Architecture
Flight Price Prediction Project

The Flight Price Prediction project architecture consists of several components that work together to provide accurate flight ticket price predictions. The architecture is designed to handle data collection, preprocessing, machine learning model development, user interface implementation, model updates, and deployment. Here is an overview of the architecture:

Data Collection Component:

- Responsible for retrieving historical flight data from reliable sources such as airline websites, travel agencies, or APIs.
- Utilizes data retrieval mechanisms like web scraping or API integration to collect the required attributes such as departure/arrival locations, dates, flight duration, airline, and ticket price.
- Stores the collected data in a structured format for further processing.

Data Preprocessing Component:

- Handles the cleaning and transformation of the collected data.
- Performs data cleaning to handle missing values, outliers, and inconsistencies.
- Ensures consistency in attribute formats and data types.
- Removes any duplicate records from the dataset.
- Conducts feature engineering to derive additional relevant features from the existing attributes.
- Performs feature scaling or normalization, if required, to bring features to a similar scale.

Machine Learning Model Development Component:

- Selects a suitable regression algorithm for flight price prediction, such as Random Forest, Gradient Boosting, or Neural Networks.
- Utilizes a machine learning library or framework, such as scikit-learn, TensorFlow, or PyTorch, to implement the chosen algorithm.
- Splits the preprocessed dataset into training and testing sets.
- Trains the machine learning model using the training dataset.
- Evaluates the model's performance using appropriate regression metrics like mean squared error (MSE), mean absolute error (MAE), or R-squared score.
- Fine-tunes the model's hyperparameters to improve prediction accuracy through techniques like grid search or random search.

User Interface Component:

- Designs and implements a user-friendly interface for users to input their travel preferences and receive flight price predictions.
- Collects user input, including departure/arrival locations, travel dates, and any additional relevant information.
- Integrates with the machine learning model to process user input and provide predicted ticket prices.
- Displays the predicted ticket prices to the user in a clear and understandable manner.

Model Updates and Maintenance Component:

- Establishes a mechanism for collecting updated historical flight data at regular intervals.
- Retrains the machine learning model periodically using the updated dataset to improve prediction accuracy.
- Implements a schedule for model updates, considering factors like data availability and prediction performance.
- Sets up an automatic model update mechanism to ensure users always have access to up-to-date predictions without disrupting their experience.
- Implements version control and rollback mechanisms to handle any issues arising from model updates.

Deployment Component:

- Selects an appropriate environment for deploying the Flight Price Prediction system, such as a web server or a cloud platform.
- Integrates the trained machine learning model, user interface, and data retrieval components into a cohesive system.
- Conducts thorough testing to ensure all components function correctly and provide accurate predictions.
- Monitors the deployed system to ensure its availability and performance.

Documentation Component:

- Creates comprehensive documentation, including a user guide and technical documentation.
- User guide provides instructions on how to use the Flight Price Prediction system effectively, including inputting travel preferences and interpreting predictions.
- Technical documentation covers the system architecture, algorithms used, implementation guidelines, maintenance procedures, and potential enhancements.

The Flight Price Prediction project architecture aims to provide a reliable and scalable system that accurately predicts flight ticket prices, assists users in making informed travel decisions, and allows for continuous model updates to adapt to changing market conditions.