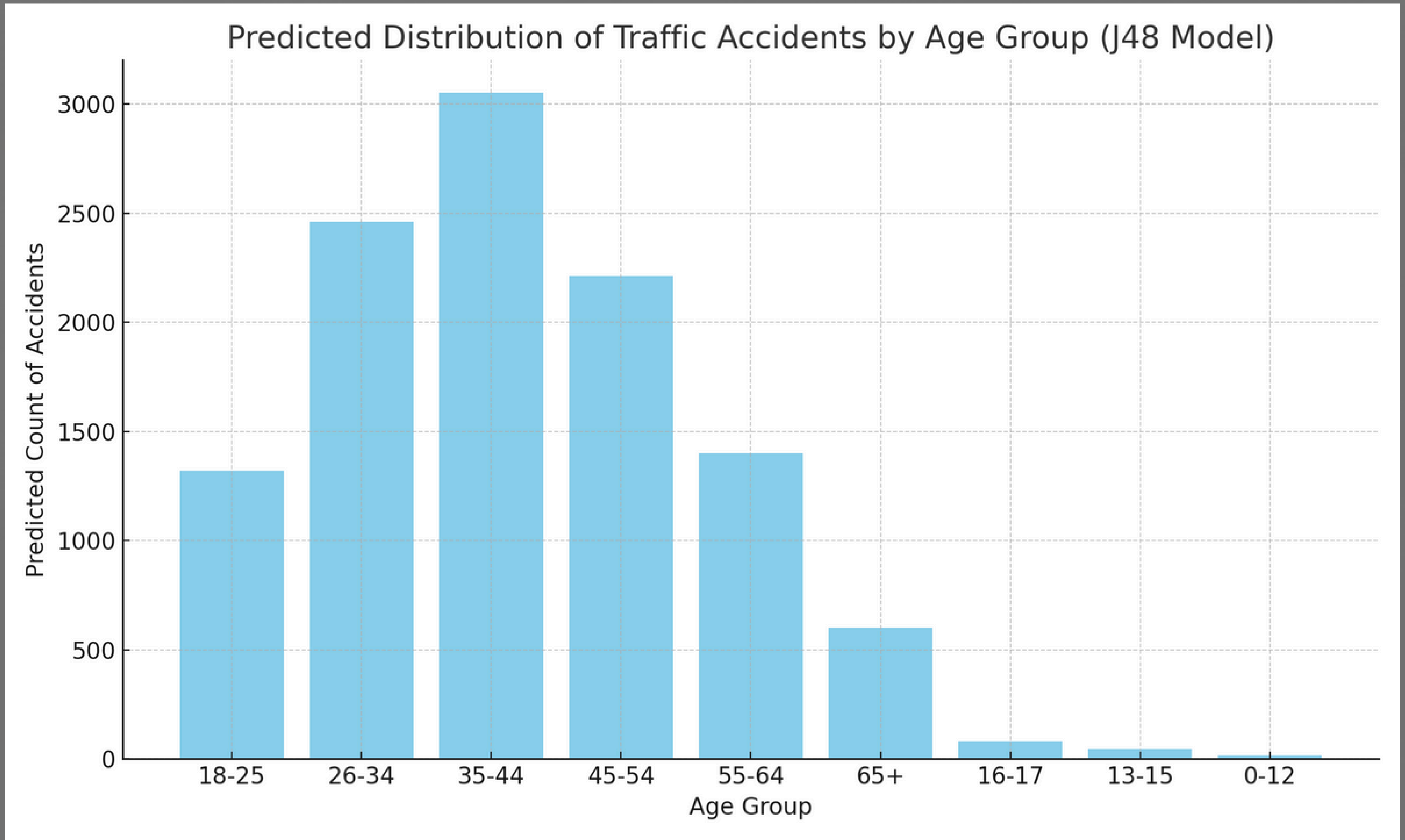
Analytical Methods

- As our main software, we used Weka.



Waikato Environment for Knowledge Analysis
Version 3.8.6
(c) 1999 - 2022
The University of Waikato
Hamilton, New Zealand

Software Used

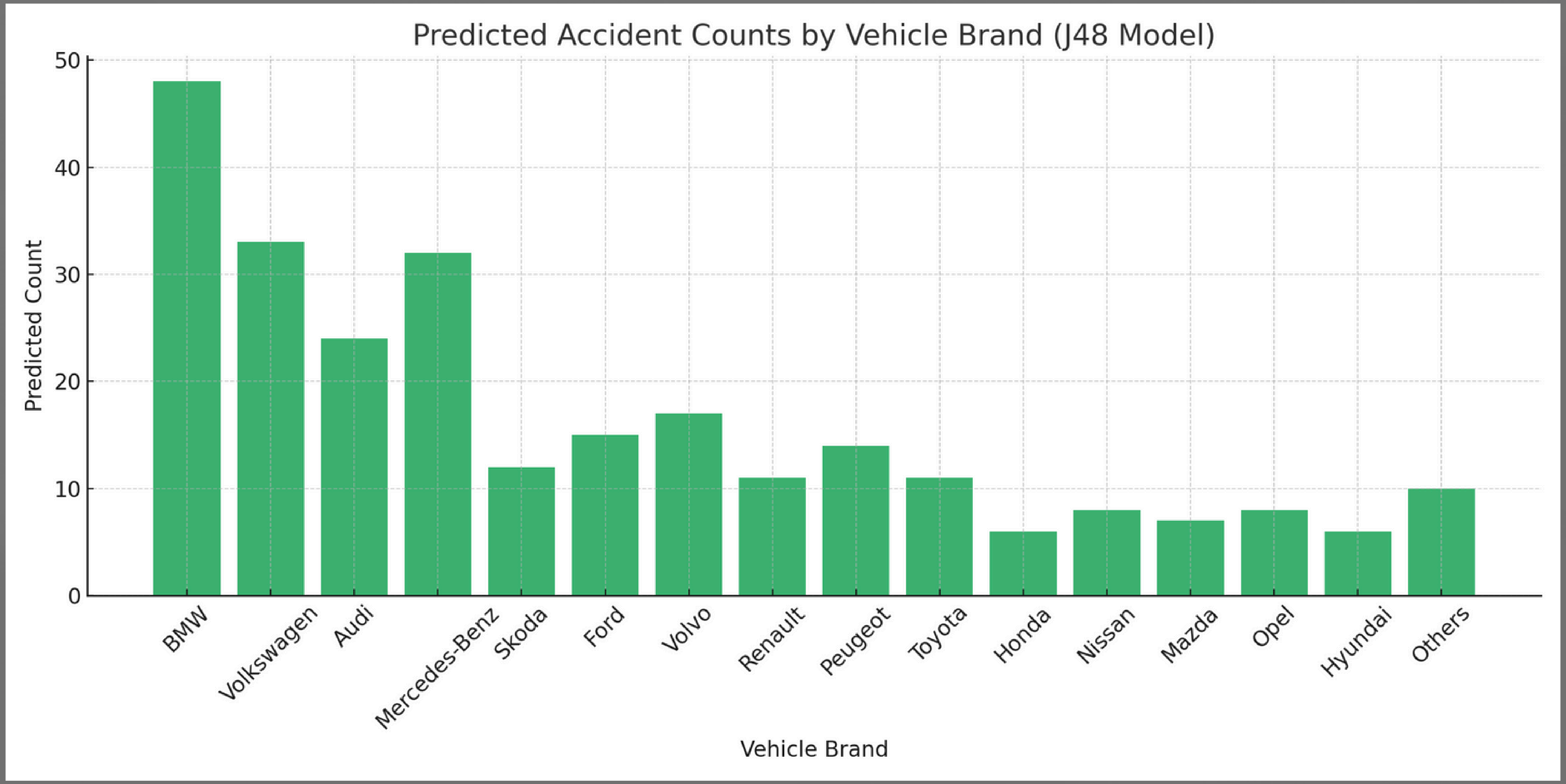


Key Results: Age Distribution

Why these age groups are high-risk.

-driving experience, habits, frequency, middle age crisis

Age Group Analysis



Key Results: Vehicle Brand Distribution

Possible reasons:

- popularity
- driving style
- vehicle power.

Brand Analysis

For insurance companies:

- traffic police
- safety campaigns.

Predictions & Practical Applications

- The study showed that machine learning models can effectively classify and detect trends in accident risk based on age.

- RandomForest achieved the best predictive performance, while J48 was used to interpret critical patterns.

- Future work could expand the dataset to include negative (non-accident) samples and additional context like time of day, weather, or alcohol influence to improve the model's realism and use in real-world risk forecasting.

Conclusion

“Data drives decisions in traffic safety.”

Thank you for your attention!