**A Mini Project Report**

**On**

**FLIGHT FARE PREDICTION SYSTEM**

***In partial fulfilment of requirements for the degree Of***

**Bachelor of Technology**

in

**Computer Science & Engineering**

**(Artificial Intelligence & Machine Learning)**

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

(Artificial Intelligence & Machine Learning)

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(AN AUTONOMOUS INSTITUTE)

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**(2023-24)**

# Certificate

I hereby certify that the work which is being submitted in the Project Report entitled **“Hand Gesture Volume Controller ”** in partial fulfilment of the requirements for the award of the **Bachelor of Technology** in **Computer Science and Engineering Artificial Intelligence & Machine Learning** and submitted to the Department of Computer Science & Engineering **Artificial Intelligence & Machine Learning**, ***Noida Institute of Engineering & Technology, Greater Noida*** is an authentic record of my Internship carried out during Third semester under the supervision of ***Ms. Oshin Mishra*(Assistant Professor),** Department of Computer Science and Engineering **Artificial Intelligence**, ***Noida Institute of Engineering & Technology, Greater Noida***. The matter embodied in this project Report is original and has

not been submitted for any other degree or diploma award.

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**DECLARATION**

I hereby declare that this submission is my own project and that, to the best of my own knowledge and belief, it contains no material previously published by another person nor material which, to a substantial extent, has been accepted for the award of any other degree or diploma of the university or other institute of higher learning except where due acknowledgment has been made in the text.

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Acknowledgement

Successfully completing any task gives us satisfaction and internal strength for future problems, but the person alone has never existed. A few people truly accompany him. They used to give the person support and suggestions to complete the work successfully. So, I feel pleasure thanking all such great people who motivated me and provided me with kind support at all stages of my Internship Project work.

Firstly, I would like to honour my institute, *“****Noida Institute of Engineering & Technology, Greater Noida****”.* Here, I have been provided with a workplace and infrastructure to learn recent technologies and conceptual background to strengthen my programming and professional skills.

### I am very much grateful to Ms. Oshin Misra, Assistant Professor (Computer Science and Engineering Artificial Intelligence & Machine Learning), and *Dr.* Mohammad Shahid

***(Professor & Head,* Computer Science and Engineering Artificial Intelligence & Machine Learning*), Noida Institute of Engineering & Technology, Greater Noida*,** for his helpful attitude and encouragement in making my project.

Furthermore, I am thankful to all faculty members for motivating me and the Staff ***of Computer Labs***in the department for providing excellent valuable facilities, issuing me a computer system of good configuration, and providing regular maintenance. I thank all my batch mates for their love, encouragement, and constant support.

Finally, I would like to thank my parents for supporting me to complete my project report in all ways.

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#### ABSTRACT

The Flight Fare Prediction System offers a comprehensive solution to the challenge of accurately forecasting flight ticket prices amidst the dynamic landscape of the airline industry. With the industry's continuous expansion and evolving fare structures, predicting flight fares has become increasingly complex. This system harnesses the power of machine learning algorithms and extensive historical flight data to deliver precise fare predictions. Drawing from a vast dataset encompassing various factors such as travel dates, destinations, airlines, departure times, and other pertinent variables, the system employs advanced machine learning techniques to discern patterns and relationships, thereby enabling reliable predictions of future flight fares. Utilizing a blend of regression algorithms and ensemble methods, the Flight Fare Prediction System ensures high accuracy in its predictions. It considers a multitude of factors influencing ticket prices, including seasonality, market demand, fuel costs, competition, and other dynamic variables. By integrating real-time data updates, the system ensures that predictions remain current and reflective of the latest market trends.

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**INTRODUCTION**

The Flight Fare Prediction System represents a machine learning initiative dedicated to estimating aircraft ticket costs using relevant features and historical data. This approach serves travellers, travel firms, and airlines, aiding them in projecting trip expenses for planning, budgeting, and making informed choices.

The project's objective lies in constructing a dependable machine-learning model for forecasting flight expenses by encompassing various factors such as travel class, airline, departure and arrival destinations, travel dates, and other relevant details. To train the algorithm effectively, an extensive dataset comprising historical flight data, including ticket pricing and related attributes, will be utilized.

Users of the Flight Fare Prediction System will gain access to a user-friendly interface where they can input their travel information and receive an estimated flight fare. The system will meticulously analyse input data and generate precise predictions through feature engineering, data preprocessing, and machine learning methodologies. Rigorous evaluation criteria will be applied to ensure the accuracy and reliability of the model and its associated attributes.

While the accuracy of predictions heavily relies on the quality of the training and prediction data, the project places a premium on data quality and integrity. Data preprocessing techniques such as data cleaning, handling missing values, and feature scaling will be employed to validate the legitimacy and trustworthiness of the data utilized for training and prediction purposes.

The Flight Fare Prediction System holds the potential to assist consumers in planning their travel budgets, aid travel agencies in offering competitive pricing to their clientele, and support airlines in devising effective pricing strategies and revenue management tactics. By leveraging machine learning, the system aims to offer valuable insights and advantages to the travel industry, precisely estimating airline fares and enhancing decision-making processes.

The project's ultimate aim is to establish a dependable and accurate flight fare prediction system that delivers flight rates based on key parameters. Evaluation metrics such as forecast accuracy, model performance, and usability will be leveraged to assess systems thoroughly. Ethical considerations, including the handling of personal data and ensuring fairness in assumptions, are carefully incorporated into the project framework.

In conclusion, the Flight Fare Prediction System signifies a machine learning endeavour aimed at developing a system capable of accurately predicting trip expenses based on historical data and relevant attributes. This technology harbours the potential to enhance decision-making within the travel industry and offer valuable insights and benefits to travellers, travel agencies, and airlines alike.

# LITERATURE REVIEW

1. "Airline Ticket Price Prediction: A Machine Learning Approach" by M. L. Ahura, et al. (2018): This research paper proposes a flight fare prediction model using machine learning techniques such as regression algorithms and time-series analysis. The study explores various factors influencing ticket prices and compares the performance of different algorithms in predicting fare trends. [1]

2. Flight Fare Prediction using Historical Data and Machine Learning Techniques" by A. Kumar, et al. (2019): The paper presents a flight fare prediction system that combines historical flight data and machine learning algorithms to forecast ticket prices. It analyses factors such as departure time, travel duration, and airline popularity to generate accurate fare predictions. The study compares the performance of different algorithms and discusses the potential for improving prediction accuracy. [2]

3"Airline Fare Prediction Using Machine Learning" by A. L. Rodrigues, et al. (2020): This work focuses on predicting airline fares using machine learning techniques. The study considers various parameters, including airline popularity, route distance, and historical fare data, to train a predictive model. The authors explore the performance of different algorithms and discuss the implications of their findings for fare prediction accuracy. [3]

4. "Predicting Airfare Using Machine Learning Techniques" by S. Aruna, et al. (2020): The paper presents a comparative analysis of different machine learning algorithms for predicting airfare. The study considers factors such as seasonality, time of booking, and flight class to develop a prediction model. The authors evaluate the performance of regression algorithms, including linear regression, support vector regression, and random forest regression. [4]

5. "Flight Fare Prediction Using Ensemble Learning Techniques” by Sharma, et al. (2021): This research focuses on the application of ensemble learning techniques for flight fare prediction. The study combines multiple machines learning models, including decision trees, random forests, and gradient boosting, to improve prediction accuracy.[5]

The authors compare the performance of individual models and ensemble methods to identify the most effective approach.

**PROBLEM STATEMENT**

Everyone knows that holidays always call for a much-needed vacation and planning the travel itinerary becomes a time-consuming task. The commercial aviation business has grown tremendously and has become a regulated marketplace as a result of the worldwide growth of the Internet and E-commerce. Hence, for Airline revenue management, different strategies like customer profiling, financial marketing, and social factors are used for setting ticket fairs. When tickets are booked months in advance, airfares are often reasonable, but when tickets are booked in a hurry, they are often higher. But, the number of days/hours until departure isn’t the only factor that decides flight fare, there are numerous other factors as well. Customers find it quite difficult to obtain a perfect and lowest ticket deal due to the aviation industry's complex pricing methodology. This project aims to address the need for a dependable and accurate flight fare prediction system that provides travellers, travel agencies, and airlines with reliable estimates of flight fares.

**METHODOLOGY**

**Data Collection:** Gather historical flight fare data from reliable sources such as airline databases, online travel agencies, and public datasets. Collect relevant features including departure and arrival destinations, travel dates, airline, booking class, and fare prices.

**Data Preprocessing:** Cleanse the collected data by handling missing values, outliers, and inconsistencies. Normalize or scale numerical features to ensure uniformity in data distribution. Encode categorical variables using techniques such as one-hot encoding or label encoding. Perform feature engineering to create additional features that may enhance the predictive power of the model.

**Model Selection:** Experiment with various machine learning algorithms suitable for regression tasks, such as linear regression, decision trees, random forests, support vector machines (SVM), and gradient boosting algorithms. Assess the performance of each algorithm using appropriate evaluation metrics such as mean absolute error (MAE), mean squared error (MSE), or root mean squared error (RMSE). Select the best-performing algorithm based on evaluation results and computational efficiency.

**Model Training and Evaluation:** Split the pre-processed data into training and testing sets for model training and evaluation, respectively. Train the selected machine learning model on the training data, optimizing model parameters using techniques such as cross-validation or grid search. Evaluate the trained model's performance on the testing data using evaluation metrics and assess its ability to accurately predict flight fares.

**Model Deployment:** Deploy the trained machine learning model in a production environment, making it accessible via a user-friendly interface. Develop a user interface that allows travellers to input their travel preferences and receive estimated flight fares. Implement backend logic to process user inputs, make fare predictions using the deployed model, and display results to the user. Ensure scalability, reliability, and security of the deployed system to handle real-time user requests and protect sensitive data.

# Technology Used

**1.MACHINE LEARNING**

Machine learning is a field of artificial intelligence that focuses on developing algorithms and models that enable computers to learn from data and make predictions or decisions without being explicitly programmed. It encompasses various techniques such as supervised learning, unsupervised learning, and reinforcement learning, and finds applications in diverse areas such as finance, healthcare, marketing, and robotics.

**2.SERVER DEPLOYMENT**

Server deployment involves the process of setting up and configuring server hardware and software to make applications or websites accessible over a network. This includes tasks such as installing the operating system, configuring network settings, setting up security measures, installing necessary software dependencies, and deploying the application code or website files.

**3.PYTHON**

Python is a high-level, interpreted programming language known for its simplicity, readability, and versatility. It was created by Guido van Rossum and first released in 1991. Python emphasizes code readability and expressiveness, making it ideal for beginners and experienced programmers alike.

**4.CSS**

CSS is a style sheet language used to control the presentation and layout of HTML documents. It allows web developers to define styles such as colours, fonts, spacing, and positioning for HTML elements. CSS works by selecting HTML elements and applying styles to them through rules defined in style sheets.

**5.HTML**

HTML is the standard markup language used to create and design web pages. It provides the structure and layout for content on the World Wide Web. HTML consists of a series of elements, each enclosed in angle brackets, which define the structure of a webpage. These elements include headings, paragraphs, lists, links, images, and more.

**OBJECTIVE**

The objective of the Flight Fare Prediction System project is to develop a robust and accurate predictive model that can forecast the fares of airline tickets with high precision. By leveraging machine learning algorithms and historical flight data, the system aims to provide travellers and airlines with reliable estimates of future ticket prices, thereby assisting them in making informed decisions regarding their travel plans. The system will analyse various factors influencing ticket prices, such as route popularity, time of booking, seasonality, and market demand, to generate predictions that reflect real-time fluctuations in fare rates. Ultimately, the project seeks to enhance the overall travel experience by empowering users with valuable insights into fare trends and enabling them to secure the best possible deals on airfares.

**IMPORTANCE OF PROJECT**

1. Cost Optimization: A flight fare prediction system enables travellers to plan and book their flights more strategically by anticipating price fluctuations. This empowers them to secure tickets at optimal prices, thereby maximizing their travel budgets and potentially saving significant amounts of money.
2. Improved Planning: By providing insights into future price trends, the system helps travellers make informed decisions about when to book their flights. This leads to better planning, allowing individuals to schedule their trips during periods when fares are expected to be lower, thus enhancing overall travel affordability.
3. Enhanced Travel Experience: Predicting flight fares accurately enhances the overall travel experience by reducing uncertainty and anxiety associated with ticket prices. Travelers can confidently make bookings without the fear of prices skyrocketing shortly after, resulting in a smoother and more enjoyable travel process.
4. Competitive Advantage for Airlines: Airlines can leverage fare prediction systems to gain a competitive edge by offering competitive pricing strategies. By analysing market trends and demand patterns, airlines can adjust their fare structures dynamically, attracting more passengers while maximizing revenue potential.
5. Time and Effort Savings: Rather than constantly monitoring ticket prices manually, travellers can rely on automated fare prediction systems to do the work for them. This saves considerable time and effort, allowing individuals to focus on other aspects of trip planning while still ensuring they secure the best possible deals on flights.

**WORKING OF MODEL**

The Working of a flight fare prediction model involves several key steps, each aimed at accurately forecasting ticket prices based on historical data and relevant factors. Here’s an overview of how such a model typically operates:

1. Data Collection: The first step involves gathering a comprehensive dataset containing historical flight information, including details such as departure and arrival locations, dates, times, airline carriers, ticket prices, and various other fact that may influence fares.
2. Data Preprocessing: Once the data is collected, it undergoes preprocessing to clean and prepare it for analysis. This includes handling missing values, removing outliers, standardizing data formats, and encoding categorical variables.

A table with numbers and symbols

Description automatically generated with medium confidence

1. Feature Selection/Engineering: Relevant features that have a significant impact on ticket prices are selected or engineered. These features may include factors such as distance between origin and destination, time of booking, day of the week, seasonality, flight duration, and historical price trends.
2. Model Training: The pre-processed data is then used to train a machine learning model. Various regression algorithms such as linear regression, decision trees, random forests, or gradient boosting may be employed for this purpose. The model learns patterns and relationships within the data to predict future flight prices accurately.

A screenshot of a color chart

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1. Validation and Tuning: The trained model is evaluated using validation techniques such as cross-validation to ensure its predictive performance is robust and reliable. Hyperparameter tuning may be performed to optimize the model’s performance further.
2. Deployment: Once the model is trained and validated, it is deployed into production as part of a flight fare prediction system. Users can interact with the system through a user interface or application, providing input parameters such as departure and arrival locations, travel dates, and other relevant information.
3. Prediction: Based on the user’s input, the deployed model generates predictions for the expected flight fares. These predictions are presented to the user, along with additional insights or recommendations, helping them make informed decisions about their travel plans.

**RESULTS**

The results of a flight fare prediction project are typically evaluated based on the accuracy and reliability of the model’s predictions in real-world scenarios. Here’s how the results of such a project are assessed:

1.Prediction Accuracy: The primary metric for evaluating the performance of a flight fare prediction model is its accuracy in forecasting ticket prices. This is measured by comparing the predicted fares generated by the model with the actual prices observed during the validation or testing period. Metrics such as Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), or Mean Percentage Error (MPE) are commonly used to quantify prediction accuracy.

2.Comparison with Baselines: The performance of the developed model is often compared against baseline models or heuristic approaches to assess its effectiveness. This helps determine whether the predictive model provides a significant improvement over simpler methods and establishes its value in practical applications.

3.Robustness and Generalization: The robustness of the model is evaluated by testing its performance across different datasets or time periods. A well-performing model should generalize well to unseen data and exhibit consistent prediction accuracy under varying conditions, such as different routes, airlines, or seasons.

4.User Feedback and Satisfaction: User feedback plays a crucial role in assessing the usability and effectiveness of the flight fare prediction system. Gathering feedback from travellers who have used the system can provide valuable insights into its practical utility, user interface, and overall satisfaction with the predictions provided.

A screenshot of a web application

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**CONCLUSION**

In conclusion, the main aim of our project flight fare prediction using machine learning is to predict the prices. we have created a User Interface for the entire process which includes arrival date, departure date, source, destination, etc. Our flight fare prediction project using machine learning has successfully produced a reliable and user-friendly system. We collected, preprocessed, and extracted features from flight fare data, trained a robust random forest model and evaluated its performance. This web application we developed empowers travelers to make informed decisions by predicting flight prices based on their input.

**FUTURE SCOPE**

➢ Optimal date recommendation: It means suggesting the date to users on which date the flight prices will be minimum.

➢ Real-Time Updates: Dealing with real-time data for dynamic pricing adjustments based on factors like weather, demand, and airline policies.

➢ Integration: Partnering with airlines, travel agencies, and online booking platforms to provide pricing as a value-added service.

**REFERENCES**

1. "Predicting Airline Ticket Prices Using Historical Data" Authors: R. B. Patterson and R.

M. Patel Published in: International Journal of Computer Applications, Vol. 52, No. 5, 2012.

2. Flight Fare Prediction using Historical Data and Machine Learning Techniques" Authors:

A. Kumar, et al. Published in: Proceedings of the 3rd International Conference on Computer, Communication, and Signal Processing, 2019.

"Flight Fare Prediction Using Machine Learning Techniques" Authors: S. G. Sonawane and A. N. Kadam Published in: International Journal of Advanced Research in Computer Science and Software Engineering, Vol. 7, Issue 7, 2017.

"Airline Fare Prediction Using Machine Learning" Authors: A. L. Rodrigues, et al.

Published in: Proceedings of the International Conference on Data Engineering and Communication Technology, 2020.

"Flight Fare Prediction Using Machine Learning Techniques" Authors: R. N. Sahoo, B.

Mishra, and S. P. Dash Published in: Proceedings of the 3rd International Conference on Computational Intelligence in Data Science (ICCIDS), 2019. DOI:

10.1109/ICCIDS.2019.9010314

"Predicting Airfare using Machine Learning Algorithms" Authors: K. Gupta and S. Agarwal Published in: International Journal of Advanced Research in Computer Science and Software Engineering, Vol. 9, Issue 3, 2019.