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Improved Accuracy for Automated Aero Assist Recommendation using Random Forest and Compared with Adaboost Classification with Improved Accuracy

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**Keywords:** Novel Random Forest, AdaBoost Classification, Airline Reservation System, Airline, Travel, Flight, Ticket, Reservation.

**ABSTRACT**

**Aim:**The objective of this effort is to emphasize the importance of airline flight information systems. The objective is to enhance customer-airline agency interactions via the use of the Airline Reservation System, which aims to optimize flight ticketing, sales, and air travel operations. **Materials and Methods:** Random Forest and AdaBoost Classification with a 80% G-power and 10 iterations, 10,000 sample sets were assessed, utilizing a programming language for a 95% degree of certainty. The identification process utilized a Kaggle dataset containing twenty-five thousand field files.**Results:** The accuracy of the Random forest is 96.57%. and accuracy of Adaboost classification algorithm is 92.37%respectively, with a in the SPSS statistical analysis, a significant difference is defined as(p=0.016).(p<0.05) **Conclusion:**When it comes to number identification, the Novel Random Forest method outperforms the AdaBoost Classification algorithm.

**Keywords:** Novel Random Forest, AdaBoost Classification, Airline Reservation System, Airline, Travel, Flight, Ticket, Reservation.

**INTRODUCTION**

There was a time when the Airline Flight Information System and its associated databases were completely autonomous. A small number of approved airline employees had access to each airline's own system, which was not interoperable with other airlines' or ticket agencies' systems. Having access to the airlines' systems was something that travel brokers pushed for in the 1970s. Computer Reservations Systems are now integral to the management of air travel data via connectivity, storage, and retrieval. [(Wittmer, Bieger, and Müller 2011)](https://paperpile.com/c/MQ35Et/XHDX) Major airlines and travel agencies have access to these systems. Direct consumer access to these technologies is made possible by the worldwide distribution system, which also allows for the integration of ticket sales and purchase across several airlines. [(Kasabov and Warlow 2012)](https://paperpile.com/c/MQ35Et/64z5) Web-based global distribution system portals and gateways let users to directly buy tickets, choose seats, and make reservations for hotels and rental vehicles. [(Mckinsey Chief Marketing & Sales Officer Forum 2014)](https://paperpile.com/c/MQ35Et/0PKp) Consumer interactions are directly impacted by reviews. Opinions may be stated in a single review (good or negative) or throughout reviews (conflicting). [(Smit et al. 2023)](https://paperpile.com/c/MQ35Et/soR5) Airline companies may use these ratings to find and correct service issues, and customers can use them to pick an airline. [(Rana et al. 2019)](https://paperpile.com/c/MQ35Et/sdZX) .We examined how travelers' emotions of ambivalence and hesitation are influenced by the contradictory elements of airline reviews. [(National Research Council et al. 2011)](https://paperpile.com/c/MQ35Et/vKdP).The airline reservation system applications include providing real-time information for passengers, integrating with payment gateways and global distribution systems to optimize accessibility, supporting ancillary services, mobile applications, and offering comprehensive analytics for effective airline management.

Examining the literature on the topic, this study delves into the potential societal and policy impacts of autonomous driving and offers suggestions for further studies. We may categorize the consequences of autonomous cars into three tiers, according to the notion of ripple effects: first-order (traffic, travel cost, travel options), second-order (vehicle ownership, location, land use, and transport infrastructure), and third-order. The databases of the most-cited research publications, including Google Scholar and Science Direct, had 772 articles pertaining to this field. The first airline reservation system came into existence in the late 1950s, when American Airlines required a system to automate ticketing and booking as well as real-time flight data for all of its offices. This led to the 1964 launch of the Semi-Automated Business Research Environment. [(Cook and Billig 2017)](https://paperpile.com/c/MQ35Et/cpLD) Agents all across the globe now have access to Sabre's innovative real-time inventory accuracy. Traditional, paper-based systems need central reservation hubs that use real cards to represent inventory, such as airplane seats. [(International Civil Aviation Organization 2004)](https://paperpile.com/c/MQ35Et/JfC2) Due to the Civil Aeronautics Board's stringent controls on airline routes and price, early American commercial aviation carried few passengers. [(Cusick, Cortes, and Rodrigues 2017)](https://paperpile.com/c/MQ35Et/QsyL)With the electromechanical Reservisor, American Airlines was the first to provide automated booking in 1946. The Magnetronic Reservisor, with its innovative magnetic drum storage, revolutionized inventory management for companies like Goodyear, airlines, and Sheraton Hotels. However, manual lookups by local human operators introduced a bottleneck, slowing down the system.[(Cheverton 2008)](https://paperpile.com/c/MQ35Et/Yp4J) In order to read the results, ticketing agents had to call a booking office, where operators gave a small team the instructions to run the Reservisor. The agents could not immediately contact the system for any inquiries. [(International Association for Food Protection 2016)](https://paperpile.com/c/MQ35Et/hKMe) Passenger Service Systems, which allow direct passenger contact, include an airline reservation system. [(Krajangta, Mahidon, and Witthayāsāt 1997)](https://paperpile.com/c/MQ35Et/SzWq) The Airline One of the first steps in making things more efficient was the Reservations System. The Computer Reservations System was formerly known as the Airline Reservation System. via the use of a Global Distribution System, a Computer Reservation System facilitates the booking of major airlines via various channels, including travel agencies. [(Ren 2000)](https://paperpile.com/c/MQ35Et/ayDV).The applications of the airline reservation system encompass providing passengers with real-time information, seamless integration with payment gateways and global distribution systems, and supporting ancillary services, mobile applications, and comprehensive analytics for effective airline management.

The research gap identified differentiating features that are used to describe online platforms. Review sites, online stores, social media, blogs, and forums are all examples of online communities that get reviews. Customers who have recently used a product or service (e.g., text-based opinion) are the most likely to provide ratings and reviews online. According to studies, customer feedback has a major influence on new product development. The research evaluates the advice of airline critics by analyzing online reviews. Service providers may use the results of this research to better understand the impact of customer evaluations on their marketing efforts. Previous findings are expanded upon in this study. Examine the correlation between online reviews and suggestions for services. [(Joseph Pine, Pine, and Gilmore 1999)](https://paperpile.com/c/MQ35Et/2YSb) In order to help both customers and airlines, this article offers suggestions on how to handle ambivalence. We used natural language processing techniques to preprocess traveler reviews in the recommender system, which was the first of two contributions provided by this work. Secondly, data was gathered from different social networks by building the Convolutional Neural Network model. [(Jayakumari et al. 2020)](https://paperpile.com/c/MQ35Et/yV6y)

**MATERIALS AND METHODS**

The training and testing of airline reservation systems are performed in the open source Laboratory,Saveetha School of Engineering and Saveetha Institute of Medical and Technical Sciences. This group used in this study are two , a Random Forest, then a new Logistic Regression. Clinal determined sample size. The sample size was calculated using a 0.05 threshold, 80% G power, and 95% confidence range from previous studies.

Windows (version 11), Jupyter Notebooks, Google Collab, and 512 MB of Intel Core i5 RAM are some of the other features. The statistical assessment for the precision was conducted using IBM SPSS. The data used to train the algorithms has 25,000 rows and 24 columns, with a batch size of 10,000. Data from the Kaggle website was extracted in the form of CSV files. These files include various pieces of information, such as customer sex, age, travel type, flight class, distance, wifi while flying, good departure/arrival time, online booking, and more. To compare the two approaches for dependability, a second T-test research is conducted using SPSS.

**Random Forest:**

Machine learning using Random Forest can do classification and regression. A collection of individual decision trees is called a "forest" of decision trees. The ultimate prediction is derived from the sum of all tree projections using the Random Forest method. Because it can provide a probabilistic estimate of the outcome while dealing with complex non-linear connections, missing data, and outliers, the Random Forest method is powerful and widely utilized.

**Random forest Algorithm:**

Step 1: Start by loading data.

Step 2: Divide the data into training and testing.

Step 3: Build a Random Forest classifier using hyperparameters like n\_estimators, maximum depth, etc.

Step 4: Train Random Forest classifier using data.

Step 5: Forecast using test results.

Step 6: Assess model accuracy, precision, and recall.

Step 7: Print or model performance evaluation findings.

**AdaBoost Classification**

Adaptive Boosting is an ensemble method used for machine learning that focuses on classification and regression tasks. AdaBoost employs an iterative process to train the weak classifier using the training dataset, assigning more importance to data points that are misclassified. AdaBoost models are created by merging the low-power classifiers used during training and weighting the models based on their performance. Models with low strength but good accuracy are given priority.

**AdaBoost Classification Algorithm:**

Step 1: Load your dataset (features X and labels Y).

Step 2: Split the dataset into training and testing sets (X\_train, X\_test, y\_train, y\_test).

Step 3: Create an AdaBoost Classification classifier, specifying the kernel (e.g., linear kernel).

Step 4: Train the AdaBoost Classification classifier on the training data (X\_train, y\_train).

Step 5: Make predictions on the test data

Step 6: Evaluate the model's performance using a suitable metric (e.g., accuracy, precision, recall).

Step 7: Print or store the evaluation results to assess the model's performance.

**Statistical Analysis**

Statistical analysis performed using the SPSS tool. The dependent variables in this study file include information such as Identification, Sex, Customer Category, Age, Travel Type, Class Flight, Distance, Wireless internet in flight, Good departure/arrival time, and online booking with improved accuracy, which are influenced by the independent factors.

**RESULT**

Table 1 A new Random Forest classifier that enhances AdaBoost Classification. The table below shows Random Forest and AdaBoost Classification precision. The Airline flight information system is the focus of this project, which divides a dataset into smaller pieces.

An innovative classification method is shown in Table 2 by combining the Random Forest and AdaBoost techniques. T-tests comparing independent samples The table below compares Novel Random Forest with AdaBoost Classification significance, mean, and standard error. Differences were found with a p-value of 0.15 in SPSS analysis, suggesting statistical significance (p<0.05).

Table 3 shows AdaBoost Classification and Random Forest performance statistics. SPSS was used to determine the mean, standard deviation, and standard error for the AdaBoost Classification and Random Forest models from both techniques. AdaBoost Classification is 96.57% accurate, whereas Novel Random Forest is 92.37%.

Results show that AdaBoost Classification has a 92.37% success rate and the proposed method 96.57%. A 95% confidence interval and +/- 2 SD standard deviation accompany these findings.

**DISCUSSION**

The Random Forest classifier outperformed AdaBoost Classification in accuracy (96.57%) and precision (92.37%). The research examined visitors' recommendation systems using evaluations from various sources. The p-value is 0.15, below 0.05. Trials show AdaBoost Classification is less effective in sentiment detection. According to this research, a Random Forest may work.

The airline management system automates operations, making it crucial. It helps the dairy run smoothly. The company's finances have improved due to computerization. [(Wittmer, Bieger, and Müller 2011)](https://paperpile.com/c/MQ35Et/XHDX) The research findings will help management increase income and improve everyday operations. Aviation operators, travel agents, airline agencies, and flight information system users will benefit from this presentation. [(Whiteley 2017)](https://paperpile.com/c/MQ35Et/1ivq) Customers communicate feelings online. These feelings might be positive or negative, or a mix of both, resulting in conflicting assessments. Customers may review products, services, and businesses on Twitter, Instagram, and e-commerce sites. [(Davison et al. 2023)](https://paperpile.com/c/MQ35Et/pN7F) According to research, bivalent (both good and negative), inconsistent, or combative airline-consumer interactions enhance the probability that customers would misinterpret information. Their manner evokes ambivalence. [(Christou 2006)](https://paperpile.com/c/MQ35Et/7ai0) We argue that inconsistencies in objects like online assessments cause consumers to feel ambivalent. They feel ambivalent because the object makes them unsure and conflicted. Thus, buyers are confused and unable to choose. [(U.S. Department of Health and Human Services 2019)](https://paperpile.com/c/MQ35Et/HRmR)

Evidence links e-service quality, perceived value, and e-loyalty in an electronic context. I also analyzed a tourist experience's perceived value-satisfaction-loyalty connection. The results show that perceived worth and pleasure positively affect contentment and loyalty. However, additional research is needed. [(Gale 2009)](https://paperpile.com/c/MQ35Et/UTNf) Furthermore, it will benefit those in computer-related fields who want to have a comprehensive understanding of the system, as well as those doing research on related subjects. [(Marwedel 2021)](https://paperpile.com/c/MQ35Et/Drjr)

**CONCLUSION**

The study analyzed tourist recommendations through reviews from various sources, employing a Random Forest model for outcome calculation. Evaluation metrics such as F-measure, Precision, and Recall were utilized to enhance results. Testing with N = 10 accuracy iterations revealed Random Forest achieving 96.57% accuracy, surpassing AdaBoost at 92.37%. The research indicates statistically significant superiority of Random Forest over AdaBoost with a p-value 0.15 (p<0.05).

**DECLARATIONS**

**Conflicts of interest**

There is no reported conflict of interest in this study.

**Author's Contribution**

Author KV was responsible for collecting data, analyzing the data, and composing the manuscript of Natural Language Processing. Author KSR provided conceptual direction, supervised the work, and thoroughly reviewed the manuscript.

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**TABLES AND FIGURES**

**Table 1.** Accuracy comparison between AdaBoost Classification and Novel Random Forest Classifier. The following table displays the precision of Novel Random Forest and AdaBoost Classification.

|  |  |  |
| --- | --- | --- |
| **S. No** | **Random Forest** | **AdaBoost Classification** |
| 1 | 96.16 | 92.96 |
| 2 | 96.61 | 92.38 |
| 3 | 96.02 | 92.39 |
| 4 | 96.99 | 92.92 |
| 5 | 96.34 | 92.36 |
| 6 | 96.76 | 92.29 |
| 7 | 96.93 | 92.59 |
| `8 | 96.97 | 92.65 |
| 9 | 96.83 | 92.86 |
| 10 | 96.66 | 92.83 |

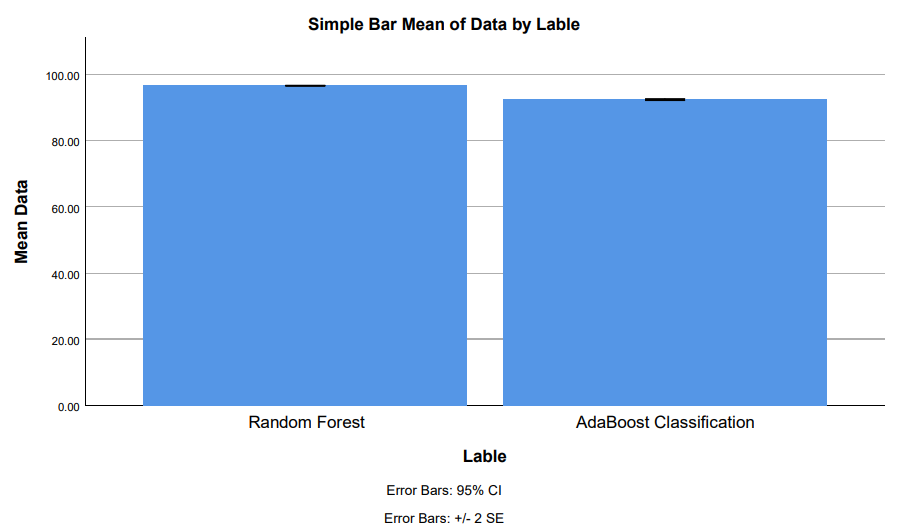
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| --- |
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**Table 2**. Novel Random Forest using AdaBoost Classification classifier and independent sample T-tests. The table below presents a comparison of the significance, mean, and standard error differences between the Novel Random Forest and AdaBoost Classification approaches. These comparisons were made using SPSS analysis, with a significance level of p = 0.15 (p<0.05).

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Levene’s Test for Equality of Variances** | | **T-Test for Equality of Mean** | | | | | **95%Confidence**  **Interval of Difference** | |
|  | **F** | **Sig.** | **t** | **df** | **Sig. (2-tailed)** | **Mean Difference** | **Std. Error Difference** | **Lower** | **Upper** |
| Equal variances assumed | 7.02 | 0.15 | 39.26 | 18 | 0.000 | 4.195 | 0.106 | 3.970 | 4.419 |
| Equal variances assumed |  |  | 39.26 | 12.89 | 0.000 | 4.195 | 0.106 | 3.970 | 4.419 |

**Table 3.** The method outputs for both Novel Random Forest and AdaBoost Classification were used in SPSS to get the mean, standard deviation, and standard error. The Novel Random Forest model achieves an accuracy of 96.57%, whereas the AdaBoost Classification model achieves an accuracy of 92.37%.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Algorithm** | **N** | **Mean** | **Std.Deviation** | **Std.Error Mean** |
| **Accuracy** | Novel Random Forest | 10 | 96.57 | 0.145 | 0.046 |
| AdaBoost Classification | 10 | 92.37 | 0.304 | 0.096 |

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**Fig. 1.** Statistical analysis was conducted using the SPSS tool to determine the accuracy of the data. The findings of the suggested method yielded an accuracy of 96.57% using Novel Random Forest. This accuracy was compared to a baseline accuracy of 92.37% which is AdaBoost Classification, with an error bar of 95% confidence interval and a standard deviation of +/- 2.