



TRAFFIC ACCIDENT SEVERITY PREDICTION USING MACHINE LEARNING ALGORITHMS

RESEARCH CONTEXT/BACKGROUND

- Traffic accidents on roads are a global concern, leading to injuries, deaths, and financial losses.
- Driver behaviour, weather conditions, road conditions, and vehicle type determine accident severity [7].
- Machine Learning (ML) algorithms improve prediction accuracy by analysing large amounts of data. Thus, current research combines supervised models such as classification techniques (Gradient Boosting, Bagging, AdaBoost, and Random Forest Classifier) to enhance accident severity classifications.
- Governments and transport authorities employ predictive analytics for risk assessment and policy formulation [5].

RESEARCH PROBLEM

Severe injuries, fatalities, and economic losses are caused by traffic accidents, which require improved predictive models [1].

Conventional statistical methods cannot manage sophisticated accident severity factors efficiently, whereas ML algorithms provide promising solutions but need to be optimised for practical use [2].

This study mainly focuses on incorporating various environmental, vehicle, and behavioural variables into predictive models.

Identifying significant accident severity predictors can improve road safety and emergency response planning.



RESEARCH AIM AND OBJECTIVES

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- **Aim:** The research aims to design ML models (Gradient Boosting, Bagging, AdaBoost, and Random Forest Classifier) to significantly predict the severity of traffic accidents based on historical data and multivarious influence factors.
 - **Objectives:**
 - To determine prominent factors in accident severity and their impact on traffic severity based on their correlations.
 - To perform different ML algorithms with accuracy percentage, classification report, confusion matrices, and loss function.
 - To compare their performance based on evaluation metrics to identify the best-suited models for predicting traffic accident severity.
 - To optimise and construct ML models to be implemented in real life to observe their performance against real-life accident data.
 - To provide diverse actionable insights for policymakers to improve road safety measures.

LITERATURE REVIEW AND LITERATURE GAP

Literature Review:

- ML algorithms such as Random Forest (87% accuracy) and Neural Networks (80%) are superior to conventional statistical approaches for predicting accident severity [4].
- Research focuses on significant predictors, including weather, road conditions, and driving behaviour, but demands massive data preprocessing steps to predict road accident severity accurately by MLP + random forest model (94%) [6].

Literature gap:

- Limited research integrates diverse behavioural factors, and real-time accident prediction models remain underexplored.
- Existing models lack explainability, making adoption by policymakers challenging.

RESEARCH METHODOLOGY



Research Method: A secondary quantitative research approach using ML models to predict accident severity is selected.

Data Collection: The secondary data is chosen from an authentic open source named Kaggle, which contains road conditions, driver details, and vehicle information regarding weather conditions [3]. Chosen Dataset link: <https://www.kaggle.com/code/poojatelavane/road-traffic-accident-severity-prediction/input>

Evaluation Metrics and Algorithms: Gradient Boosting, Bagging, AdaBoost, and Random Forest Classifiers are going to perform with accuracy percentage, classification report, confusion matrices, loss function, and Graphical User Interface for real-life application.

PROJECT PLANNING AND RESOURCES

Task	Week 1-2	Week 3-4	Week 5-6	Week 7-8	Week 9-10	Week 11-12
<u>Evaluation</u> and approval of the proposal						
Evaluation of Research aim, objectives, questions, and hypothesis.						
Proceeding with Introduction						
Reviewing Previous Studies						
Illustrating the Methodological choices						
Secondary Data Collection						
Data Analysis and Software implementation						
Evaluation of ML Models						
Evaluating results that have been obtained from Software incorporation by GUI						
Discussion with previous studies						
Conclusions, Recommendations, and Future Scope						
Final submission						

PROJECT IMPACT AND LIMITATIONS

- **Impact:**

- It improves road safety by predicting the severity of accidents and facilitating emergency response.
- Assists policymakers in adopting evidence-based traffic regulations to optimise resource allocation for preventing accidents.

- **Limitations:**

- Dependence on data completeness and quality and real-time prediction is still a challenge for some unknown factors.
- Model interpretability also impacts the process of adoption for policymakers.

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THANK YOU