🚗 Car Price Prediction Web App — Documentation

Project Overview

This is a machine learning-powered Streamlit application that predicts the price of vehicles based on user inputs like horsepower, torque, body style, and other vehicle features.

The app supports:

* User authentication (Login/Register)
* Admin and user roles
* Prediction history tracking
* Interactive charts for feature importance and trends
* User profiles with CSV download of their prediction history

Technology Used

* Frontend/UI: [Streamlit](https://streamlit.io/)
* Backend/Logic: Python
* Data Persistence: JSON files (users.json, current\_user.json, prediction\_history.json)
* Model: Pre-trained linear regression (linear\_model.pkl)
* Charts: Plotly
* Images: PIL for sidebar and banner images
* Other: Pandas, NumPy

Directory Structure

📦car\_price\_app/

┣ 📄main.py

┣ 📄login\_utils.py

┣ 📄profile\_page.py

┣ 📄user\_panel.py

┣ 📄linear\_model.pkl

┣ 📄feature\_importance.xlsx

┣ 📂images/

┃ ┣ 📄Pic 1.jpg

┃ ┗ 📄Pic 2.png

┣ 📄users.json

┣ 📄current\_user.json

┗ 📄prediction\_history.json

🌟 Features

* ✅ User registration and authentication
* ✅ Admin and normal user separation
* ✅ Interactive sidebar for input
* ✅ Vehicle price prediction
* ✅ Feature importance visualization
* ✅ Prediction trend and analytics
* ✅ Profile page with CSV export
* ✅ Role-based access for admin tools

🔍 Modules Breakdown

main.py

Purpose: Main Streamlit app logic.

Key Responsibilities:

* Checks login status via get\_current\_user()
* Presents Login/Register forms
* Loads ML model and feature importance Excel
* Accepts vehicle input via sidebar
* Predicts price on button click
* Saves history in prediction\_history.json
* Shows feature importance using Plotly
* Routes to profile via session state
* Admins can view all users' prediction history

Main Sections:

* Sidebar vehicle input interface
* Center plot: Feature importance
* Right panel: Prediction interface
* Admin extras: View all user histories
* Profile routing via st.session\_state["page"]

login\_utils.py

Purpose: Authentication and user management utilities.

Functions:

* load\_users() → Reads from users.json
* save\_users(users) → Writes to users.json
* authenticate(username, password) → Returns user dict if credentials match
* login\_user(user\_data) → Saves session info to current\_user.json
* logout\_user() → Clears session file
* get\_current\_user() → Reads active user from file
* register\_user(username, password) → Adds user with default user role

profile\_page.py

Purpose: Shows the authenticated user's profile and prediction history.

Features:

* User profile card (username and role)
* Table of prediction history (from prediction\_history.json)
* CSV download option
* Line chart: Predicted price trend
* Bar chart: Average price by car make (parsed from one-hot encoding)

user\_panel.py

Purpose: CLI-like script for non-GUI interaction (optional usage).

Functions:

* user\_panel(username) → View profile, prediction history, average report, logout
* admin\_panel(username) → View/add/remove users via terminal

Note: Depends on a module named auth, which appears to be either a placeholder or unused. In this case, its logic overlaps with login\_utils.py.

📊 Data Files

| File | Description |
| --- | --- |
| users.json | Stores all registered users with their credentials and roles |
| current\_user.json | Stores the current logged-in user |
| prediction\_history.json | Appends each prediction with user input and result |
| linear\_model.pkl | Pre-trained model loaded by the app |
| feature\_importance.xlsx | Contains feature importances to visualize in the UI |

▶️ How to Run

1. Install requirements:

pip install streamlit pandas numpy plotly pillow openpyxl

1. Ensure necessary files exist:
   * linear\_model.pkl (pre-trained model)
   * feature\_importance.xlsx (feature importance scores)
   * Create empty users.json, prediction\_history.json, and current\_user.json if they don’t exist.
2. Run the Streamlit app:

streamlit run main.py

1. Usage:
   * Register or login
   * Use the sidebar to input car specs
   * Click "Predict" to get price
   * Check your prediction history on the Profile page

🔐 Security Notes

* Passwords are stored in plain text in users.json (❗ not suitable for production)
  + 🔐 Use hashing (e.g., bcrypt) for real-world scenarios
* No user session expiration
* File-based user/session management (not database-backed)