A
Mini-Project Report on

Car Marketplace Site with Valuation of Used Cars using ML

Submitted in partial fulfillment of the requirements
for the degree of
BACHELOR OF ENGINEERING
IN
Computer Science & Engineering
Artificial Intelligence & Machine Learning

by

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2023-2024

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CERTIFICATE

This is to certify that the project entitled **"Car Marketplace Site with Valuation of Used Cars using ML"** is a bonafide work of Prathamesh Mhatre (22106026), Raj Nikam (22106027), Aaryaman Kattali (22106077), Tejashri Maske (22106051) submitted to the University of Mumbai in partial fulfillment of the requirement for the award of **Bachelor of Engineering** in **Computer Science & Engineering (Artificial Intelligence & Machine Learning).**

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Project Report Approval

This Mini project report entitled "**Car Marketplace Site with Valuation of Used Cars using ML"** by **Prathamesh Mhatre (22106026), Raj Nikam (22106027), Aaryaman Kattali (22106077), Tejashri Maske (22106051)** is approved for the degree of ***Bachelor of Engineering*** in ***Computer Science & Engineering***, (AIML) ***2023-24***.

External Examiner: _____

Internal Examiner: _____

Place: APSIT, Thane

Date:

Declaration

We declare that this written submission represents my ideas in my own words and whereothers' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission hasnot been taken when needed.

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ABSTRACT

The automotive industry is undergoing a digital transformation, with online car marketplaces playing a pivotal role in reshaping how consumers buy and sell vehicles. This report presents the design and implementation of a car marketplace website equipped with Machine Learning (ML) model for the accurate valuation of used cars. The project addresses the challenge of providing precise and equitable pricing information to enhance the overall user experience within the automotive marketplace. The proposed car marketplace website offers an intuitive user interface for listing, searching, and comparing vehicles, simplifying the process of connecting buyers and sellers.

The primary innovation resides in the integration of ML algorithms, which harness historical sales data, vehicle specifications, market dynamics, and relevant contextual factors to provide instant, data-driven valuations for pre-owned cars. This ML-driven valuation system aims to foster transparency, reduce information asymmetry, and facilitate fair price negotiations within the marketplace. To assess the system's performance, extensive testing and validation procedures are conducted, including comparisons with conventional valuation methods and gathering user feedback. The results demonstrate the system's capacity to deliver precise and competitive valuations, thereby enhancing user satisfaction and trust in the online car marketplace.

In conclusion, the development of a car marketplace website with a machine learning-based used car valuation system represents a significant advancement in streamlining and improving the fairness of the automotive resale market. This project underscores the transformative potential of ML techniques in revolutionizing the determination of used car values and offers a valuable resource for both buyers and sellers in the automotive industry.

Keywords: Car marketplace, Used car valuation, Machine learning, Fair pricing.

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CHAPTER 1

INTRODUCTION

1. INTRODUCTION

The used car market is a massive and constantly evolving ecosystem, driven by factors such as vehicle age, mileage, condition, make, model, and regional demand. Accurately valuing a used car in this complex landscape is a challenging task, both for buyers who want to ensure they're getting a fair deal and sellers who aim to set an appropriate selling price. Traditional methods of valuation, such as relying solely on historical sales data or expert opinions, often fall short of providing precise estimates. Machine learning, with its ability to process vast amounts of data and identify intricate patterns, offers a promising solution to this problem. By leveraging ML algorithms, we can create a car marketplace platform that provides users with real-time, data-driven valuations for used cars, enhancing the decision-making process and ensuring fair transactions.

The primary objectives of this project are as follows:

1. Develop a user-friendly car marketplace website.
2. Implement machine learning models to predict accurate valuations for used cars.
3.Enhance the user experience by providing detailed insights into the valuation process.
4. Improve transparency and trust in the buying and selling process.

Machine learning (ML) is a subfield of Artificial Intelligence (AI) that works with algorithms and technologies to make useful inferences from data. Machine learning algorithms are well suited to problems entailing large amounts of data which would not be possible to process without such algorithms. ML works algorithmically rather than mathematically and permit a machine to “learn” and adapt its predictions to best fit the data it has trained on.

Using machine learning to better utilize data on all the less common features of a car can more accurately predict the value of a vehicle. This is a clear benefit to consumers, especially those who themselves cannot ascertain the value of the vehicle that they are buying or selling and must rely on a tool. A tool that is more tailored to the non-standard features of the car can provide a more accurate price and make the market fairer for all participants. There are several machine learning regression models that can be applied to price prediction. This work will investigate which one offers the best performance according to several criteria. The nature of machine learning is to train on past data to predict unseen data. Applied to price prediction of cars, the data is sourced from past sales while the predictions are for the present value of cars.

The purpose of this thesis is to evaluate several different machine learning models for used car price prediction and draw conclusions about how they behave. This will deepen the knowledge of machine learning applied to car valuations and other similar price prediction problems.

CHAPTER 2

LITERATURE SURVEY

2. LITERATURE SURVEY

2.1-HISTORY

The concept of online car listings began to gain traction in the late 1990s and early 2000s with the launch of websites like AutoTrader and Cars.com. These platforms allowed users to search for used cars listed by dealers and private sellers, but they did not initially incorporate machine learning-based valuations. Around the mid-2000s, companies like Kelley Blue Book and Edmunds started offering data-driven car valuations, providing users with estimated prices based on factors such as make, model, year, mileage, and condition. As machine learning techniques became more accessible and powerful, some online car marketplaces began integrating ML-based valuation systems. These systems used algorithms to analyze historical sales data and other factors to provide more accurate price estimates for used cars .

In the 2010s, several standalone car valuation tools and platforms emerged. Companies like TrueCar and CarGurus implemented machine learning algorithms to offer users a better understanding of a car's fair market value, taking into account various parameters. While not machine learning-based, these valuations marked a shift toward databased pricing. As ML became more prevalent in the industry, ethical considerations such as fairness and bias in pricing models gained attention. Efforts were made to ensure that ML algorithms did not discriminate against certain demographic groups. The evolution of car marketplace sites with ML-based valuation systems continues to this day. These platforms are continuously improving their algorithms, expanding data sources, and incorporating user feedback to provide more accurate and transparent valuations.

Beyond 2021, the use of machine learning in car valuation is likely to become even more sophisticated. This may include the integration of real-time market data, more advanced AI algorithms, and greater personalization of valuations based on individual user preferences and needs.

2.2-LITERATURE REVIEW

1."Emerging Trends in the Automotive Industry" by Deloitte (2019): This report highlights emerging trends in the automotive industry, including the use of AI and ML for vehicle valuation and online marketplaces.

2. "Used Car Price Prediction using Supervised Learning Techniques" by Pattabiraman Venkatasubbu, et al. (2019): Focusing on the used car market, this research utilizes different machine learning algorithms like Lasso Regression , Multiple Regression and Regression Tree and compares their performance.

3. **"Car Price Prediction using Machine Learning Techniques" by Enis Gegic, et al. (2019):** This study involves creating classes namely "Cheap", "Moderate" and "Expensive" using Random Forest. They made use of Support Vector Machine and Artificial Neural Network for classification.

4.**"User Experience (UX) in the Age of Machine Learning" by Jonathan Widawski, et al. (2018):** This article discusses the role of user experience in machine learning applications and the importance of providing users with clear and interpretable model outputs.

5.**"Designing User Interfaces for Explainable AI" by Doshi-Velez, et al. (2017):** This research explores techniques for designing user interfaces that present machine learning model outputs in a way that users can understand and trust.

6."The Impact of E-commerce on the Automotive Industry" by Boston Consulting Group (2017): While not focused on ML, this report provides insights into how the automotive industry is adapting to digital platforms and e-commerce, including the sale of used cars.

CHAPTER 3

Problem Statement

3. PROBLEM STATEMENT

For the purposes of car valuation, popular guides tend not to use machine learning. Instead, they source data from local sales and average the prices of many similar cars. This method works well if you have a common car with a common set of features. The condition of the car is judged very roughly, typically on a scale of one to three. Cars that are “unusual” are therefore hard to evaluate. Effectively, no inferences are drawn from similar cars but from a different make and model, whereas with machine learning, the entirety of the dataset and its features are used to train the model predictions. Using machine learning is a solution to the problem of utilization of all the data and will assist in utilizing all the features of a car to make valuations

New cars of a particular make, model, location, and feature selection are identical in condition, function, and price. When new cars are sold for the first time they are then classified as used cars. As an asset ages, its price changes because it declines in efficiency in the current and in all future periods. Depreciation reflects the change in net present value over time. Revaluation, on the other hand, is the change in value or price of an asset that is caused by everything other than aging. This includes price changes due to inflation, obsolescence, and any other change not associated with aging. A car with the same make, model, year, and geographic region, but this a larger engine than a different car should command a different value at different times.

The nature of machine learning is to train on past data to predict unseen data. Applied to price prediction of cars, the data is sourced from past sales while the predictions are for the present value of cars. Therefore, a criterion for the selection of a machine learning model it remains accurate in its predictions for future years, not included in the data set.

CHAPTER 4

Experimental Setup

4. EXPERIMENTAL SETUP

4.1 Software Setup

1. Programming Languages:

- Python: Python is a popular language for machine learning and web development.

2. Integrated Development Environment (IDE):

- Jupyter Notebook or JupyterLab: Ideal for data analysis and experimentation.
- PyCharm: A popular Python IDE with smart code completion, code inspection, and debugging tools.

3. Web Development:

- Streamlit: Streamlit is a popular Python library for rapidly creating web applications with minimal effort. It's especially well-suited for data scientists and engineers who want to quickly turn data scripts into shareable web applications. Streamlit makes it easy to create interactive and data-driven web applications using familiar Python scripts.

4. Data Manipulation and Analysis:

- NumPy: For numerical operations.
- Pandas: For data manipulation and analysis.

5. Machine Learning and Data Science Libraries:

- Scikit-Learn: For building and training machine learning models.
- Catboost: For improved prediction accuracy.

6. Data Visualization:

- Matplotlib: For basic data visualization.

7. Version Control:

- Git: For version control of your project.

8. Project Management and Collaboration:

- GitHub: A cloud-based platform for hosting Git repositories and facilitating collaboration on software development.

9. Documentation:

- Use Jupyter Notebooks for creating project documentation and explanations.

10. Text Editors:

- Visual Studio Code, Sublime Text.

11. Virtual Environment:

- Anaconda: Set up a virtual environment using conda to manage project dependencies.

12. Deployment: localhost

13. Communication Tools:

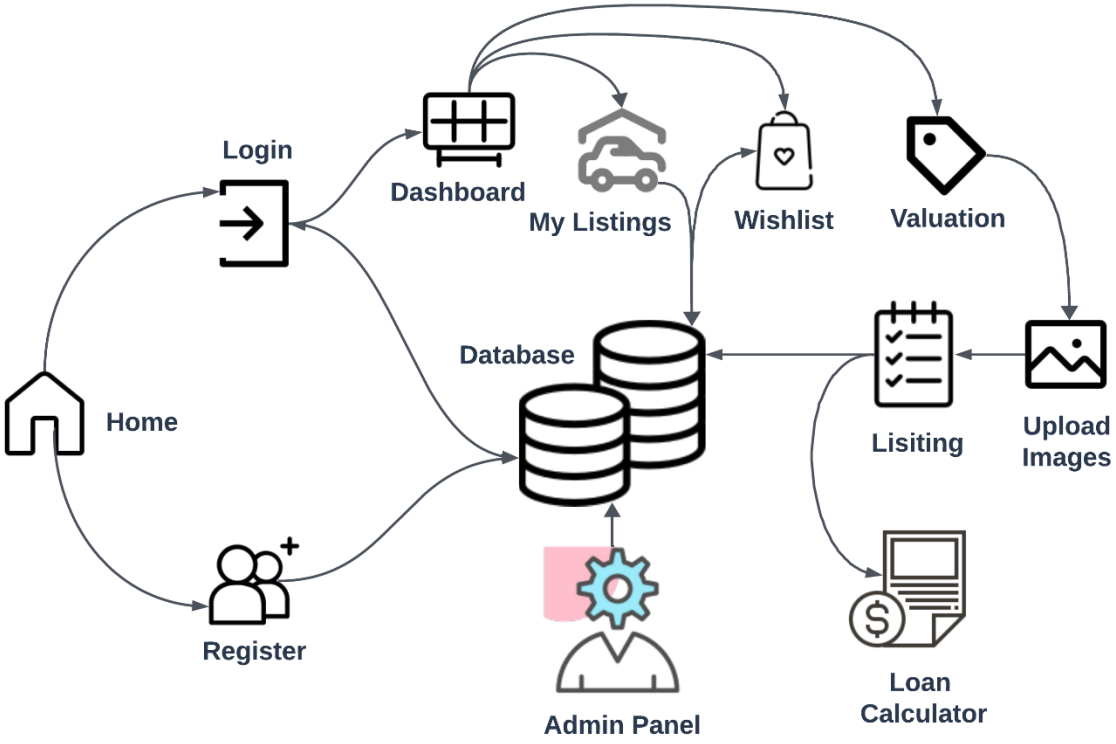
- Discord: Many businesses and professional teams use Discord for communication and collaboration.It's a great platform for remote work, allowing teams to communicate in real-time through text, voice, or video channels.

CHAPTER 5

Proposed System & Implementation

5. Proposed System & Implementation

5.1 Block Diagram of Proposed System



5.2 Description of Block Diagram

The main components are:

- **Database:** This is where all the data about the cars is stored, including the make, model, year, mileage, condition, price, and any other relevant information. It includes listings, saved listings, wishlist and uploaded images. It also stores login and registration data of users.

- **Valuation:** This has the machine learning model that is used to estimate the value of used cars. The model is trained on a large dataset of historical car sales data, which allows it to learn the factors that influence the value of used cars.

- **User interface:** This is the part of the website that users interact with to browse and search for cars, get valuation estimates, and post listings for their own cars.

The user interface includes the following features:

- **Login and registration:** Users need to create an account in order to access the full features of the website, such as posting listings and contacting sellers.
- **Dashboard:** This is where users can manage their listings and view their wishlist.
- **My Listings:** This is where users can post listings for their own cars. The listings typically include information such as the make, model, year, mileage, condition, price, and photos of the car.
- **Wishlist:** This is where users can save cars that they are interested in.
- **Home:** This is the landing page of the website.
- **Admin Panel**: The admin panel of a car marketplace website is a backend interface that allows administrators to manage the website and its users.
    - **User Bans**: This allows administrators to ban / delete users.

5.3 Implementation

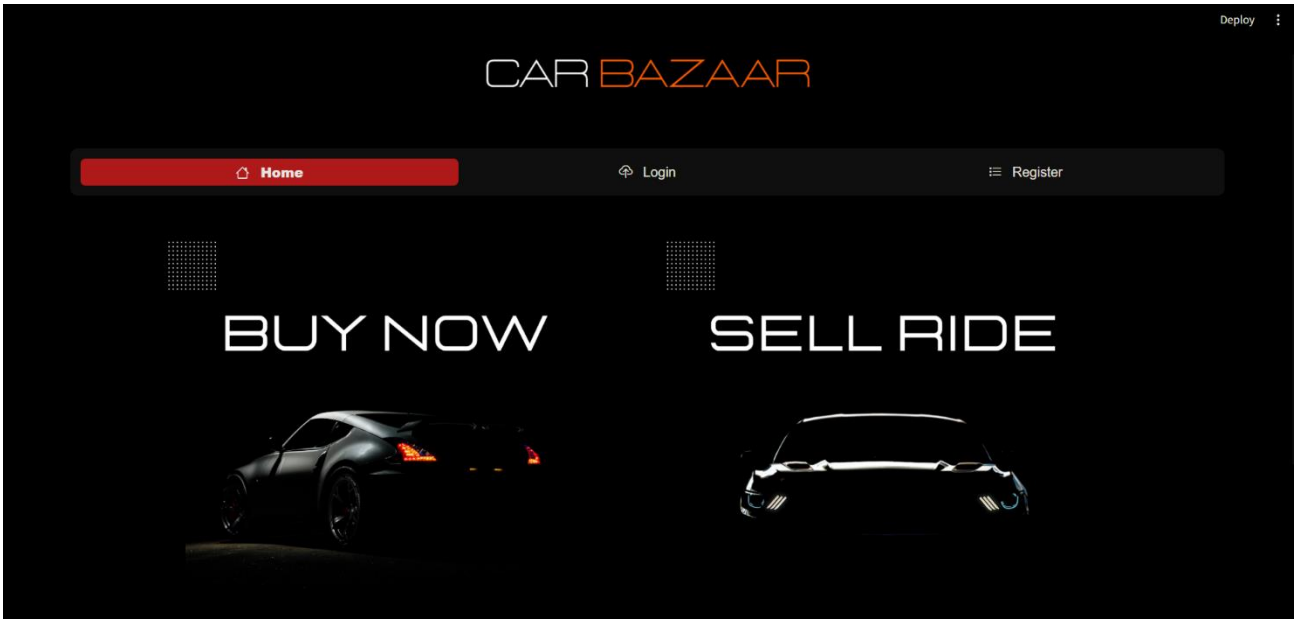


Fig 5.3.1 The homepage of the web app.

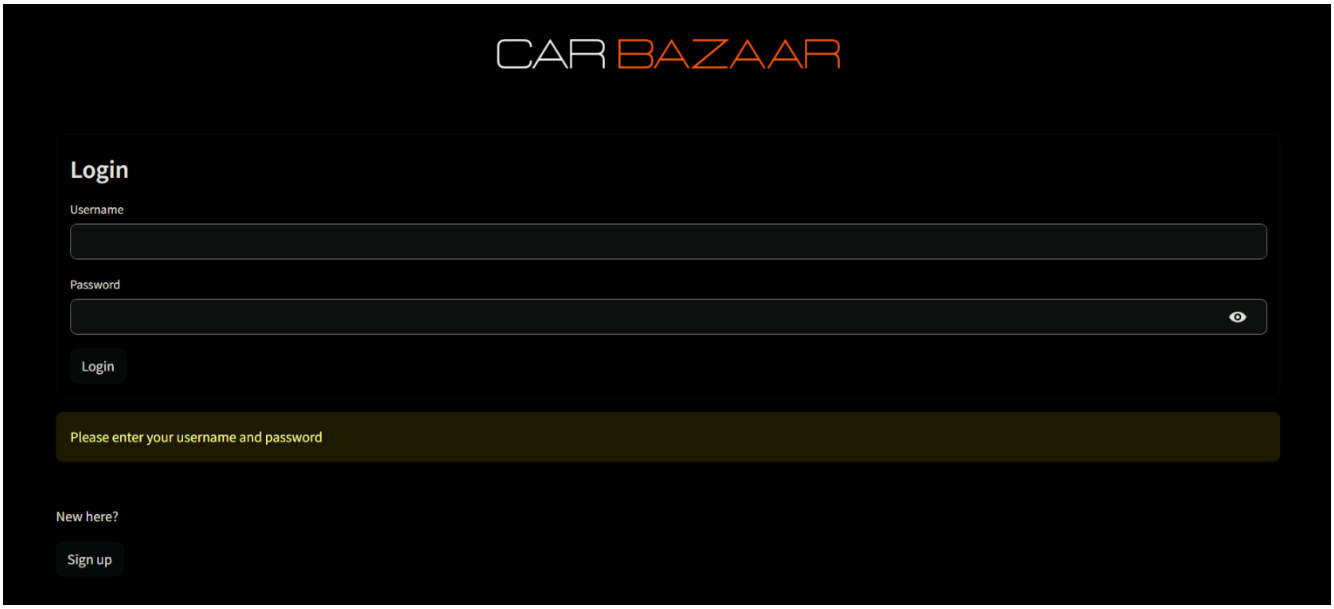


Fig 5.3.2 The login page of the web app.

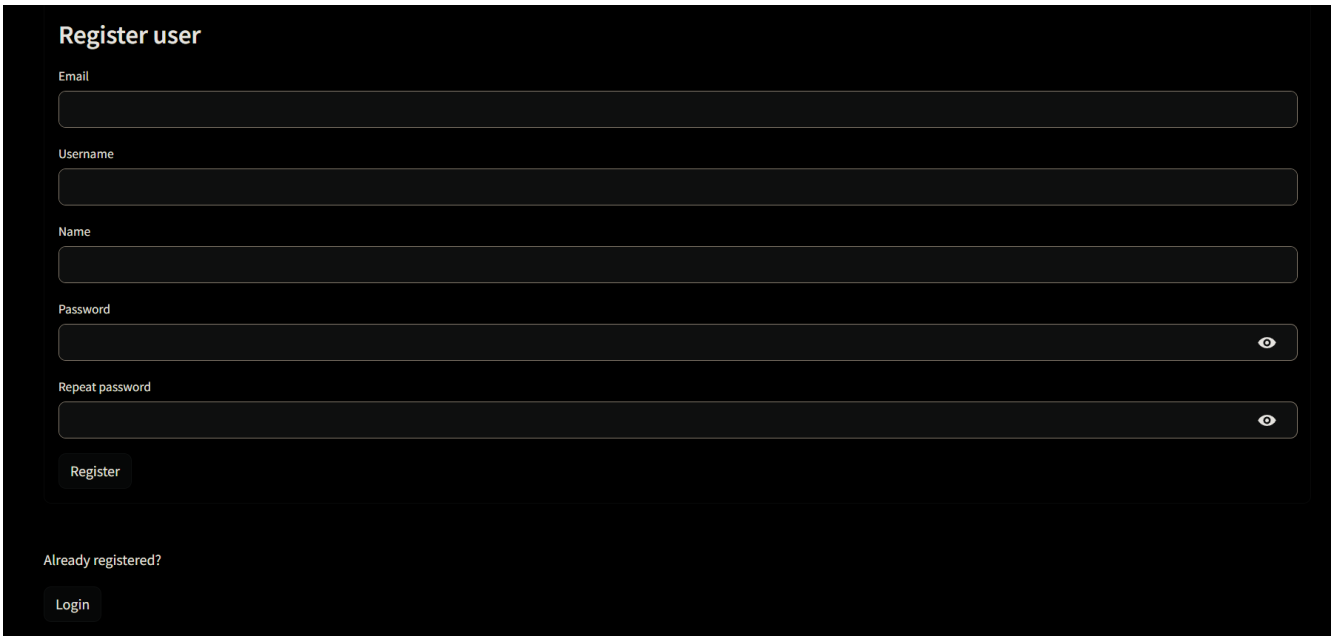


Fig 5.3.3 The register user page of the web app.

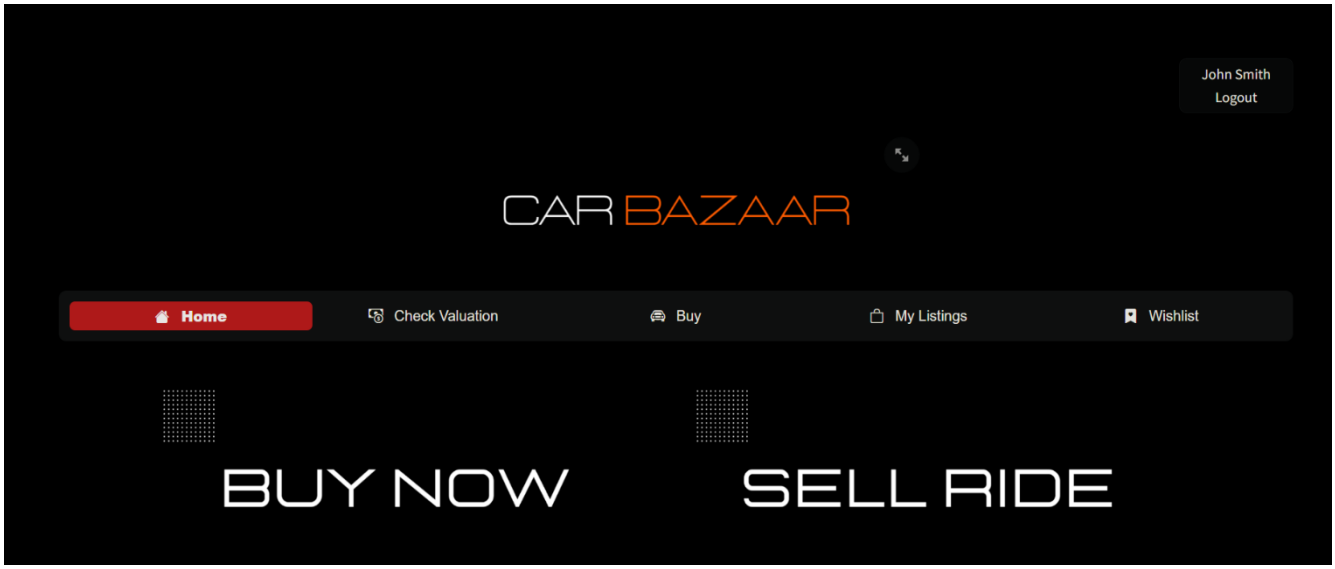


Fig 5.3.4 The dashboard page of the user after login.

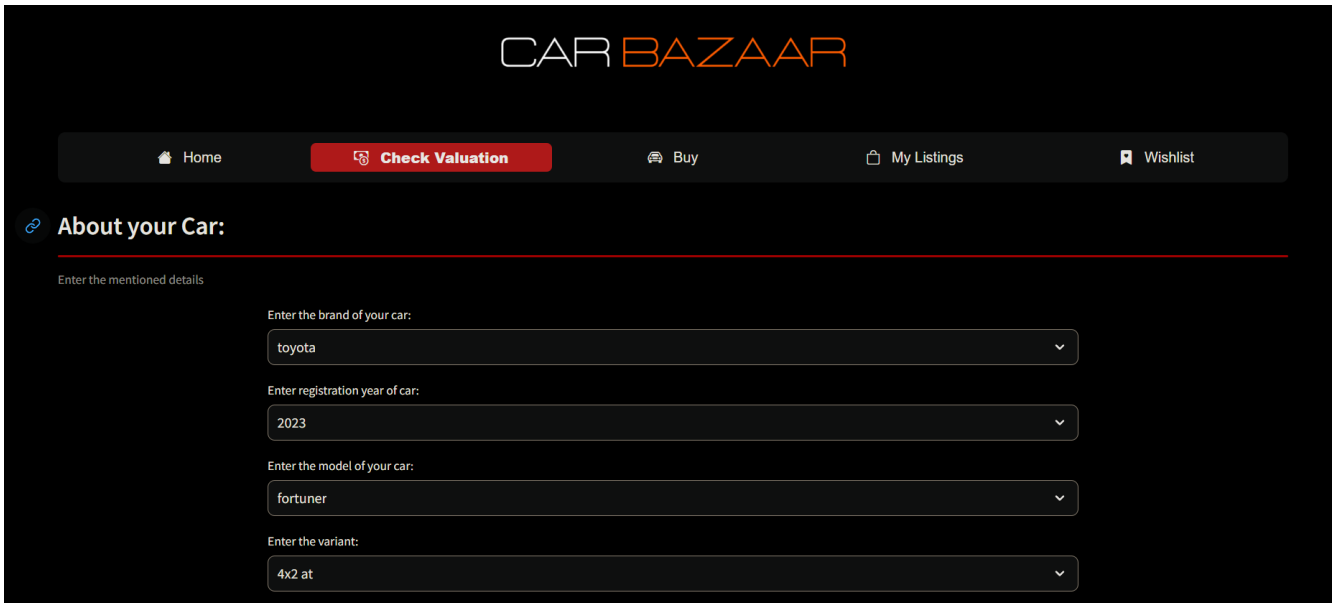


Fig 5.3.5 The check valuation page to predict price.

Fig 5.3.6 The suggested valuation page showing range of price.

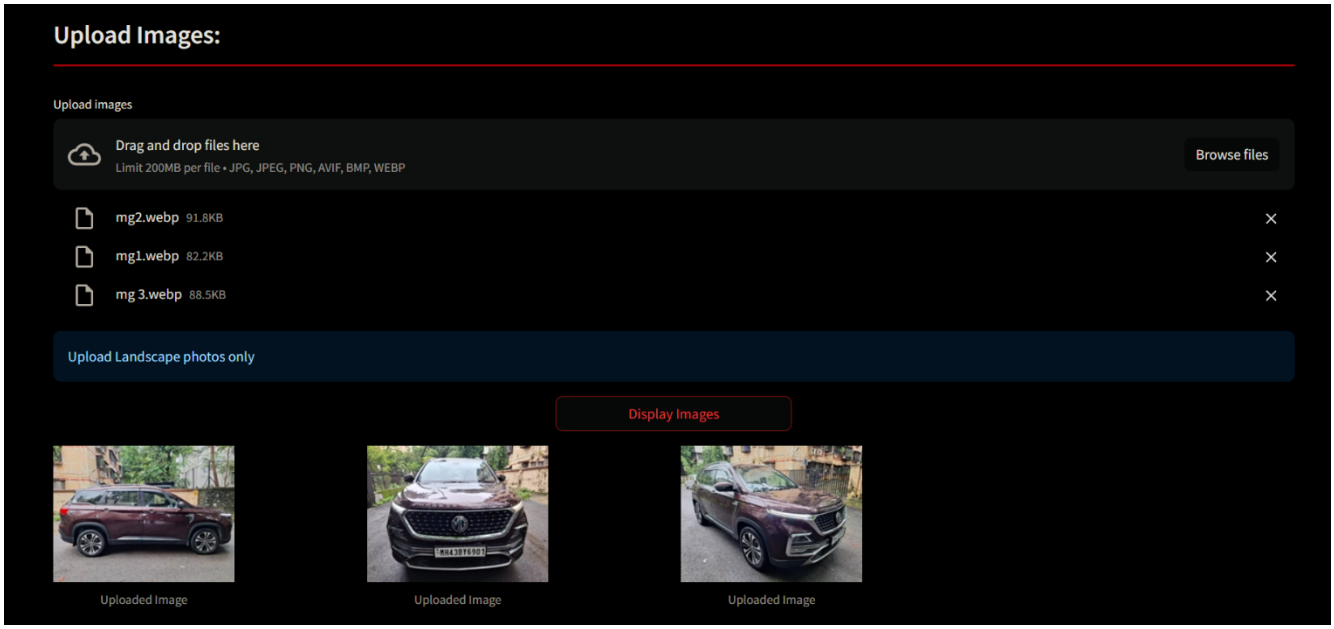


Fig 5.3.7 The upload image page showing interface to upload car photos.

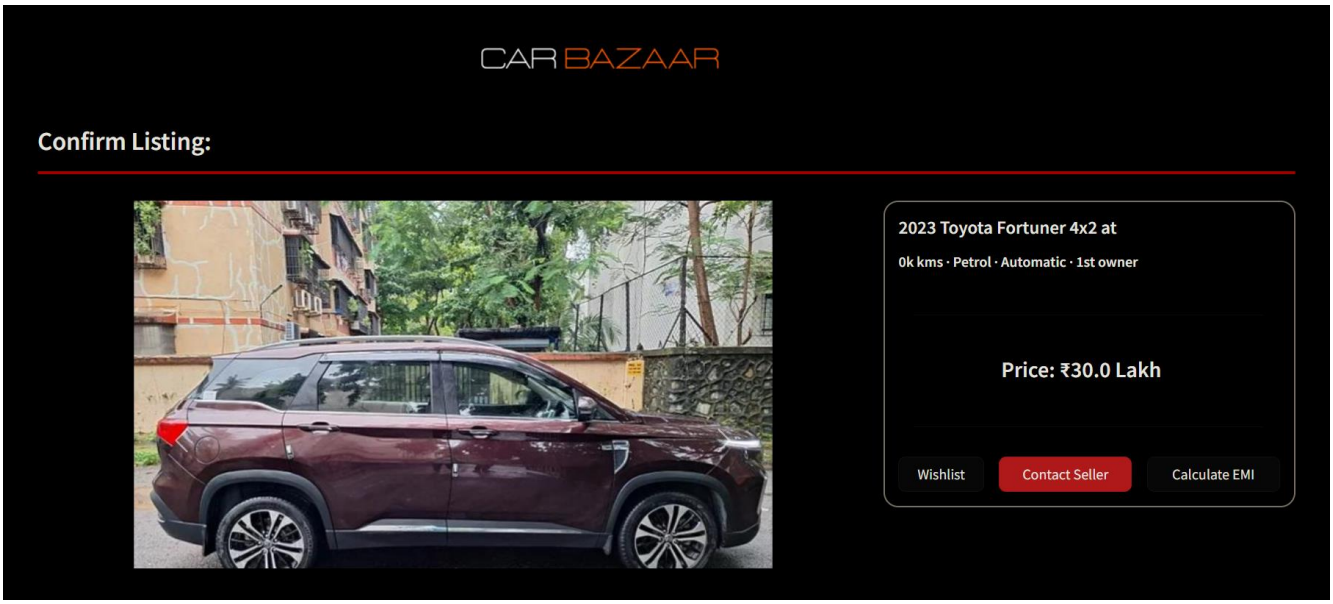


Fig 5.3.8 The confirm listing page to preview the listing.

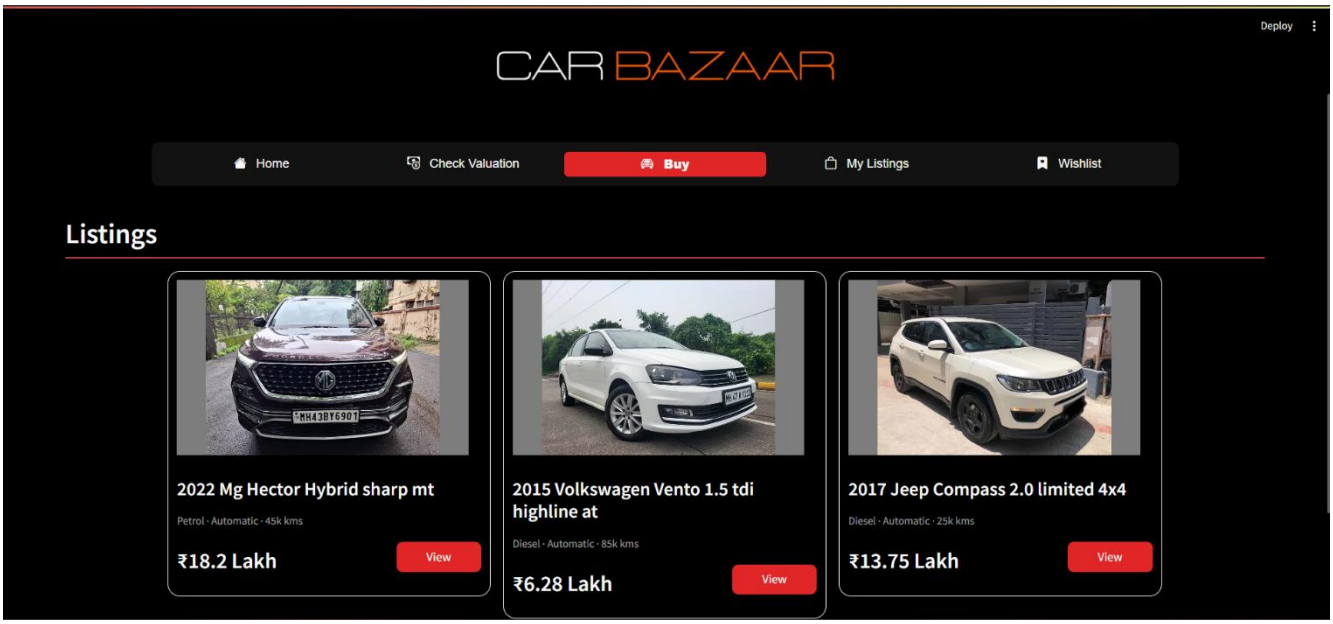


Fig 5.3.9 The listings page showing list of cars on sale.

CHAPTER 6

Conclusion

i. Conclusion

In conclusion, the introduction of Machine Learning (ML) for car valuation within the context of a car marketplace site represents a pivotal leap forward in the used car industry. This innovative approach not only enhances the overall user experience by providing accurate valuations but also creates a more transparent and efficient marketplace. It empowers both buyers and sellers to make well-informed decisions, mitigating information asymmetry and enabling fair pricing. While the successful integration of ML is evident, it is crucial to acknowledge ongoing challenges in terms of data quality, model maintenance, and privacy concerns. However, these challenges should be viewed as opportunities for continuous improvement. As we look to the future, this endeavor has the potential to reshape the used car market, setting new standards for data-driven decision-making and user satisfaction.

To sustain and expand upon this success, the journey ahead involves refining ML models, extending the range of cars covered, and staying attuned to the evolving needs of users. The data-driven insights garnered from this platform can be invaluable not only for enhancing the user experience but also for offering market intelligence to car dealerships, manufacturers, and other stakeholders in the automotive sector. By continuing to invest in research and development, this car marketplace site has the potential to lead the way in demonstrating how ML can transform an industry and serve as a catalyst for innovation across various sectors that seek to harness the capabilities of artificial intelligence and data analytics.

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References

Research Papers:

[1] “Emerging Trends in the Automotive Industry” by Deloitte (2020)

[2] Used Car Price Prediction using Supervised Learning Techniques” by Pattabiraman Venkatasubbu, et al. (2019)

[3] “Car Price Prediction using Machine Learning Techniques” by Enis Gegic, et al. (2019):

[4] “A Survey of Big Data Architectures and Machine Learning Algorithms in Healthcare” by Tariq Rahim Soomro, et al. (2017)

[5] “User Experience (UX) in the Age of Machine Learning” by Jonathan Widawski, et al. (2018)

[6] “Designing User Interfaces for Explainable AI” by Doshi-Velez, et al. (2017)

[7] “The Impact of E-commerce on the Automotive Industry” by Boston Consulting Group (2017)

URL:

[1] https://docs.streamlit.io/

[2] https://github.com/scrazzz/imgbbpy/blob/main/documentation.md

[3] https://pymongo.readthedocs.io/en/stable/