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Application of Hybrid Algorithms for Car Recommendation System

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Abstract: ***Web based recommendation for any item is a hard and fast requirement in any E-commerce website. This research paper explores the system which is employed to recommend car to the users based on the requirement provided by the user. This methodology narrow the sphere right down to some criteria that car buyer consider like looks , cost, safety, functionality, performance , fuel economy, technology etc. A hybrid recommendation system is a special variety of recommendation system which might be considered as the combination of the content and therefore the collaborative filtering method.***
Keywords: data analysis; model deployment; pre- owned cars; regression; root-mean-squared error; car recommendations; hybrid recommender algorithm;

I. INTRODUCTION

Recommendation is such a thing that is not new to our society. This had always been a component of humankind where humans used to recommend their colleagues better way for decide on things .As globalization is a new normal, there are plentiful of products in every category. Recommendation techniques have always played a very crucial role in marketing activities. If we talk about vehicles, recommendation is a much needed thing for today's buyers. People's craze for wheels is not a new thing as in the last part of Stone Age; the invention of wheel was done. In fact wheels are the proof of intelligence of humans. But the wheel alone, without any further coinage, would not have done much for the mankind. As the time passes, technology grew and stands on what we see today. Owning a vehicle has become a mandatory requirement in the modern world. Automobile industries are investing a lot on producing different car models to cater the needs of their customers with different social and economic backgrounds. The foremost objective of this work is to recommend a car according the user need.

II. RESEARCH METHODOLOGY

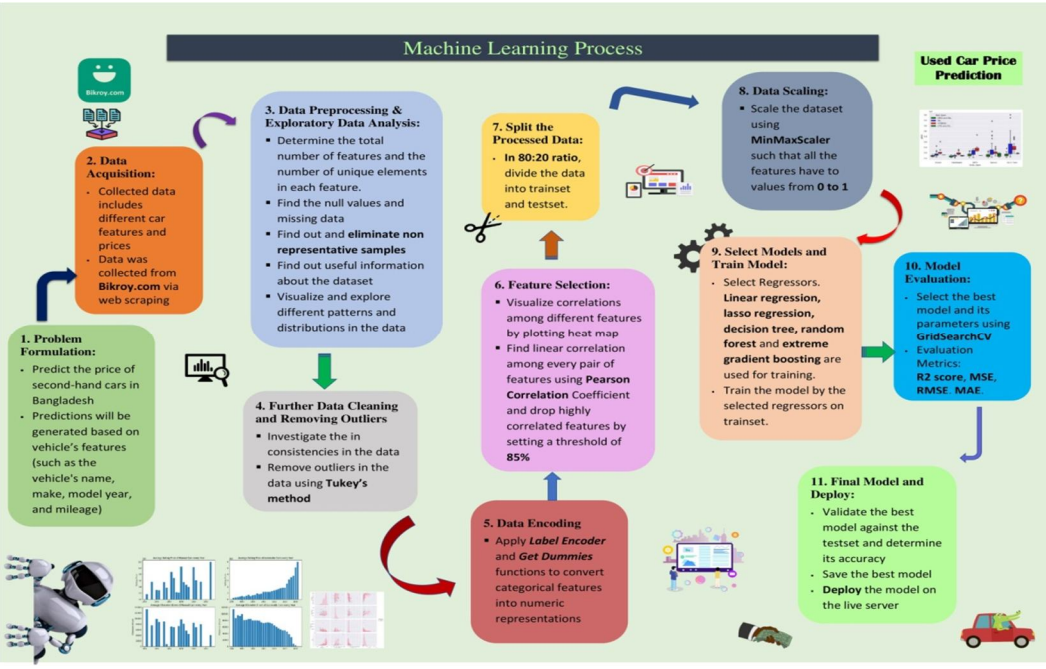


Figure 1. Flow Chart of Research Methodology.

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A recommendation system is a subclass of Information filtering Systems that looks for to predict the rating or the preference a user might give to an item. "Information Filtering" is a field of study designed for creating a systematic and scientific approach for extracting information that a particular person finds important from a larger stream of knowledge and information. Recommendation system is active information filtering system that seeks to give the user information items the user is specifically interested in.

By its design , recommendation system is personalized system for user. Relevant items are shown using the content of the previously searched items for the users. This is content based filtering. Recommending items to users based on their interest and preference of other similar users is basically collaborative-based filtering. For eg:- When we shop on Amazon it recommends new products saying *"Customer who brought this also brought"*.

Recommendations are of two type: personalized and Non personalized. While personalized recommendation system suggests products to a user according to the user profile and their previous purchase history, a non-personalized recommender system displays products that are popular among the people in general during the time period. Hence, we can see, the more complete and precise each user profile leads more successful is the recommendation process.

A. Why Recommendation System

1) *Customer Satisfaction:* Many a time , customer gets product recommendation from their past browsing. This way they are guided to compare their thoughts and knowledge to get best of the thing they are searching.
2) *Personalization:* Seeking help from friend and family and then purchasing a product is many a time influenced by their thoughts rather than customers own requirement and budget. Recommendation system help reducing the distractions.
3) *More Sales for the Company:* With the help of recommendation system companies are benefited with loyal customers . Also this helps them to identify what customers really need.

B. Contribution to the System

1) *Users: In order to achieve personalization, different parameters like ratings of the user, demographic attributes like age, gender, profession, income,place etc,*
2) *Behaviour: attributes like browsing pattern, click stream data, filtering pattern etc of the users are involved in the design of the system.*
3) *Models: In car recommend system client also check other features like car name,brand ,model,current model,fuel type and price*

The dataset collected may not always be in a format that is suitables for machine learning algorithms to operates on RS.

Number of unique values for all the features.

Feature Name	name
car_name	name
brand	brand
car_model	model
model_year	year
transmission	Transmission (automatic or manual)
body_type	Body type
fuel_type	Fuel type
engine_capacity	capacity of engine in(cc)
kilometers_run	Kilometers run by the car

Finally, values of the feature *fuel type* were mapped to four broader values according to their needs. They are cng and oil, pentrol, hybrid, and lpg and Oil.example: Lpg,octane, Petrol, diesel has been mapped to a broader categorys oil. car that run with both cng and pentrol are mapped to category cng and pentrol.. Other categories are like mapped in a similar manners

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After processing the feature fuel type.

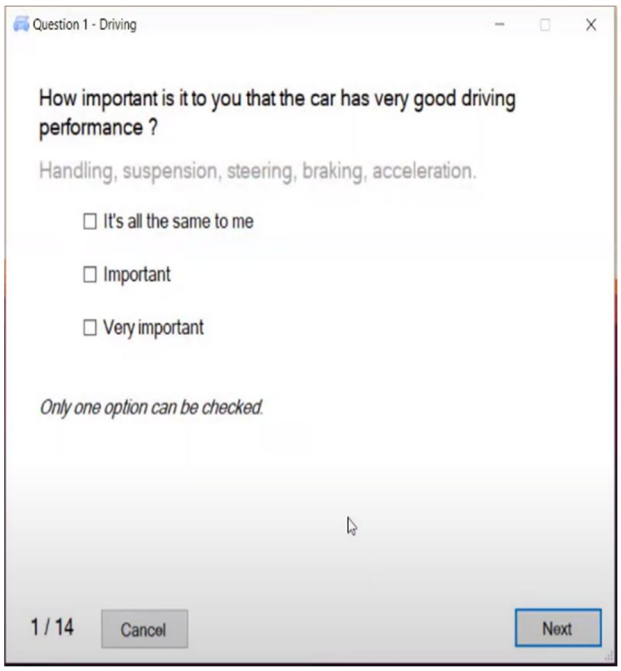
Fuel_Type	Description
CNG and Oil	cars that run on both CNG and Oil
Oil	cars that run on oil
Hybrid	Hybrid cars
LPG and Oil	cars that run on both LPG and oil

1) *Content-based:* In this system items are recommended that are similar to items that the user have searched or bought in past . The possible similarity of product is calculated based on the feature which is very near to the demands of the user in the new one.
2) *Collaborative Filtering System:* It is called as "client-to-client correlation." This is probably the most popular method of recommendation. This method is based on kind of partnership method where user and items are closely related to have recommendation.
3) *Demographic:* This works on the basis of the profile of the user . Profile of the user means what occupation he has, what is his age and also the geography around the user.
4) *Knowledge-Based:* Knowledge based recommendation system is most powerful tool if used properly. In this method different constraint is fed to the machine like which qualities of the item is best suited to the user. This actually works on data. Hence have a major drawback, that if data is not fed properly or not implemented as it is needed it may even produce false results,
5) *Constraint-Based Systems:* This system is very much similar to the knowledge base recommendation system. Here the recommendation works on some specific set of rules like what are the demands of user about car type, fuel type, cost of the car, space, and much more.
6) *Community-Based:* In this system the preference to the community of buyer is given.
7) *Hybrid Recommendation System:* This system is mixture of above all recommendation systems in appropriate amounts.

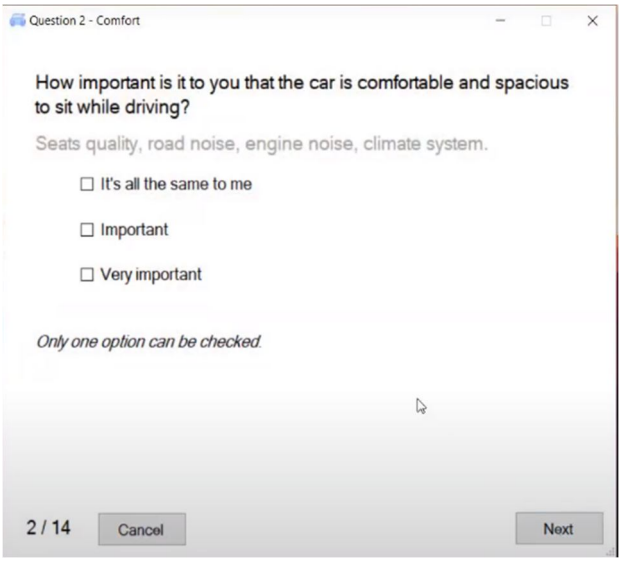
III. TEST CASES AND RESULTS

Clicking on "option" in the MENU FRAME brings you on this frame. This window looks as follows:

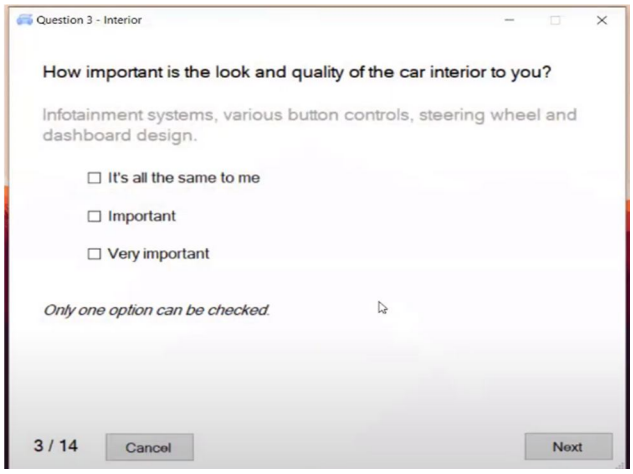
1) This window provides suggestion of car(s). User needs to inputs .



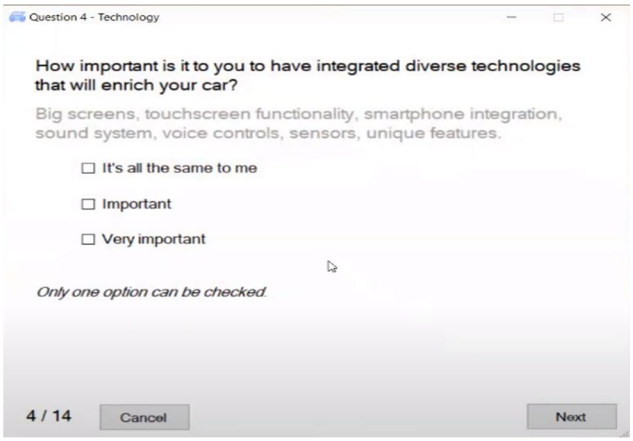
2) In this option suggestion of car seat quality,road noise ,engine noise, climate system.



3) In third option click by user infotainment system, various button controls, steering wheel and dashboard design.

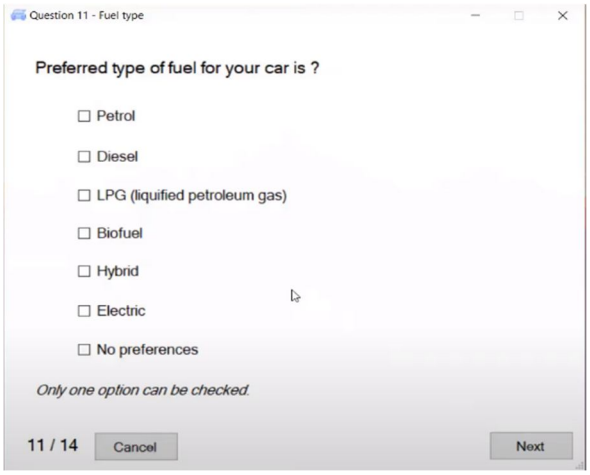


4) In forth option choose one by user. It suggest big screens, touchscreen functionality, smartphone itegration sound system, voice controls, sensors, unique features.

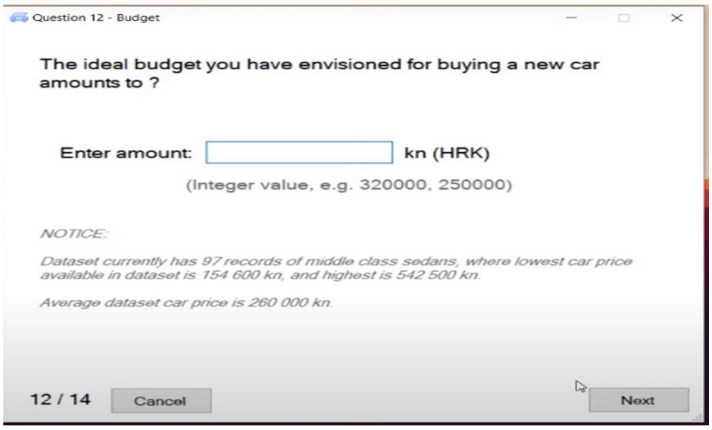


5) In the option suggestion about deep and wide trunk capable for taking several passenser suitcases.
6) Efficiency of fuel consumption for performance it delivers
7) Prefered number of seats in the car.
8) Consider combined fuel consumption for city highway driving.

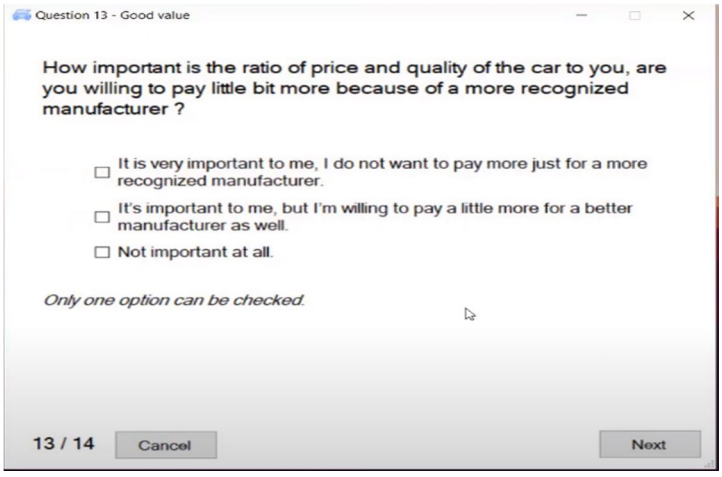
9) consider type of fuel for car like petrol ,diesel,lpg,biofuel,hybrid,electric .



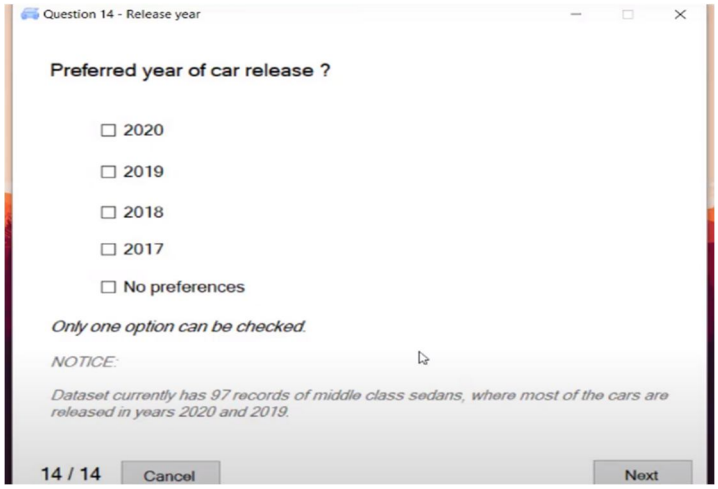
10) Amount of car you have envisioned for buying a new car price.



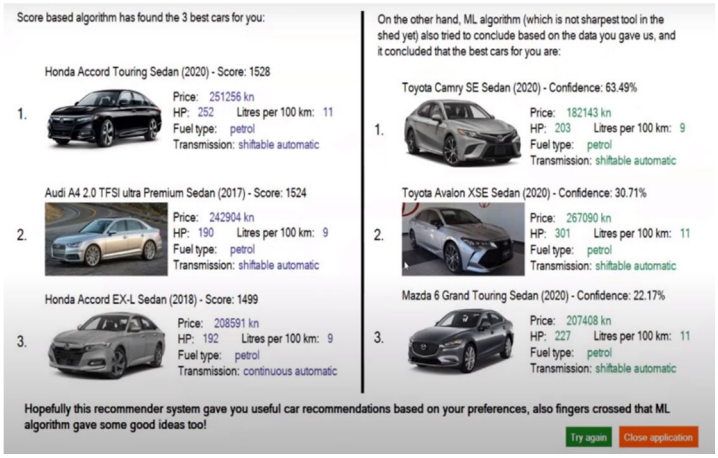
You willing to pay some amount for manufacture click by user.



Year of car release mention it.



Final result all car show in window page which one you perfered .If did't find then click try again.



IV. CONCLUSIONS:

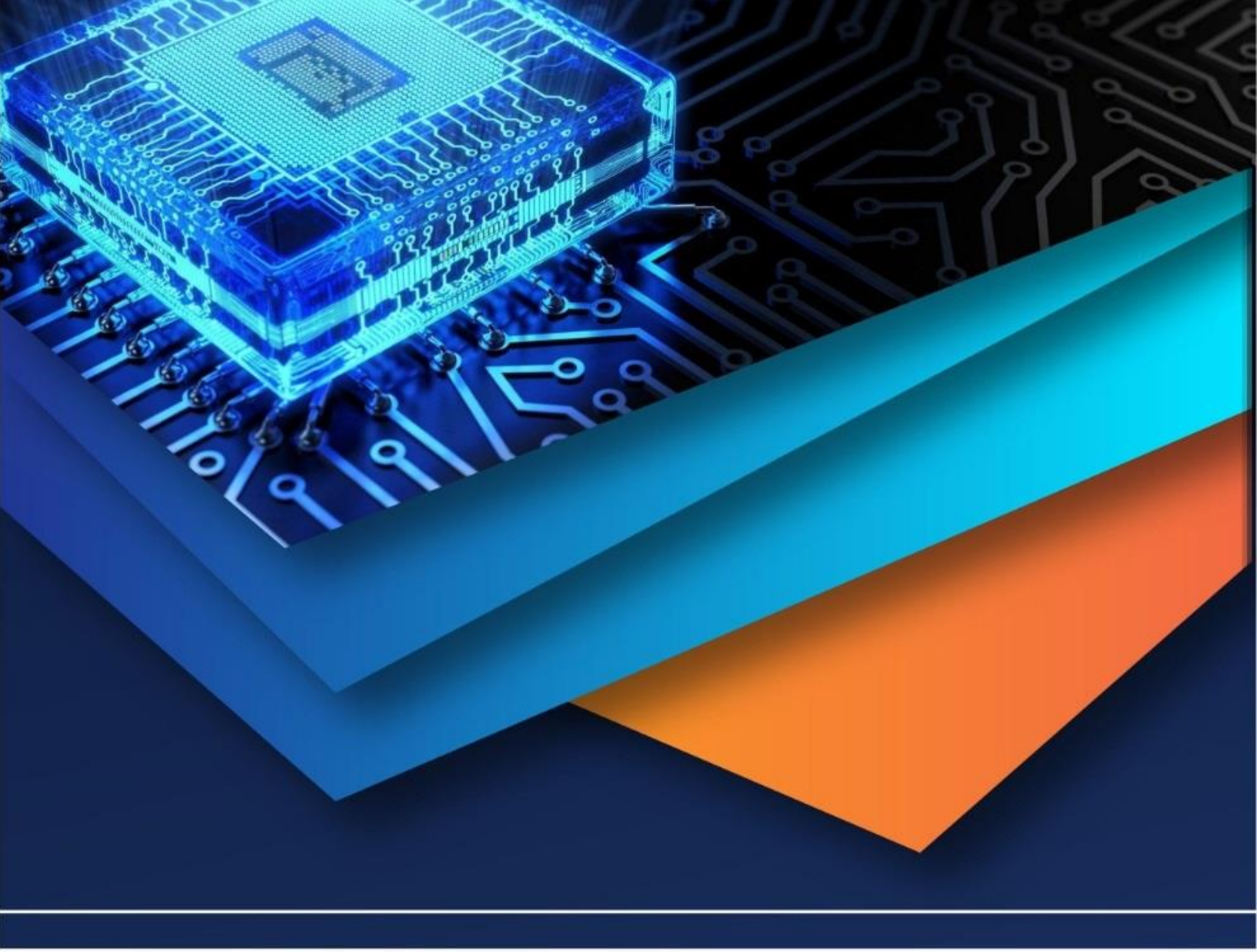
The hybrid recommendation algorithm is efficient in suggest recommendations. This system mainly helps users to purchase car without more knowledge about car, also suggests many option available based on the customer requirement. It can correctly suggest the user car model based on their requirement. To provides accurate and current information to the client, links are provided for each car model for user can know review, detail, image of model. The user can click on the link and there by update information on the internet. This is useful as the users can view the images, view of the car, reviews of other users, ratings, details, etc. Data Visualizations help to see the analysis of the available car models at a glances. If user is low on budget, there is an option to view Car Loans of banks and direct link to get. This system can surely help to choose the appropriate car, meeting the users requirement.

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