**LITERATURE SURVEY**

## 1) Capacity And Delay Analysis For Airport Manoeuvring Areas Using Simulation

**AUTHORS: E. Cinar, F. Aybek, A. Caycar, C. Cetek**

To investigate the air traffic flow in a highly complex system such as an airport manoeuvring area, a two-stage method based on fast- and real-time simulation techniques is applied. The first stage involves the analysis with fast- and real-time simulations of a baseline model created to determine the congestion points. Based on the analysis, improvements to be performed in the layout of the manoeuvring area are proposed. In the second stage, alternative scenarios implementing these improvements are generated and evaluated in a fast-time simulation environment. Based on the results of simulations of different runway configurations, the main areas of congestion in the baseline airport model are determined. Congestion nodes are identified in the departure queue points and in the taxiway system. To mitigate congestion at these points, three alternative models comprising taxiway and fast-exit taxiway reconfigurations are tested using the fast-time simulation technique. The alternative solution found to be the best in these tests is selected for further testing in real-time simulations. It is shown that the solution would result in an increase in the number of hourly operations and a significant decrease in total ground delays. When conducting the studies needed to identify congestion and design improvements, simulation techniques save both expense and time. Although fast-time simulations are usually adequate for identifying solutions, when critical configurations for the airport are considered, it is shown that it is necessary to also test the results of the fast-time simulations in real-time simulations. The effects of meteorological events, such as rain, fog and snow, etc. are ignored in the simulations. Ground movements in manoeuvring areas are significantly affected by the runways used. Consequently, to enable a comprehensive evaluation in the study, three alternative runway use scenarios are examined. This study utilizes a combination of fast- and real-time simulation techniques to identify the points where congestion occurs in the manoeuvring areas of large-scale airports and to find solutions to minimize the congestion. This approach attempts to combine advantages of both techniques while reducing their shortcomings. No study is found in the literature using both of these techniques together for the capacity analysis of airport manoeuvring areas.

# 2) Flight Arrival Delay Prediction Using Gradient Boosting Classifier

**AUTHORS:**  **Navoneel, et al., Chakrabarty**

The basic objective of the proposed work is to analyse arrival delay of the flights using data mining and four supervised machine learning algorithms: random forest, Support Vector Machine (SVM), Gradient Boosting Classifier (GBC) and k-nearest neighbour algorithm, and compare their performances to obtain the best performing classifier. To train each predictive model, data has been collected from BTS, United States Department of Transportation. The data included all the flights operated by American Airlines, connecting the top five busiest airports of United States, located in Atlanta, Los Angeles, Chicago, Dallas/Fort Worth, and New York, in the years 2015 and 2016. Aforesaid supervised machine learning algorithms were evaluated to predict the arrival delay of individual scheduled flights. All the algorithms were used to build the predictive models and compared to each other to accurately find out whether a given flight will be delayed more than 15 min or not. The result is that the gradient boosting classifier gives the best predictive arrival delay performance of 79.7% of total scheduled American Airlines’ flights in comparison to kNN, SVM and random forest. Such a predictive model based on the GBC potentially can save huge losses; the commercial airlines suffer due to arrival delays of their scheduled flights.

# 3) Prediction Of Weatherinduced Airline Delays Based On Machine Learning Algorithms

**AUTHORS** **: Y. J. Kim, S. Briceno, D. Mavris, Sun Choi**

# The primary goal of the model proposed in this paper is to predict airline delays caused by inclement weather conditions using data mining and supervised machine learning algorithms. US domestic flight data and the weather data from 2005 to 2015 were extracted and used to train the model. To overcome the effects of imbalanced training data, sampling techniques are applied. Decision trees, random forest, the AdaBoost and the k-Nearest-Neighbors were implemented to build models which can predict delays of individual flights. Then, each of the algorithms' prediction accuracy and the receiver operating characteristic (ROC) curve were compared. In the prediction step, flight schedule and weather forecast were gathered and fed into the model. Using those data, the trained model performed a binary classification to predicted whether a scheduled flight will be delayed or on-time.

# 4) Flight Delay Prediction System Using Weighted Multiple Linear Regression

**AUTHORS** : **S. Sharma, H. Sangoi, R. Raut, V. C. Kotak, S. Oza**

Flight delays hurt airlines, airports, and passengers. Their prediction is crucial during the decision-making process for all players of commercial aviation. Moreover, the development of accurate prediction models for flight delays became cumbersome due to the complexity of air transportation system, the number of methods for prediction, and the deluge of flight data. In this context, this paper presents a thorough literature review of approaches used to build flight delay prediction models from the Data Science perspective. We propose a taxonomy and summarize the initiatives used to address the flight delay prediction problem, according to scope, data, and computational methods, giving particular attention to an increased usage of machine learning methods. Besides, we also present a timeline of significant works that depicts relationships between flight delay prediction problems and research trends to address them.

**5)** **Development Of A Predictive Model For On-Time Arrival Fight Of Airliner By Discovering Correlation Between Fight And Weather Data**

**AUTHORS**: **Noriko, Etani**

An important business of airlines is to get customer satisfaction. Due to bad weather, a mechanical reason, and the late arrival of the aircraft to the point of departure, flights delay and lead to customer dissatisfaction. A predictive model of on-time arrival flight is proposed with using flight data and weather data. The key research in this paper is to discover the correlation between flight data and weather data. The relation between pressure pattern and flight data of Peach Aviation, which is LCC (low-cost carrier) in Japan, are clarified, and it is found that the sea-level pressures of 3 weather observation spots, which are Wakkanai as the most northern spot, Minami-Torishima as the most eastern spot, and Yonagunijima as the most western spot, can classify the pressure patterns. As a result, on-time arrival fight is predicted at 77% of the accuracy with using Random Forest Classifier of machine learning. Furthermore, feasibility of the predictive model is evaluated by developing a tool of on-time arrival flight prediction.