



ISS Project (Graduate Certificate in Intelligent Reasoning Systems)

GameRS: Game Recommendation System

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Executive Summary

In today's digital era, the gaming industry has witnessed exponential growth, offering a vast array of games across numerous categories. To cater to diverse preferences and ever-evolving trends, it has become crucial to develop a robust and efficient game recommendation system. Such a system aims to enhance the user experience by suggesting relevant games tailored to individual preferences. Our project's aim is serving users better and keeping up with the dynamic nature of the gaming industry with a multifunctional and convenient game recommendation system.

To meet market demands, our system will focus on game matching, user profiling, chatbot interface, game introduction, and advanced recommendation algorithms. We will ensure quick and accurate game matching based on factors such as genre and gameplay style. Users will have personalized profiles where they can input their gaming preferences, playing habits, and favorite genres. Our chatbot interface will provide a convenient way for users to search, answer basic questions, and display relevant data. The system will also include an introduction page for each game to provide detailed information.

In conclusion, we successfully developed a multifunctional and convenient game recommendation system using IRS knowledge with python, html, javascript and flask. It has main functions like game/genre based recommendation, chatbot interface, data visualization, blur search, user account and so on. With our Personalization, Two-way and Conversational system, we expect a good market impact and bridge function.

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1. Demand Analysis

1.1. Development Background

The global video game market size was estimated at USD 217.06 billion in 2022 and is expected to grow at a compound annual growth rate (CAGR) of 13.4% from 2023 to 2030. The market's expansion is attributed to the ongoing trend of online gaming, the emergence of high bandwidth network connectivity, and the continuous demand for 3D games. In addition, an upsurge in the penetration of smartphones has made video games more accessible, portable, and social. This has further driven the industry growth with the emergence of technologically advanced and more powerful smartphones. The market players are also focusing on developing advanced gaming products and services to attract a larger customer base, which is positively influencing the overall industry.

The outlook of the market is being further enhanced by a steady growth in the number of video gamers year over year. The population growth, broadening demographics, increased accessibility, social interaction, and connectivity, and changing perceptions and cultural acceptance of gaming led to a significant rise in the number of gamers. These factors have contributed to the mainstream popularity of video games as a form of entertainment, leading to a growing number of players worldwide. This, in turn, is expected to fuel the market demand over the forecast period. According to Newzoo, there are 3.22 billion gamers worldwide as of 2023. However, this number is expected to rise to 3.32 billion gamers worldwide by 2024.

The emergence of the 5G network further boosted the number of gamers around the globe. Major market players have taken profound steps in this direction to gain a competitive edge. In January 2022, AT&T announced to join forces with NVIDIA Corp. to deliver high-end 5G cloud gaming experiences. This initiative will enable users to play around 100 free-to-play titles and games they own on renowned PC game stores, such as Epic Games Store, Steam, Ubisoft Connect, Origin, GOG, etc. The realistic, state-of-the-art graphics built on NVIDIA RTX technology and advanced AI features will provide a virtual world experience to gamers.

Furthermore, esports has experienced rapid growth in recent years, becoming a mainstream form of entertainment. It is a booming industry where skilled video gamers play competitively. Esports tournaments and competitions attract massive online and offline audiences, with millions of viewers and fans worldwide. The esports industry does not only

include traditional sports-related games, such as NBA2K and FIFA, but also games, such as Counter-Strike, League of Legends, and Dota. The most popular esports genres include multiplayer online battle arenas, real-time strategy, and first-person shooter games. The increasing popularity of esports has led to a surge in demand for high-quality, competitive games that provide an engaging and immersive experience for players and viewers alike.

In today's digital era, the gaming industry has witnessed exponential growth, offering a vast array of games across numerous categories. To cater to the diverse preferences and ever-evolving trends, it has become crucial to develop a robust and efficient game recommendation system. Such a system aims to enhance the user experience by suggesting relevant games tailored to individual preferences. This report provides an overview of a game recommendation system project with the objective of serving users better and keeping up with the dynamic nature of the gaming industry.

The gaming market encompasses a wide range of game genres and categories. From action-packed adventures to immersive role-playing experiences, there are countless options available to players. However, with this vast selection, finding games that align with personal interests can be challenging. Therefore, the development of a comprehensive recommendation system can greatly assist users in discovering new games that they may enjoy.

It is important to recognize that different players exhibit varying preferences at different stages or periods. For example, casual gamers might prefer puzzle or arcade games for short bursts of entertainment, while hardcore gamers might lean towards intense multiplayer or open-world experiences. Understanding these preferences and tailoring recommendations accordingly is essential for a successful game recommendation system.

1.2. Market / User Analysis

1.2.1. Target Users

The game recommendation system project targets a wide range of users within the gaming community. The system aims to cater to the diverse preferences and interests of gamers, ensuring that each user receives personalized game recommendations based on their individual tastes and playing habits.

Casual Gamers: This category includes individuals who enjoy gaming as a form of leisure and entertainment. Casual gamers often prefer games that are easy to learn and offer quick bursts of fun. The recommendation system will suggest games from various genres that align with their preference for casual gameplay.

Hardcore Gamers: These are dedicated and passionate gamers who invest significant time and effort into gaming. They seek immersive experiences, challenging gameplay, and a wide variety of genres. The recommendation system will provide them with recommendations for intense multiplayer games, open-world adventures, strategic role-playing games, and more.

Genre-Specific Gamers: Some users have specific preferences for certain genres, such as action, adventure, puzzle, sports, strategy, or simulation. The recommendation system will recognize these preferences and offer tailored suggestions within their preferred genre, helping them explore new titles within their areas of interest.

Game-Makers or Trend-Seekers: These users are always on the lookout for the latest gaming trends, popular titles, and emerging genres. The recommendation system will keep them updated by suggesting trending games, newly released titles, and games that are growing in popularity, allowing them to stay ahead of the curve.

Gamers Seeking Variety: There are users who enjoy exploring games across multiple categories, seeking diversity in their gaming experiences. The recommendation system will provide them with a mix of recommendations, offering games from different genres to satisfy their craving for variety.

It is important to note that the game recommendation system will adapt and learn from user feedback, continuously refining its recommendations to enhance user satisfaction. By considering the preferences, gaming habits, and trends of various target users, the system aims to serve as a valuable tool in their gaming journey, introducing them to new games and helping them discover titles that align with their unique preferences.

1.2.2. Market / User Analysis

The gaming industry is currently facing several challenges that present opportunities for the game recommendation system project. The market analysis highlights the existing problems, competitors, trends, demands, user needs, and opportunities within the gaming industry.

Problem in the Market:

- **Less Focus on Recommendations:** The market primarily emphasizes game rankings rather than personalized recommendations. This results in users potentially missing out on games that suit their preferences.
- **Complex Filters:** Existing filtering systems are often difficult to use, making it challenging for users to find games according to their specific criteria.
- **Lack of Game Maker Port:** There is a lack of integration between game recommendation platforms and game makers, limiting the exposure and reach of new game releases.

(1) **Competitors:** The game forum and platform act as competitors in the market. These platforms provide a space for gamers to discuss and discover new games, but they may not necessarily offer personalized recommendations based on individual preferences.

(2) **Trends:** Rapid Growth of Games and Players: The gaming industry is experiencing swift growth in terms of both game releases and the number of players. This indicates a need for efficient and accurate game recommendations to help users navigate the vast selection available.

(3) **Slow Expansion of Categories:** Although games and players are growing rapidly, the expansion of game categories has been relatively slow. This presents an opportunity for the recommendation system to help users explore diverse game genres and expand their gaming experiences.

(4) **Demands:** The primary demand in the market is to quickly match players with games that align with their preferences. Additionally, there is a need for game makers to have their games effectively recommended to potential players, maximizing their visibility and reach.

(5) **User Needs:** Users require a simple and quick recommendation system that can suggest suitable games based on their preferences. They seek a streamlined process that eliminates the complexities of searching and filtering through extensive game libraries.

(6) **Opportunities:** The game recommendation system project has the opportunity to capitalize on the simplicity and personalization of its recommendation process. By providing users with tailored game suggestions and integrating game maker portfolios, the system can offer a unique and comprehensive solution.

In conclusion, the market analysis highlights the existing problems in the gaming industry, the presence of competitors, emerging trends, demands from users, and the opportunities for

the game recommendation system project. By addressing the need for personalized and efficient recommendations while focusing on simplicity and integration with game makers, the system can position itself as a valuable tool in the gaming market.

1.3. Demand Analysis

1.3.1. Functional Requirements

a) Game Matching: The system should be able to quickly and accurately match players with games that align with their preferences, taking into account factors such as genre, similar gameplay style.

b) User Profiling: The system should allow users to create personalized profiles where they can input their gaming preferences, playing habits, and favorite genres. The system should utilize this information to generate tailored recommendations.

c) Chatbot: The system should have a chatbot interface for users to search quicker and easier, answer some basic questions and show the data.

d) Game Introduction: The system should have an introduction page to show the details of the exact game in order to let users check.

e) Recommendation Algorithms: The system should employ advanced recommendation algorithms that learn and adapt based on user feedback, continuously improving the accuracy and relevance of game suggestions.

1.3.2. Non-Functional Requirements

a) Performance: The system should be able to handle a large volume of user requests simultaneously, ensuring fast response times and minimal downtime. It should also have the capability to scale and accommodate future growth in user base and game library size.

b) User-Friendly Interface: The system should have an intuitive and user-friendly interface, making it easy for users to navigate, search for games, and access personalized recommendations. The interface should be visually appealing and responsive across different devices and screen sizes.

c) Security and Privacy: The system should prioritize the security and privacy of user data, implementing robust encryption protocols and access controls to prevent unauthorized access or data breaches.

d) Personalization: The system should prioritize personalization, offering recommendations that are tailored to each user's unique preferences. It should understand and adapt to individual preferences over time.

2. Project Objectives

2.1. Problem Statement

2.1.1 Personalized User Requirements

- **Diverse User Groups:** Users from different ages, genders, and cultural backgrounds have varying game preferences.
- **Unique Game Preferences:** Preferences for game types (action, strategy, RPG, etc.), themes, and visual styles differ among users.
- **Gameplay Style Preferences:** Players have diverse preferences for game difficulty, complexity, and modes (single vs. multiplayer).
- **Contextual Usage:** Game choices may vary significantly based on the user's time, location, and mood

2.1.2 Information Overload

- **Vast Game Libraries:** Thousands of game choices make it hard for users to find games that genuinely interest them.
- **Difficulty Discovering New Games:** Newly released or niche games often get lost in the sheer volume of information.
- **Complex Rating Systems:** Complex user reviews and rating systems make it hard for users to quickly form opinions.

2.1.3 Dynamic Market Adaptability

- **Rapidly Changing Gaming Trends:** Keeping up with emerging game genres and shifting player interests is challenging.
- **Difficulty Promoting New Games:** New games struggle to gain exposure and user attention quickly.

- **Seasonality and Event-Driven User Behaviors:** Festivals, major game events, etc., can influence the popularity of games and user behavior patterns.

2.1.4 Analysis Techniques

- **User Segmentation and Profiling:** Techniques like cluster analysis to group users with similar interests and behaviors.
- **Preference Modeling:** Utilizing collaborative filtering, content-based filtering, or hybrid models to deduce user preferences from data.
- **Natural Language Processing (NLP):** Analyzing user reviews and discussions to extract sentiment and topical information about games.
- **Trend Analysis:** Identifying emerging patterns or shifts in user behavior and game popularity.

2.2. Analysis Basis

2.2.1 Data Sources

- **User Behavioral Data:** Gameplay history, purchase history, time spent on various games, and interaction patterns.
- **User-Provided Data:** Ratings, reviews, and preferences explicitly provided by the users.
- **Game Metadata:** Genres, developers, release dates, platforms, and other descriptive data about games.
- **External Data Sources:** Trends from gaming websites, forums, social media sentiment, and market research reports.

2.2.2 Analysis Techniques

- **User Segmentation and Profiling:** Techniques like cluster analysis to group users with similar interests and behaviors.
- **Preference Modeling:** Utilizing collaborative filtering, content-based filtering, or hybrid models to deduce user preferences from data.

- **Natural Language Processing (NLP):** Analyzing user reviews and discussions to extract sentiment and topical information about games.
- **Trend Analysis:** Identifying emerging patterns or shifts in user behavior and game popularity.

2.2.3 Methodologies

- **Machine Learning Models:** Details about specific algorithms (like neural networks, decision trees) used to predict user preferences and recommend games.
- **A/B Testing:** Describing how different recommendation models or features are tested against each other to evaluate effectiveness.
- **Performance Metrics:** Discussing how the system's success is measured, such as accuracy, precision, recall, or user engagement metrics.

2.2.4 System Feedback and Adaptation

- **Real-time Learning:** How the system incorporates new data and user feedback to update and refine recommendations.
- **Feedback Loop:** Mechanisms for users to provide feedback on recommendations, enhancing model accuracy over time.

2.2.5 Ethical Considerations

- **Data Privacy and Security:** Ensuring user data is handled securely, with respect for privacy and compliance with relevant laws and guidelines.
- **Bias Mitigation:** Strategies to identify and reduce bias in recommendations, ensuring fairness and diversity in game suggestions.

2.3. Objectives

2.3.1 Game Matching Based on User Preferences

- **In-Depth User Profiling:**
 - Analyze user gaming behavior, including playtime duration, frequency, and preferred game genres. Integrate this with interactive data such as ratings and reviews.

- Include data from users' social media activities and forum participation to gain a comprehensive understanding of their preferences.
- **Personalized Recommendation Algorithm:**
 - Employ collaborative filtering, content-based filtering, or advanced machine learning techniques such as Convolutional Neural Networks (CNNs) or Recurrent Neural Networks (RNNs) to identify latent user preferences.
 - Continuously update the recommendation logic to reflect the latest changes in user tastes and preferences.

2.3.2 Dynamic Recommendations Integrating Market Trends

- **Market Data Integration:**
 - Regularly collect and analyze market trend data from gaming platforms, social media, and news outlets.
 - Track industry-leading indicators, such as bestseller lists, new game releases, and major gaming events.
- **Trend-Aware Recommendations:**
 - Incorporate market trend data into the recommendation model to ensure that suggestions align with both individual user preferences and current market hotspots.
 - Adjust recommendation strategies in anticipation of major game releases or seasonal events.

2.3.3 Integrated Chatbot Customer Service

- **Functional Design:**
 - Provide services including game recommendations, account support, and FAQs.
 - Integrate a user feedback mechanism to collect opinions and suggestions on recommended results.

- **Technical Implementation:**

- Utilize Natural Language Processing (NLP) and machine learning technologies to develop capabilities for understanding and responding to user inquiries.
- Implement a continuous learning mechanism to constantly enhance the chatbot's accuracy and user satisfaction.

- **Interaction Experience Optimization:**

- Offer an easy-to-use conversational interface, enabling users to effortlessly obtain information and assistance.
- Utilize multi-turn dialogues and personalized suggestions to enhance the quality and user experience of interactions.

2.3.4 Overall Experience and Feedback Loop

- **User Experience Monitoring:**

- Monitor user interaction data and system usage in real-time to gauge user experiences and preferences.

- **Continuous Optimization:**

- Regularly optimize recommendation logic and chatbot functionalities based on user feedback and behavior data.
- Track the effectiveness of recommendations and user satisfaction levels to ensure continuous improvement and adaptability of the system.

3. Data

3.1. Image Data Pre-Processing

3.1.1. Obtain data

The data is obtained from Kaggle, a platform that offers a wide range of datasets for data science. Available from: <https://www.kaggle.com/datasets/fronkongames/steam-games-dataset>

3.1.2. Pre-Processing

The obtained dataset contains 39 columns of game information, including Name, Game ID, Release date and so on. Nevertheless, the objective of this project is to recommend recent release games based on Content-based filtering. Therefore, about 18000 games are selected from 76000 games based on the released date and the 39 columns of information is being selected, leaving only 6 columns of information: Game name, Game ID, Tags, Genres, About the game and Categories. The obtained game information is stored in a csv file game.csv as shown in figure 3.1.

	A	B	C	D	E	F	G
1	AppID	Name	About the	Categories	Genres	Tags	
2	2525270	The House'	The Hous	Single-pla	Adventure,	Adventure,Casual,Action-	
3	2414640	Bite Size T	Bite Size T	Single-pla	Adventure,	Horror,Adventure,Atmosph	
4	2486670	TD Tower [T	d Tower [Single-pla	Action,Cas	Tower Defense,Casual,Sci-	
5	2304650	The Scrap	The Scrap	Single-pla	Action,Adv	Action,Shooter,Third-Pers	
6	2519670	Wind Love	Gameplay	Single-pla	Indie,Simu	Hentai,Adventure,Dating &	
7	2218400	Greedland	Introducing	Single-pla	Action,Adv	Action Roguelike,Bullet He	
8	2405900	Bit The Ap	The player	Single-pla	Indie	Immersive Sim,Interactive	
9	2510010	Nightmare	EXPLORE T	Single-pla	Action,Adv	Action,Adventure,Horror,&	
10	2259230	Sym.BIOS:	Sym.BIOS:	Single-pla	Indie	Visual Novel,Choices Matt	
11	1100290	Super Spac	Super Spac	Single-pla	Action,Cas	Action,Indie,Bullet Hell,Ac	
12	2266980	Cyber Stric	Embark on	Single-pla	Action,Indi	Indie,Action Roguelike,Ro	

Figure 3.1 The data

The data's format is being converted to pandas' Dataframe when being processed by NLP method.

4. System Design

4.1 Introduction

There are two mainstream ways of achieving recommendation, Content-based filtering and Collaborative filtering.

4.1.1 Content-based filtering

Content-based filtering is a method which computes the similarity between different items based on text-based features like keywords. After obtaining the vectors that represent different items, the system will start to recommend items that are similar to the user's

preferred item based on cosine similarity. Content-based filtering is commonly used in movie, music and game platforms, the online streaming music platform Pandora is a good example of the Content-based recommendation method.

4.1.2 Content-based filtering

Another mainstream recommendation method is Content-based filtering, different from Content-based filtering, Collaborative filtering requires the user's preference against different items. Two common ways of achieving Collaborative filtering are user-based Collaborative filtering which measures the similarity between users in order to recommend one person's preference to another similar person; item-based Collaborative filtering which measures the items' similarity based on users' preference so that recommendations can be made.

4.1.3 Hybrid System

Hybrid recommendation is sometimes hired to achieve better performance by combining different recommendation algorithms.

4.1.4 Proposed method

In this project, due to the limitation of the available data and the constraints of the complexity of the system, the team proposed the Content-based filtering method which aims to recommend games based on the users' input game name or game genre.

4.2 Recommendation System

The System mainly consists of the recommendation system, the chatbot, the frontend and the backend.

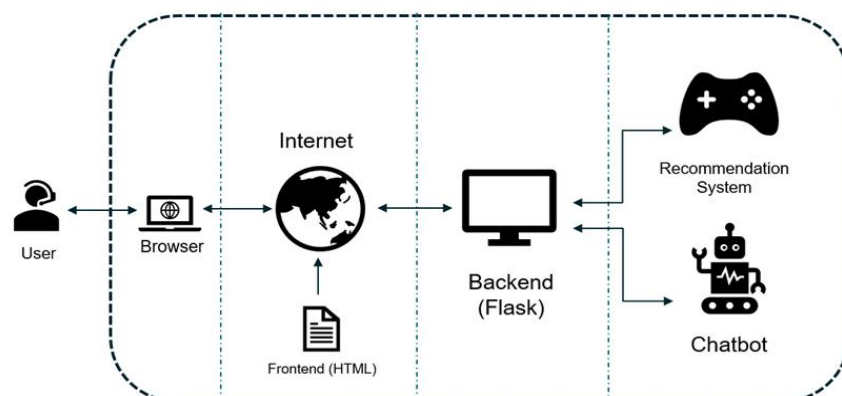


Figure 4.1 The system overview

4.2.1 Natural Language Process

The first step is to import the data, as it can be seen from the figure below, the original data set contains information including the ID, name, genre, category, the game introduction and tags of the games.

	AppID	Name	About the game	Categories	Genres	Tags
0	2525270	The House	' The House ' is a short psychological horror ...	Single-player,Steam Workshop	Adventure,Casual,Indie	Adventure,Casual,Action-Adventure,Walking Simu...
1	2414640	Bite Size Terrors: Erobos Heaven	Bite Size Terrors: Are Short Experimental Horr...	Single-player,Steam Achievements	Adventure,Indie	Horror,Adventure,Atmospheric,Psychological Hor...
2	2486670	TD Tower Defense	Td Tower Defense is a fun tower defense shoote...	Single-player	Action,Casual	Tower Defense,Casual,Sci-fi,Strategy,Combat,Re...
3	2304650	The Scrap	The Scrap is an independent third-person shoot...	Single-player,Steam Achievements	Action,Adventure,Indie	Action,Shooter,Third-Person Shooter,3D,Third P...
4	2519670	Wind Love	Gameplay Wind Love - Is a Japanese-style visua...	Single-player,Steam Achievements,Captions avai...	Indie,Simulation	Hental,Adventure,Dating Sim,Casual,Choices Mat...

Figure 4.2 The Input Data

In the game name recommendation system, the category, the game introduction and tags of the games columns will be processed while in the game genre recommendation system, the genre column is processed.

After importing the data, the Space-Based tokenization method is applied to separate continuous text into separate words by the space. The main goal of tokenization is to divide the text into more manageable units so that it can be used for further processing.

The next step is to convert all text into lowercase, the purpose of this step is to standardize the text and eliminate inconsistencies which are caused by variations in letter case. After converting into lower case, the vocabulary size is reduced and the text consistency is improved.

After converting all text into lower case, the next step is to remove the stop words. Stop words refer to the words which frequently appear in the text but have no actual meaning. In English, 'the' is a commonly removed stop word.

The final step of natural language processing is to conduct stemming. Stemming is a procedure which reduces the words to their original forms. For example, eating and ate will be reduce to eat. The stemming process is completed by the function PorterStemmer from the nltk library in this project.

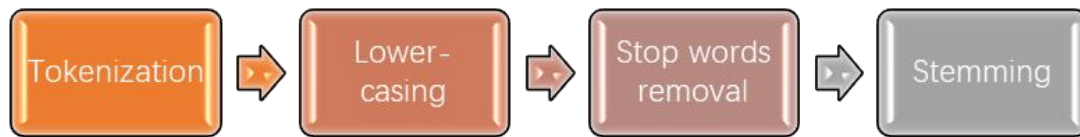


Figure 4.3 The NLP pipeline

4.2.2 Similarity Matrix

After the natural language processing, the next step is to build the similarity matrix for the games.

The function `CountVectorizer` is imported from the Scikit-learn library. `CountVectorizer` is a text feature extraction function used to convert text data into numerical feature vectors. It breaks down the text data into words or phrases and counts their occurrences in each sample, and then converts these counts into numerical feature vectors. In this project, maximum features is set to be 5000 for game name recommendation and 54 for game genre recommendation.

After obtaining the feature vector generated by the `CountVectorizer` function, the function `cosine_similarity` is imported from the Scikit-learn library. The `cosine_similarity` function computes the similarity between each game vector from another and derives the similarity matrix.

It can be seen from the figure below; the similarity matrix contains the similarity between each game to another. The larger the number is, the more similar the two games are.

```

print(similarity.shape)
print(similarity)

(18560, 18560)
[[1.          0.30961358 0.07803185 ... 0.36006607 0.15886771 0.17282528]
 [0.30961358 1.          0.05930113 ... 0.13842764 0.06501018 0.03940212]
 [0.07803185 0.05930113 1.          ... 0.06815309 0.26215206 0.23833221]
 ...
 [0.36006607 0.13842764 0.06815309 ... 1.          0.07827216 0.17394702]
 [0.15886771 0.06501018 0.26215206 ... 0.07827216 1.          0.15966927]
 [0.17282528 0.03940212 0.23833221 ... 0.17394702 0.15966927 1.          ]]
  
```

Figure 4.4 The similarity matrix

The similarity matrix is then saved in the pickle file and exported for future use to recommend.

4.2.3 Recommendation

The recommendation is based on the users' input. The system will return the top 5 recommendations to the user according to the input.

```
recommend_genre("action, casual")

Super Space Club
Nebula's Descent
Scplash
KAGITORI -BIRD IN THE CAGE HIDING THE KEY-
PLONG
```

Figure 4.5 Outputs of game genre recommendation

```
recommend('erozld')

Oh, Dungeon Master
Senpai and the Mysterious Dungeon
Into The Dark
Ouroboros Dungeon
Archmage Ricka
```

Figure 4.6 The output for game name recommendation

4.3 Chatbot System

The questions and answers used by the chatbot are firstly created manually as shown below.

	Q	A
0	What is the theory behind the recommendaton?	Item-based recommendation theory is employed, ...
1	How to use the game recommendation system?	Simply input your favourite game or preferred ...
2	How many games are included in recommendation ...	There are more than 18,000 games pulished betw...
3	Can you recommend some good games to me?	Sure, games like Starfield, Chants of Sennaar ...
4	Where can I download the recommended games?	All the games are available to download in Ste...
5	Why does the system go wrong?	Apologies, Maybe you could check if the App is...

Figure 4.7 The questions and answers

These questions and answers are then processed by the function `TfidfVectorizer` imported from the `Scikit-learn` library. Like `CountVectorizer`, `TfidfVectorizer` is a method which counts the occurrence of letters in a text. Nevertheless, it also takes Term Frequency-Inverse Document Frequency into account. Term Frequency-Inverse Document Frequency is a statistic which considers the frequency of a word's occurrence in one document (tf) and the rarity of the word across the entire corpus (IDF).

The output of the `TfidfVectorizer` is a sparse matrix with the shape 6*30.

After initializing the question and answers, the chatbot is set to conduct the `TfidfVectorizer` function to the input text and compute the input text's similarity between all the stored questions. If the input text's cosine similarity with any question exceeds the threshold of 0.2, a corresponding answer will be given. If the similarity between the input and multiple questions are above 0.2, then the answer will be the corresponding answer from the question with highest similarity.

```
Bill: My name is Bill. I am the Service bot for this recommendation system. if you have any questions, please feel free to ask. If you want
to end the conversation, type Bye!
hi
Bill: hey
Can you give me some recommendations
Bill: Ans: Sure, games like Starfield, Chants of Sennaar and Citizen Sleeper: Purge have high rates which suggests they are worth playing. F
or more personalized recommendation, please enter your favourite game or preferred genre.
Can you give me some recommendations
Bill: Ans: Sure, games like Starfield, Chants of Sennaar and Citizen Sleeper: Purge have high rates which suggests they are worth playing. F
or more personalized recommendation, please enter your favourite game or preferred genre.
bye
Bill: Bye! take care...
```

Figure 4.8 The output for the chatbot

4.4 Backend

The flask framework is hired to build the backend structure in this project.



Figure 4.9 The flask framework

Flask is a popular web framework for building web applications in Python. The reason the flask framework is chosen other than framework like Django is that flask is relatively easy by using the Python language. Besides, the frontend and backend can be developed separately using flask.

It can be seen from the figure below; the frontend and backend content are being put under the same folder called websites.

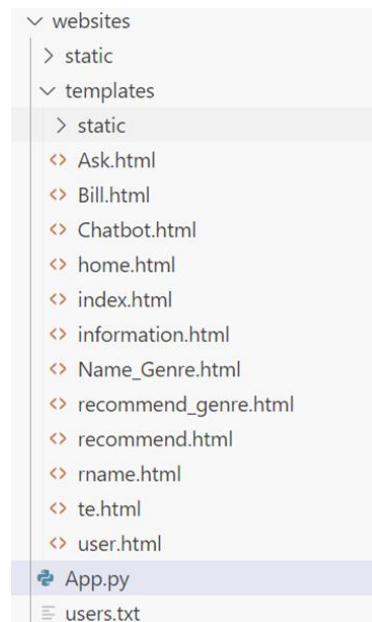


Figure 4.10 The websites folder

Functions like register, login are integrated in the backend.

4.5 Frontend

In this project, the HTML language is employed to develop the frontend. HTML is a foundational language for web development and also is supported by all modern web browsers. It can be used in conjunction with CSS and JavaScript to create interactive and dynamic websites.

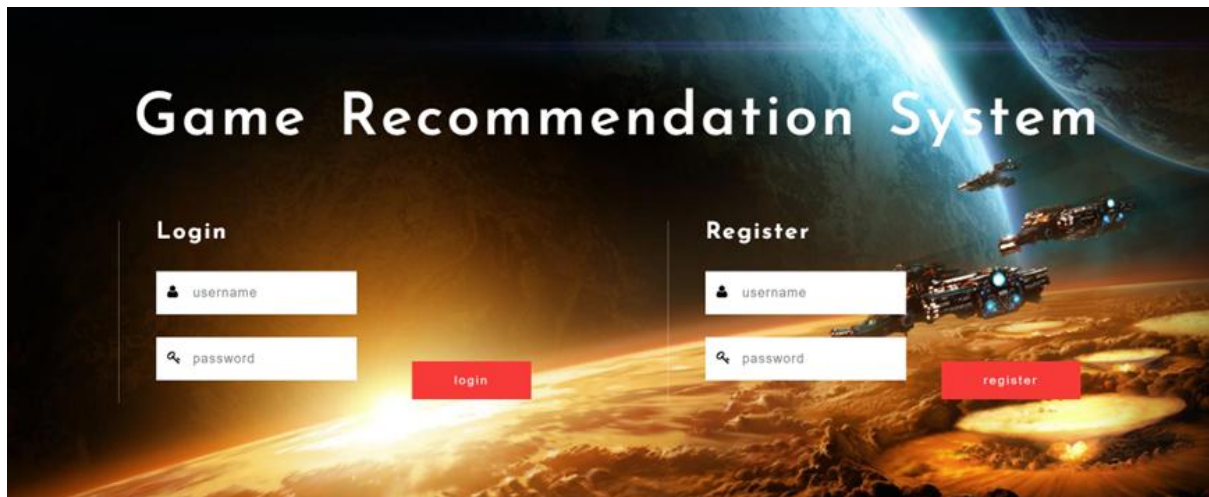


Figure 4.11 The login page

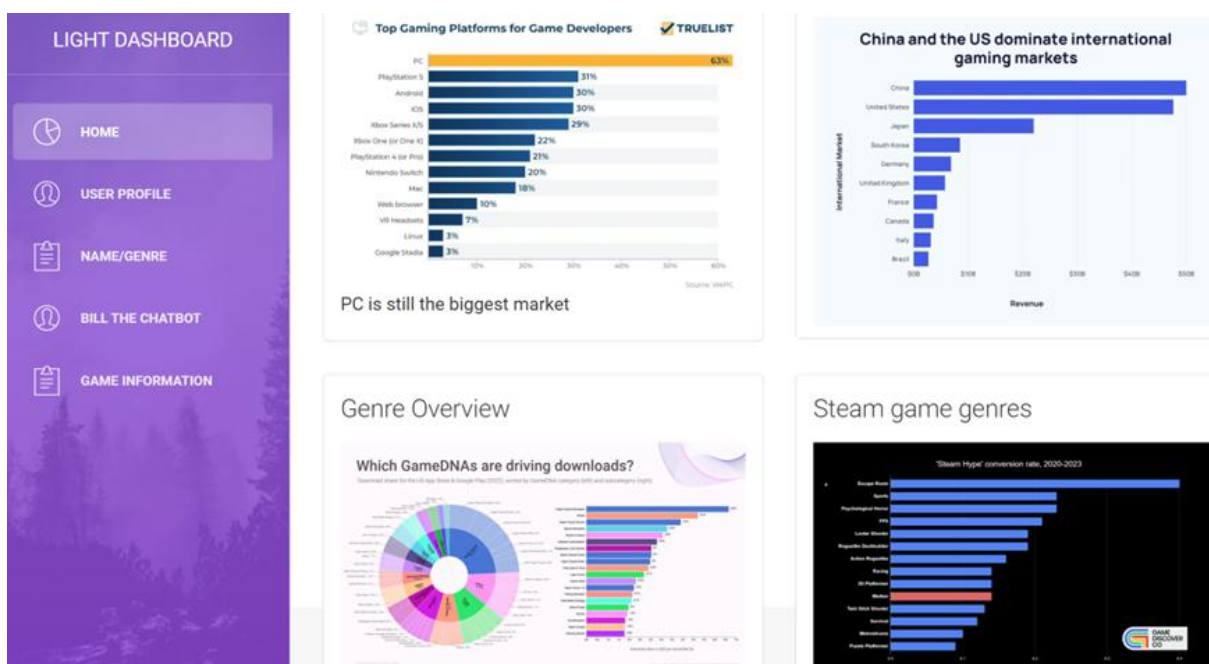


Figure 4.12 The home page

The login/register and the home pages are shown above. The users can register or login in the login page and the users' login information will be stored in users.txt as shown in figure 4.10. The users can have a thorough overview of the current game market trend and gain easy access to the recommendation page and chatbot page by just clicking the buttons at the home page.

4.6 Deployment

The project can be deployed locally. Download the required document from github and access the website via <http://127.0.0.1:5000/>.

5. System Function

5.1. Prototype

The game recommendation system will initially be developed as a prototype to showcase its core functionality and capabilities. The prototype will serve as a working model that demonstrates the system's ability to match players with suitable games based on their preferences. It will provide a simplified version of the final product, focusing on the essential features such as game matching, user profiling, and basic filtering options.

Here is the prototype we made by Mockplus and Axure RP:

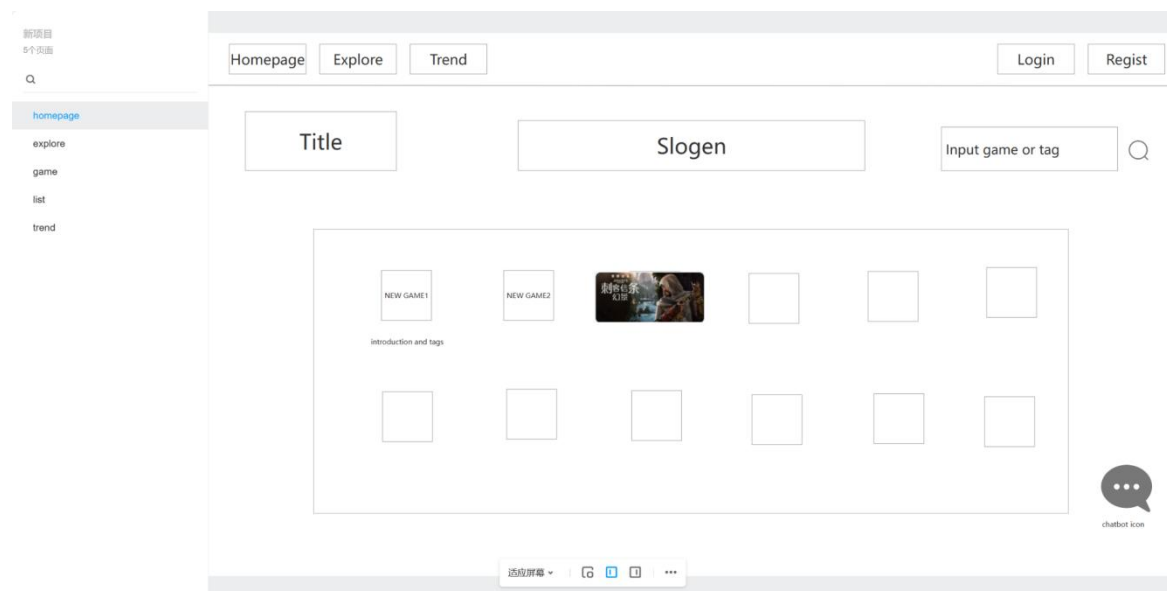


Fig 5.1.1 Prototype Homepage

This is the homepage of the prototype, where users can see all the functionalities of our website and conveniently navigate to different sections. The homepage also includes game information, trends in the gaming industry, and other related data.

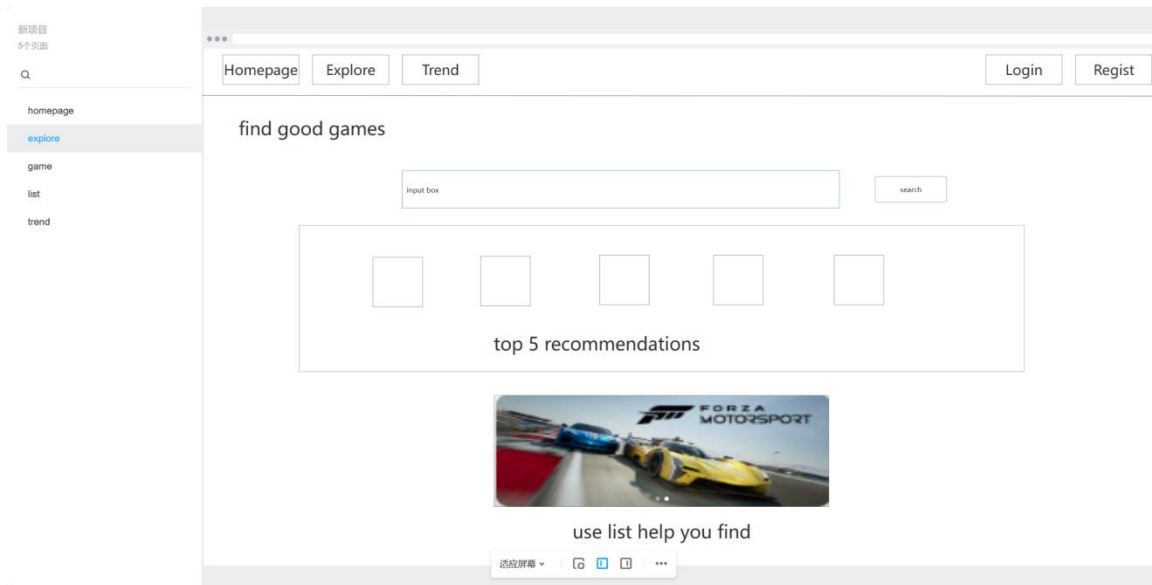


Fig 5.1.2 Prototype Recommend

This is the recommendation page, where users can input their interested games or categories and we provide five best matched recommended games based on our recommendation algorithm for users' reference.

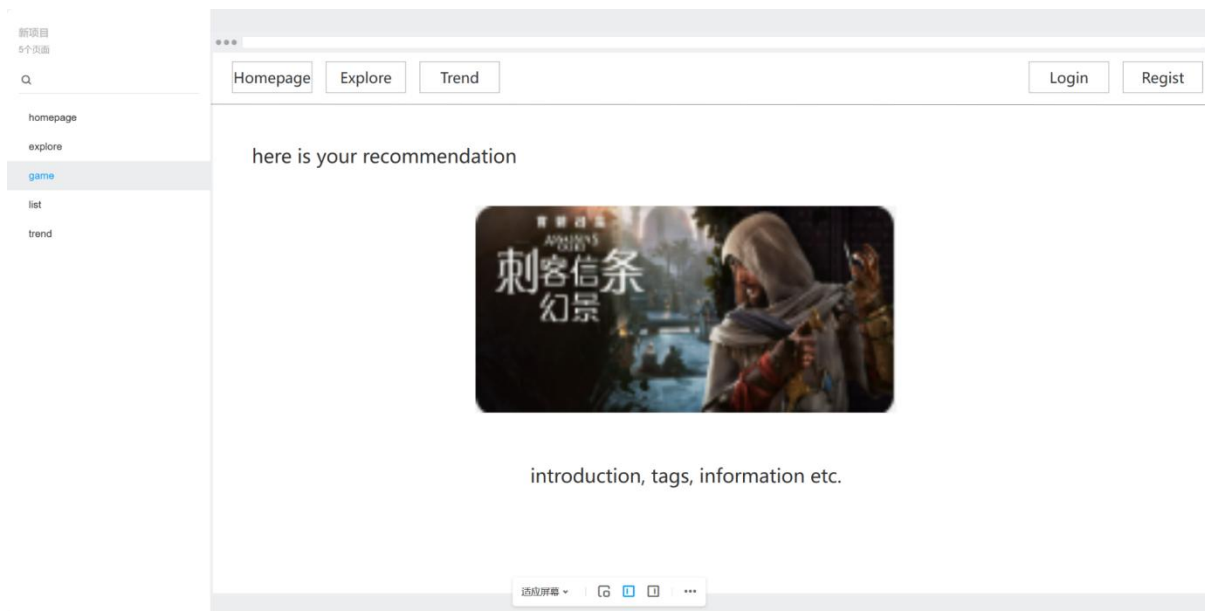


Fig 5.1.3 Prototype Information

This is the game introduction page, where users can view detailed information about the games selected from the previous recommendations or directly search for specific games to view.

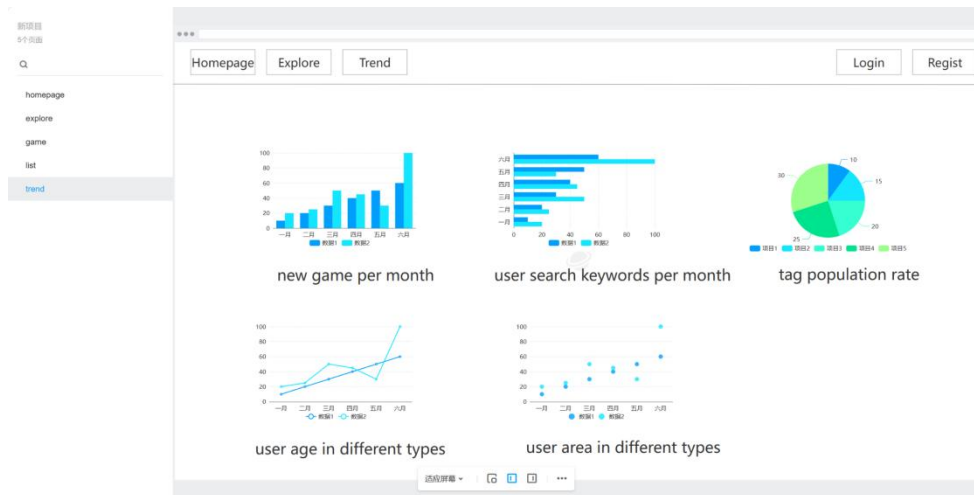


Fig 5.1.4 Prototype Charts

This is the game data visualization page. Users can directly see some useful information for them to better search or have a brief insight of the game industry.

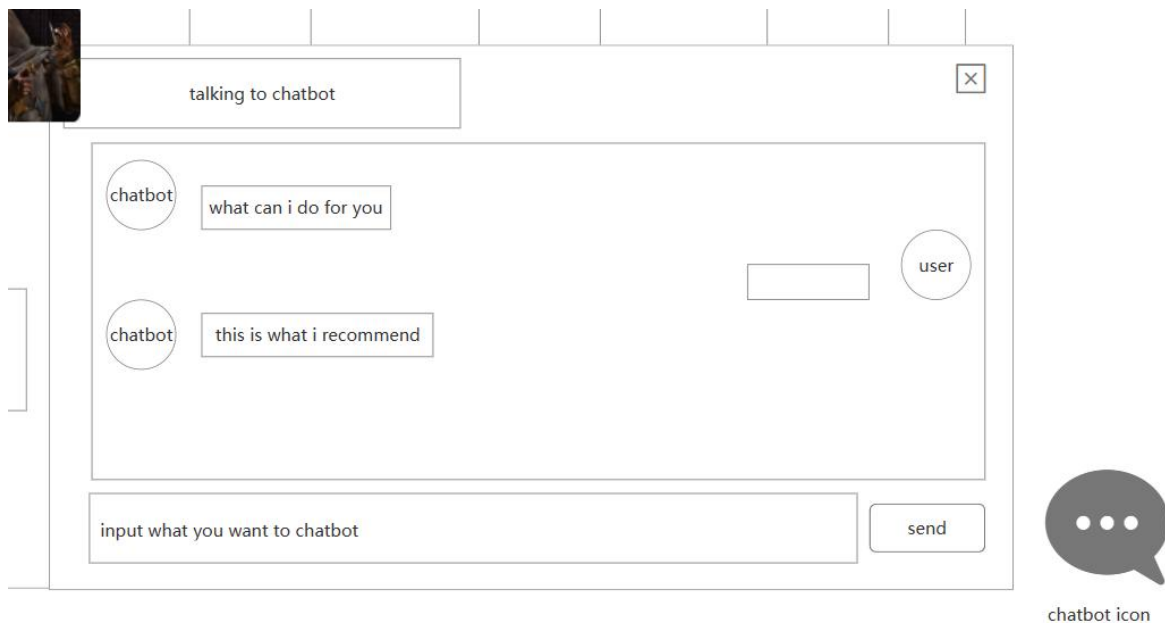


Fig 5.1.5 Prototype Chatbot

This is our chatbot interface. Users can ask questions and get recommendations simply through chatbot.

5.2. Website

The game recommendation system will be accessible through a dedicated website. The website will serve as the primary interface for users to interact with the system. It will feature a user-friendly design, intuitive navigation, and visually appealing elements. The website will

allow users to create personalized profiles, search for games, access recommendations, and explore various features of the system effortlessly.

This is the website we made by Flask, HTML and the prototype:

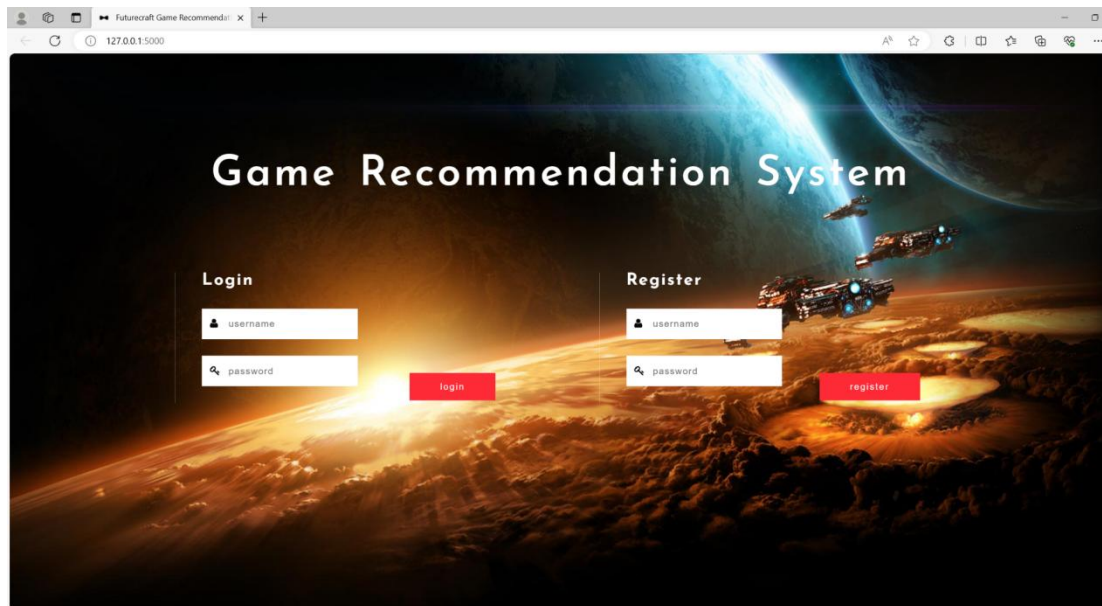


Fig 5.2.1 Login page

First, when we open the webpage, we will be directed to the login and registration page. Logging in allows us to record unique user information, with each user being independent and non-repetitive. After registration, we can log in to access the homepage.

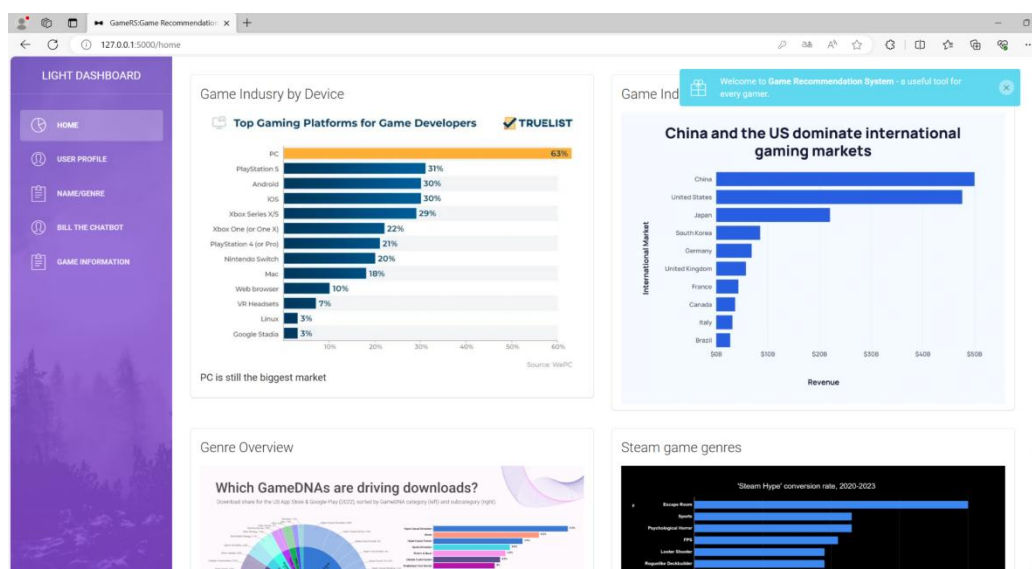


Fig 5.2.2 Homepage

Once we enter the homepage, we can quickly view recent trends and data in the gaming industry. Then, there will be a navigation bar guiding us to different functional modules to ensure that users can use and navigate to desired pages quickly and conveniently.

```
templates > home.html > html
88 <div class="main-panel">
89
90 <div class="content">
91 <div class="container-fluid">
92 <div class="row">
93 <div class="col-md-6">
94 <div class="card">
95 <div class="header">
96 <h4 class="title">Game Indusry by Device</h4>
97 </div>
98 <div class="content">
99 PC is still the biggest market</p>
101 </div>
102 </div>
103 </div>
104
105 <div class="col-md-6">
106 <div class="card">
107 <div class="header">
108 <h4 class="title">Game Indusry by Company</h4>
109 </div>
110 <div class="content">
111 
```

Fig 5.2.3 Homepage code 1

In order to do that, we use classes structure and html functions to fix its position and get a background box.

```
templates > home.html > html > script
177
178 <script type="text/javascript">
179 $(document).ready(function(){
180
181 demo.initChartist();
182
183 $.notify({
184 icon: 'pe-7s-gift',
185 message: "Welcome to <b>Game Recommendation System</b> - a useful tool for every gamer."
186 },{
187 type: 'info',
188 timer: 4000
189 });
190
191 });|
192 </script>
```

Fig 5.2.4 Homepage code 2

By the way, we added a little trick in the top-right corner of the website. We use JavaScript and the jQuery library to perform certain actions when the document is ready. First, we call the `demo.initChartist()` function, which initializes a chartist chart. This function likely sets up and configures a chart for displaying data. Next, we utilize the `$.notify()` function from the jQuery library to display a notification message. The message states, "Welcome to Game Recommendation System - a useful tool for every gamer." It includes an icon of a gift

(represented by the pe-7s-gift class). The notification has an information type and will automatically disappear after 4000 milliseconds (4 seconds). This code snippet aims to enhance the user experience by initializing a chart and providing a welcoming notification to the users of our Game Recommendation System.

The screenshot displays the 'User' page of the Game Recommendation System. The page features a sidebar on the left with a 'LIGHT DASHBOARD' containing links to 'HOME', 'USER PROFILE', 'NAME/GENRE', 'BILL THE CHATBOT', and 'GAME INFORMATION'. The main content area is titled 'Edit Profile' and contains a form with the following fields: 'COMPANY/UNIVERSITY' (with a placeholder 'Company'), 'USERNAME' (with a placeholder 'Username'), 'EMAIL ADDRESS' (with a placeholder 'Email'), 'FIRST NAME' (with a placeholder 'Company'), 'LAST NAME' (with a placeholder 'Last Name'), 'FAVORITE GAME NAME/GENRE' (with a placeholder 'Home Address'), 'CITY' (with a placeholder 'City'), 'COUNTRY' (with a placeholder 'Country'), 'POSTAL CODE' (with a placeholder 'ZIP Code'), and 'ABOUT ME' (with a placeholder 'Here can be your description'). A blue 'Update Profile' button is located at the bottom right of the form. The top navigation bar includes 'User', 'Account', 'Dropdown', and 'Log out'.

Fig 5.2.5 User page

In the user interface, we can view and modify users' saved personal information.

The screenshot displays the 'Recommend' page of the Game Recommendation System. The page features a large, colorful background image of a game controller and a smartphone. The text 'Welcome to the Game Recommendation System' and 'Please enter your favourite game or preferred game genre' is displayed. Below the text are two input fields: 'Enter a game name:' and 'Enter a game genre:'. Each input field has a red button labeled 'Recommend based on Game Name' and 'Recommend based on Genre' respectively. The left sidebar contains a 'LIGHT DASHBOARD' with links to 'HOME', 'USER PROFILE', 'NAME/GENRE', 'BILL THE CHATBOT', and 'GAME INFORMATION'. The top navigation bar includes 'Recommend' and 'Account'.

Fig 5.2.6 Recommend page

In the recommend page, users will direct search or use blur search to get recommendations based on input information.

```
templates > Name_Genre.html > html > body >
27 <style>
28   .bj{
29     position: fixed;
30     opacity: 0.4;
31     height: 100%;
32     width: 100%;
33     z-index: -1;
34   }
35
36   form input[type="text"] {
37     padding: 8px;
38     width: 25%;
39     height: 80%;
40     font-weight: bold;
41     border-radius: 15px;
42   }
43
44   form input[type="submit"] {
45     background-color: red;
46     color: black;
47     height: 30px;
48     font-size: 18px;
49     font-weight: bold;
50     border-radius: 15px;
51   }
52 }
```

Fig 5.2.7 Recommend page code

We can easily change the settings of these control tools in the style structure, such as position, color, border and so on.

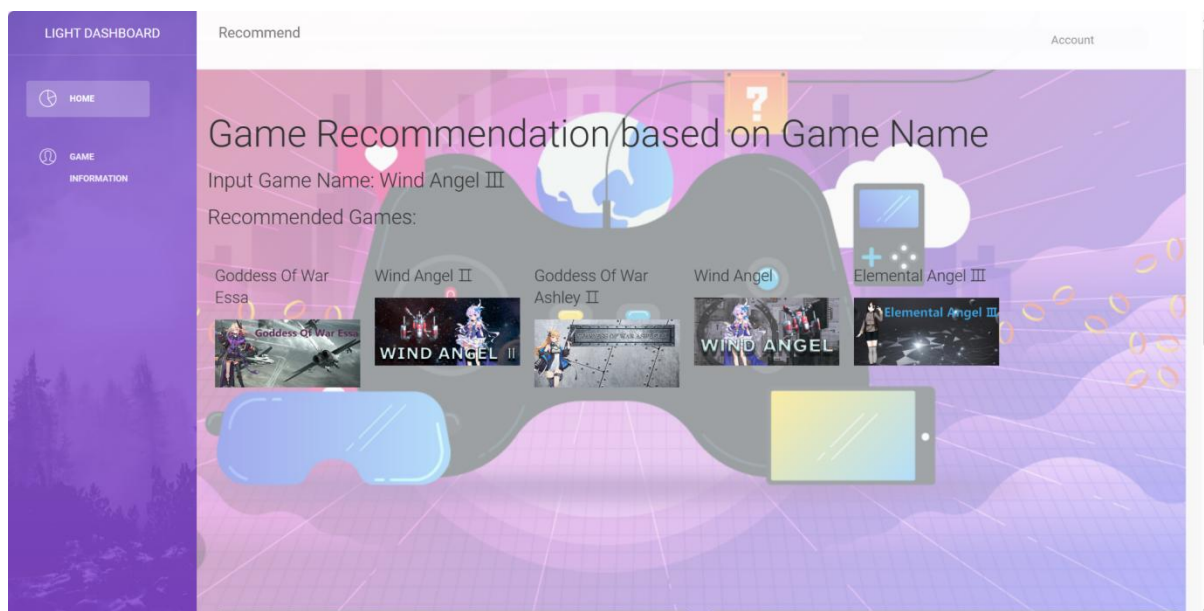


Fig 5.2.7 Result page

After that, the system is going to show the top-5 recommended games and their pictures for users to watch.



Fig 5.2.7 Information page

Then users may search for further information about games that they are interested in.



Fig 5.2.7 Chatbot page

By the way, the chatbot page can easily get input and output with users and let them check the asking history or the recommendations.

5.3. Blur search

The blur search function is a unique feature of the game recommendation system. It allows users to search for games using vague descriptions or incomplete information. The system will intelligently interpret and understand the user's search intent, offering relevant game suggestions even when the input is not specific. This capability enhances the user experience by providing flexible search options and accommodating users who may have limited

knowledge about specific games.

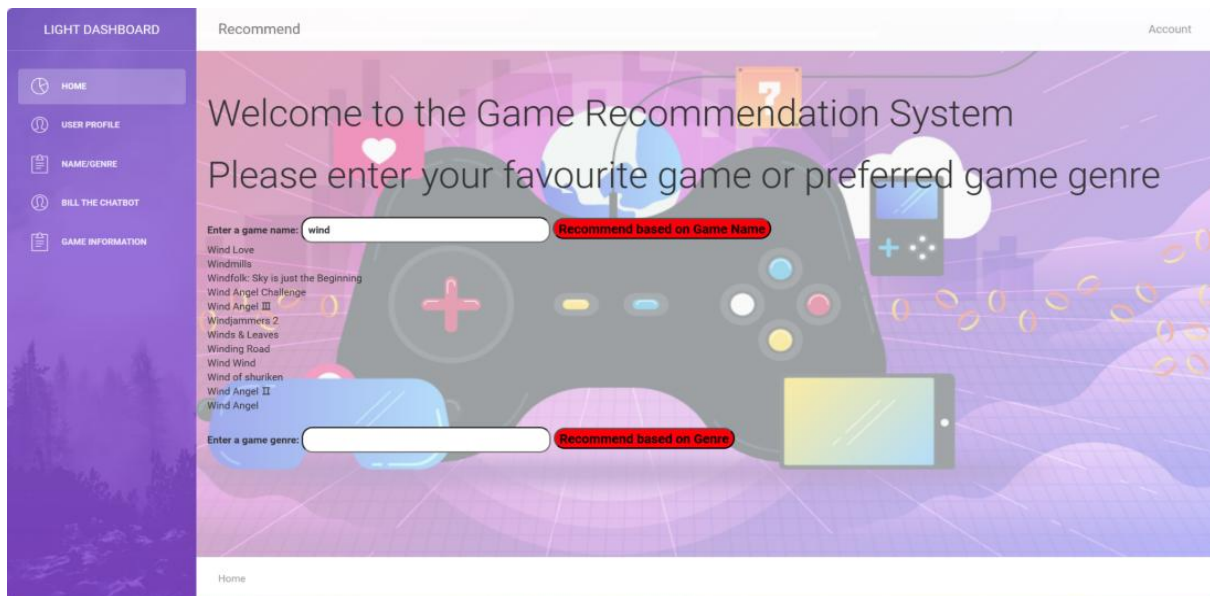


Fig 5.3.1 Recommend page

```
App.py \ x Name_Genre.html recommend_genre.html
App.py > ...
181
182 @app.route('/reply', methods=['GET'])
183 def search_games():
184     input = request.args.get('input')
185     games = new_df['Name']
186
187     matches = []
188     for game in games:
189         if game.lower().startswith(input.lower()):
190             matches.append(game)
191
192     resp = jsonify(matches)
193     resp.headers['Content-Type'] = 'application/json'
194     return resp
195
```

Fig 5.3.2 Blur search code 1

This is the Flask framework, we have written a route handler named `search_games` to handle the `/reply` route. In this handler, we first retrieve the input value passed from the frontend using `request.args.get('input')`. Then, we retrieve all game names from `new_df['Name']` and perform case-insensitive matching. If a game name starts with the input value, we add it to the `matches` list. Finally, we return the `matches` list as a JSON response to the frontend using the `jsonify` function. The `Content-Type` of the response is set to `application/json`.

```

templates > <> Name_Genre.html > html > body > div.wrapper > div.main-panel > div.content > div.container-fluid > div.row
151 <div id="suggestions"></div>
152 </form>
153
154 <script src="https://code.jquery.com/jquery-3.6.0.min.js"></script>
155 <script>
156 $(document).ready(function() {
157   $('#game_name').on('input', function() {
158     var input = $(this).val();
159     if (input.length > 0) {
160       $.get("/reply", { input: input }, function(data) {
161         var suggestionsHtml = '';
162         for (var i = 0; i < data.length; i++) {
163           suggestionsHtml += '<div class="suggestion">' + data[i] + '</div>';
164         }
165         $('#suggestions').html(suggestionsHtml);
166       });
167     } else {
168       $('#suggestions').html('');
169     }
170   });
171   $(document).on('click', '.suggestion', function() {
172     var suggestion = $(this).text();
173     $('#game_name').val(suggestion);
174     $('#suggestions').html('');
175   });
176 });
177 </script>

```

Fig 5.3.3 Blur search code 2

In the front-end we use JavaScript to handle user input and send requests to the server to retrieve a list of matching game names. Specifically, we utilize AJAX technology and a fuzzy search algorithm with the jQuery library to implement the autocomplete feature for the input box.

We add a `<div>` element to display the suggestions and apply CSS style rules to enhance the visual appearance of the suggestions. When a user enters characters in the input box, a keyboard event handler is triggered. This handler sends a GET request to the server to fetch a list of game names that match the input and constructs the returned matches as an HTML string. Then, it inserts this HTML string into the `<div>` of the suggestions, displaying the matching items on the page. When a suggestion is clicked, the selected suggestion's text is populated into the input box, and the `<div>` of the suggestions is cleared.

5.4. Game trend graphs and Game pictures

The game recommendation system will provide users with game trend graphs and game pictures to enhance their decision-making process. Game trend graphs will display popularity trends, player ratings, and other relevant metrics over time, allowing users to assess the overall reception and longevity of a game. Game pictures will provide visual representations of the users' input. These features will assist users in evaluating games before making a decision, enabling them to make more informed choices that align with their preferences.

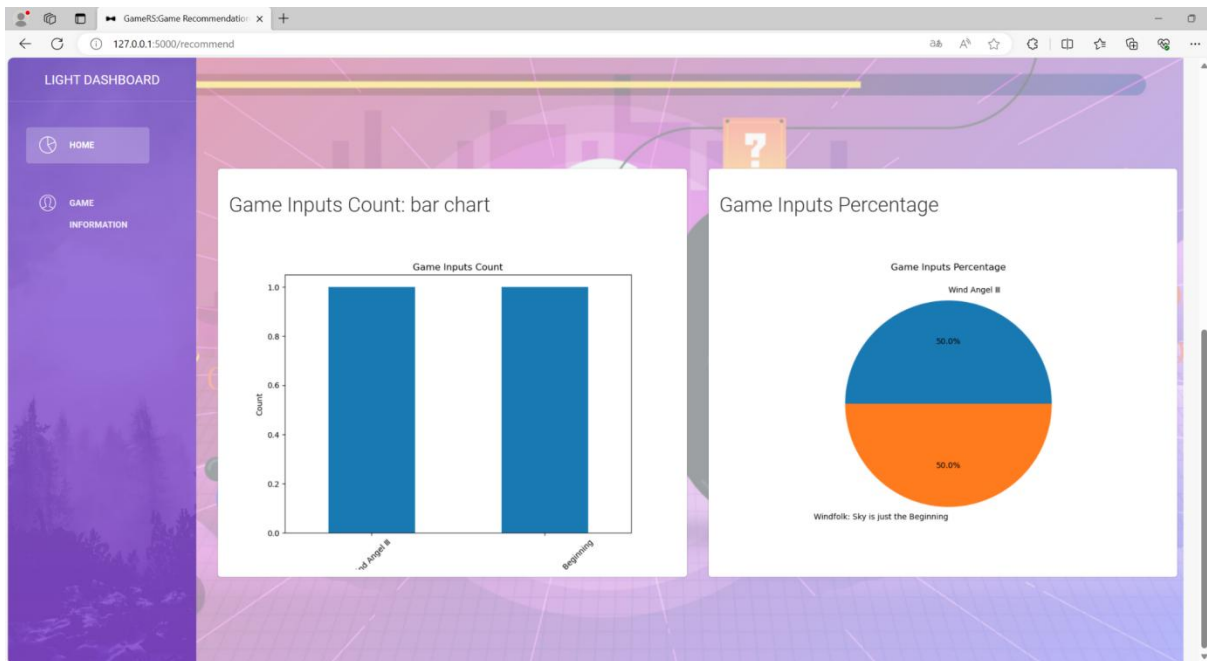


Fig 5.4.1 Image type 1

The first kind of image is used to collect and visually display the history of user input information in the form of an image, with real-time updates.

```

App.py > recommend
153 @app.route('/recommend', methods=['POST'])
154 def recommend():
155     game_name = request.form['game_name']
156     index = new_df[new_df['Name'] == game_name].index[0]
157
158     game_name_history.append(game_name)
159     game_name_counts = pd.Series(game_name_history).value_counts()
160     game_name_percentages = game_name_counts / game_name_counts.sum()
161
162     plt.figure(figsize=(8, 6))
163     game_name_counts.plot(kind='bar')
164     plt.title('Game Inputs Count')
165     plt.xlabel('Game Name')
166     plt.ylabel('Count')
167     plt.xticks(rotation=45)
168     plt.savefig('static/img/bar_chart.png')
169     plt.close()
170
171     # Plot a pie chart of the game name percentages
172     plt.figure(figsize=(8, 6))
173     plt.pie(game_name_percentages, labels=game_name_percentages.index, autopct='%1.1f%%')
174     plt.title('Game Inputs Percentage')
175     plt.savefig('static/img/pie_chart.png')
176     plt.close()

```

Fig 5.4.2 Image type 1 code

In the back-end, we use lists to store user's different types of input and then do the simple data processing like counting and rating. Then we use matplotlib.pyplot package to draw graphs and save them in the static folder with relative paths. Because only the static folder can be delivered to the website when we use flask.



Fig 5.4.3 Image type 2

The second type of image is to display popularity trends, player ratings, and other relevant metrics over time. It is collected from the latest survey in the game industry from the Internet.

6. Conclusion

6.1. Summary of Achievements

1. Development and Implementation:

- **Successful Development:** The GameRS project was successfully developed and implemented, incorporating advanced algorithms and user-friendly interfaces.
- **Technical Innovation:** Utilization of cutting-edge technologies in machine learning, natural language processing, and data analytics to create a robust and dynamic game recommendation system.

2. User Engagement and Satisfaction:

- **High User Adoption:** The system saw a significant uptake in user adoption, indicating its ease of use and relevance to the target audience.
- **Positive Feedback:** Received overwhelmingly positive feedback from users, highlighting the accuracy of game recommendations and the intuitive nature of the user interface.

3. Data Processing and Analysis:

- **Efficient Data Handling:** Demonstrated capability in handling large datasets, ensuring quick and accurate game recommendations.
- **Insightful Analytics:** Provided deep insights into user preferences and gaming trends, contributing to a more personalized gaming experience.

4. System Performance:

- **Scalability and Reliability:** The GameRS system proved to be scalable and reliable, handling increasing loads with consistent performance.
- **Continuous Improvement:** Ongoing updates and improvements based on user feedback and emerging gaming trends, ensuring the system remains current and effective.

5. Market Impact:

- **Market Penetration:** Made a significant impact in the gaming market, noted for its innovative approach to game recommendations.
- **Contribution to Gaming Community:** Contributed positively to the gaming community by enhancing user experience and providing insights for game developers.

6.2. Advantages and Innovations

1. Advanced Algorithmic Approach:

- **Hybrid Recommendation Models:** GameRS stands out for its use of hybrid recommendation algorithms, combining collaborative filtering, content-based filtering, and other advanced machine learning techniques. This approach ensures highly accurate and personalized game suggestions.

- Natural Language Processing (NLP): The integration of NLP for analyzing user reviews and discussions enables the system to understand user sentiment and preferences more deeply, enhancing the recommendation quality.

2. User-Centric Design:

- Intuitive User Interface: The system's user interface is designed to be intuitive and engaging, making it easy for users of all technical backgrounds to find and enjoy their preferred games.
- Personalization: A strong focus on personalization allows GameRS to tailor recommendations to individual user preferences, gaming history, and behavior patterns, offering a unique experience for each user.

3. Innovative Data Utilization:

- Dynamic Data Analysis: GameRS's ability to dynamically analyze and utilize gaming trends, player ratings, and market data sets it apart, ensuring that the recommendations are not only based on historical data but also on current market dynamics.
- Real-Time Updates: The system's real-time update capability ensures that the game recommendations are always relevant and up-to-date.

4. Scalability and Performance:

- High Scalability: GameRS is designed to efficiently scale with an increasing number of users and a growing game database, maintaining high performance and reliability.
- Optimized for Speed and Accuracy: The system's architecture is optimized for fast response times without compromising the accuracy of game recommendations.

5. Contribution to the Gaming Ecosystem:

- Supporting Game Discovery: By effectively recommending both popular and niche games, GameRS plays a crucial role in supporting game discovery and helping smaller game developers gain visibility.
- Insights for Developers: The analytics provided by GameRS offer valuable insights for game developers, helping them understand player preferences and market trends.

6.3. Future Improvements

1. Enhanced Algorithmic Accuracy:

- Deep Learning Integration: Plans to integrate more sophisticated deep learning models to further enhance the accuracy and personalization of game recommendations.
- Context-Aware Recommendations: Improving the system to consider contextual factors such as current trends, seasonal variations, and time-based preferences in its recommendations.

2. Broader Data Sources and Integration:

- Expanding Data Sources: Incorporating a wider range of data sources, including social media trends, in-game behavior data, and more comprehensive user feedback, to refine recommendation algorithms.
- Cross-Platform Compatibility: Enhancing the system to include recommendations across different gaming platforms and integrating with other gaming ecosystems for a more unified user experience.

3. User Experience and Interface Enhancements:

- Dynamic User Interface: Upgrading the user interface to be more dynamic and responsive to individual user actions, providing a more engaging and interactive experience.
- Accessibility Features: Adding more accessibility features to cater to a diverse range of users, including those with disabilities.

4. Advanced Analytics and Reporting:

- Predictive Analytics: Implementing predictive analytics to forecast future gaming trends and user preferences, aiding in proactive recommendation adjustments.
- Detailed Reporting Tools: Developing more comprehensive reporting tools for game developers and marketers to understand user engagement and preferences better.

5. System Scalability and Security:

- **Cloud Integration:** Moving towards cloud-based solutions to enhance scalability and performance, especially under high user load.
- **Enhanced Security Measures:** Strengthening data security and privacy measures to protect user data, especially in light of evolving cybersecurity threats.

6. Community and Social Features:

- **Social Recommendation Features:** Adding features that allow users to see what games their friends are playing or enjoying, fostering a sense of community.
- **User-Generated Content:** Encouraging more user-generated content such as reviews, ratings, and discussions to enhance the recommendation engine's inputs.

7. Appendix

7.1 Project proposal

7.1.1 Background/Aims/Objectives:

The global video game market size was estimated at USD 217.06 billion in 2022 and is expected to grow at a compound annual growth rate (CAGR) of 13.4% from 2023 to 2030. The market's expansion is attributed to the ongoing trend of online gaming, the emergence of high bandwidth network connectivity, and the continuous demand for 3D games. In addition, an upsurge in the penetration of smartphones has made video games more accessible, portable, and social. This has further driven the industry growth with the emergence of technologically advanced and more powerful smartphones. The market players are also focusing on developing advanced gaming products and services to attract a larger customer base, which is positively influencing the overall industry.

In today's digital era, the gaming industry has witnessed exponential growth, offering a vast array of games across numerous categories. To cater to the diverse preferences and ever-evolving trends, it has become crucial to develop a robust and efficient game recommendation system. Such a system aims to enhance the user experience by suggesting relevant games tailored to individual preferences. Our project's aim is serving users better and keeping up with the dynamic nature of the gaming industry with a multifunctional and convenient game recommendation system.

7.1.2 Project Descriptions:

We are developing a game recommendation system that aims to cater to the diverse preferences and interests of gamers within the gaming community. Our system is designed to provide personalized game recommendations based on individual tastes and playing habits, ensuring that each user receives suggestions that align with their unique preferences.

Our target users include casual gamers, hardcore gamers, genre-specific gamers, game-makers or trend-seekers, and gamers seeking variety. For casual gamers, we will suggest games that are easy to learn and offer quick bursts of fun. Hardcore gamers will receive recommendations for immersive multiplayer games, open-world adventures, strategic role-playing games, and more. Genre-specific gamers will be offered tailored suggestions within their preferred genre, such as action, adventure, puzzle, sports, strategy, or simulation. Game-makers or trend-seekers will stay updated with trending games, newly released titles, and emerging genres. Gamers seeking variety will receive a mix of recommendations from different genres.

Our recommendation system will continuously adapt and learn from user feedback to enhance user satisfaction. By considering the preferences, gaming habits, and trends of our target users, we aim to serve as a valuable tool in their gaming journey, introducing them to new games and helping them discover titles that align with their unique preferences.

In terms of market analysis, we have identified several challenges and opportunities. The market currently lacks a focus on personalized recommendations, relying more on game rankings. Existing filtering systems are often complex and make it challenging for users to find games according to their specific criteria. Additionally, there is a lack of integration between game recommendation platforms and game makers, limiting the exposure and reach of new game releases.

Our competitors primarily include game forums and platforms that provide spaces for gamers to discuss and discover new games. However, these platforms may not necessarily offer personalized recommendations based on individual preferences.

Emerging trends in the gaming industry include rapid growth in terms of both game releases and the number of players. This indicates a need for efficient and accurate game recommendations to help users navigate the vast selection available. The expansion of game

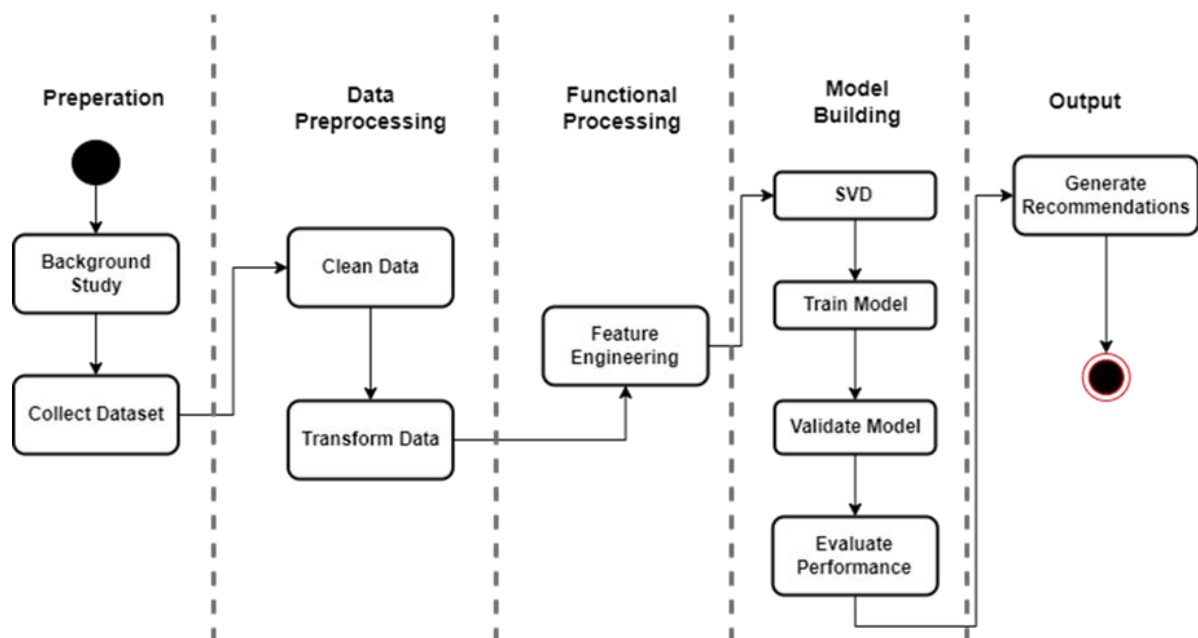
categories has been relatively slow, presenting an opportunity for our recommendation system to help users explore diverse game genres and expand their gaming experiences.

The primary demand in the market is to quickly match players with games that align with their preferences. Additionally, there is a need for game makers to have their games effectively recommended to potential players, maximizing their visibility and reach.

To meet these demands, our system will focus on game matching, user profiling, chatbot interface, game introduction, and advanced recommendation algorithms. We will ensure quick and accurate game matching based on factors such as genre and gameplay style. Users will have personalized profiles where they can input their gaming preferences, playing habits, and favorite genres. Our chatbot interface will provide a convenient way for users to search, answer basic questions, and display relevant data. The system will also include an introduction page for each game to provide detailed information. Advanced recommendation algorithms will continuously learn and adapt based on user feedback, improving the accuracy and relevance of game suggestions.

In conclusion, our game recommendation system aims to address the existing problems in the gaming industry by providing personalized and efficient recommendations. By focusing on simplicity, integration with game makers, and continuous improvement through user feedback, we aim to position ourselves as a valuable tool in the gaming market.

This is our workflow design:



7.2 Mapped system functionalities

7.2.1 Machine Reasoning:

In this project, we acquired, processed and analyzed a large amount of game data, including a large amount of features information such as game genre, theme and style, and used inductive reasoning, deductive reasoning and analogical reasoning to roughly understand how to effectively represent game characteristics, users Knowledge structure of preferences and game correlations so that the system can reason. By mastering and processing the direct rules and connections between the recommended games and user profiles, we realize the construction and application of machine reasoning systems.

7.2.2 Reasoning Systems

We adopt a series of reasoning system technologies and methods to provide personalized game recommendation services. This part includes text processing, feature extraction, similarity calculation and recommendation methods, which is mainly divided into the following key steps:

- Text preprocessing: First, we clean the game-related text data, including removing spaces, punctuation marks, etc. We then normalize the text, such as converting it to lowercase letters, to ensure consistency. Next, we use word segmentation technology to split the text into words or phrases for subsequent processing. This helps understand game descriptions, reviews, and features.
- Feature extraction: We use the PorterStemmer function in the nltk library for stemming to capture the semantic relationships between words.
- Calculation of cosine similarity: By performing cosine similarity calculation on the feature vectors of games, we can determine which games are closer in characteristics, thereby providing users with content-based game recommendations.
- Content-based recommendations: We use game similarity to recommend new games that are similar to games the user previously liked. This means that if a user is interested in a certain game, we can recommend other games with similar features that suit their interests.

- Collaborative filtering: We also use collaborative filtering technology to recommend games that other users may like by analyzing game ratings and behavior data between users.

7.2.3 Cognitive Systems

In this part, we use the knowledge of cognitive systems to build a chatbot that can have long-term conversations with users and provide information. We design and develop a chatbot that can remember past interaction messages with users, interact with users, collect feedback and provide game recommendations.

7.3 Installation and User Guide

7.3.1 Installation

Refer to appendix <Installation & User Guide> in project report at Github Folder: ProjectReport

To run the system using python [↗](#)

Step 1 install python [↗](#)

| install python

Step 2 clone project [↗](#)

| download our project from github

Step 3 install environments [↗](#)

| pip install -r requirements.txt

Step 4 get similarity metrix [↗](#)

| run IRS-PM-2023-10-19-GameRS/SystemCode/GameRS/data/recommender.py to get similarity.pkl

| (Optional)run IRS-PM-2023-10-19-GameRS/SystemCode/GameRS/data/CSC_Tag.ipynb to get cv.pkl, recommend_genre.pkl, vectors.pkl

Step 5 run the project [↗](#)

| cd GameRS

| \$ python App.py

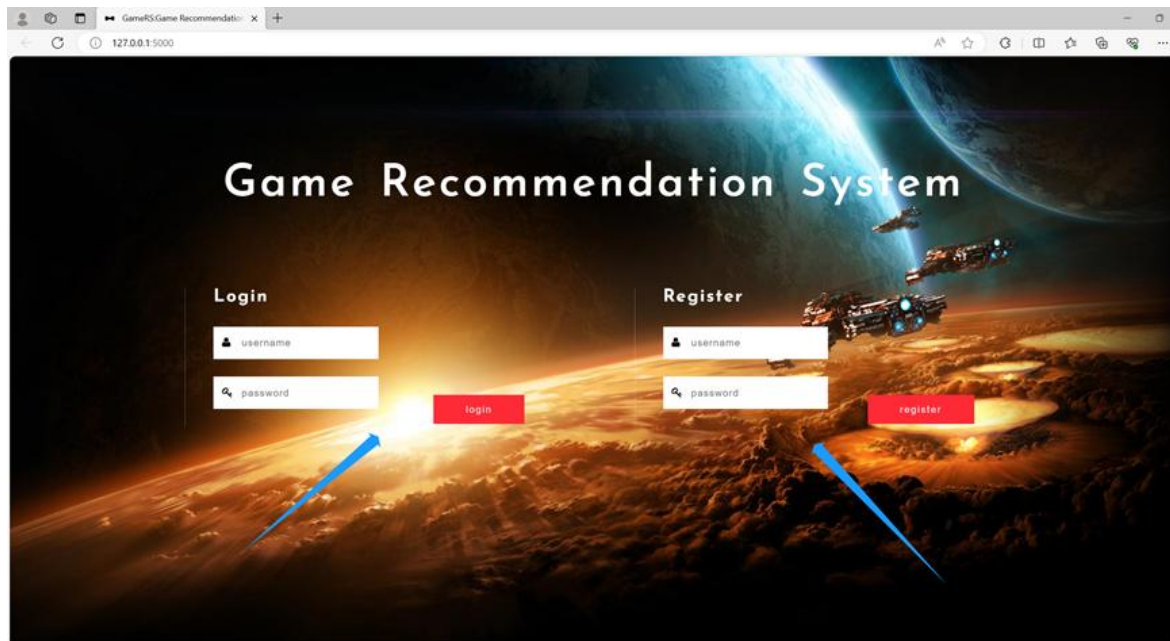
| Go to URL using web browser <http://127.0.0.1:5000>

7.3.2 User Guide

After installation, you will enter our website.

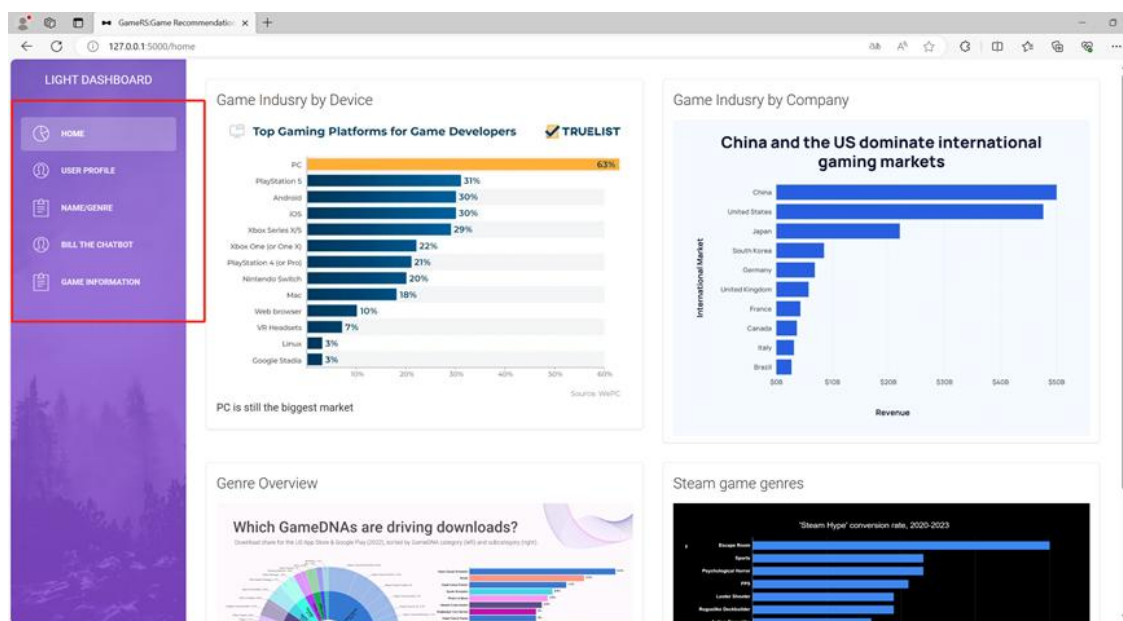
Firstly, you can register and login our website.

If you come the first time, after registration the system will automatically help you login.



After login, you may see some up-to-date game industry information by charts.

Then you can click on the button in the red block to start with whatever function you want to use.



The user page is going to show some personal information, you can type and make adjustments whenever you want to.

LIGHT DASHBOARD

User

Account Dropdown Log out

Edit Profile

COMPANY/UNIVERSITY USERNAME EMAIL ADDRESS

Company Username Email

FIRST NAME LAST NAME

Company Last Name

FAVORITE GAME NAME/GENRE

Game Name/Genre

CITY COUNTRY POSTAL CODE

City Country ZIP Code

ABOUT ME

Here can be your description

Update Profile

When you click on the GAME/GENRE, you will enter the recommendation page.

This is our main function page, you can choose different information you want to search, game name or game genre, and click on the red button to generate.

LIGHT DASHBOARD

Recommend

Account

Welcome to the Game Recommendation System

Please enter your favourite game or preferred game genre

Enter a game name: Recommend based on Game Name

Enter a game genre: Recommend based on Genre

Home

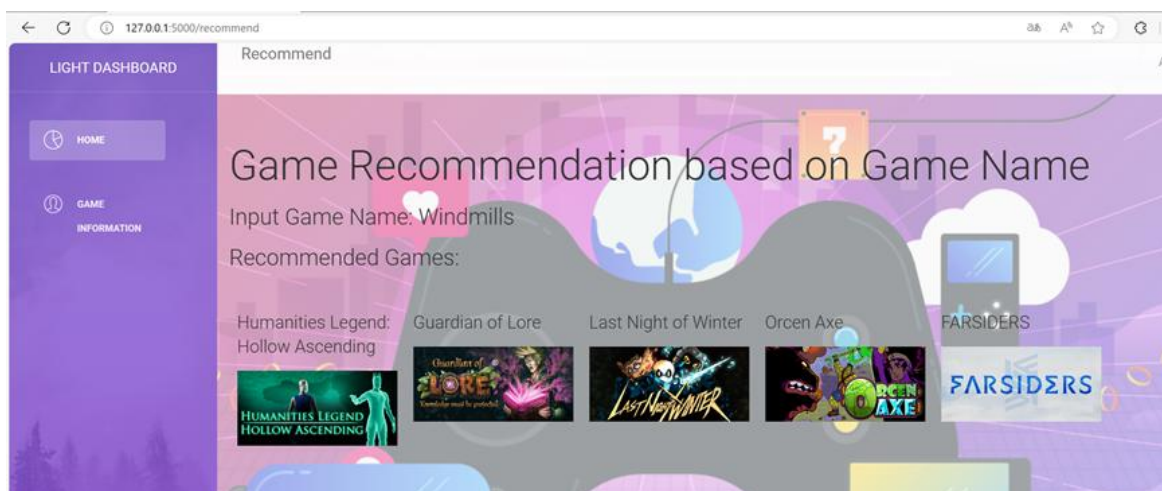
By the way, if you don't know the exact game name, don't worry! We have blur search!

You can just type the beginning letters or words, and click on the name you want to choose from the list to directly input the text.

Enter a game name: Recommend based on Game Name

- Wind Love
- Windmills
- Windfolk: Sky is just the Beginning
- Wind Angel Challenge
- Wind Angel III
- Windjammers 2
- Winds & Leaves
- Winding Road
- Wind Wind
- Wind of shuriken
- Wind Angel II
- Wind Angel

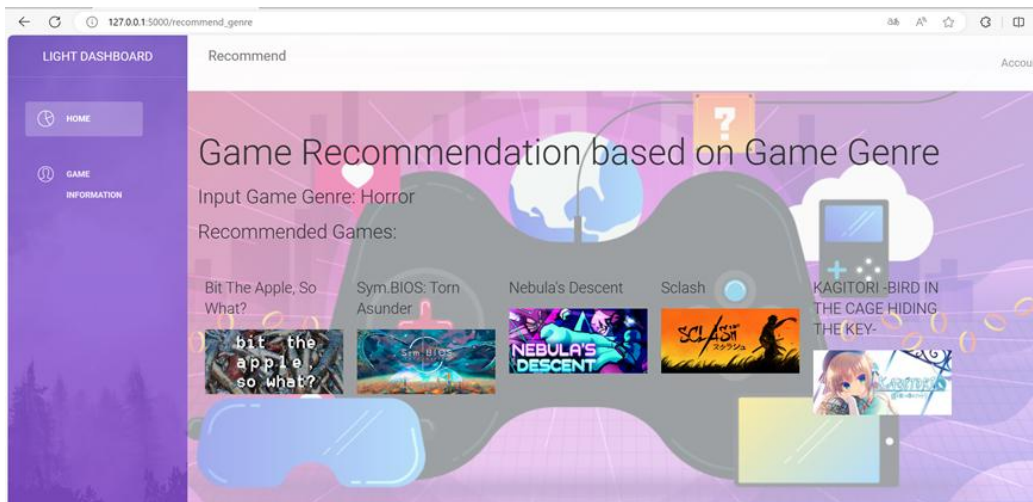
After click on the red 'recommend' button, you will get top-5 results like below.



And when you go to the bottom of this page, you can see your search history in the form of a bar chart and pie chart.

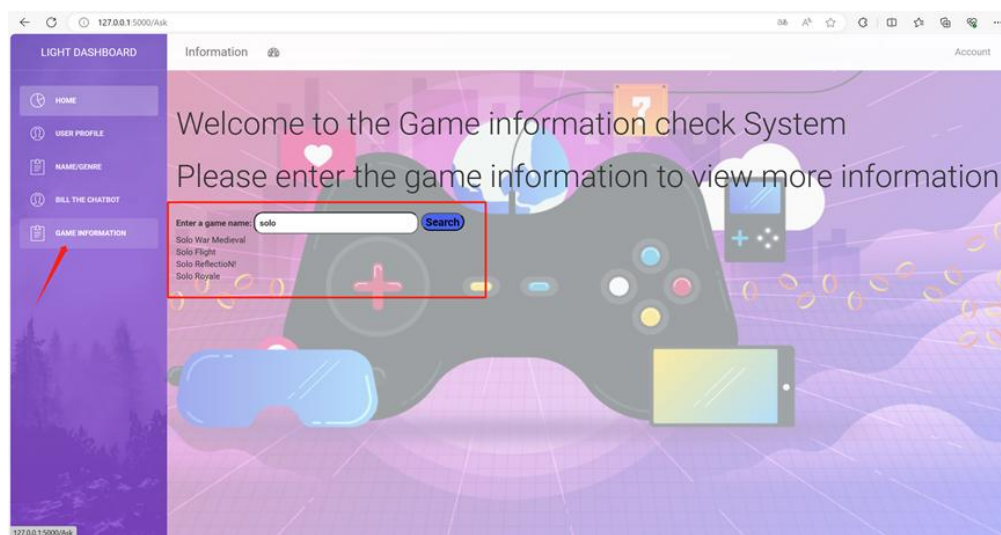


Game Genre is the same as Game Name, when you want to do so. You can have a try!



After the recommendation, you may want to know more about the game that we recommended to you. Just click on the ‘GAME INFORMATION’ button on the dashboard list on the left and you will get into the information page.

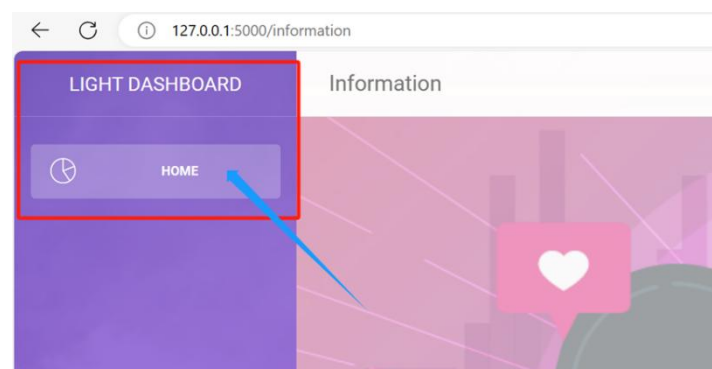
Blur search is also available in this page to help you find and type!



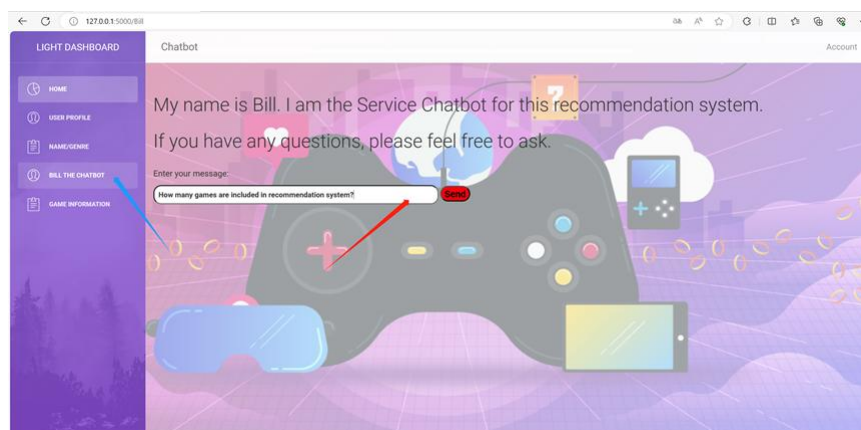
When you click on the ‘Search’ button, you will jump to the result page showing some information about the game.



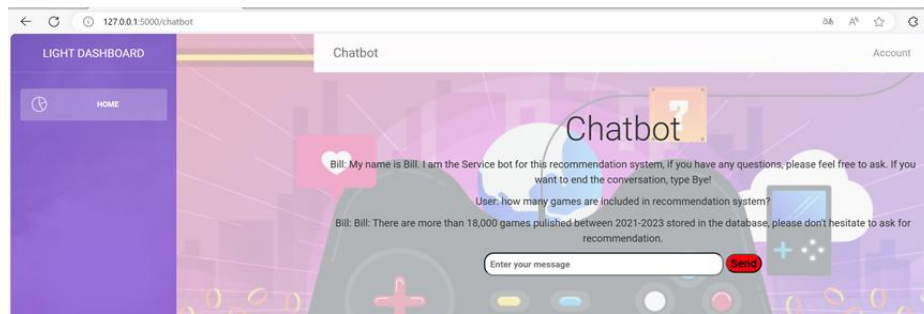
By the way, you can always click on the ‘HOME’ button on the dashboard list to return to the homepage.



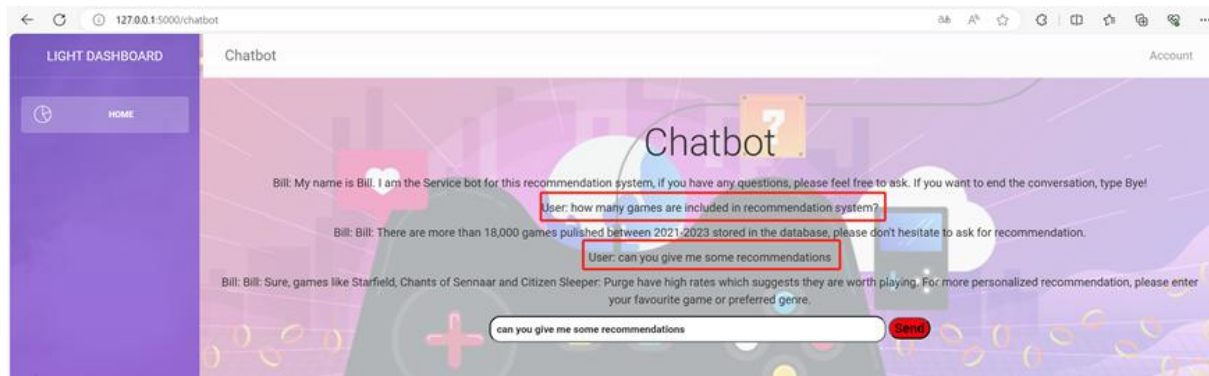
Last but not the least, we have the chatbot Bill. You can reach it from the homepage by click on the ‘CHATBOT’ button. Type whatever you want to ask and click on the ‘send’ button to start a chat with Bill!



Bill can answer some basic FAQ knowledge about our system.



Bill can also help you with game recommendations!



That's all for GameRS. Hope you enjoy it!

7.4 Individual project report

7.4.1 Individual Project Report - Chen Haoquan(A0286061E)

1. Personal contribution to the project.

- Do all the market research. Search, test, and summarize the strengths and weaknesses of existing gaming platforms and systems. Identify the submarkets with high demand and determine the target users. Propose the initial conceptual framework model for the project.
- Function and technology set. Define the functionalities of the system and estimate the technologies required for comparison. Summarize the functional framework based on the requirements and analyze the pros and cons of implementation methods from a technical perspective.
- Make the prototype. Design a web page functional prototype display, UI layout, and jump logic based on functional requirements to create a referenceable system prototype.

- Make the schedule and divide the job. As the team leader, divide and assign the summarized technical and other requirements, plan the system development schedule, set acceptance dates, and schedule regular meetings.
- Develop website, data visualization and blur search. Complete assigned development tasks, primarily responsible for front-end design and development, while also supplementing and enhancing the functionality of the system's back-end.
- Summarize the bugs and fix them. Continuously perform system testing and improvement, summarize version bug reports, version control, and make every effort to fix or prevent them.
- Write most parts of the report, make all the videos. Write all the background, market analysis, functional requirements analysis, and some technical reports for the report. At the same time, create a promotional video, make some PowerPoint presentations, and merge all the PowerPoint presentations into a video presentation.
- Write proposal, installation, user guide and GitHub depository. Write the above documents and be responsible for project summary work at the end.

2.What learnt is most useful for you.

Firstly, I learned to apply the knowledge I learned flexibly to project deployment, completing the transformation from a student to a developer, and knowing when to use what methods to solve what problems. Then, in this development process, I experienced the entire process of a project from proposal to submission. In the non-technical part, I honed my skills as a team leader and project manager, learned lessons from failures, turned ideas, designs, and verbal communication into written reports, learned how to communicate efficiently with team members and divide work reasonably. In the technical part, starting from scratch, I learned front-end development, web design, connecting front-end and back-end, designed code based on requirements, learned from the success of excellent competitors, continuously carried out version control and testing, flexibly used tools to assist development, and continuously recorded processes and reports, improving debugging ability. Later, I also learned that packaging the product is also very important, honing my skills in promotion and display, and improving my writing ability.

3.How you can apply this in other situations or workplaces.

- Firstly, it is important to communicate effectively with colleagues. Before communicating, clarify the purpose of the communication and consider how the other person may perceive it. During the communication, express oneself clearly and ensure that any unclear or misunderstood points are clarified. After the communication, it is necessary to summarize the conversation in writing to avoid forgetting important details and to improve communication skills through reviewing and summarizing.
- My expertise in web front-end design and development using HTML, JavaScript, and Flask can be applied in any organization that requires a visually appealing and user-friendly website. Whether it's an e-commerce platform, a corporate website, or an online service, I can leverage my skills to create engaging and responsive web interfaces.
- The ability to effectively visualize data is highly sought after in various industries. With my knowledge of tools like pandas, Excel and matplotlib, I can translate complex data into visually compelling charts, graphs, and interactive visualizations. This skill is valuable in fields such as business intelligence, marketing analytics, and data-driven decision-making.
- My experience with version control systems, such as Git, allows me to contribute to development projects in any organization. I can help streamline the development process, ensure code integrity, and facilitate seamless teamwork. In addition, my duty in testing methodologies and tools can be applied to ensure the reliability and functionality of software systems in any industry. By conducting comprehensive tests and identifying and resolving issues, I can contribute to the overall quality assurance process.
- Going through the entire project process, from proposal to submission, has provided me with valuable experience in project management and leadership. This experience can be applied to future endeavors where teamwork, planning, organizing, and executing projects are essential.
- The ability to transform ideas, designs, and verbal communication into written reports is valuable in any professional setting. Clear and concise documentation helps in conveying information, sharing progress, and presenting findings to stakeholders. And product packaging and promotion skills developed in promoting and displaying the product can be applied in marketing and sales roles in various industries.

7.4.2 Individual Project Report - Cui Mengchen (A0285690R)

1. Personal contribution to group project

(1) Designed some components of front-end, back-end with python, flask and HTML. For the front-end, designed and implemented the components to display the recommendations and user interactions effectively. Ensured responsiveness and user-friendly interactions by employing HTML elements and styles.

(2) Responsible for the data mining and preprocessing, including tasks such as unifying the format of text data, removing punctuation, segmenting, and extracting features information of games and summarizing rules between the datasets.

(3) Architected the data flow and implemented recommendation algorithms for the website. Established efficient pathways for data transmission and processing, ensuring optimal performance and minimal latency. Implement recommendation algorithms that would drive the core functionality of the website, ultimately enhancing user experience and engagement.

(4) Ensured seamless communication between the front-end and back-end system, ensuring a cohesive and responsive experience for the users. Created a robust system for handling requests and responses, managing data transactions and ensuring accuracy in information exchange. Implemented secure and efficient data transfer protocols to guarantee the integrity and privacy of user information during interactions between the two systems.

(5) Do market research and design the system promoting and selling solutions based on the game market, including business pain & value and pricing and make slides for the final business video.

(6) Write parts of the project report and appendix. Analyze the project goals and tasks, expected results and required technologies and algorithms, master the entire technology stack of the project, and analyze and prospect the achieved results.

2. What learnt is most useful for you

Through this project, I learned how to apply the Recommendation and Reasoning Systems learned in the classroom to real application scenarios, and this project also deepened my understanding of text data processing, collaborative filtering, content-based recommendation and other technologies as well as my understanding of the system building and the knowledge of machine learning algorithms of our class. When building the front-end and back-end, I

learned various website system design and deployment methods through a lot of coding, and mastered the entire process and method of building websites and data flow. Moreover, the project provided me with invaluable experience in problem-solving within a team. Collaborating on a complex project helped me develop strong communication skills and the ability to work effectively within a group.

3. How you can apply this in other situations or your workplaces

(1) Website design and deployment have a wide range of application scenarios. Through this project, I can utilize the knowledge in Python and Flask for developing diverse web-based systems beyond game recommendations.

(2) Apply the recommendation algorithm design skills which we used to create other personalized recommendation systems for various domains like movies, products, or content management platforms.

(3) Based on the data flow and seamless communication techniques which I used, I can use this experience in integrating front-end and back-end components to architect similar systems and streamline communication between different modules in diverse software projects.

7.4.3 Individual Project Report - Huang Yifei (A0285719M)

1. Personal Contribution

1.1 Login Functionality Module with Flask-Login:

- **Flask-Login Integration:** Integrated Flask-Login, a Flask extension for handling user sessions, to manage user authentication in the Game Recommendation System.
- **User Authentication Flow:** Developed the user authentication flow using Flask-Login, which included user login, logout, and session management. Ensured that the system securely handles user credentials and session data.
- **User Session Management:** Implemented user session management to track logged-in users across the application. Utilized Flask-Login's features to handle user sessions, remember me functionality.
- **Error Handling and Feedback:** Implemented robust error handling in the login process to provide clear feedback to users during login failures, such as incorrect credentials or account issues.

1.2 Single Sign-On (SSO) Implementation

- **Integration of SSO:** Seamlessly integrated Single Sign-On capabilities to allow users to access multiple applications or services with one set of login credentials, enhancing the user experience.
- **Interoperability:** Worked on the interoperability of SSO across different platforms and services within the Game Recommendation System.

1.3 Data Pre-Processing

- **Text Preprocessing:** Focused on cleaning game-related text data, which included removing spaces, punctuation marks, and other non-essential characters.
- **Normalization:** Implemented text normalization techniques, such as converting text to lowercase, to ensure consistency across different data inputs.
- **Word Segmentation:** Utilized word segmentation technology to split the text into individual words or phrases.
- **Feature Extraction:** Employed the Porter Stemmer function from the nltk library for stemming, capturing the semantic relationships between words.
- **Cosine Similarity Calculation:** Performed cosine similarity calculations on the feature vectors of games.

1.4 Additional Contributions

- **Collaboration and Teamwork:** Collaborated closely with other team members, contributing to the overall planning, design, and execution of the project.
- **Problem-Solving:** Actively involved in troubleshooting and resolving technical issues related to login, SSO, data preprocessing, and database functionalities.
- **Documentation and Reporting:** Maintained comprehensive documentation of the development process, including technical specifications, user manuals, and system architecture diagrams.

2. Key Learnings and Insights:

2.1 Technical Skills and Knowledge

- **Advanced Data Handling:** Gained substantial experience in data preprocessing, including cleaning, normalization, and transformation. Learned the importance of preparing data meticulously to ensure the accuracy and effectiveness of machine learning models.
- **Flask and Web Development:** Enhanced understanding of Flask for web development, particularly in implementing user authentication and session management with Flask-Login. This deepened my knowledge of web application frameworks and their role in creating dynamic, user-centric web services.

2.2 Problem-Solving and Innovation

- **Algorithm Implementation:** The project provided a practical context for applying theoretical knowledge, especially in implementing and fine-tuning recommendation algorithms like content-based filtering and collaborative filtering.
- **User-Centric Design:** Learned the importance of focusing on the end-user experience, ensuring that the system is not only functional but also intuitive and engaging. This involved understanding user needs and preferences to tailor the system's design and recommendations.

2.3 Personal Growth

- **Critical Thinking:** Developed a more analytical approach to problem-solving, learning to weigh various factors and potential solutions before implementing the most effective one.
- **Continuous Learning:** The project underscored the value of continuous learning and staying updated with the latest technological trends and best practices in software development and data science.

3. Future Application in Workplace

- **Technical Skills:** The technical skills I've developed, especially in web development and data handling, will position me strongly for tech roles, giving me an edge in job interviews and practical tasks.

- **Continuous Learning:** This project highlights the importance of continuous learning and self-improvement, crucial for my personal and professional development in a fast-paced tech career.
- **Networking and Exposure:** The interactions and networking opportunities during the project can open doors to future collaborations, internships, and job opportunities in the tech industry.
- **Understanding of Industry Requirements:** Gaining firsthand experience in a project closely aligned with industry standards provides me with insight into what skills and knowledge are most valued in the tech sector.

7.4.4 Individual Project Report - Liang Jinning (A0285754N)

1. Your contribution to the project

- Developed a well-performed recommendation algorithm based on NLP preprocessing, countvectorizer and cosine similarity.
- Developed a functional chatbot system based on tf-idf vectorizer and cosine similarity.
- Coordinated with other team members to complete the frontend and backend of the system.
- Wrote the System Design part of the project report.
- Assisted to complete the project presentation and the project video.

2. What learnt is most useful for you

- **Creating Presentations and Proposals:** The project commenced with a clear definition of its objectives and scope. This entailed crafting presentations and proposals to articulate the project's vision, goals, timeline, and resource requirements.
- **Algorithm Development:** Once the proposal was approved, the development of algorithms commenced. This phase could involve activities such as data collection, data cleansing, feature engineering, model selection, and training. Algorithm development is the core of the project and determines the quality of the final outcomes.

- **Delivering Results:** Once the algorithm, frontend, and backend were developed and integrated, the project was tested rigorously. The final results were delivered, and the project was deployed for actual use or presented to stakeholders.

3. How you can apply this in other workplaces or situations

- The ability to search effective solutions on the internet through multiple channels.
- The ability to apply the NLP knowledge fast and precisely to other projects which require NLP processing.
- The ability to apply text feature extraction algorithms along with similarity algorithms to build recommendation algorithms.
- The ability to build frontend and backend of the system efficiently with flask framework and html language.