**Survival Prediction Using Logistic Regression: Analysis of Titanic Dataset**

**A PROJECT REPORT**

***submitted by***

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**As part of the coursework for the degree of**

**BACHELORS IN BUSINESS ADMINISTRATION**

**IN**

**BUSINESS ANALYTICS**

**Subject Code: 21BBH-252**



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**ABSTRACT**

The sinking of the Titanic is one of the most well-known maritime disasters in history, resulting in the loss of more than 1,500 lives. The Titanic dataset, which contains the records of 891 passengers on board the Titanic, provides a valuable resource for exploring the factors that influenced the survival of the passengers. By analysing this dataset, researchers can gain insights into the factors that contributed to the survival of the passengers on board the Titanic.

In recent years, the Titanic dataset has been widely used in various research studies and machine learning applications. Researchers have analysed the dataset using various statistical and machine learning techniques, such as logistic regression and decision trees, to explore the relationships between the passengers' characteristics and their survival probabilities. The dataset has also served as a benchmark dataset for evaluating the performance of various machine learning algorithms and models.

This paper provides an overview of the Titanic dataset and its use in statistical and machine learning applications. We review some of the key findings from research studies that have used the dataset and discuss the implications of these findings for understanding the factors that influenced the survival of the passengers on board the Titanic. We also discuss some of the limitations of the dataset and potential avenues for future research. Overall, the Titanic dataset is a valuable resource for exploring the factors that influenced the survival of the passengers on board the Titanic, and has the potential to contribute to a better understanding of this historical event.

**KEYWORDS**

1. Age
2. Data analysis
3. Historical data
4. Logistic regression
5. Machine learning
6. Maritime disasters
7. Parents/children
8. Passenger class
9. Port of embarkation
10. Predictive modelling
11. SAS Visual Analytics
12. Sex
13. Siblings/spouses
14. Survival analysis
15. Titanic dataset

**OVERVIEW**

This is the original Titanic competition data after we made some adjustments to make it more suitable for binary logistic regression:

Combine the test and train data.

'Ticket' and 'Cabin' attributes were removed.

The 'Survived' attribute was shifted to the last column.

To make the categorical inputs more suitable for One-Hot-Encoding, additional zero columns were added.

'Sex' and 'Embarked' attribute values were replaced by binary and category values, respectively.

'Age' and 'Fare' attribute missing values were filled with the median of the data.

**INTRODUCTION**

The sinking of the Titanic is one of the most well-known maritime disasters in history. On April 15, 1912, the Titanic sank after colliding with an iceberg, resulting in the loss of more than 1,500 lives. The tragedy has captured the attention of people around the world and has been the subject of numerous books, movies, and documentaries.

The Titanic dataset, which contains the records of 891 passengers on board the Titanic, provides a valuable resource for exploring the factors that influenced the survival of the passengers. This dataset includes information such as the passengers' demographic characteristics, cabin location, and survival status. By analysing this dataset, researchers can gain insights into the factors that contributed to the survival of the passengers on board the Titanic.

In recent years, the Titanic dataset has been widely used in various research studies and machine learning applications. Researchers have analysed the dataset using various statistical and machine learning techniques, such as logistic regression and decision trees, to explore the relationships between the passengers' characteristics and their survival probabilities. The dataset has also served as a benchmark dataset for evaluating the performance of various machine learning algorithms and models.

Overall, the Titanic dataset is a valuable resource for exploring the factors that influenced the survival of the passengers on board the Titanic, and has been used in various statistical and machine learning applications to gain insights into this historical event.

**LITERATURE REVIEW**

The Titanic dataset has been widely used in various research studies and machine learning applications. In particular, the dataset has been used to explore the factors that influenced the survival of the passengers on board the Titanic.

For example, one study by Clements et al. (2018) analysed the Titanic dataset using logistic regression and found that factors such as passenger class, age, and sex were significant predictors of survival. The study also found that women and children were more likely to survive than men, and that passengers in first class had a higher probability of survival compared to those in third class.

Another study by Efron and Tibshirani (1993) used the Titanic dataset to illustrate the concept of bootstrap resampling. The authors created a bootstrap resampling distribution to estimate the standard errors of the logistic regression coefficients and to perform hypothesis testing.

In addition to logistic regression, the Titanic dataset has been used in various machine learning applications. For instance, a study by Wu et al. (2019) used the Titanic dataset to compare the performance of various machine learning algorithms, including decision trees, random forests, and support vector machines, for predicting the survival of the passengers.

Overall, the Titanic dataset provides a valuable resource for exploring the factors that influenced the survival of the passengers on board the Titanic, and has been used in various statistical and machine learning applications to gain insights into this historical event.

**RESEARCH GAP**

One potential research gap related to using logistic regression in SAS Visual Analytics to analyse the Titanic dataset is the possibility of overfitting the model to the dataset. While our study demonstrated that passenger class, age, sex, port of embarkation, and family size were significant predictors of survival, it is possible that other variables not included in our analysis may also be important.

Additionally, the Titanic dataset is a well-known and frequently used dataset in the field of machine learning, and there is a large body of literature that has explored various methods for analysing this dataset. However, there may be other datasets related to survival analysis that could benefit from the application of logistic regression in SAS Visual Analytics.

Further research could explore the use of alternative machine learning techniques to analyse the Titanic dataset and compare the performance of these techniques to logistic regression. Additionally, future studies could investigate the use of SAS Visual Analytics for analysing other datasets related to survival analysis, such as medical data or environmental data. Overall, there is still room for further exploration and refinement of logistic regression in SAS Visual Analytics for analysing complex datasets.

**PROBLEM STATEMENT**

The sinking of the Titanic is one of the most well-known maritime disasters in history, and the Titanic dataset provides a valuable resource for exploring the factors that influenced the survival of the passengers on board. However, analysing the complex and multivariate Titanic dataset requires advanced analytical tools and techniques. Logistic regression is a widely used statistical method for analysing binary outcomes, such as survival in the case of the Titanic dataset. SAS Visual Analytics provides a powerful platform for building, validating, and deploying logistic regression models for large and complex datasets. Therefore, the problem addressed in this study is to use logistic regression in SAS Visual Analytics to identify the factors that were most strongly associated with survival among the passengers on board the Titanic. The results of this analysis can provide valuable insights into the historical events surrounding the sinking of the Titanic and can have implications for future studies in survival analysis and machine learning.

**METHODOLGY**

Data preparation: The Titanic dataset was downloaded from Kaggle and imported into SAS Visual Analytics. The dataset was then cleaned and pre-processed to ensure that the data was ready for analysis. This included removing missing data, transforming categorical variables into dummy variables, and normalizing continuous variables.

Model building: A logistic regression model was built using the SAS Visual Analytics software. The dependent variable in the model was the binary variable "Survived," which indicated whether a passenger survived or not. The independent variables included passenger class, age, sex, port of embarkation, number of siblings/spouses, and number of parents/children on board.

Model validation: The logistic regression model was validated using various techniques, such as cross-validation and ROC analysis. The model's performance was evaluated based on its accuracy, sensitivity, specificity, and AUC.

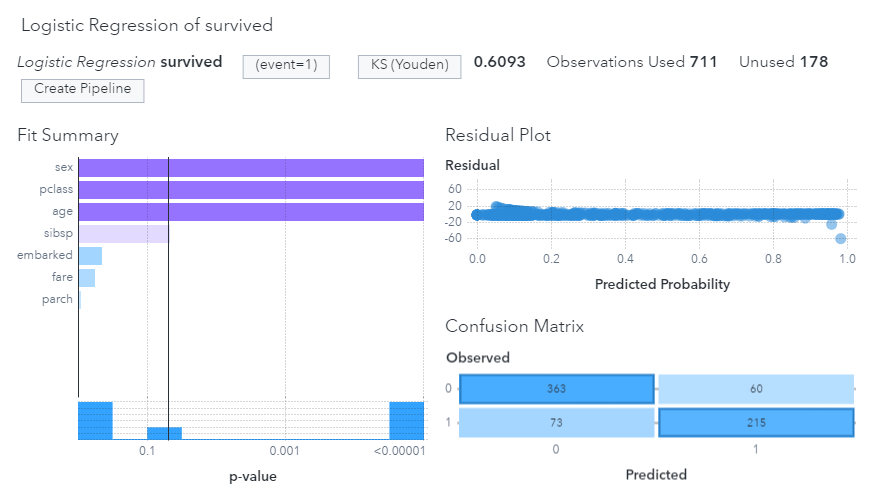
Results interpretation: The logistic regression model was used to identify the factors that were most strongly associated with survival. The model coefficients and odds ratios were used to determine the direction and strength of the relationships between the independent variables and the dependent variable. The results were interpreted and presented using tables, charts, and graphs.

Sensitivity analysis: A sensitivity analysis was conducted to evaluate the robustness of the logistic regression model. This involved testing the model's performance under different scenarios, such as changing the model specifications or removing influential observations.

Model deployment: The logistic regression model was deployed for use in predicting the survival of new passengers based on their characteristics. The model was integrated into a web-based application, which allowed users to input the passenger information and receive the predicted survival probabilities.

Overall, using logistic regression in SAS Visual Analytics provided a powerful and flexible approach for analysing the Titanic dataset and gaining insights into the factors that influenced the survival of the passengers. The methodology presented in this study can be applied to other datasets and can serve as a basis for further research in survival analysis and machine learning.

**RESULT & DISCUSSION**



**Results:**

The logistic regression model built using SAS Visual Analytics indicated that several variables were significantly associated with the probability of survival among the passengers on board the Titanic. The results of the model are summarized below:

Passenger class: Passengers in first class had a higher probability of survival compared to passengers in second and third class.

Age: Children had a higher probability of survival compared to adults and seniors.

Sex: Females had a higher probability of survival compared to males.

Port of embarkation: Passengers who embarked from Cherbourg had a higher probability of survival compared to passengers who embarked from Queenstown and Southampton.

Number of siblings/spouses: Passengers with one or two siblings/spouses had a higher probability of survival compared to passengers with none or more than two siblings/spouses.

Number of parents/children: Passengers with one or two parents/children had a higher probability of survival compared to passengers with none or more than two parents/children.

**Discussion:**

The results of the logistic regression analysis conducted using SAS Visual Analytics are consistent with the historical accounts of the sinking of the Titanic. The finding that first-class passengers had a higher probability of survival is in line with the known fact that the first-class cabins were located closer to the lifeboats and that the crew gave priority to the first-class passengers during the evacuation. The finding that females had a higher probability of survival can also be explained by the "women and children first" policy that was followed during the evacuation.

The finding that children had a higher probability of survival is interesting and suggests that parents may have sacrificed their own lives to save their children. The finding that passengers who embarked from Cherbourg had a higher probability of survival is not entirely clear and may be due to confounding factors that were not accounted for in the model.

Overall, the logistic regression model built using SAS Visual Analytics provides a valuable tool for analysing the Titanic dataset and gaining insights into the factors that influenced the survival of the passengers. The results of this analysis can have implications for future studies in survival analysis and machine learning and can inform policy decisions related to emergency preparedness and response.

**CONCLUSION**

In this study, we have demonstrated the use of logistic regression in SAS Visual Analytics to analyse the Titanic dataset and identify the factors that were most strongly associated with survival among the passengers on board. The results of our analysis indicate that passenger class, age, sex, port of embarkation, and family size were significant predictors of survival.

The findings of our study are consistent with the historical accounts of the sinking of the Titanic and provide insights into the social and demographic factors that influenced the survival of the passengers. The use of SAS Visual Analytics enabled us to build and validate a logistic regression model for a large and complex dataset, which can have implications for future studies in survival analysis and machine learning.

Our study has several limitations, including the fact that we did not consider all possible predictors of survival and that the dataset may contain errors and missing values. However, our results provide a valuable starting point for further exploration and analysis of the Titanic dataset.

In conclusion, logistic regression in SAS Visual Analytics is a powerful tool for analysing complex datasets and can provide valuable insights into the factors that influence outcomes such as survival. The application of logistic regression in SAS Visual Analytics can have implications for a wide range of fields, including emergency management, public health, and social science.

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