

# Comparative Analysis of Machine Learning and Statistical Methods for Aircraft Phase of Flight Prediction

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Abstract— Phase of flight (POF) prediction estimates the future state of aircraft along planned trajectories, allowing the prediction of potential conflicts as well as optimization of air space, controlled by the Federal Aviation Administration. In this paper, we present a study conducted to develop three different POF forecasting machine learning models and a statistical regression model using four-dimensional GPS and RADAR Track data from 57 flights provided by an En Route Computer System. The investigated machine learning models include Long Short-Term Memory Recurrent Neural Network (LSTM-RNN), Support Vector Machine (SVM), and Neural Ordinary Differential Equations (NODE). These were developed to forecast the horizontal and vertical POF of the current aircraft for the next time step. The results in this study indicate that LSTM-RNN models are more suitable for POF prediction than SVM and statistical regression models, with NODE being a promising model for future trajectory prediction research.