



WatchUrDelay

A tool to predict and visualize flight delays and cancellations

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Summary

WatchUrDelay is a tool that provides **flight delay predictions** on a **rich user interface**. It uses **machine learning models** built on historical *flight and weather data* to deliver **valuable insights** through various visualizations.

Problem and Motivation

- Flight delays have detrimental impacts on the psychology and mental health of passengers, as well as net welfare of a nation
- Service-related factors are key selection criteria for travelers making itinerary choices, however there is a lack of such information available to the public
- Several machine learning models have shown effectiveness in predicting flight delays in a limited scope.

\$39B

A 30% reduction in flight delays can increase US net welfare by \$39 billion annually [1]

2 - 3

US air travelers depend on aggregator sites when shopping for flights, visiting on average between 2 – 3 sites [2]

10%

Business travelers value a 10% improvement in on-time performance at \$38 [3]

18 Million Edges

We have used flight and weather data from 2019 to 2021, creating a weighted graph of 18 million edges and 421 nodes taking 2 GB of disk space

Feature Engineering

WatchUrDelay uses novel approaches to feature engineering to enhance our model performance and ensure reliability of our predictions

Customized Results

Users input departure and arrival airports, and date and time of intended travel for customized flight delay predictions using our model

Data Pre-Processing

Data was filtered to include only those edges with a minimum of 10,000 flights, yielding support for predictions at 56 unique airports

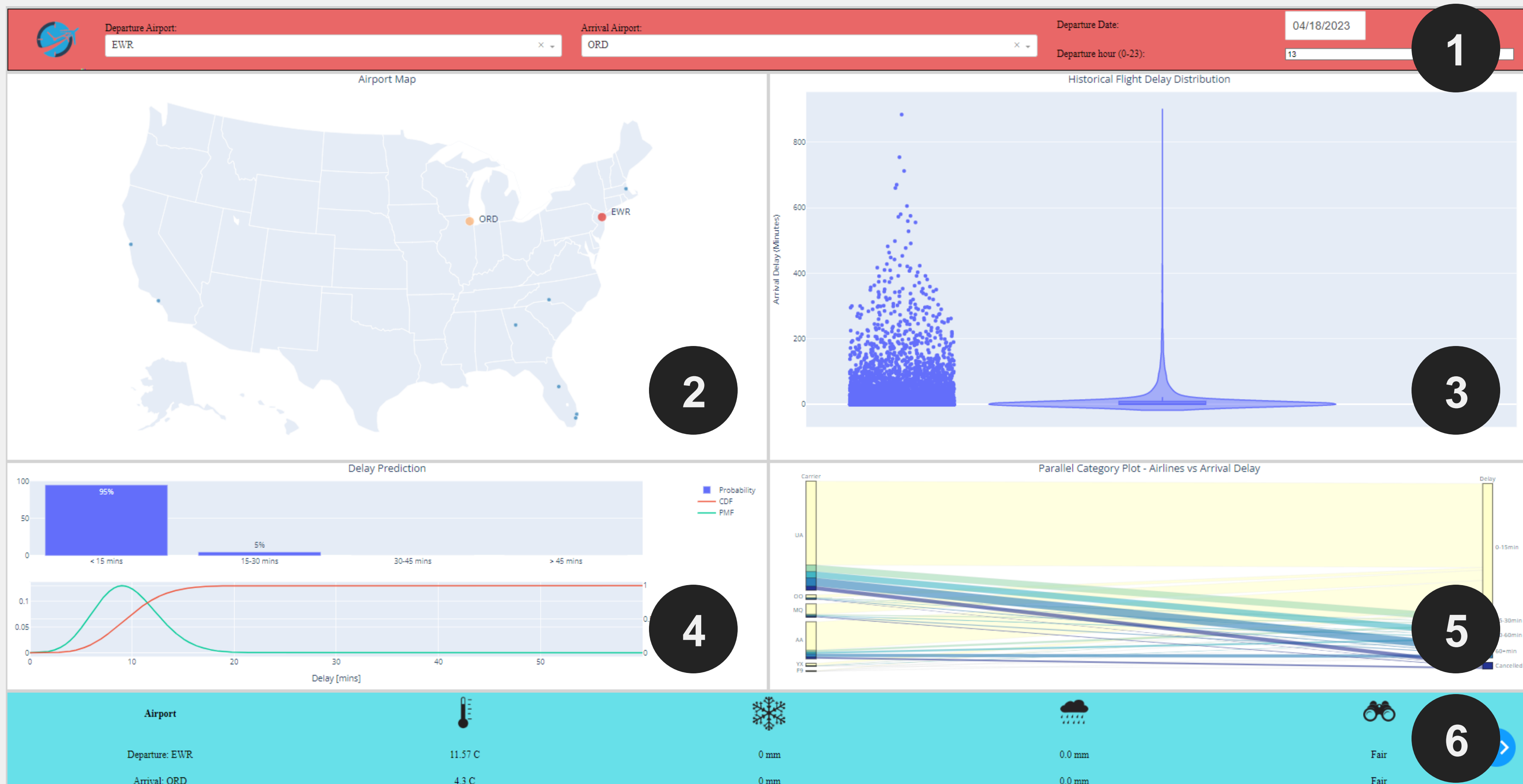
Real-Time Weather

Our product places an emphasis on integrating up-to-date weather forecasts in our algorithm by employing API calls on each user input

Visual Insights

Predictions are displayed in a dashboard, designed with a user-centered approach with carefully selected, insightful visualizations

- User Input Section** – featuring drop downs for airport selection, and travel date and time
- Dynamic Airport Map** – changes based on user selection to highlight selected travel airports and identify alternate travel destinations
- Arrival Delay Violin Plot** – presenting distribution of arrival delays for historical flights travelling the specified travel route
- Predicted Arrival Delay** – outlining the probability distribution, and binned probability of predicted arrival delay for given user inputs
- Arrival Delay by Airline** – providing insight by breaking down arrival delays based on carrier
- Weather Panel** – showing weather forecast for travel airports for the specified date and time



Public Survey Results

A survey was conducted on various social networking sites with 200 total participants.

91% of participants indicated a need for a flight delay prediction tool

83% of participants considered machine learning prediction a critical feature

11% of participants considered weather forecast panel a critical feature

User Survey Results

A survey was conducted with 21 participants, with all participants using the tool.

Majority of participants Found the tool to be innovative

Most participants Found predictions to be accurate

Most participants Found visualizations to be informative

Reliable and Accurate Delay Predictions

The tool was tested against real flights across 6 destinations in the US:

- 72% accuracy** in predicting occurrence of a delay
- 60% accuracy** in predicting the duration of a delay within 10 minutes

The weather forecast was tested against a 7-day window for the same 6 US airports :

- 96% accuracy** for 1-day predictions
- 95% accuracy** for 3-day predictions
- 88% accuracy** for 5-day predictions
- 86% accuracy** for 7-day predictions

[1] Peterson, Everett B., Kevin Neels, Nathan Barcozi, and Thea Graham. 2013. "The Economic Cost of Airline Flight Delay." Journal of Transport Economics and Policy 47, no. 1 (January): 107-121.

[2] Holland, Christopher, Julia Jacobs, and Stefan Klein. 2016. "The role and impact of comparison websites on the consumer search process in the US and German airline markets." Information Technology & Tourism 16 (1): 127-48.

[3] Adler, Thomas, Stacey Falazarano, and Gregory Spitz. 2005. "Modeling Service Trade-Offs in Air Itinerary Choices." Journal of the Transportation Research Board 1 (1915): 20