**Title Page 3**

Enhanced Accuracy for Automated Aero Assist Recommendation using Random Forest and Compared with Support Vector Machine with Improved Accuracy

K. Varshini1, K.Sashi Rekha 2

K. Varshini1

Project student,

Department of Computer Science and Engineering,

Saveetha School of Engineering,

Saveetha Institute of Medical and Technical Sciences,

Saveetha University, Chennai, Tamil Nadu, Pincode: 602105.

kethuvarshini1556.sse@saveetha.com

K.Sashi rekha 2

Research Guide, Corresponding Author,

Department of Computer Science and Engineering,

Saveetha School of Engineering,

Saveetha Institute of Medical and Technical Sciences,

Saveetha University, Chennai, Tamil Nadu, Pincode: 602105.

sashirekhak.sse@saveetha.com

**Keywords:** Novel Random Forest, Support Vector Machine, Airline Reservation System, Airline, Travel, Flight, Ticket, Reservation.

**ABSTRACT**

**Aim:** Bringing attention to the significance of flight information systems for airlines is the goal of this endeavor. Optimizing flight ticketing, sales, and air travel operations is the goal of the Airline Reservation System, which strives to improve customer-airline agency relations. **Materials and Methods:** This study compares Random Forest and Support vector machines using 10,000 samples across 10 iterations, achieving an 80% G-power. with a 95% confidence level. The identification dataset utilized in the study comprises 25,000 database records sourced from the field, obtained through a Kaggle dataset.**Results:** With an accuracy of 96.57%, the new Random Forest approach outperforms the most recent Support Vector Machine upgrade by a wide margin. The facts as they stand have major implications for statistics. (0.044, p-value).appreciable (p<0.05). **Conclusion:** The Random Forest approach achieves better results than the Support Vector Machine technique in number identification.

**Keywords:** Novel Random Forest, Support Vector Machine, Airline Reservation System, Airline, Travel, Flight, Ticket, Reservation.

**INTRODUCTION**

Once upon a time, the Airline Flight Information System and the databases connected to it operated independently. The proprietary systems of the airlines were incompatible with one another and with the ticketing bureaus, and only a select few authorized staff had access to them. In the 1970s, travel agents advocated for the right to access the airline networks. These days, connecting, storing, and retrieving data pertaining to air travel is impossible without computer reservation systems. [(Wittmer, Bieger, and Müller 2011)](https://paperpile.com/c/MQ35Et/XHDX) The global distribution system enables the integration of ticket sales and purchasing across several airlines and provides direct customer access to these technologies. [(Kasabov and Warlow 2012)](https://paperpile.com/c/MQ35Et/64z5) Users are able to purchase tickets, choose seats, and reserve hotels and rental cars directly via web-based gateways and portals that are part of the worldwide distribution system. [(Mckinsey Chief Marketing & Sales Officer Forum 2014)](https://paperpile.com/c/MQ35Et/0PKp) Several advantages come with crossing international boundaries Either a single review (positive or negative) or several reviews (conflicting) could express an opinion. [(Smit et al. 2023)](https://paperpile.com/c/MQ35Et/soR5) In recent times, contradictory internet reviews—a topic that has received less attention have grown in importance. Customers may use them to choose an airline, and airlines can use them to identify and fix service concerns. [(Rana et al. 2019)](https://paperpile.com/c/MQ35Et/sdZX) A new study paradigm is exploring passenger perceptions that induce doubt or ambivalence when making a decision, in an effort to resolve the issue of contradicting airline evaluations. We looked at how the contradicting aspects of airline evaluations impact passengers' ambivalence and hesitancy. [(National Research Council et al. 2011)](https://paperpile.com/c/MQ35Et/vKdP)Airline applications include mobile booking, in-flight entertainment, and crew scheduling apps for passengers, while operational systems manage reservations, revenue, and maintenance to optimize overall airline efficiency.

This paper reviews the existing literature on the subject and explores the possible policy and social effects of autonomous driving, while also proposing avenues for further research. Using the concept of ripple effects, we may classify the impacts of autonomous vehicles into three levels: first-order (traffic, travel cost, travel alternatives), second-order (vehicle ownership, location, land use, and transport infrastructure), and third-order (all three). Google Scholar and Science Direct, two databases of highly-cited research papers, had 772 articles related to this area. To automate ticketing and booking and to provide all of its offices with real-time flight data, American Airlines needed a system in the late 1950s, and so the first airline reservation system was born. The Semi-Automated Business Research Environment was launched in 1964 as a result of this. [(Cook and Billig 2017)](https://paperpile.com/c/MQ35Et/cpLD) Central reservation hubs using physical cards to represent inventory, such airline seats, were necessary for traditional paper-based systems. [(International Civil Aviation Organization 2004)](https://paperpile.com/c/MQ35Et/JfC2) The Airline Deregulation Act, which deregulated the sector, demanded that airlines increase their efficiency to compete in a free market. Government tariffs used to ensure that airlines would make a profit. The travel industry relied on the Airline Reservation System and its successors in this unregulated climate. Few people rode in early commercial aircraft in the United States because of the Civil Aeronautics Board's strict regulations on airline routes and pricing. [(Cusick, Cortes, and Rodrigues 2017)](https://paperpile.com/c/MQ35Et/QsyL) American Airlines pioneered automated booking in 1946 with the electromechanical Reservisor. After it came the revolutionary Magnetronic Reservisor, a machine that stored data temporarily on a magnetic drum. A bottleneck occurred in the system as a result of the necessity for local human operators to do lookups. [(Cheverton 2008)](https://paperpile.com/c/MQ35Et/Yp4J) Booking office operators instructed a small crew to run the Reservisor, and ticketing agents had to phone them in order to view the findings. It took some time for the agents to get in touch with the system for any kind of inquiry. [(International Association for Food Protection 2016)](https://paperpile.com/c/MQ35Et/hKMe) An airline reservation system is one example of a Passenger Service System that enables direct passenger engagement. [(Krajangta, Mahidon, and Witthayāsāt 1997)](https://paperpile.com/c/MQ35Et/SzWq) A Flight Company The Reservations System was an early attempt at streamlining operations. An earlier name for what is now known as the Computer Reservations System was the Airline Reservation System. Booking major airlines via numerous channels, including travel agents, is made easier with the use of a Computer Reservation System and a Global Distribution System. [(Ren 2000)](https://paperpile.com/c/MQ35Et/ayDV)

The research gap identified Online platforms are characterized by distinguishing characteristics. The internet is home to many communities that solicit feedback, such as review sites, online shops, social media, blogs, and forums. The majority of internet ratings and reviews are from customers who have just utilized the product or service (e.g., text-based opinion). Research shows that consumer opinions have a significant role in shaping future product iterations. By examining internet evaluations, the study assesses the advice of airline critics. The findings of this study could help service companies learn how client reviews affect their advertising strategies. This research builds upon earlier results. Find out how service recommendations and internet reviews relate to one another. [(Joseph Pine, Pine, and Gilmore 1999)](https://paperpile.com/c/MQ35Et/2YSb) This article provides advice on how to deal with ambivalence, which can benefit airlines and consumers alike. Two things came out of this study. First, we preprocessed traveler evaluations in the recommender system using natural language processing methods. Second, the Convolutional Neural Network model was built using data collected from various social networks. [(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 , Support Vector Machines follow Random Forests. Clinical studies determine the sample size. The previous study was utilized to calculate the sample size, which was set at 80% G power, with a 95% confidence interval and a significance threshold of 0.05.

Along with Windows (version 11), additional features include Jupyter Notebooks, Google Collab, and 512 MB of Intel Core i5 RAM. Using IBM SPSS, we ran the statistical test to determine the accuracy. With 10,000 batches, the data utilized to train the algorithms comprises 24 columns and 25,000 rows. We used CSV files to pull data from the Kaggle website. Among the many pieces of data included in these files are the following: client sex, age, trip type, flight class, distance, wifi while flying, excellent departure/arrival time, online booking, and others. A second T-test study is carried out using SPSS to compare the two methods for reliability.

**Random Forest:**

Classification and regression are two tasks that machine learning using Random Forest can do. A "forest" of decision trees is just a grouping of individual trees. The Random Forest approach is used to obtain the final forecast by adding up all the tree projections. A strong and commonly used approach, Random Forest can offer a probabilistic estimate of the result even when dealing with complicated non-linear relationships, missing data, and outliers.

**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 save model performance evaluation findings.

**Support Vector Machine:**

A method often used in natural language processing, supervised motor learning, may be used to achieve reversion. A hyperplane in n-dimensional space is used by Support Vector Machine to properly segregate and classify input data points. The hyperplane's dimensionality is dictated by the dataset's feature count. For SVMs trained with exactly two parameters, the hyperplane forms a straight line in a two-dimensional space. If there are more than three features in the dataset, the hyperplane will become a two-dimensional plane.

**Support Vector Machine 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 a Support Vector Machine classifier, specifying the kernel (e.g., linear kernel).

Step 4: Train the Support Vector Machine 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: An improved Random Forest classifier for SVM. You can see the accuracy of Random Forest and Support Vector Machine in the table below. This research breaks down a dataset into smaller components and focuses on the airline flight information system.

Table 2 displays a novel classification approach that integrates the Random Forest and AdaBoost algorithms. Independent sample T-tests Statistical measures such as significance, mean, and standard error are compared between Novel Random Forest and Support Vector Machine in the table below. According to SPSS analysis, there were differences with a p-value of 0.044, indicating statistical significance (p<0.05).

Table 3 displays the data on the performance of Random Forest and Support Vector Machines. Results for the Random Forest and Support Vector Machine models, as well as their standard deviations and standard errors, were calculated using SPSS. The accuracy rate of Novel Random Forest is 93.43%, whereas that of Support Vector Machine is 96.57%.

With a success percentage of 96.57%, the suggested technique outperforms Support Vector Machine (93.43%). Results are presented with a 95% CI and a standard deviation of +/- 2 SD.

**DISCUSSION**

When comparing the two classifiers, Random Forest achieved better accuracy (96.57%) and precision (93.43%) than Support Vector Machine. Using assessments from a variety of sources, the study investigated visitors' recommendation systems. With a value of 0.044, the p-value is less than the significance level of 0.05. Support Vector Machine performs worse in sentiment detection trials. A Random Forest might be effective, based on these findings.

Because it automates processes, the airline management system is vital. Having it improves the dairy's efficiency. Computerization has helped the company's finances. [(Wittmer, Bieger, and Müller 2011)](https://paperpile.com/c/MQ35Et/XHDX) The results of the study will be useful for management in two ways: increasing revenue and enhancing day-to-day operations. Attendees of this presentation will include flight information system users, travel agents, airline agencies, and operators of aviation. [(Whiteley 2017)](https://paperpile.com/c/MQ35Et/1ivq) Online, customers express their emotions. These emotions could be good, bad, or neutral, leading to contradictory evaluations. Reviews of goods and services may be found on social media platforms like Twitter and Instagram as well as on e-commerce websites. [(Davison et al. 2023)](https://paperpile.com/c/MQ35Et/pN7F) Research shows that customers are more likely to misunderstand information in encounters between airlines and consumers that are bivalent (both positive and negative), inconsistent, or confrontational. They make you feel conflicted. [(Christou 2006)](https://paperpile.com/c/MQ35Et/7ai0) Our main point is that customers get mixed feelings when there are discrepancies in things like online evaluations. Because the thing evokes feelings of uncertainty and conflict in them, they experience ambivalence. This leaves consumers bewildered and unable to make a decision. [(U.S. Department of Health and Human Services 2019)](https://paperpile.com/c/MQ35Et/HRmR)

Online customer loyalty, service quality, and perceived value are all positively correlated. I also looked at the relationship between a tourist's pleasure, loyalty, and the perceived worth of their trip. Perceived value and pleasure have a favorable effect on happiness and loyalty, according to the data. But more study is required. [(Gale 2009)](https://paperpile.com/c/MQ35Et/UTNf) It will also be useful for researchers in the area of computers and related disciplines who want to have a thorough grasp of the system. [(Marwedel 2021](https://paperpile.com/c/MQ35Et/Drjr)**).**

**CONCLUSION**

In this study, tourist suggestions were analyzed through reviews from various sources, employing the Random Forest model for computation. Enhanced results were achieved using evaluation metrics like F-measure, Precision, and Recall. The recommendation system underwent evaluation, including feature extraction and the impact of feature count, with N = 10 accuracy iterations. Random Forest outperformed AdaBoost with a classification accuracy of 96.57%, surpassing Support Vector Machine with greater accuracy and interpretability, supported by a significant statistical value of p=0.044 (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.

**Acknowledgements**

The authors extend their appreciation to the Saveetha School of Engineering and Saveetha Institute of Medical and Technical Science (formerly Saveetha University) for offering the necessary support to successfully complete this project.

**Funding**

The authors express their gratitude to the following organizations for their financial support, which made it possible to carry out the study.

1. CK technology Pvt. Ltd Chennai.
2. Saveetha School of Engineering.
3. Saveetha Institute of Medical and Technical Sciences.
4. Saveetha University.

**REFERENCES**

[Cheverton, Peter. 2008. *Global Account Management: A Complete Action Kit of Tools and Techniques for Managing Key Global Customers*. Kogan Page Publishers.](http://paperpile.com/b/MQ35Et/Yp4J)

[Christou, Anastasia. 2006. *Narratives of Place, Culture and Identity: Second-Generation Greek-Americans Return “Home.”* Amsterdam University Press.](http://paperpile.com/b/MQ35Et/7ai0)

[Cook, Gerald N., and Bruce G. Billig. 2017. *Airline Operations and Management: A Management Textbook*. Routledge.](http://paperpile.com/b/MQ35Et/cpLD)

[Cusick, Stephen K., Antonio I. Cortes, and Clarence C. Rodrigues. 2017. *Commercial Aviation Safety, Sixth Edition*. McGraw Hill Professional.](http://paperpile.com/b/MQ35Et/QsyL)

[Davison, Michelle, Jason Chan, Meg Clarke, Caroline Mitchell, Alan Yan, and Elwyn Henaway. 2023. “Yarning to Reduce Take Own Leave Events in First Nations Patients Presenting to the Emergency Department-Presenting the Qualitative Themes and Co-Design of the Deadly RED Project.” *Health Promotion Journal of Australia: Official Journal of Australian Association of Health Promotion Professionals*, December. https://doi.org/](http://paperpile.com/b/MQ35Et/pN7F)[10.1002/hpja.835](http://dx.doi.org/10.1002/hpja.835)[.](http://paperpile.com/b/MQ35Et/pN7F)

[Gale, Bradley. 2009. *Managing Customer Value: Creating Quality and Service That Customers Can See*. Simon and Schuster.](http://paperpile.com/b/MQ35Et/UTNf)

[International Association for Food Protection. 2016. *Procedures to Investigate Waterborne Illness*. Springer.](http://paperpile.com/b/MQ35Et/hKMe)

[International Civil Aviation Organization. 2004. *Manual on the Regulation of International Air Transport*.](http://paperpile.com/b/MQ35Et/JfC2)

[Jayakumari, J., George K. Karagiannidis, Maode Ma, and Syed Akhter Hossain. 2020. *Advances in Communication Systems and Networks: Select Proceedings of ComNet 2019*. Springer Nature.](http://paperpile.com/b/MQ35Et/yV6y)

[Joseph Pine, B., Joseph Pine, and James H. Gilmore. 1999. *The Experience Economy: Work Is Theatre & Every Business a Stage*. Harvard Business Press.](http://paperpile.com/b/MQ35Et/2YSb)

[Kasabov, E., and A. Warlow. 2012. *The Compliance Business and Its Customers: Gaining Competitive Advantage by Controlling Your Customers*. Springer.](http://paperpile.com/b/MQ35Et/64z5)

[Krajangta, Jurairat, Mahāwitthayālai Mahidon, and Mahāwitthayālai Mahidon Khana Witthayāsāt. 1997. *Self Service Airline Reservation System VIA Internet*.](http://paperpile.com/b/MQ35Et/SzWq)

[Marwedel, Peter. 2021. *Embedded System Design: Embedded Systems Foundations of Cyber-Physical Systems, and the Internet of Things*. Springer Nature.](http://paperpile.com/b/MQ35Et/Drjr)

[Mckinsey Chief Marketing & Sales Officer Forum. 2014. *Big Data, Analytics, and the Future of Marketing and Sales*. Createspace Independent Pub.](http://paperpile.com/b/MQ35Et/0PKp)

[National Research Council, Division of Behavioral and Social Sciences and Education, Board on Behavioral, Cognitive, and Sensory Sciences, and Committee on Behavioral and Social Science Research to Improve Intelligence Analysis for National Security. 2011. *Intelligence Analysis: Behavioral and Social Scientific Foundations*. National Academies Press.](http://paperpile.com/b/MQ35Et/vKdP)

[Rana, Nripendra P., Emma L. Slade, Ganesh P. Sahu, Hatice Kizgin, Nitish Singh, Bidit Dey, Anabel Gutierrez, and Yogesh K. Dwivedi. 2019. *Digital and Social Media Marketing: Emerging Applications and Theoretical Development*. Springer Nature.](http://paperpile.com/b/MQ35Et/sdZX)

[Ren, Dazhou. 2000. *An Online Airline Reservation System with XML*.](http://paperpile.com/b/MQ35Et/ayDV)

[Smit, Chloé C. H., Maarten Lambert, Kris Rogers, Steven P. Djordjevic, Antoine M. Van Oijen, Caitlin Keighley, Katja Taxis, Hamish Robertson, and Lisa G. Pont. 2023. “One Health Determinants of Antimicrobial Resistance in Humans in the Community: An Umbrella Review.” *International Journal of Molecular Sciences* 24 (24). https://doi.org/](http://paperpile.com/b/MQ35Et/soR5)[10.3390/ijms242417204](http://dx.doi.org/10.3390/ijms242417204)[.](http://paperpile.com/b/MQ35Et/soR5)

[U.S. Department of Health and Human Services. 2019. *TIP 35: Enhancing Motivation for Change in Substance Use Disorder Treatment (Updated 2019)*. Lulu.com.](http://paperpile.com/b/MQ35Et/HRmR)

[Whiteley, David. 2017. *An Introduction to Information Systems*. Bloomsbury Publishing.](http://paperpile.com/b/MQ35Et/1ivq)

[Wittmer, Andreas, Thomas Bieger, and Roland Müller. 2011. *Aviation Systems: Management of the Integrated Aviation Value Chain*. Springer Science & Business Media.](http://paperpile.com/b/MQ35Et/XHDX)

**TABLES AND FIGURES**

**Table 1.** Accuracy comparison between Support Vector Machine and Random Forest Classifier. The following table displays the precision of Random Forest and Support Vector Machine.

|  |  |  |
| --- | --- | --- |
| **S. No** | **Random Forest** | **Support Vector Machine** |
| 1 | 96.16 | 93.72 |
| 2 | 96.61 | 93.10 |
| 3 | 96.02 | 93.51 |
| 4 | 96.99 | 93.38 |
| 5 | 96.34 | 93.19 |
| 6 | 96.76 | 93.95 |
| 7 | 96.93 | 93.86 |
| `8 | 96.97 | 93.38 |
| 9 | 96.83 | 93.88 |
| 10 | 96.66 | 93.67 |

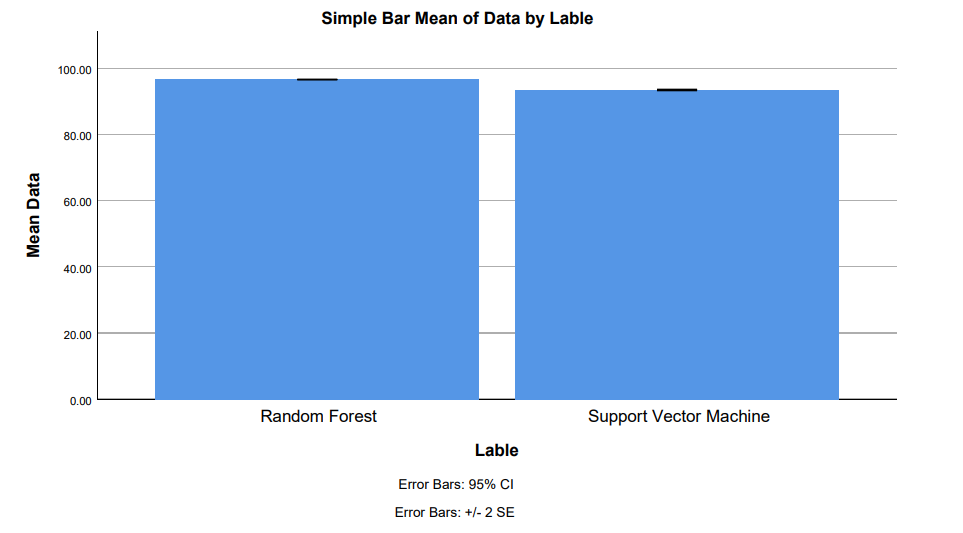
|  |
| --- |
|  |

**Table 2**. Random Forest using Support Vector Machine 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 Support Vector Machine approaches. These comparisons were made using SPSS analysis, with a significance level of p = 0.044 (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 | 4.71 | 0.044 | 32.43 | 18 | 0.000 | 3.143 | 0.096 | 2.939 | 3.346 |
| Equal variances assumed |  |  | 32.43 | 13.83 | 0.000 | 3.143 | 0.096 | 2.939 | 3.351 |

**Table 3.** The method outputs for both Random Forest and Support Vector Machine were used in SPSS to get the mean, standard deviation, and standard error. The Random Forest model achieves an accuracy of 96.57%, whereas the Support Vector Machine model achieves an accuracy of 93.43%.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Algorithm** | **N** | **Mean** | **Std.Deviation** | **Std.Error Mean** |
| **Accuracy** | Novel Random Forest | 10 | 96.57 | 0.145 | 0.046 |
| Support Vector Machine | 10 | 93.43 | 0.269 | 0.085 |

****

**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 Random Forest. This accuracy was compared to a baseline accuracy of 93.43% which is Support Vector Machine, with an error bar of 95% confidence interval and a standard deviation of +/- 2.