

# Role of AI to improve performance parametersto generate optimized flight routes

**Anagha Shinde**

Assistant Professor, Empire Education society's I.I.A.E, Affiliated to Pune university

**Abstract:** This paper discusses the performance parameters to generate flight routes. Airlines around the world constantly adding new destinatoions to their network. Selection optimized flight route beneficial according to safe travels for passangers as well as reducing consumption of fuel. Artificial intellegence with machine learning method helps to improve perofrmance parameters of flight by effectively generating model for anlysis of all essential parameter for generlization of flight routes.AI helps in improving airlines safty, automatic flight casulas and more essential reducing tasks of pilots for easy operations of flights.

**Keywords:** Role of AI, Dijkstra's algorithm, Weather Prediction algorithm, XGBoost algorithm, Flight routes.

## I. INTRODUCTION

Air traffic control(ATC)is the most crucial component of airlines. Manned aircraft basically depends on radars for an helpful .



Fig 1: shortest path prediction graph

Artificial intelligence with deep learning model decision making models helpful to decide weather condition which is essential parameter for flight route planning. Aircraft monitoring is also essential parameter for planning of flight route .AI can help to monitor health of aircraft and any essential measures requires for repairs in minimize time.AI can help in condition monitoring, data analysis of engine parts such as breaks, gears, generator etc.With the help of AI powered plane can reduce number of flight delays.



Fig 2: shortest path prediction graph

Humans always have tendency to stick with the familiar points while deciding flight routes for moving source to destination. But in reality there are number of options for how to travel from source to destination. Artificial Intelligence collects data through weather, flight congestion, wind flow, altitude etc and prepares one model which considers lot of options for deciding flight routes to travel from source to destination. AI can collect large amount of data in very less amount of time and gives result faster than human.

Route planning improves customer satisfaction, improves operational and financial performance. It is the process of identifying and evaluating feasibility of new routes. According to air control traffic control management, route planning is compliance of flight. Route planning is nothing but optimization of low cost flight routes.



Fig 3: shortest path prediction graph

Optimization of flight routes is the collection of routes that airline operates. Whenever passenger decides path of travel from source to destination, airlines decide feasible route for them which is profitable for both i.e. to passenger as well as to airline.

AI powered Machine learning model in AI, with the help of weather forecast predicts fuel consumption rate which helps in reducing fuel consumption rates in every flight. Fuel consumption rate calculation helps in improving operational efficiency of flight.

Machine learning in AI generates a predictive model by collecting historical data. With the help of this historical data it trains the model to predict future data. Different methods to predict this model is by different machine learning algorithms, data science, time series and differentiating clustering algorithms etc. With the help of use of Python language with its functionalities and libraries it is easier for prediction of flight routes. Python has many functions which make data analysis and prediction easy.

First step in analysing prediction model in python is to collect and explore data set. Next step is to predict feature which are relation with prediction. This step is very important which decides which data set is helpful in statistical analysis of model. After that next process is to build a model by splitting data sets into training data.

This paper mainly describes predictive algorithms for optimization of flight routes according to weather conditions as well as more fuel efficient system. Predictive analysis uses present data sets with some trends and pattern. These patterns and trends are helpful to find future trends and patterns. Predictive analysis includes steps like defining problem, collection and analysis of data and then last to build predictive model.



Fig 4: shortest path prediction graph

In our defined approach procedure includes collection of data such as atmospheric conditions, flight and airspace data, actual trajectories observed from radar from last three years records, dataset should include more number of flight information, demand data.

For flight route optimization to find shortest path Dijkstra's algorithm is employed. Dijkstra's algorithm is the type of algorithm used to find shortest route with node analysis method. This algorithm is a high efficient algorithm that works on nodal analysis, with use of Google Map to find shortest path. This algorithm works in network analysis protocol for determining shortest path between two nodes on the network.

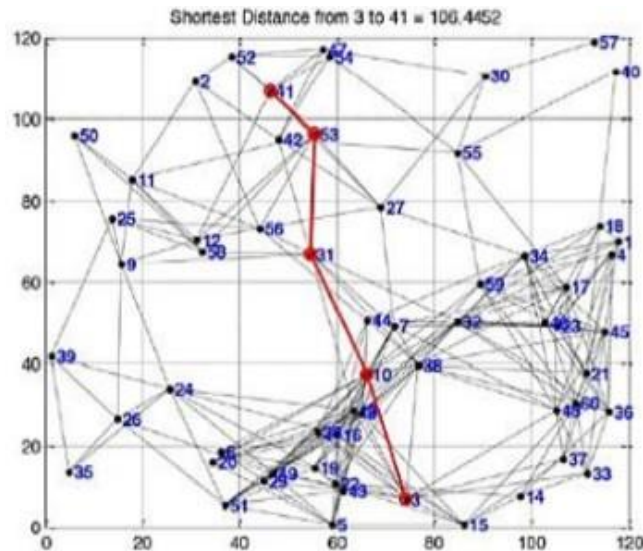


Fig 5: shortest path prediction graph

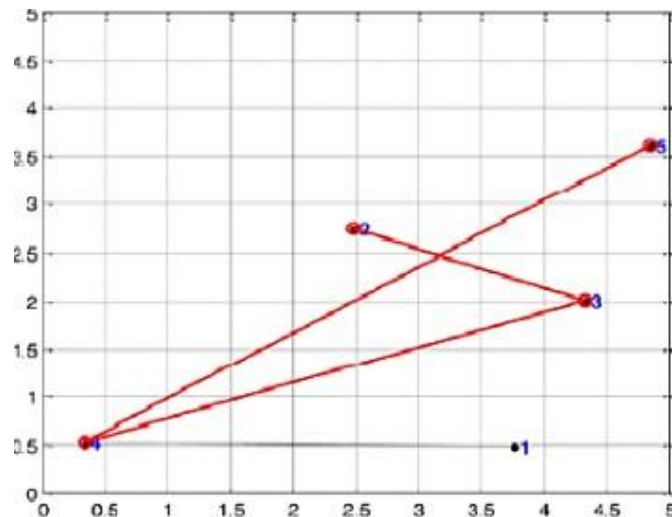


Fig 6: shortest path prediction graph



Fig 7: shortest path prediction graph

Following diagram shows process of prediction algorithm in machine learning with training data set. Set of data used to prepare model and predicted model used to find final result.

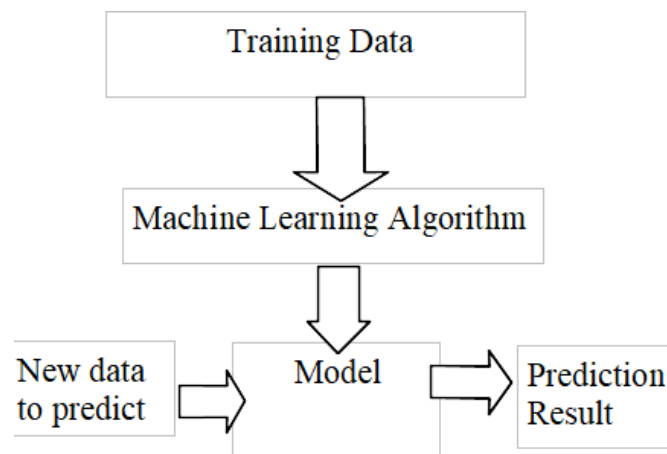


Fig8 :shortest path prediction graph

## II. SHORTEST PATH PREDICTION

Dijkstra's algorithm works in steps:

- i) Initialization of starting point for the path.
- ii) Setting of weights for each edge of the graph.
- iii) From starting point of vertex, find nearest vertices that are connected to starting point.
- iv) Setting of weights for other edges of the graph.
- v) Go on adding the values on each vertices and prepare summation of all the points.

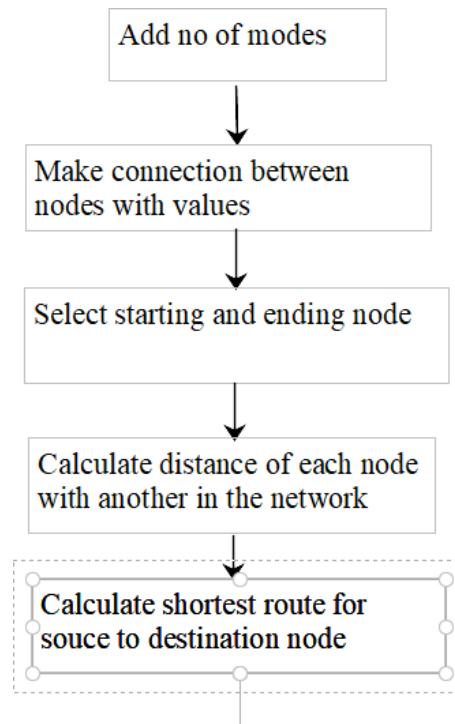


Fig 9: Flowchart of Dijkstra’s algorithm

**III. WEATHER PREDICTION**

For detection of flight route weather forecating is also essential parameter.In this aprooch by using convolution neural network deep learning weather prediction algorithm followed.This model uses past weather data for prediction of futute atmosphere.Deep learning aprooch has more frequency,scope and accuracyof predicted forecast.

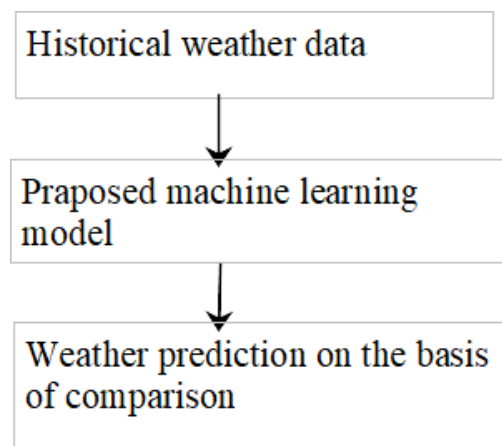


Fig:10 Flowchart for Weather prediction algorithm XGBoost is distributed gradient-boosted leading

machine learning library for regression, classification, and ranking problems.XGBoost algorithm boosts a single model by combining other more weak models.It goes on train weak models and finally predict new model with greater efficiency.

In praposed aprooch ,XGBoost combines two algorithms one based on prediction of weather analysis and another based on shortest path finding named Dijkstra’s algoorthm.XGboost combines two algorithms .XGBoost combines predictions of two models and makes strongest model .It helps in getting gretaer accuracy to optimize accurate flight route.



#### **IV. RELATED WORK**

In the last few years, the Topic-based on flight route detection algorithms are in research process. But there are limitations as previous methods applied only by considering any single parameter using one algorithm. In proposed approach it integrates two algorithms by considering two parameters such as weather prediction model as well as and shortest path prediction model.

#### **V. CONCLUSION**

The proposed method for AI based optimization of flight route to improve performance included three algorithms based on consideration of two For improving performance parameters of flight route optimization two essential parameters are there i.e. flight shortest path, weather parameters, effect of which increases fuel efficiency. Due to these three essential parameters flight route optimization becomes more accurate and more easy.

#### **REFERENCES**

- [1] Aircraft route optimization using genetic algorithms Second International Conference On Genetic Algorithms In Engineering Systems: Innovations And Applications Department of Automatic Control, Nanjing University of Aeronautics and Astronautics, China august 2002
- [2] Route Optimisation for Maximum Air to Ground Channel Quality, November 2020
- [3] Airplane Flight Route Optimization Problem with Multi-constraints , INSPEC Accession Number: 23119
- [4] A Ripple Spreading Algorithm for Free-Flight Route Optimization in Dynamical Airspace. 2020 IEEE Symposium Series on computational intelligence (SSCI) INSPEC Accession Number: 20341115
- [5] Aircraft route optimization using genetic algorithms. Second International Conference On Genetic Algorithms In Engineering Systems: Innovations And Applications, 2002. Einstein, A., B. Podolsky, and N. Rosen, 1935,.
- [6] The Research of Route Planning Approach for Flight. 2017 9th International Conference on Measuring Technology and Mechatronics Automation (ICMTMA) 2017, Electronic ISSN: 2157-1481
- [7] Route Optimisation for Maximum Air to Ground Channel Quality. Electronic ISSN: 2169-3536
- [8] Aircraft Target Detection in Remote Sensing Images Based on Improved YOLOv5 SHUN LUO 1 , JUAN YU 1 , YUNJIANG XI 2 , AND XIAO LIAO
- [9] Aircraft Trajectory Prediction With Enriched Intent Using Encoder- Decoder Architecture PHU N. TRAN , HOANG Q. V. NGUYEN, DUC-THINH PHAM , AND SAMEER ALAM School of Mechanical and Aerospace Engineering, Air Traffic Management Research Institute, Nanyang Technological University, Singapore 639798
- [10] Research on the Air Traffic Flow Prediction Using a Deep Learning Approach HONG LIU, YI LIN , ZHENGMAO CHEN, DONGYUE GUO, JIANWEI ZHANG, AND HAILONG JING
- [11] UAV Flight Path Planning When Considering Coverage Radius of UAV, Published in: 2019 IEEE/ACIS 18th International Conference on Computer and Information Science (ICIS) DOI: 10.1109/ICIS46139.2019.9481914
- [12] Method of Automated Flight Route Planning for Unmanned Aerial Vehicles to Search for Stationary Objects, Published in: 2020 IEEE 11th International Conference on Dependable Systems, Service and Technologies (DESSERT) DOI: 10.1109/DESSERT50317.2020.9125084
- [13] Aircraft route optimization using adaptive simulated annealing, Published in: Proceedings of the IEEE 1991 National Aerospace and Electronics Conference NAECON 1991 DOI: 10.1109/NAECON.1991.165900
- [14] The Research of Route Planning Approach for Flight, Published in: 2017 9th International Conference on Measuring Technology and Mechatronics Automation (ICMTMA) DOI: 10.1109/ICMTMA.2017.0067
- [15] Flight path optimization based on obstacles and weather updates, Published in: 2016 3rd International Conference on Signal Processing and Integrated Networks (SPIN) DOI: 10.1109/SPIN.2016.7566732