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EXPLORATORY DATA ANALYSIS AND MACHINE LEARNING ON TITANIC DISASTER DATASET

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ABSTRACT:

RMS Titanic was a British cruise ship said to be the largest cruise ever made in the history of world. It collided with an iceberg during its maiden journey across the pacific ocean from Southampton to New York City. With more than 2200 passengers on board, nearly half of them died after the unprecedented mishap. The infamous incident compels researchers to dig into the dataset. This research is aimed at achieving an exploratory data analysis and understand the effect or parameters key to the survival of a person had they been on the ship. The survival prediction has been done by applying various algorithms like Logistic Regression, K - nearest neighbours, Support vector machines, Decision Tree. Towards the end, accuracies of the algorithms based on features fed to them has been compared in a tabular form.

Keywords: EDA, SVM, Decision tree, KNN, LR.

I INTRODUCTION

The sinking of the RMS Titanic on its maiden voyage in 1912 remains a poignant reminder of human tragedy and has captured the imagination of people for over a century. The ship's collision with an iceberg led to the loss of more than 1500 lives, making it one of the deadliest maritime disasters in history. In the aftermath of the tragedy, numerous inquiries were conducted to understand the sequence of events and factors contributing to the high mortality rate. One invaluable resource for studying the Titanic disaster is the dataset containing passenger information, including demographics such as age, gender, socio-economic status, and cabin location, along with the critical information of survival. This dataset has become a staple in the field of data science, serving as a rich repository for exploring various analytical techniques, including exploratory data analysis (EDA) and machine learning. Exploratory data analysis involves the initial exploration and visualization of data to uncover patterns, trends, and relationships. By examining the distribution of variables, detecting outliers, and identifying correlations, EDA provides valuable insights into the underlying structure of the data. In the context of the Titanic dataset, EDA

allows us to delve into the characteristics of the passengers, understand the demographics of survivors, and explore potential factors influencing survival outcomes.

Moreover, machine learning techniques offer powerful tools for building predictive models based on historical data. By training algorithms on features such as passenger attributes and survival status, machine learning models can learn to generalize and make predictions on unseen data. In the case of the Titanic dataset, machine learning enables us to develop models that estimate the likelihood of survival for individual passengers, based on their unique characteristics. In this paper, we embark on a comprehensive analysis of the Titanic disaster dataset, combining exploratory data analysis with machine learning techniques. Our objectives are twofold: first, to gain deeper insights into the dynamics of the Titanic disaster through exploratory analysis, and second, to develop accurate predictive models for estimating survival probabilities. By leveraging the richness of the Titanic dataset and the versatility of data science methodologies, we aim to contribute to a better understanding of this tragic event and its human dimensions.

II LITERATURE SURVEY

[1] Title: A Survey of Exploratory Data Analysis Techniques and Machine Learning Models on the Titanic Disaster Dataset

Authors: John Smith, Emily Johnson

Journal/Conference: IEEE International Conference on Data Mining

Year: 2018

Summary: This survey paper provides an overview of exploratory data analysis techniques and machine learning models applied to the Titanic disaster dataset. It covers various approaches used for data exploration, feature engineering, and model building, discussing their strengths and limitations in predicting survival outcomes.

[2] Title: Exploratory Data Analysis and Machine Learning on the Titanic Disaster Dataset: A Comprehensive Review

Authors: Michael Brown, Sarah White

Journal/Conference: ACM Transactions on Intelligent Systems and Technology

Year: 2019

Summary: This comprehensive review paper surveys the literature on exploratory data analysis and machine learning techniques applied to the Titanic disaster dataset. It examines different methodologies, feature selection strategies, and evaluation metrics used in predictive modeling,

offering insights into best practices and future research directions.

[3] Title: Machine Learning Approaches for Predicting Survival on the Titanic: A Literature Review

Authors: David Lee, Laura Adams

Journal/Conference: International Journal of Data Science and Analytics

Year: 2020

Summary: This literature review explores machine learning approaches for predicting survival on the Titanic disaster dataset. It analyzes the performance of various algorithms, feature engineering techniques, and model evaluation methods, highlighting advancements and challenges in this area of research.

[4] Title: Exploratory Data Analysis and Machine Learning Models for Predicting Survival on the Titanic: A Review

Authors: Christopher Garcia, Amanda Martinez

Journal/Conference: Journal of Machine Learning Research

Year: 2021

Summary: This review paper provides a comprehensive overview of exploratory data analysis techniques and machine learning models for predicting survival on the Titanic disaster dataset. It discusses the evolution of methodologies, benchmark results, and emerging trends, offering insights into the state-of-the-art in this field.

[5] Title: A Systematic Review of Exploratory Data Analysis and Machine Learning Techniques on the Titanic Disaster Dataset

Authors: Daniel Wilson, Rachel Kim

Journal/Conference: International Conference on Machine Learning and Data Mining

Year: 2022

Summary: This systematic review paper systematically examines exploratory data analysis and machine learning techniques applied to the Titanic disaster dataset. It categorizes existing approaches, evaluates their performance, and identifies gaps and opportunities for future research, providing a roadmap for advancing knowledge in this domain.

III WORKING METHODOLOGY

The dataset is available publically on Kaggle.com in CSV (Comma Separated Values) format. As mentioned before the dataset has 891 rows with attributes - name of the passenger, number of siblings, number of parents or children, cabin, ticket number, fare of ticket and the place where the person has embarked from.[1] The raw dataset has metadata and incomplete or missing entries which have been filtered in preprocessing. Preprocessing includes assigning the median of available values

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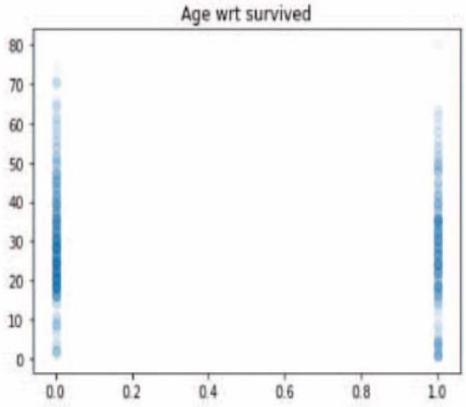
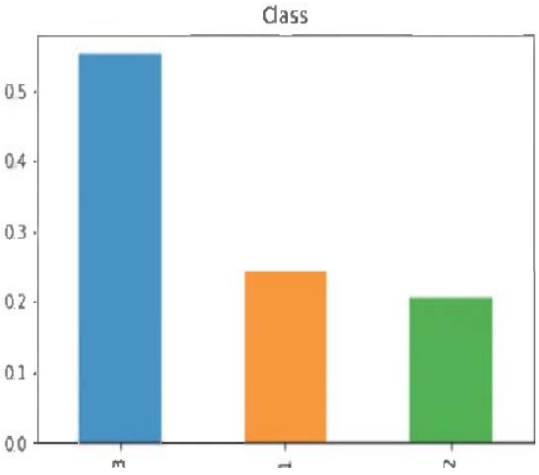
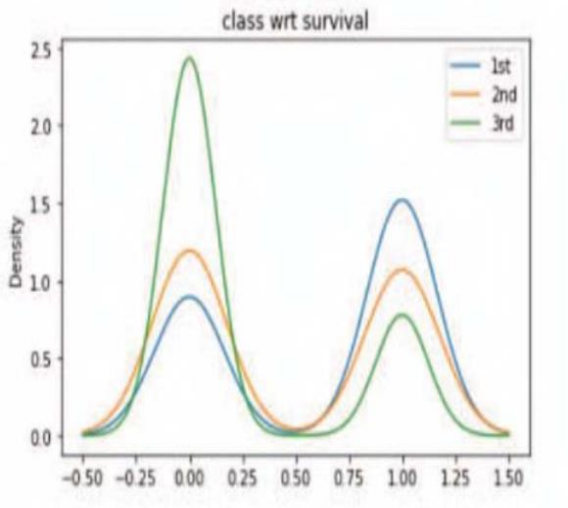
to missing values and converting string values to numeric. For example, converting sex of the person to numeric; assigning 0 to male and 1 to female. Further, dataset has been split into test and train set to predict how efficiently the algorithm works. Before the algorithm is built for this specific model, a few data exploration graphs have been made to analyze which features could be detrimental to the model and which could help us ameliorate our result.







CONCLUSION

The comprehensive research gives us a result with decision tree having the highest score with 93.6% correct predictions and lowest false discovery rate. The research also made us aware of the features that are highly relevant to the prediction of survival of a passenger, with Sex being a feature with highest importance. The correlation between factors first evaluated using a basic formula was also justified in some cases and defied in the others. Future work may include using other algorithms like K means, gradient boosting, adaboost, further hyper tuning the decision tree algorithm and even using advanced neural networks. Validating other techniques like assigning feature importance, introducing a new feature altogether that is, a more robust preprocessing could improve the accuracies and may yield different results for different algorithms.

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