# HABITATION RECOMMENDATION USING MACHINE LEARNING

**Mahesh Yadav G [1] , Nagendra G P [1] , Nikhil A V [1] , Pratheek B J [1] ,  Dr.Kavitha C [2]**

*[1] Student, Department of Computer Science Engineering, DSATM, Bangalore, India*
*[2] Professor and Head of Department, Computer Science Engineering, DSATM, Bangalore, India*

***Abstract:*** Renting has been one of the major adopting methods for habitation over the years. However, finding the right place to live is a challenging task for an individual to look out for. As there are many methods available to look out for houses. In this paper, one such method is proposed. The developed method uses the user interactions, artificial intelligence, and machine learning to understand the user requirements and recommend the right place for the individual. The user requirements are collected from the user by the chatbot and the data is fed to the machine learning model, then the recommended places are mapped over the google maps interface for the user. The proposed method helps the user in finding the right place in an easy and efficient way.

***Keywords* – Habitation, Artificial Intelligence, Machine Learning, Chatbot, Google Maps.**

## I.    INTRODUCTION

With the basic need for higher education and work location, people tend to relocate from their native to different locations. This results in an individual looking for accommodation based on their preferred choices and budget. A Habitation recommendation system makes use of data collected from the user and some filtering machine methods to recommend/suggest consumer requirements as per their wishes and affording functionality. This Habitations Recommendation system makes use of the Gaussian Mixture Models clustering algorithm to predict the user's interest. Clustering is a data mining and machine learning technique that consists of clustering a collection of data points into clusters based on their similarity. The purpose of clustering is to split the data into distinct groups, such that the data points within each group are more similar to each other than they are to data points in other groups. Cluster analysis is the process of applying cluster algorithms to a data set for the purpose of identifying and characterising clusters within the data. It is a common technique in data exploration and analysis, and is used to identify patterns and relationships within the data. The user interface provides the interface for the user to pin or mark down their preferred location over the map to find out the nearby habitation. After the user marks the location, the user requirements are collected using an interactive method (AI chat-bot), the further process of calculating real-time distances between the property and nearby facilities and calculating the related places over the trained models, and displaying the same to the user over the interface. This proposed system helps in finding the desired accommodation with the help of information technology which is efficient and cost-effective over the physical search for the places.

## II.   LITERATURE SURVEY

**[1]** Study of the Reasons Regarding Why People Choose to Reside in Paying Guest Households was developed by Prachi Rattanpal and mainly focused on examining the reasons for which people choose to reside in paying guest households. In this paper, the study was conducted over a large number of paying guest households for both girls and boys, who are college students to working professionals. The residents of the paying guests were interviewed and their responses were collected and analyzed. From the data collected the respondents were studied under four categories, as students, those who are attending coaching classes, who are doing internships, and those who were working.  The most of the respondents were from the age group of 19-24 years, where the largest proportion were students enrolled in various city colleges or institutes. It was observed that the lifestyle of the respondents was the one that they desired but could not have while living with their parents at home or got influenced by the people or social media. The respondents suggest that one desiring to stay in paying guest should not miss use their freedom and involve in wrong activities, they should be adjusting and cooperative with others and also treat PG as their second home by maintaining cleanliness and a homely environment.

[2] Maximum Gaussian Mixture Model for Classification presented by Xianbin Hong, Sheng-Uei Guan, Xuan Zhao, and Nian Xue. This paper presented a comparison among the different of models and algorithms that could solve classification problems. In a real-life scenario, the boundaries of classes for the classification could be complex and may not be easily distinguishable. In accordance to deal with the complex situations and to overcome the limitation of several algorithms, the authors presented a Maximum Gaussian Mixture Model (MGMM) as their continued research and analysis. Also provided a view on the usage of the Expectation Maximum algorithm to solve MGMM. The authors did research on the artificial data and the real-time data and found the accuracy varying from 0.9341 to 0.942 for the A value being 8-50. ("A means the average points in each Gaussian"). The paper suggested that the average point in each Gaussian A would depend on the number of points in the data set and the size of the data. Thereby, this paper proposed that the Maximum Gaussian mixture model (MGMM) classification model works well in all of the real-life datasets tested and continues to work well when dealing with high dimensional data.

[3] Recommendation systems developed by Siddhesh Jagtap, Yash Mane, Tushar Kadam, and Trupti Dange which use the information provided by the user and also some filtering techniques to recommend items such as Web Pages, Videos, Music, TV Shows, Books, Electronics gadgets, etc. This recommendation system uses a series of data mining steps such as pre-processing analysis, and result interpretation. This system investigates the user preference and ratings and depending upon the rating it tries to rate the unknown data. And also they generalized the recommendation system into various types such as Pull, Push, and Passive. Push is the direct method that gives the recommendation or sends the recommendation to the users through emails or some notification. The pull recommendation system gives suggestions only when the user asks for it. And Passive recommendation system recommends products that are related to the product being viewed. This concludes that various methods to build the recommender system and to enhance the performance and also the accuracy of the system.

[4] Google Chart Tools and Google Maps API in Data Visualization by Ying Zhu Georgia State University. This paper talks about different tools in map interface like, Google Chart Tools. It is a free, powerful, and easy-to-use charting library that allows developers to create interactive charts and graphs for websites and applications. It offers a wide range of chart types, including line charts, bar charts, pie charts, scatter plots, and more. It also includes a variety of customization options, such as the ability to change the appearance of charts, add labels and legends, and apply different styles and themes. Google Maps API is a set of programming tools that allows developers to integrate Google Maps into their own websites and applications. The API provides a number of features for interacting with maps, including the ability to display maps, add markers and overlays, and customize the appearance of the map. It also allows developers to query for location information, such as the distance between two points or the estimated travel time between two locations.

[5] The Rent vs Buy Decision of Residential Property developed by C. Bertasso, D.G.B. Boshoff, and D. Pillay. The need for shelter is the top priority and must needed necessary for every individual from multi-billionaires to extremely poor individual of the world. This paper examines the various factors when deciding whether to rent or buy the property. And also this paper investigates the literature on the topic and highlights all the constituent that impacts the decision. And also the paper reports the results from the interviews held with estate agents, consumers, and financial institutions with a view of market activity. From this, they generalize the formula for whether to rent or buy a residential property.

$$\text{Buy the property if, } D \geq C/c$$

$$\text{Rent the property if, } D < C/c$$

$$\{D: \text{Deciding Factor, } C: \text{Returns on buying the property, } c: \text{Return on renting the property}\}$$

From this, they concluded that everyone prefers to buy their own residential property due to personal insecurity they feel. Unfortunately, this doesn't possible for everyone who is not in the right circumstances. And also, the young individual prefers to rent the house rather than buy because of maintenance and living cost. Buying your own housing unit affects in a financial way and also the financial difficulties of the world we live in, it should make more economical sense to lease a housing unit rather than buy them.

[6] A history and future of Web APIs by Jacek Kopecky, Paul Fremantel, Rich Boakes. In this article, we will examine the evolution of client-server interfaces in distributed information systems, including messaging and RPC systems that predated the Web, to RESTful Web APIs. It also discuss the important role that the client-server interface plays in Web applications, and consider the future of Web APIs, including the potential incorporation of hypermedia and semantics. The majority of distributed information systems have a client-server architecture, much like the Web itself. It also discuss the roles of "Web Service" technologies and Service-Oriented Architectures in these systems.

[7] A Survey Paper on Chat-bots by Aafiya Shaikh, Dipti More, Ruchika Puttoo, Sayli Shrivastav, and Swati Shinde. This research aims to develop a virtual conversational method and system to help relieve the psychological stress of adolescents. The goal is to provide positive guidance through continuous dialogue and encourage adolescents to think and face challenges with a positive and optimistic attitude. It propose the use of an adolescent-oriented intelligent conversational chat system called "Happy Soul," which acts as a virtual friend and can assist adolescents in releasing stress by encouraging, understanding, comforting, and guiding them to express their negative feelings. Chatbots have gained widespread adoption in recent years, particularly in the field of customer support. However, they can also be used to provide mental support and serve as a companion for users. By using chatbots in this way, it hopes to contribute to the development of happier generations.

**[8]** Study the Factors Affecting the Choice of Accommodation for New Students: Case in Da Nang City, Vietnam by Le Anh Tuan. This paper demonstrates the major factors affecting the accommodation or housing options for students in Vietnam. The research showed that there were 6 major factors influencing the choice of habitation which included Location, Facilities, quality of service, Living environment, security, and price Based on this they conducted many results to recommend and help first-year students to get the preferred accommodation.

They conducted a survey among 500 students and got 450 valid entries out of which 216 were males and 189 were females.

TABLE: Results of reliability analysis of variable groups by Cronbach'Alpha coefficient

| No | Group variables | Number of observation variables | Cronbach's Alpha |
|----|-----------------|--------------------------------|------------------|
| 1 | Location | 3 | 0.804 |
| 2 | Facilities | 4 | 0.810 |
| 3 | Quality of service | 4 | 0.829 |
| 4 | Living environment | 3 | 0.756 |
| 5 | Security | 3 | 0.762 |
| 6 | Price | 4 | 0.754 |
| 7 | Decision to choose | 4 | 0.849 |

Source: Author synthesis [8]

## III. METHODOLOGY:

The proposed system is based on web development and machine learning. It uses APIs for the real-world data of the location, to communicate and transfer data between the server and the client. APIs are a set of programming tools that enable a program to communicate with another program or operating system and help software developers create their applications. The workflow of an application is as follows: The user wants to know the suitable accommodations of any location

- The user can search or pin the location of his wish.
- The user provides the preferred lifestyle, budget, size, habits, and food preferences using our friendly AI based chatbot.
- The places API is invoked for the particular pinned location and then we collected a large dataset of housing listings and associated information, including location, price, size, amenities, and user reviews.

- The retrieved data is inputted for our trained machine learning model for the calculations and classify the available habitat at a pinned location.

- Then the classified places are grouped and the available places are ranked based on user preference.

- The user interface is updated with the suggestions of our model and also locates all the nearby facilities like health care, metro, marts, shopping complex, etc.
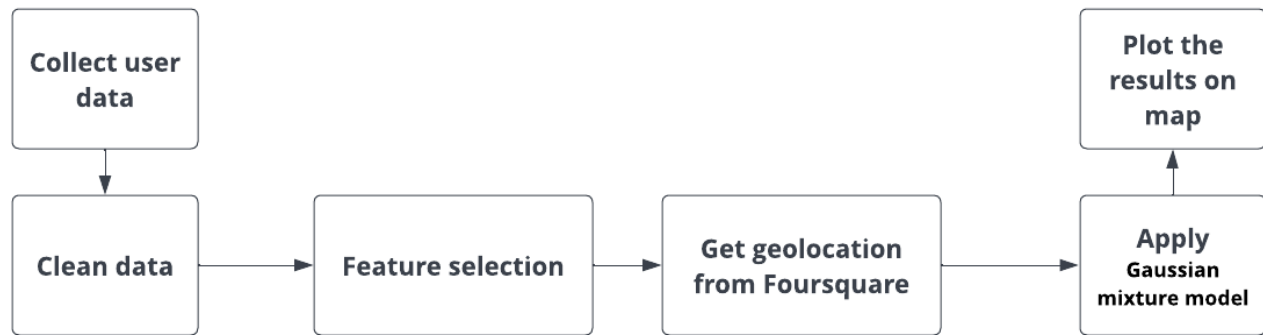
Fig 1: Flow chart of Habitation Recommendation System

### A. User Interface

The system contains a simple and user-friendly interface to interact with the user. The UI allows the user to login or signup for the application or begin his search for accommodation. Once the user is logged in with his/her credentials the interface is updated with google maps and a chatbot. The user can pin down his preferred location over the map and then start interacting with the chatbot which asks the user for their requirements, this user data collected by the chatbot is stored and sent to the server.

The map-based web page allows users to view the recommended housing options on a map, and the chatbot enables users to communicate with the system and receive personalized recommendations through a conversational interface.

### B. Server

The server handles all the request responses of the application. The server provides a robust API service for the application. It is responsible for collecting information from the frontend to storing information in the backend, it is also responsible for the user authentication, data cleaning, and calling machine learning models. Each operation it performs has an endpoint which can be called whenever required.

### C. Application of ML models

The data collected from the user are cleaned and pre-processed and used in GMM. The Gaussian mixture model is a probabilistic model that assumes that the underlying data is generated from a mixture of a finite number of Gaussian distributions.

In the habitation recommendation system, the Gaussian mixture model was used to analyze user preferences and search criteria, and then recommend housing options based on this analysis. The model took into account a variety of factors, such as location, price, size, and amenities, to provide users with a comprehensive list of options that meet their needs and preferences.

The Gaussian mixture model was chosen for its ability to model complex, multi-dimensional data and handle uncertainty in the data. It also allows for the incorporation of multiple features and their interactions, making it well-suited for the task of recommending housing options based on multiple criteria.

Overall, the use of the Gaussian mixture model in the habitation recommendation system provided a powerful and effective tool for finding suitable housing options, helping users to quickly and easily find a new home that meets their needs and preferences.

### D. Foursquare API

Foursquare API provides a range of tools for developers to incorporate up-to-date location data. It provides location based experiences with diverse information about venues, users, photos, and check-ins. The API supports real time access to places, Snap-to-place that assigns users to specific locations, and Geo-tag.

The integration of the Foursquare API allows users to view the recommended housing options in relation to nearby amenities and points of interest, providing a more comprehensive understanding of the local environment and the convenience of the recommended housing options. Additionally, the Foursquare API enables the incorporation of user reviews and ratings of the recommended housing options, allowing users to make informed decisions based on the experiences of others.

**E. Google Maps API**

The Google Maps API is a software development kit (SDK) that allows developers to access and integrate the functionality of Google Maps into other applications. The API enables users to display maps, search for and retrieve driving, transit, and walking directions, and perform various other map-related tasks.

The integration of the Google Maps API allows users to view the recommended housing options on a map, providing a visual representation of the locations and proximity to other points of interest. Additionally, the use of the Google Maps API enables the incorporation of real-time traffic and transportation information, allowing users to more accurately assess the feasibility and convenience of the recommended housing options.

## IV. CONCLUSION

In conclusion, the habitation recommendation system using machine learning is a valuable tool for assisting users in finding suitable housing options. By leveraging machine learning algorithms to analyze user preferences and search criteria, the system is able to generate accurate and personalized recommendations that meet the needs and preferences of individual users. The combination of machine learning and interactive features, such as a map-based web page and chatbot, provides a powerful and user-friendly tool for finding suitable housing options, significantly streamlining the process of finding and selecting a new home.

Overall, the habitation recommendation system represents a significant advancement in the field of real estate and housing search, providing a valuable resource for those in search of housing. Its ability to personalize recommendations and incorporate interactive features makes it an essential tool for anyone looking to find a new home that meets their needs and preferences.

## V.    REFERENCES

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