

Hong Kong Baptist University  
Department of Computer Science



# Game Recommendation System

COMP4135 Group Project: System Documentation

Group: Too Young Too Simple

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## **I. System description:**

### **1. Introduction**

The game industry has experienced significant growth in recent years, resulting in a plethora of game genres. Consequently, the vast number of games available poses a challenge for players in their search for a preferred game. Game platforms such as Steam and Epic solely provide downloads and limited recommendations. Our team has developed a game recommendation system that employs a hybrid recommendation algorithm to address the challenge of providing precise recommendations to users. This system is designed to offer personalized game recommendations to users.

### **2. System Overview**

Our hybrid game recommender system is designed with the following main functions:

- a. About page: About our team and our contact information.
- b. Login/Signup page: Allow users to log in or register new accounts.
- c. Signup page: The user registers a new account, including a username (email) and password.
- d. User profile page: Display user's username(email), and update function.
- e. Main page:
  - Words of welcome.
  - Get recommendations: Allow users to enter three games they have played or their three favorite games. After the user input, our system will calculate the recommended games for the user on the backend, and return five games for the user on the main page.
  - Select Game: User can choose from a drop-down bar, but since we have tens of thousands of games, we also allow users to enter the name of the game to search.
  - Game display: The system will show Game Cover, Game Name, About This Game (Added after collected user feedback questionnaire) and Recommendation Explanation for each game.
  - Recommendation explanation: The reason that we recommended these games for the users. Include: Share tags, Share genres and Same developer.
- f. Feedback: The user can choose "Like" or "Dislike" for the generated recommendations. If the user chooses "Like", there will be an alert of thanks. If the user chooses "Dislike", then our system will according his/her input information to generate five new ones.

### 3. Hybrid recommendation algorithm

Our game recommendation system is a hybrid recommendation system that integrates a content-based recommendation method and weighting strategy based on the number of ratings to provide personalized game recommendations for users. By combining the content information of the game (such as detailed description, Steam tags, and game categories) and the number of positive ratings of the game, our system is able to comprehensively consider the similarity and popularity of the game to precisely generate recommendations that are more in line with user interests.

Although our system does not directly adopt a typical collaborative filtering approach (we do not have access to a dataset of user ratings), it still embodies the idea of hybrid recommendation, where information from different sources is combined to provide users with more comprehensive and accurate recommendations. In our system, the content similarity and the number of positive ratings represent the content-based and rate-based recommendations, respectively. They are weighted to average to obtain the composite score used to rank the games.

Our proposed hybrid recommendation algorithm consists of the following steps:

a. Data pre-processing: We found that the datasets we got from kaggle were not usable directly because they were scattered. So I used python to combine the data sets (MergeData.py).

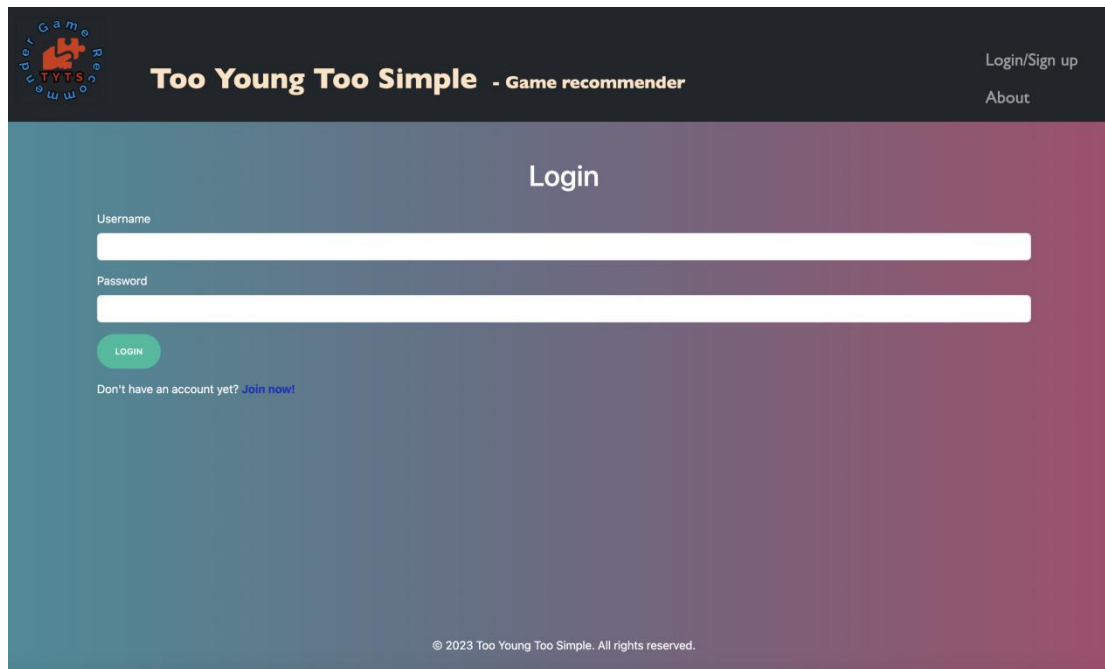
- Merge data: Merge the individual DataFrames into a single DataFrame called merged\_df using the 'appid' and 'steam\_appid' fields as keys. This process combines all relevant data for each game into a single record.
- Remove duplicate columns: After merging the DataFrames, remove the duplicate 'steam\_appid' columns, as they contain redundant information.
- Save the merged DataFrame: Save the merged\_df DataFrame to a new CSV file called 'merged\_steam\_data.csv'. This file will be used for further data processing and analysis.
- Read file content: Read the content of the 'merged\_steam\_data.csv' file into a string variable.
- Replace non-standard line terminators: Some rows in the CSV file may contain non-standard line terminators ('\u2028' and '\u2029'). Replace these with the standard newline character ('\n') to ensure compatibility with other data processing tools and libraries.
- Write the modified content back to the file: Write the updated content with the standard line terminators back

to the 'merged\_steam\_data.csv' file.

- b. Data Preparation: Load the game and user rating data from CSV files, preprocess the data by filling missing values, and combine the game's detailed description, Steamspy tags, and categories into a single 'combined\_features' field.
- c. Feature Extraction: Compute the Term Frequency-Inverse Document Frequency (TF-IDF) matrix for the 'combined\_features' field using TfidfVectorizer, which helps quantify the importance of each term within the game descriptions, tags, and categories.
- d. Content-Based Recommendations: For each selected game, calculate the cosine similarity between its TF-IDF vector and the vectors of all other games. Then, sort the games by their similarity scores and select the top 5 most similar games as content-based recommendations.
- e. Compute Average Similarity: For each game in the combined recommendations, calculate the average cosine similarity between the game and the user's selected games. This metric represents the content-based aspect of the recommendations.
- f. Popularity-Based Recommendations: Normalize Positive Ratings: Calculate the normalized positive ratings for each game, which represents the popularity-based aspect of the recommendations.
- g. Compute Weighted Score: Assign weights to the average similarity and normalized positive ratings (e.g., 0.6 for content similarity and 0.4 for positive ratings. The weights we obtained after many experiments.), and compute the weighted score for each game by multiplying the respective weights with their corresponding metrics and adding them up.
- h. Sort and Select Recommendations: Sort the combined recommendations by their weighted scores in descending order and select the top 5 games as the final hybrid recommendations.

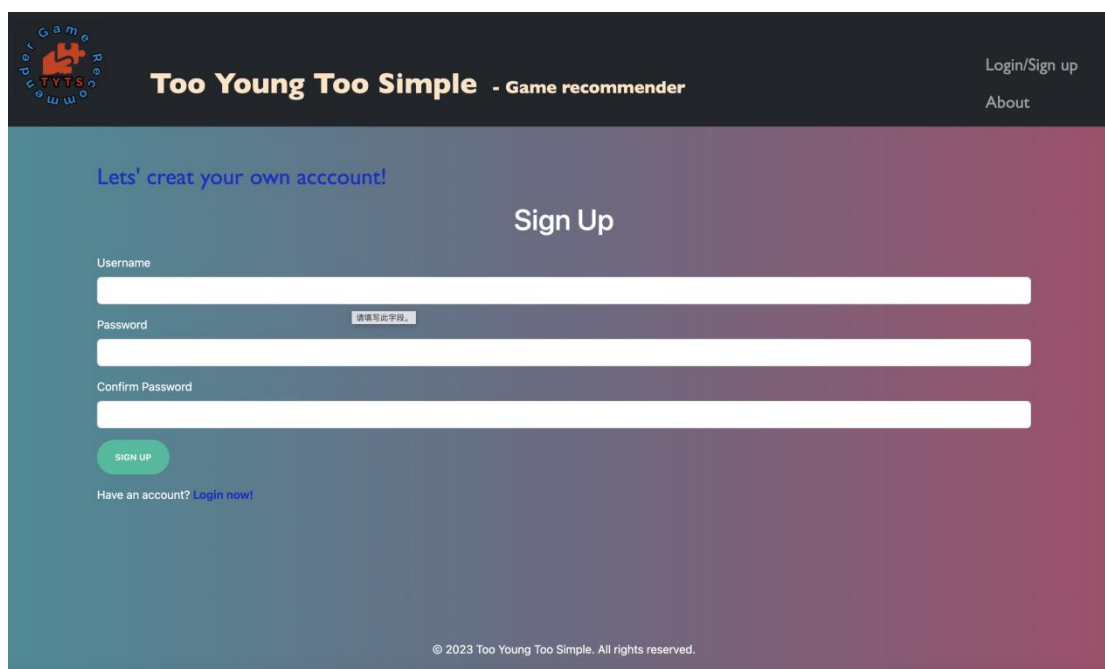
By following these steps, our hybrid recommendation algorithm combines the strengths of content-based and ratingNumbers-based approaches to generate personalized and accurate game recommendations for users

## II. User Interface Screenshot



The screenshot shows the login page of the 'Too Young Too Simple - Game recommender' website. The header is dark blue with a logo on the left and navigation links 'Login/Sign up' and 'About' on the right. The main content area has a light blue background with the title 'Login' in the center. Below the title are two white input fields for 'Username' and 'Password'. A green 'LOGIN' button is positioned below the password field. A link 'Join now!' is provided for users who don't have an account. The footer contains the copyright notice '© 2023 Too Young Too Simple. All rights reserved.'

Figure.1. Login page



The screenshot shows the sign up page of the 'Too Young Too Simple - Game recommender' website. The header is dark blue with a logo on the left and navigation links 'Login/Sign up' and 'About' on the right. The main content area has a light blue background with the title 'Sign Up' in the center. Above the title is a blue link 'Lets' creat your own acccount!'. Below the title are three white input fields for 'Username', 'Password', and 'Confirm Password'. A green 'SIGN UP' button is positioned below the 'Confirm Password' field. A link 'Login now!' is provided for users who already have an account. The footer contains the copyright notice '© 2023 Too Young Too Simple. All rights reserved.'

Figure.2. If user doesn't have account, then the user can click join now to the sign up page. After signing up, the user then can relogin to the system.

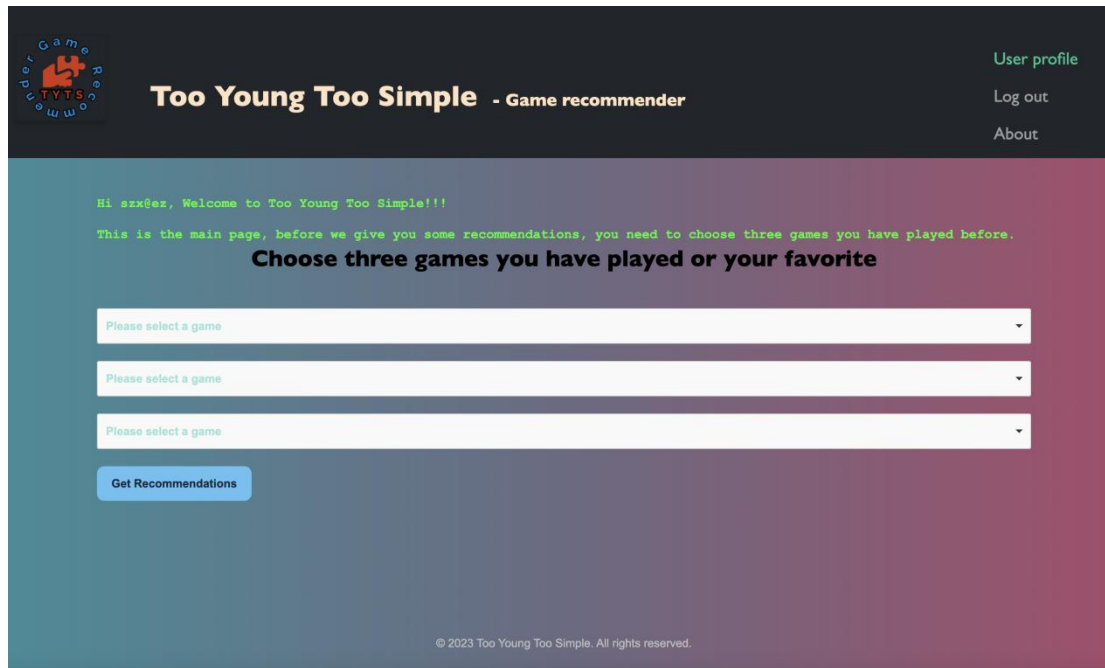



Figure.3. The main page of our game recommendation system, here users can select three games they have played or they like, and then they can click “Get recommendation” and wait a little bit to get 5 games.



[User profile](#)
[Log out](#)
[About](#)

# Too Young Too Simple - Game recommender






Hi szx@ez, Welcome to Too Young Too Simple!!!

This is the main page, before we give you some recommendations, you need to choose three games you have played before.

## Choose three games you have played or your favorite

Get Recommendations

## Recommended Games

Game Cover	Game Name	About This Game	Recommendation Explanation
	Team Fortress Classic	One of the most popular online action games of all time, Team Fortress Classic features over nine character classes -- from Medic to Spy to Demolition Man -- enlisted in a unique style of online team warfare. Each character class possesses unique weapons, items, and abilities, as teams compete online in a variety of game play modes.	<p>We recommend this game for you because it has the following similarities to games you've played before or your favorite:</p> <p>The share genre: Action, The share tag: 'shooter', 'multiplayer', 'first_person', Same developer: Valve, And this is recommended based on your chosen games: Counter-Strike, Grand Theft Auto V, Call of Duty®.</p>
	Ricochet	A futuristic action game that challenges your agility as well as your aim, Ricochet features one-on-one and team matches played in a variety of futuristic battle arenas.	<p>We recommend this game for you because it has the following similarities to games you've played before or your favorite:</p> <p>The share genre: Action, The share tag: 'shooter', 'multiplayer', 'first_person', Same developer: Valve, And this is recommended based on your chosen games: Counter-Strike, Grand Theft Auto V, Call of Duty®.</p>
	Day of Defeat: Source	Day of Defeat offers intense online action gameplay set in Europe during WWII. Assume the role of infantry, sniper or machine-gunner classes, and more. DoD:S features enhanced graphics and sounds design to leverage the power of Source, Valve's new engine technology.	<p>We recommend this game for you because it has the following similarities to games you've played before or your favorite:</p> <p>The share genre: Action, The share tag: 'shooter', 'multiplayer', 'first_person', Same developer: Valve, And this is recommended based on your chosen games: Counter-Strike, Grand Theft Auto V, Call of Duty®.</p>
	Half-Life	Named Game of the Year by over 50 publications, Valve's debut title blends action and adventure with award-winning technology to create a frighteningly realistic world where players must think to survive. Also includes an exciting multiplayer mode that allows you to play against friends and enemies around the world.	<p>We recommend this game for you because it has the following similarities to games you've played before or your favorite:</p> <p>The share genre: Action, The share tag: 'shooter', 'multiplayer', 'first_person', Same developer: Valve, And this is recommended based on your chosen games: Counter-Strike, Grand Theft Auto V, Call of Duty®.</p>
	Deathmatch Classic	Enjoy fast-paced multiplayer gaming with Deathmatch Classic (a.k.a. DMC). Valve's tribute to the work of id software, DMC invites players to grab their rocket launchers and put their reflexes to the test in a collection of futuristic settings.	<p>We recommend this game for you because it has the following similarities to games you've played before or your favorite:</p> <p>The share genre: Action, The share tag: 'multiplayer', 'first_person', Same developer: Valve, And this is recommended based on your chosen games: Counter-Strike, Grand Theft Auto V, Call of Duty®.</p>

Like Dislike

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Figure.4. These 3 pictures are the full size of our web, it contains 5 games recommendation, each game have a cover, game introduction and recommendation explanation(Like game genre, developer).



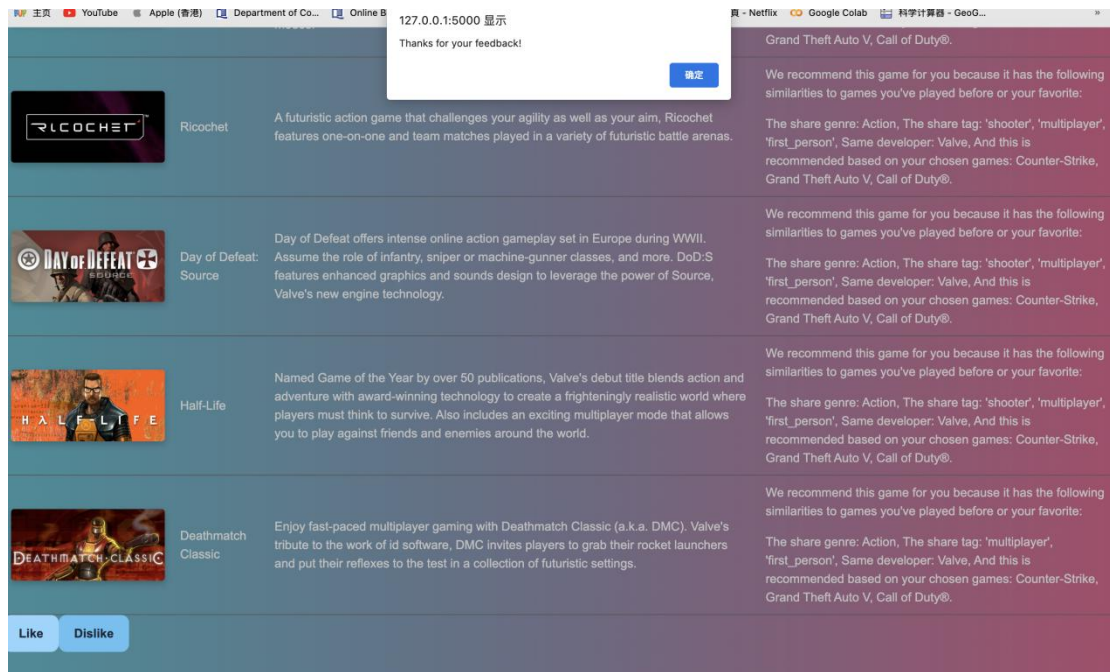


Figure.5. If user click “Like” button, it will show the feedback.






Recommended Games			
Game Cover	Game Name	About This Game	Recommendation Explanation
	Grand Theft Auto IV	<p>PLEASE NOTE: Microsoft no longer supports creating Games for Windows-LIVE accounts within Grand Theft Auto IV. You can create an account through <a href="#">account Xbox.com</a> and then log into your account in game.</p> <p>What does the American dream mean today? For Niko Bellic fresh off the boat from Europe, it is the hope he can escape from his past. For his cousin, Roman, it is the vision that together they can find fortune in Liberty City, gateway to the land of opportunity. As they slip into debt and get dragged into a criminal underworld by a series of shysters, thieves and sociopaths, they discover that the reality is very different from the dream in a city that worships money and status, and is heaven for those who have them and a living nightmare for those who don't.</p> <ul style="list-style-type: none"> <li>• New high resolution technology brings Liberty City to life with even more stunning graphical detail</li> <li>• Expanded multiplayer will require even more strategy and skill to come out on top</li> <li>• Custom Match allows you to pick your favorite multiplayer options and then instantly find online matches that fit</li> <li>• Optimized for PC controls and Xbox 360 controller</li> </ul>	<p>We recommend this game for you because it has the following similarities to games you've played before or your favorite:</p> <p>The share genre: Action, The share tag: 'shooter', 'multiplayer', And this is recommended based on your chosen games: Counter-Strike, Grand Theft Auto V, Call of Duty®.</p>
	GUN™	<p>When life robs Colton White of all that matters, the only thing left he can trust is his GUN. From award-winning developer, Neversoft, and accomplished screenwriter, Randall Jahnson (The Mask of Zorro, The Doors), GUN follows Colton on his quest for discovery as he seeks to exact vengeful justice on those who have wronged him. GUN is a realistic epic action/adventure that lets gamers experience the brutality of the lawless West.</p> <ul style="list-style-type: none"> <li>• New and savage ways to punish: Stealthily sneak up and attack your enemies, use them as cover, stab and shoot them. Blast away and watch the aftermath, shoot guns out of enemy hands, or destroy with dynamite.</li> <li>• Extensive variety of missions and game play: Wage war on horseback, commandeer trains, protect prostitutes, collect bounties, play poker, hunt buffalo, and more. Multiple game play styles include: precision shooting, stealth tactics, and use of explosives. Embark on numerous side missions that allow you to master gun slinging and horse riding. Unlock secret weapons and upgrade your skills and abilities to improve your weapon and equipment performance.</li> <li>• Brutal realism: Act as a gunslinger protecting righteousness, or seek retribution as you face corrupt lawmen, warring tribes, cold-blooded outlaws, and ruthless renegades. Encounter legendary</li> </ul>	<p>We recommend this game for you because it has the following similarities to games you've played before or your favorite:</p> <p>The share genre: Action, The share tag: 'shooter', And this is recommended based on your chosen games: Counter-Strike,</p>
	F-22 Lightning 3	<p>your.</p> <p>Features</p> <ul style="list-style-type: none"> <li>• Extreme temperatures affect flight performance.</li> <li>• Changing weather effects including: rain, snow, hail, and wind.</li> <li>• Fly it yourself or use the Auto-Options: Auto-landings, Auto-taxi, Auto-takeoff, Auto-shoot list, Auto-formation, Auto-in-flight refueling.</li> <li>• The most realistic weather environments ever created.</li> <li>• Mass Destruction! Use tactical nuclear weapons to level entire city regions.</li> <li>• Voice-Over-Net technology allows players to talk to each other during Novaworld multiplayer combat.</li> </ul>	<p>We recommend this game for you because it has the following similarities to games you've played before or your favorite:</p> <p>And this is recommended based on your chosen games: Counter-Strike, Grand Theft Auto V, Call of Duty®.</p>
	Grand Theft Auto: Episodes from Liberty City	<p>PLEASE NOTE: Microsoft no longer supports creating Games for Windows-LIVE accounts within Episodes From Liberty City. You can create an account through <a href="#">account Xbox.com</a> and then log into your account in game.</p> <p>Grand Theft Auto: Episodes from Liberty City includes both The Lost and Damned, and The Ballad of Gay Tony together and does not require a copy of the original Grand Theft Auto IV to play.</p> <p>In The Lost and Damned, experience Liberty City as Johnny, a veteran member of The Lost, a notorious biker gang. Johnny has been creating business opportunities for The Lost in Liberty City but his first loyalty must be to the patch he wears on his back and to Billy Grey, the club's President. However, when Billy returns from rehab hell-bent on bloodshed and debauchery, Johnny finds himself in the middle of a vicious turf war with rival gangs for control of a city torn apart by violence and corruption. Can the brotherhood survive?</p> <p>The Ballad of Gay Tony injects Liberty City with an overdose of guns, glitz, and grime. As Luis Lopez, part-time hoodlum and full-time assistant to legendary nightclub impresario Tony Prince (aka "Gay Tony"), players will struggle with the competing loyalties of family and friends, and with the uncertainty about who is real and who is fake in a world in which everyone has a price.</p>	<p>We recommend this game for you because it has the following similarities to games you've played before or your favorite:</p> <p>The share genre: Action, The share tag: 'shooter', 'multiplayer', And this is recommended based on your chosen games: Counter-Strike, Grand Theft Auto V, Call of Duty®.</p>
	Grand Theft Auto III	<p>The sprawling crime epic that changed open-world games forever. Welcome to Liberty City. Where it all began.</p> <p>The critically acclaimed blockbuster Grand Theft Auto III brings to life the dark and seedy underworld of Liberty City. With a massive and diverse open world, a wild cast of characters from every walk of life and the freedom to explore at will, Grand Theft Auto III puts the dark, intriguing and ruthless world of crime at your fingertips.</p>	<p>We recommend this game for you because it has the following similarities to games you've played before or your favorite:</p> <p>The share genre: Action, The share tag: 'shooter', 'multiplayer', And this is recommended based on your chosen</p>

Figure.6 If the user click “dislike” button, it will re-recommend different 5 games to users.

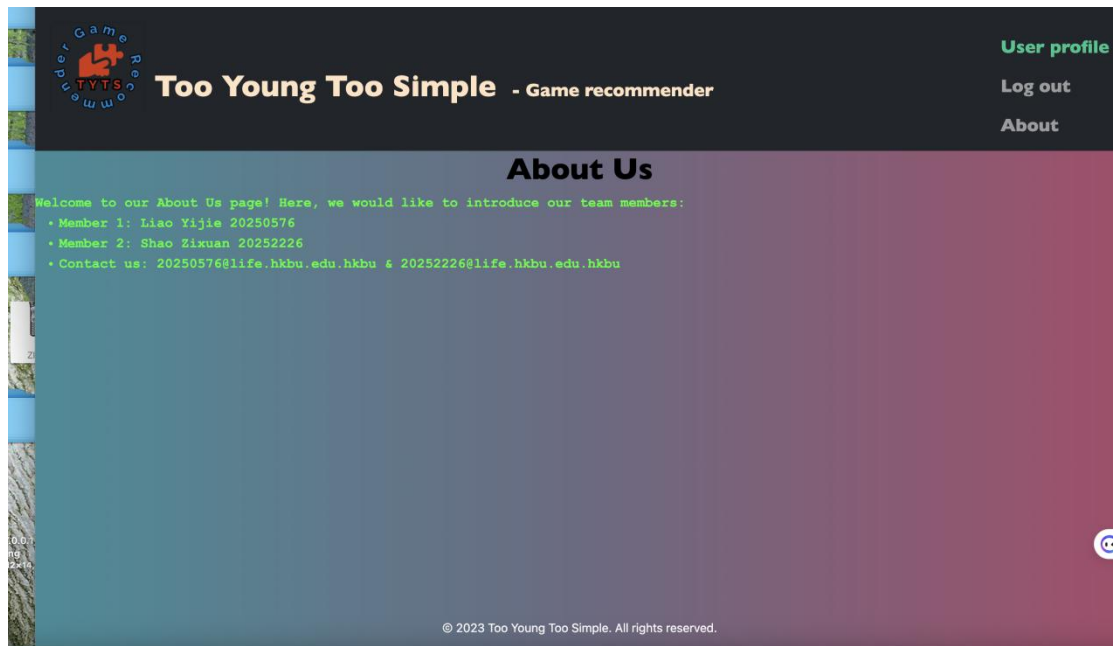


Figure.7. This is the About page for our group with contact information.

### III. Evaluation procedure and result

#### The First Stage (Initial period) (User satisfaction)

After the initial design of our system, we only tested our game recommendation system with students on campus. We invited 20 students to use our system and asked them to fill in the online questionnaire after using the game recommendation system.

The content of the questionnaire is as follows :

**TYTS Game Recommendation System Feedback**

**Questionnaire**

After you try our game recommendation system, please fill in the following questionnaire according to your actual satisfaction level.

---

**\*1. What is your identity?**

☐ Student

☐ Office Worker

☐ Unemployed people

**\*2. Have you ever used a similar recommendation system like our recommendation system?**

☐ Yes

☐ No

**3. In the recommendation system you've used before, do you think they recommended the right things to you?**

☐ Totally right

☐ Most are right

☐ Neutral

☐ Most are wrong

☐ Totally wrong

\*4. Do you think the interface design of our recommendation system is novel?

Not agree

Strongly agree

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

\*5. Are you satisfied with our interface design?

Very dissatisfied

Very Satisfied

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

\*6. Do you think the operating way of our recommendation system is Concise?

Not agree

Strongly agree

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

\*7. Do you think our database has all games you want to choose?

Strongly Disagree

Strongly agree

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

\*8. Do you think the games our system recommend meet your expectations?

Strongly disagree

Strongly agree

1	2	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

\*9. Do you think should we add a more detailed introduction for each game the system recommend?

☐ yes

☐ No

\*10. How likely would you recommend our system to your friends?

impossible

very likely

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

Unfortunately, according to the results of the questionnaire survey, the user's evaluation of our system is lower than the average level. The main problems are as follows:

(1). Most users were not satisfied with the interface design of our system. The system user interface we designed in the early stage was very simple, just a simple white background and simple buttons. So the user wanted us to make the user interface so nice and fresh that it would entice other users to try the game recommendation system.

(2). Users told us that the way the system worked was a bit confusing because some of the buttons were cluttered, and the function of each button was not clearly marked, so they thought our way of operation should be more straightforward and concise.

Therefore, we have focused on upgrading the user experience, we have modified the user interface to make it more beautiful, and we have simplified a series of buttons to make the system simpler to operate.

## Second Stage

### (User satisfaction)

After modifying and upgrading the system, we invited over 90 people and friends from mainland of China and Hong Kong to test our game recommendation system. For some people have basic computer programming experience, so we directly sent the system folder to them, and they could test it on their own computers. For people who don't have computer skills, we show them our recommendation system via zoom video conferencing. And asked them to fill out the same questionnaire after the test. According to the statistics, users' praise has increased greatly as follows:



From the result, we can get that we invite people from different positions in society, including students, office workers, and the unemployed, to take the test. Judging from the data, we have greatly improved the problems that occurred in the first stage, and the majority of users are satisfied with our interface design and operation way and they They are more than willing to recommend the system to their friends.

However, the question 9 illustrates that for the game recommendation system, users are more prefer to know a brief introduction of each game, so we finally added a simple introduction, game gif animation, game mode and some tasks in the game for each game to help users determine whether these games are what they really want.

**(In the submmited file, you can find the demographic information of all participants who tested our systrm! Name is Demographic.xlsx.)**

### **(Recommendation Accuracy)**

According to the results of two questionnaires, most users are satisfied with the games recommended by the recommendation system, which means that the accuracy of our recommendation algorithm is pretty good as the RMSE value we calculated below is pretty low which means that our algorithm can make prediction correctly.

### **Evaluation of our system**

We also compared the performance of our hybrid recommendation algorithm with two non-hybrid algorithms (A and B) by evaluating their Root Mean Squared Error (RMSE).

We perform the following steps:

- a. Define the evaluation function: Create a function named 'evaluate' that takes in various parameters, including the similarity function, k-values, data, and weights.
- b. Load the merged data: Read the 'merged\_steam\_data.csv' file into a pandas DataFrame.
- c. Calculate the TF-IDF matrix: Use TfidfVectorizer to transform the combined features of each game into a TF-IDF matrix.
- d. Normalize the positive ratings: Calculate the normalized positive ratings for each game by scaling them between 0 and 1.
- e. Set the weight for content similarity: Assign a weight to the content similarity component of the hybrid recommendation algorithm.
- f. Compare the recommendation algorithms: Evaluate the three algorithms

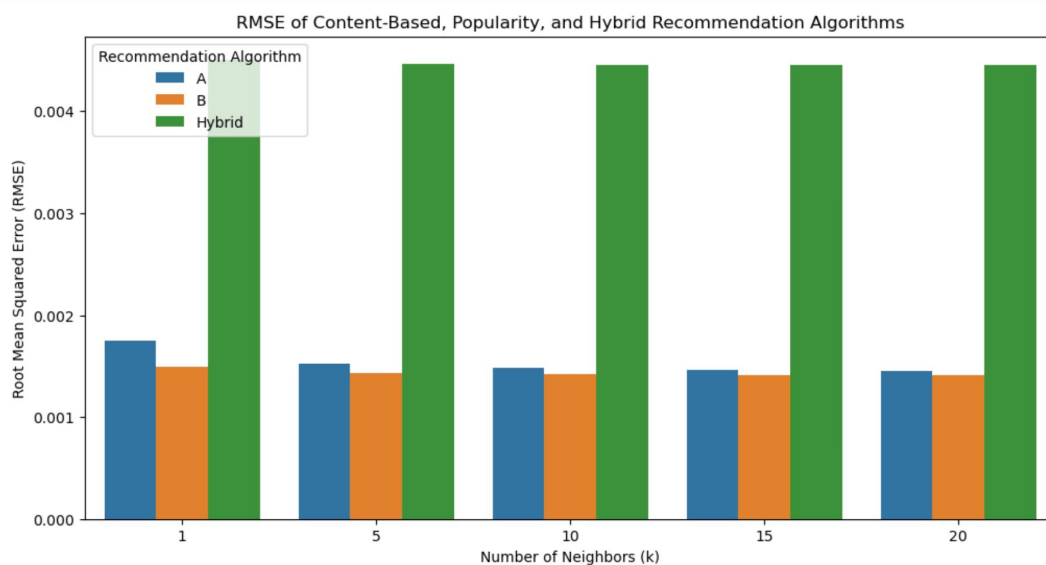


- (content-based, popularity-based, and hybrid) using different k-values.
- Visualize the results: Plot the RMSE values of each method as a bar plot for each k-value, making it easy to compare their performance.
  - Perform paired t-tests: Conduct paired t-tests to determine if the differences between the hybrid algorithm and the non-hybrid algorithms (A and B) are statistically significant.
  - evaluate the significance: If the p-value for the t-tests is less than the significance level ( $\alpha = 0.05$ ), conclude that the differences between the algorithms are statistically significant. Otherwise, conclude that the differences are not significant.

The results of the t-tests indicate that the hybrid algorithm has a statistically significant difference in performance compared to both non-hybrid algorithms A and B. This suggests that our hybrid recommendation algorithm is more effective in providing personalized game recommendations for users.

There are some result:

Result 1:



```
print(results)
```

```

k  method  rmse
0   1      A  0.001751
1   1      B  0.001492
2   1  Hybrid  0.004509
3   5      A  0.001524
4   5      B  0.001429
5   5  Hybrid  0.004460
6  10      A  0.001481
7  10      B  0.001416
8  10  Hybrid  0.004458
9  15      A  0.001462
10 15      B  0.001411
11 15  Hybrid  0.004458
12 20      A  0.001451
13 20      B  0.001407
14 20  Hybrid  0.004459

```

```
# 提取各种方法的RMSE
rmse_a = np.array(results[results['method'] == 'A']['rmse'])
rmse_b = np.array(results[results['method'] == 'B']['rmse'])
rmse_hybrid = np.array(results[results['method'] == 'Hybrid']['rmse'])

# 配对t检验: Hybrid vs A
t_statistic, p_value_hybrid_vs_a = stats.ttest_rel(rmse_hybrid, rmse_a)
print(f"Hybrid vs A: t-statistic = {t_statistic}, p-value = {p_value_hybrid_vs_a}")

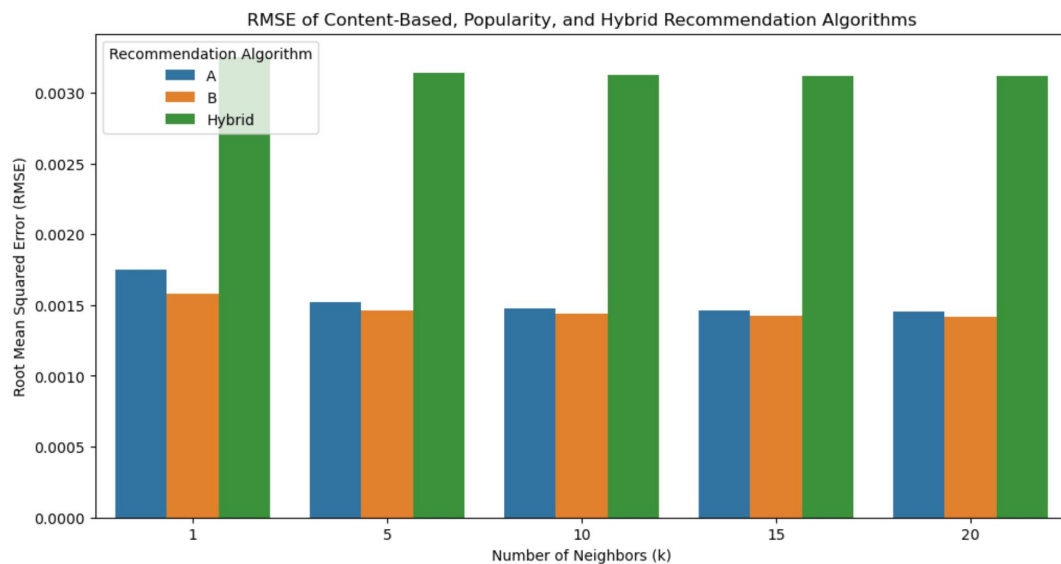
# 配对t检验: Hybrid vs B
t_statistic, p_value_hybrid_vs_b = stats.ttest_rel(rmse_hybrid, rmse_b)
print(f"Hybrid vs B: t-statistic = {t_statistic}, p-value = {p_value_hybrid_vs_b}")

# 判断显著性
alpha = 0.05
if p_value_hybrid_vs_a < alpha:
    print("Hybrid与A之间的差异是显著的。")
else:
    print("Hybrid与A之间的差异不是显著的。")

if p_value_hybrid_vs_b < alpha:
    print("Hybrid与B之间的差异是显著的。")
else:
    print("Hybrid与B之间的差异不是显著的。")
```

Hybrid vs A: t-statistic = 63.731689568469136, p-value = 3.6309229619894096e-07  
Hybrid vs B: t-statistic = 472.86699305969165, p-value = 1.20000291184942e-10  
Hybrid与A之间的差异是显著的。  
Hybrid与B之间的差异是显著的。

## Result 2:



```
print(results)
```

	k	method	rmse
0	1	A	0.001751
1	1	B	0.001580
2	1	Hybrid	0.003254
3	5	A	0.001524
4	5	B	0.001460
5	5	Hybrid	0.003137
6	10	A	0.001481
7	10	B	0.001437
8	10	Hybrid	0.003125
9	15	A	0.001462
10	15	B	0.001427
11	15	Hybrid	0.003122
12	20	A	0.001451
13	20	B	0.001421
14	20	Hybrid	0.003121

```

# 提取各种方法的RMSE
rmse_a = np.array(results[results['method'] == 'A']['rmse'])
rmse_b = np.array(results[results['method'] == 'B']['rmse'])
rmse_hybrid = np.array(results[results['method'] == 'Hybrid']['rmse'])

# 配对t检验: Hybrid vs A
t_statistic, p_value_hybrid_vs_a = stats.ttest_rel(rmse_hybrid, rmse_a)
print(f"Hybrid vs A: t-statistic = {t_statistic}, p-value = {p_value_hybrid_vs_a}")

# 配对t检验: Hybrid vs B
t_statistic, p_value_hybrid_vs_b = stats.ttest_rel(rmse_hybrid, rmse_b)
print(f"Hybrid vs B: t-statistic = {t_statistic}, p-value = {p_value_hybrid_vs_b}")

# 判断显著性
alpha = 0.05
if p_value_hybrid_vs_a < alpha:
    print("Hybrid与A之间的差异是显著的。")
else:
    print("Hybrid与A之间的差异不是显著的。")

if p_value_hybrid_vs_b < alpha:
    print("Hybrid与B之间的差异是显著的。")
else:
    print("Hybrid与B之间的差异不是显著的。")

Hybrid vs A: t-statistic = 53.16069157816946, p-value = 7.494884704842842e-07
Hybrid vs B: t-statistic = 339.90324808107005, p-value = 4.494743696353084e-10
Hybrid与A之间的差异是显著的。
Hybrid与B之间的差异是显著的。

```

## Individual reflection report

**Liao Yijie 20250576:** Throughout the system development and evaluation process, my role primarily encompassed designing the entire system and user interface, as well as writing all the front-end development code. In addition, I conceived and evaluate the hybrid recommendation algorithm and implemented all the back-end code. My responsibilities included outlining the system description in the report and ensuring that the entire project adhered to our objectives and design principles.

**(Report contribution :50%)**

While the current system implementation has achieved promising results, there are a few areas that can be improved. In terms of user interface design, the current layout and presentation could be optimized to enhance user experience. For instance, incorporating a more intuitive and visually appealing interface with clear navigation options would allow users to explore the recommended games more efficiently.

As for the choice of recommendation methods, the hybrid algorithm shows significant improvement over the non-hybrid algorithms. However, there is always room for enhancement. In future work, we can try to obtain user ratings and other data to use collaborative filtering to improve our recommendation algorithm. Exploring more

advanced machine learning techniques, such as deep learning models, could potentially lead to better recommendations. Moreover, incorporating additional features like user preferences or gameplay history could further personalize recommendations and improve the system's performance. In summary, by addressing these issues and iterating upon the current system, we can strive for a more robust and user-friendly game recommendation platform.

**Shao Zixuan 20252226:** In the whole project, I was responsible for the design and updating of the front-end page, the search of the game database, the communication and testing of the recommendation algorithm with other team members, the design of the questionnaire, invite people to do the test, integrate user feedback data and the present them in the report.

**(Report contribution :50%)**

From my observation, today's many recommendation system like Bilibili, Netflix, TaoBao and TikTok, their user interface still gives users a sense of simplicity and easy operation even though it has very rich functions and buttons. Therefore, this is what our system needs to improve. In the future, we can enrich the functions of the recommendation system, maybe not only recommend games, but also recommend more different kinds of things, such as goods. Books or travel hotels, make it a comprehensive site. At the same time, we can also improve our database and back-end programs in the future, so that it can carry more data and user information.



For our recommendation algorithms, In the apps I talked about earlier, they don't just mix two algorithms. According to my search, Netflix's hybrid recommendation algorithm combines hundreds or even thousands of recommendation algorithms, so we can also mix more algorithms to improve the accuracy of our recommendation system.

**Yang Shu 20252013:** My part: Our group set the theme of a game platform for recommending games to users. I am in charge of algorithm design, the first of which is the content based recommendation method. We have used the TF-IDF vectorizer, calculating the dot product will directly give us the cosine similarity score. And we also use Hybrid Weighting: a user-based weighting approach may be combined with an item-based weighting approach to assign weights based on both user preferences and item characteristics.

My observation: For my observations of issues with the current system implementation. First I think that before making personalized recommendations to users, it is possible to recommend the most recent popular games to users. To get that, we can add one more algorithm to calculate the most popular games in the past week. Demographic Filtering can be used to calculate the highest mean rating game. Besides, I think for the content-based recommendation method, our group only use description to calculate the similarity of the different games, we can evaluate it more by using more content of the game (tags, background, publish year, keyword etc).

## Participation Form

### COMP4135/7240 Group Assignment Participation Form

	Student ID	Student Name	Actual workload (clearly specify your contribution to this group project)	Percentage	Signature
Member 1	20250576	Liao Yijie	Throughout the system development and evaluation process, my role primarily encompassed designing the entire system and user interface, as well as writing all the front-end development code. In addition, I conceived and evaluate the hybrid recommendation algorithm and implemented all the back-end code. My responsibilities included outlining the system description in the report and ensuring that the entire project adhered to our objectives and design principles.	50%	
Member 2	20252226	Shao Zixuan	In the whole project, I was responsible for the design and updating of the front-end page, the search of the game database, the communication and testing of the recommendation algorithm with other team members, the design of the questionnaire, invite people to do the test, integrate user feedback data and the present them in the report.	45%	


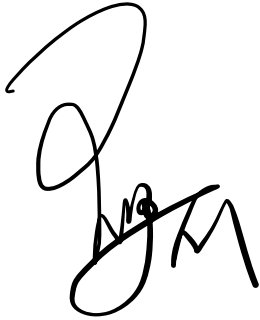
Member 3	20252013	Yang Shu	Our group set the theme of a game platform for recommending games to users. I am in charge of algorithm design, the first of which is the content based recommendation method. We have used the TF-IDF vectorizer, calculating the dot product will directly give us the cosine similarity score. And we also use Hybrid Weighting: a user-based weighting approach may be combined with an item-based weighting approach to assign weights based on both user preferences and item characteristics.	5%	构造
Member 4 (if there is)					
				Total: 100%	

Date: 2023/04/26\_\_\_\_\_

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## COMP4135/7240 Group Assignment Participation Form

	Student ID	Student Name	Actual workload (clearly specify your contribution to this group project)	Percentage	Signature
Member 1	20250576	Liao Yijie	Throughout the system development and evaluation process, my role primarily encompassed designing the entire system and user interface, as well as writing all the front-end development code. In addition, I conceived and evaluate the hybrid recommendation algorithm and implemented all the back-end code. My responsibilities included outlining the system description in the report and ensuring that the entire project adhered to our objectives and design principles.	50%	
Member 2	20252226	Shao Zixuan	In the whole project, I was responsible for the design and updating of the front-end page, the search of the game database, the communication and testing of the recommendation algorithm with other team members, the design of the questionnaire, invite people to do the test, integrate user feedback data and the present them in the report.	45%	

Member 3	20252013	Yang Shu	Our group set the theme of a game platform for recommending games to users. I am in charge of algorithm design, the first of which is the content based recommendation method. We have used the TF-IDF vectorizer, calculating the dot product will directly give us the cosine similarity score. And we also use Hybrid Weighting: a user-based weighting approach may be combined with an item-based weighting approach to assign weights based on both user preferences and item characteristics.	5%	杨述
Member 4 (if there is)					
				Total: 100%	

Date: 2023/04/26\_\_\_\_\_