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Software Requirements Specification (SRS)

Caro Game Website

I. Introduction

1.1. Purpose

The purpose of this document is to define the software requirements for the development of an online Caro (Gomoku) game website. This website will serve as a platform for players to engage in Caro matches against human opponents or an AI system. The primary goal of the system is to provide a smooth, interactive, and user-friendly experience that ensures fairness and competitiveness in gameplay. The platform will incorporate various features such as real-time game updates, intuitive UI design, and efficient matchmaking to enhance user engagement. Additionally, it will cater to different skill levels by offering ranked and unranked matches, allowing both casual and competitive players to enjoy the game. Security measures, data storage, and user authentication will also be key components to ensure a safe and seamless gaming experience for all users.

1.2. Scope

The Caro Game Website will be a web-based platform where users can:

- Register and log in to their accounts, allowing them to create personalized profiles and save game progress.
- Play Caro with other users in real-time or against an AI opponent with adjustable difficulty settings to match different skill levels.
- Participate in ranked matches and leaderboards to compete with other players globally and track their performance over time.
- Engage in real-time chat with other players during matches, fostering a sense of community and interaction within the platform.
- View match history and game statistics, enabling users to analyze their gameplay, track their win/loss ratio, and improve their strategies.
- Access the website seamlessly on both desktop and mobile devices, ensuring a responsive and adaptive user experience regardless of the device used.
- Receive notifications for challenges, game invites, and ranking updates to stay informed about ongoing matches and community activities.
- Customize their gaming experience with different themes, board styles, and user interface preferences for a more personalized and engaging experience.

1.3. Definitions

- **Caro (Gomoku):** A traditional strategy board game played on a grid, typically 15x15 or 19x19, where two players take turns placing their respective marks (X

or O) on the board. The objective of the game is to be the first player to align five marks in a row, either horizontally, vertically, or diagonally, without being blocked by the opponent. Caro, a variation of Gomoku, is widely played in many regions and has different rule variations, including special blocking rules to prevent easy victories.

- **AI (Artificial Intelligence):** A computational system designed to simulate human-like decision-making and problem-solving abilities when playing against users. The AI opponent in the Caro game will have varying difficulty levels, employing algorithms such as Minimax or Monte Carlo Tree Search (MCTS) to evaluate board positions and make optimal moves based on strategic considerations.
- **UI/UX (User Interface and User Experience):** UI refers to the design and layout of the graphical elements that users interact with, such as buttons, menus, and the game board itself. UX encompasses the overall experience a user has while navigating the website, ensuring ease of use, efficiency, and engagement. A well-designed UI/UX will provide intuitive controls, visually appealing aesthetics, and seamless interactions to enhance the player's gaming experience.

II. Overall Description

2.1. Product Perspective

The Caro Game Website will be an independent web application designed to provide an engaging and interactive online gaming experience. It will feature both multiplayer and AI-based gameplay modes, allowing users to challenge other players in real-time or test their skills against a computer opponent with varying difficulty levels. The platform will integrate a robust user authentication system to ensure secure access, allowing users to create and manage their accounts, track their performance, and engage with the community. Real-time communication capabilities will be implemented, enabling players to chat with their opponents, receive notifications about game invitations, and interact through messaging features. The game logic will be structured to ensure fair play, with rules strictly enforced to maintain the integrity of matches. Additionally, the platform will be optimized for performance, ensuring low-latency interactions and seamless gameplay on both desktop and mobile devices. Future enhancements may include tournament features, advanced AI improvements, and expanded social functionalities to further enrich the user experience.

2.2. User Classes and Characteristics

- **Guest Users:** Guest users are individuals who access the website without creating an account. They can play practice games against the AI or other guest users without the need for registration. However, they do not have access to ranked matches, leaderboards, or chat functionalities. Their gameplay progress is not saved, and they cannot view match history or statistics. The primary purpose of guest users is to allow new visitors to experience the game before committing to registration.

- **Registered Players:** Registered players have full access to all essential features of the platform. They can participate in ranked matches against other players, engage in real-time chat, and view their match history and performance statistics. By creating an account, registered players can customize their profiles, track their ranking on the leaderboard, and receive notifications about challenges and game invites. They also have the ability to adjust game settings, select AI difficulty levels, and participate in tournaments if implemented in future updates.
- **Administrators:** Administrators are responsible for overseeing the platform's functionality and ensuring a fair and smooth gaming experience for all users. They manage user accounts, monitor ongoing and completed matches, and have the authority to moderate chat conversations to prevent inappropriate behavior. Administrators can handle reports of misconduct, enforce penalties such as temporary or permanent bans, and oversee website maintenance tasks. Additionally, they have access to system performance metrics, server status, and security logs to ensure platform stability and data integrity.

2.3. Operating Environment

- The Caro Game Website will be a fully web-based application, eliminating the need for users to download or install any software. It will be accessible through modern web browsers, including Google Chrome and Microsoft Edge ensuring compatibility across different platforms.
- The platform will feature a responsive design that dynamically adjusts its layout and interface elements to provide an optimal viewing and interaction experience on desktops, tablets, and mobile devices. This ensures usability across different screen sizes and resolutions, offering a consistent and intuitive experience for all users.
- The game and associated data will be hosted on cloud-based or dedicated servers to ensure reliability, scalability, and high availability. The cloud infrastructure will allow the system to efficiently manage traffic spikes, support multiple concurrent users, and provide a seamless gaming experience without performance issues.
- Security measures such as SSL encryption, firewall protection, and regular security audits will be implemented to safeguard user data and prevent unauthorized access or cyber threats. The system will also support data backups to prevent loss of game history and account information.

2.4. Constraint

The system must support real-time game updates with minimal latency, ensuring smooth gameplay and preventing delays in move execution during matches.

User data must be securely stored and handled, implementing encryption and authentication protocols to prevent unauthorized access and data breaches.

The AI opponent should feature multiple difficulty levels, catering to both beginner and advanced players. The AI should progressively challenge users by making strategic moves based on advanced algorithms, adapting its playstyle according to the player's skill level.

The system must be designed to handle a high number of concurrent users efficiently, ensuring performance remains optimal even during peak usage times.

III. Specific Requirements

3.1. Functional Requirements

3.1.1. User Registration and Login

Users must be able to create an account to access all features of the Caro game website, ensuring a personalized experience tailored to their preferences and gameplay history. The registration process is a crucial first step for new users, as it allows them to engage with the platform fully, including participating in games, accessing their profiles, and tracking their progress over time. By creating an account, users can also enjoy features such as saving game statistics, customizing their profiles, and interacting with other players, which enhances the overall gaming experience.

During the registration process, users are required to provide several key pieces of information:

- **Name:** This will serve as the user's unique identifier on the platform.
- **Password:** A secure password that protects the user's account and personal information.
- **Email Address:** This will be used for account verification and communication purposes, including password recovery options.

The image shows a registration form titled "Register". It contains three input fields: "Name", "Email", and "Password", each represented by a light gray rectangular box. Below these fields is a "Register" button, also represented by a light gray rectangular box. The entire form is enclosed in a thin gray border.

Figure 1: Register page.

Users should be able to securely log in and log out of their accounts to ensure that their personal data and game progress are protected. This functionality is critical for maintaining user privacy and security, as it allows users to access their profiles, track their gameplay statistics, and participate in online matches while safeguarding their accounts from unauthorized access. The login process should be straightforward and intuitive, enabling users to enter their credentials easily. Once logged in, users should be granted immediate access to a personalized dashboard where they can view their game history, current matches, and any notifications related to their account. Additionally, the logout feature is equally important, as it allows users to safely exit their sessions, especially when using shared or public devices, minimizing the risk of someone else accessing their account.

log in to their accounts, users are required to provide two essential pieces of information:

- **Email:** This serves as the unique identifier for each user on the platform, allowing the system to recognize and authenticate the individual.
- **Password:** A secure password that the user has previously set during the registration process. This password is critical for ensuring the security of the user's account.

Login

Figure 2:Login page.

3.1.2. Game Mechanics

Single-player Mode

In the single-player mode, users can engage in gameplay against an artificial intelligence (AI) opponent, allowing them to enjoy the Caro game even when no other players are available. This mode is particularly beneficial for new players looking to practice their skills or for experienced players seeking to refine their strategies without the pressure of competing against human opponents. The AI is designed to simulate varying levels of difficulty, providing a tailored experience that can adapt to the user's skill level.

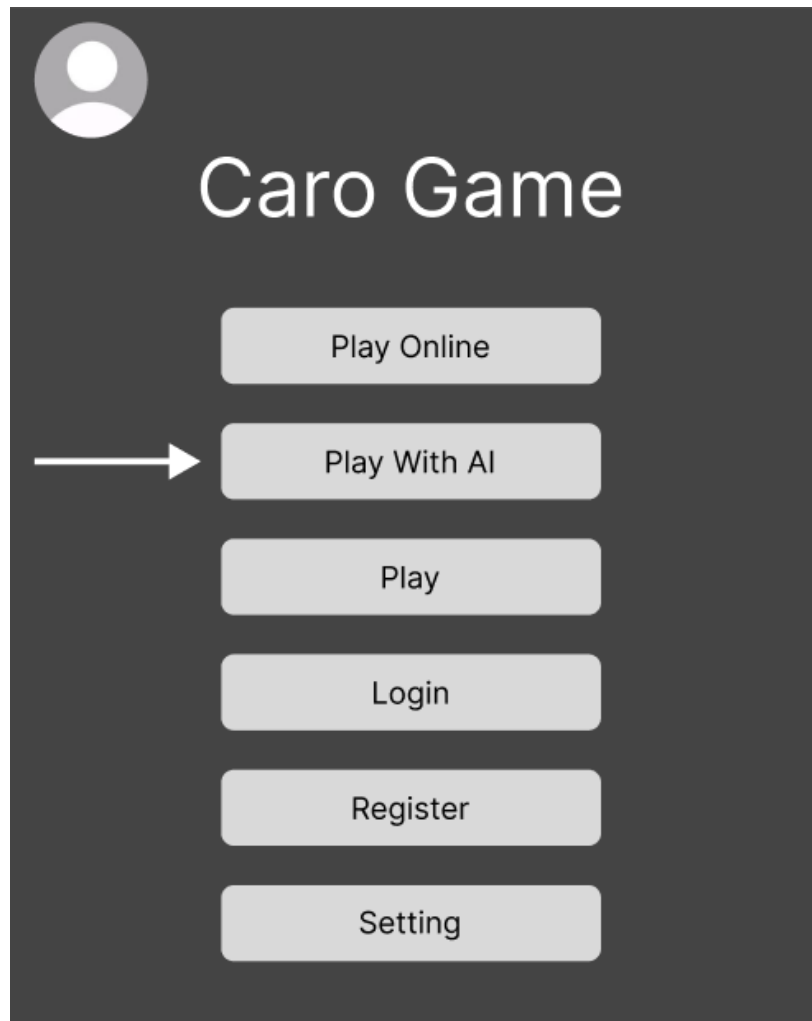


Figure 3: Click the play button to play with AI.

Multiplayer Mode

In multiplayer mode, users can create or join game rooms, facilitating competitive play with friends or other users around the world. This mode fosters a sense of community and interaction, as players can engage in live matches and enjoy the social aspects of gaming. Users can easily navigate to the multiplayer section of the site, where they are presented with options to either host a new game or join an existing room created by others.

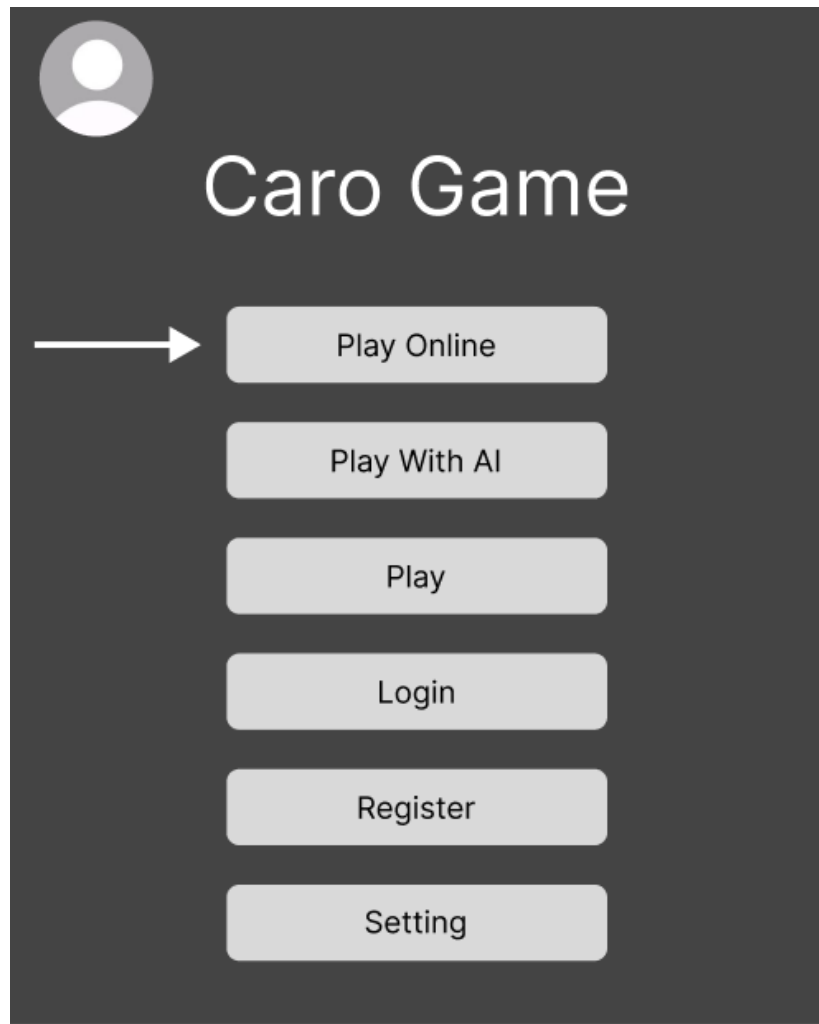


Figure 4: Multiplayer Mode.

Chat Feature

To further enrich the multiplayer experience, a chat feature is included, enabling players to communicate with each other during the game. This chat interface allows participants to strategize, share tips, and engage in friendly banter, fostering camaraderie and enhancing the social aspect of the game. Users can send text messages in real-time, making gameplay more interactive and enjoyable. The chat feature also includes options for emojis and reactions, allowing players to express themselves and create a more vibrant gaming environment. This blend of competition and communication is essential for building a community around the Caro game, making each match not just a test of skill, but also a social event where players can connect and share their passion for the game.

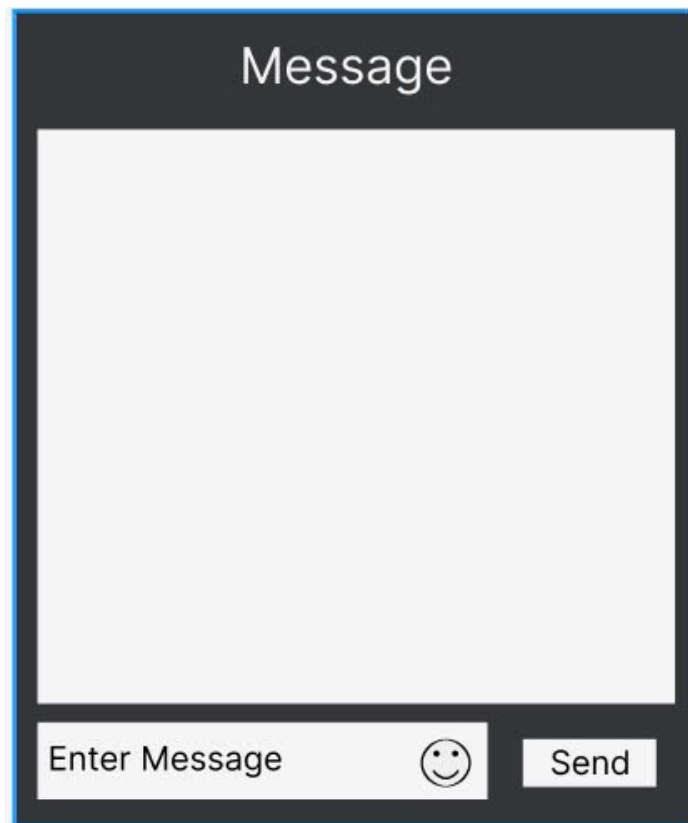


Figure 5:Chat Feature.

Settings Function

The Game Modes section of the Caro game website is designed to offer players a variety of gameplay experiences tailored to their preferences and skill levels. Within this section, the settings function plays a crucial role in enhancing the overall gaming experience by allowing users to customize key aspects of their gameplay.

Customization Options: The settings function enables players to adjust various parameters that influence their game. For instance, users can select their preferred game mode, whether it be a casual match, a timed tournament, or a ranked game. Each mode can have specific rules and scoring systems, and players can choose one that best fits their playing style. Additionally, the settings may allow for adjustments to the game board size, accommodating both traditional gameplay and more expansive formats for advanced players.

Difficulty Levels: Another important feature within the settings function is the ability to select difficulty levels. Players can choose between easy, medium, and hard settings, which will adjust the AI's competitiveness in single-player modes. This ensures that novice players can learn the game at a comfortable pace while experienced players are challenged appropriately. By offering varying levels of difficulty, the game becomes accessible to a wider audience, encouraging players of all skill levels to engage and improve.

Sound and Visual Preferences: The settings function also includes options for sound and visual preferences. Players can toggle background music and sound effects on or off, or adjust the volume to create a more personalized gaming atmosphere. Additionally, visual settings might include themes or color schemes, allowing players to select a look that resonates with their personal style. This level of customization not only enhances enjoyment but also helps create a more immersive experience.

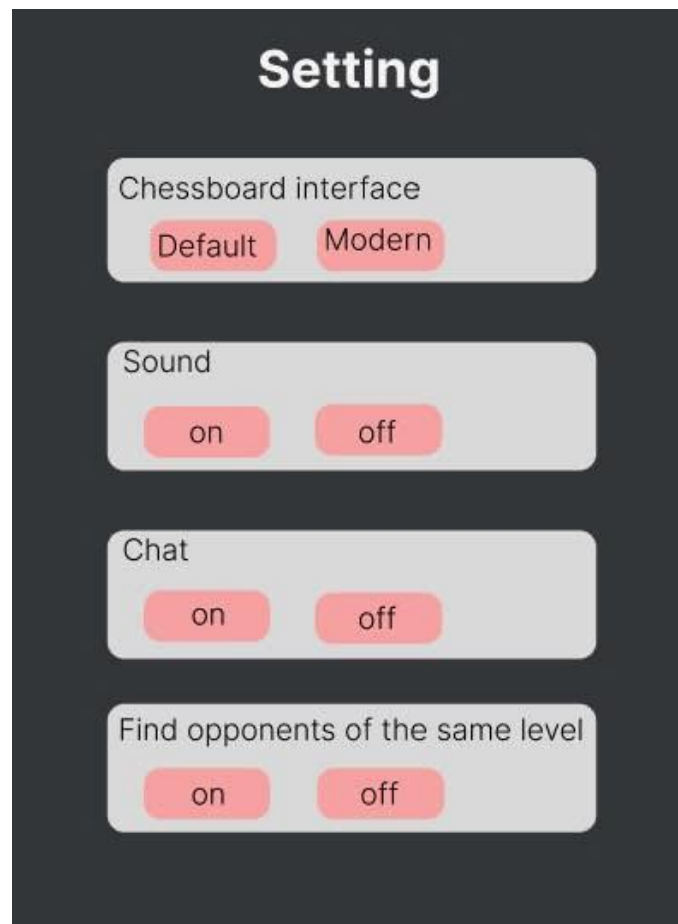


Figure 6:Settings Function.


Leaderboard Functionality

The leaderboard feature within the Game Modes section of the Caro game website serves as an essential component for fostering competition and community engagement among players. It allows users to track their performance relative to others, promoting a sense of achievement and motivation to improve. Here's a detailed overview of how the leaderboard functions and its significance:

Real-Time Updates: The leaderboard is designed to display real-time updates, reflecting the latest game results and player rankings. As matches conclude, the scores are automatically calculated and updated on the leaderboard, ensuring that players can see their current standing without delay. This immediacy enhances the competitive spirit, as players can quickly identify their rank and strive to improve it.

Ranking Criteria: The leaderboard typically ranks players based on several criteria, such as total wins, win-loss ratios, and points earned through gameplay. This multi-faceted approach allows for a more comprehensive evaluation of player skill and performance. For instance, players with a high number of wins but also a high number of losses may have a different rank compared to those with fewer games but a higher win ratio. This nuanced ranking system encourages players to engage in more matches to fine-tune their skills and achieve better standings.

Incentives and Rewards: To further motivate players, the leaderboard can be tied to incentives or rewards. For example, players who achieve high rankings might receive badges, trophies, or in-game currency that can be used to enhance their experience. Recognizing top performers not only adds to the competitive atmosphere but also encourages players to engage consistently to earn these accolades.



	Username 1	Point
	Username 2	Point
	Username 3	Point
	Username 4	Point

Figure 7:Leaderboard Functionality.

3.1.3. Game Board

After the player presses the play button, he will be redirected to the game room where the chessboard interface will appear.

The game interface of the Caro game will prominently feature a 10x10 grid, serving as the foundational layout for gameplay. This grid format is designed to facilitate strategic thinking and planning, allowing players to place their marks (either X or O) strategically as they compete to achieve five in a row. The choice of a 10x10 grid strikes a balance between complexity and accessibility, providing ample space for players to devise their strategies while remaining manageable for beginners. The grid

will be visually appealing, with clear lines and a user-friendly design that enhances the overall gaming experience.

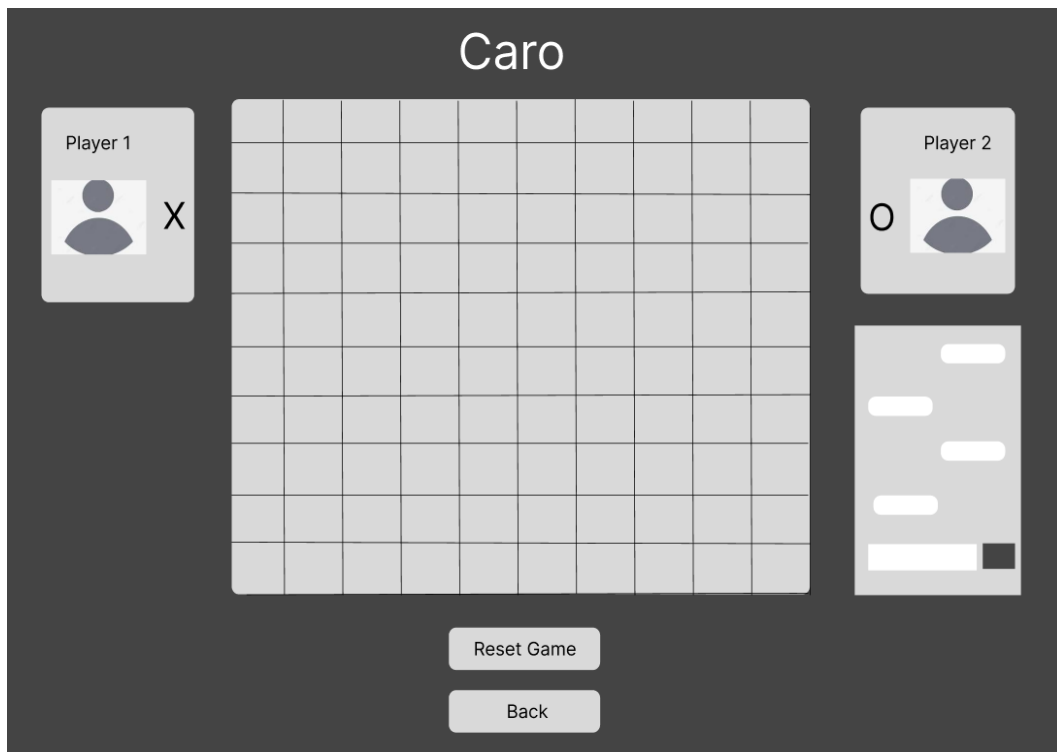


Figure 8:Interface when playing.

During gameplay, players interact with the grid by clicking on the desired cell to place their mark. The input process is designed to be intuitive, allowing users to make their moves with ease. As players click on an empty cell, their mark (either X or O, depending on which player they are) will be placed, signaling their turn. This click-based input method streamlines the gameplay, enabling quick decision-making and maintaining the game's pace. Additionally, visual feedback will be provided, such as highlighting the selected cell before the mark is placed, ensuring players can easily track their moves.

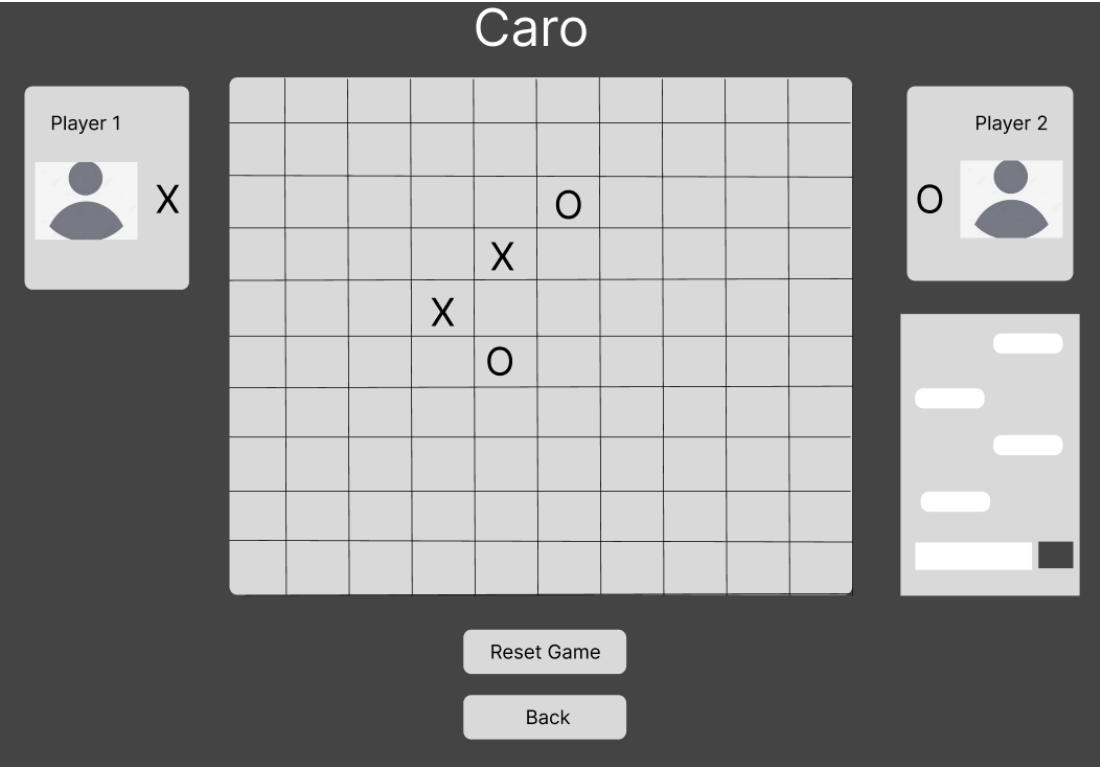


Figure 9:Click on the empty boxes to mark the selection points.

Players can click reset game to refresh the board to start a new game or click back to return to the home page to customize the game or if they don't want to play anymore.

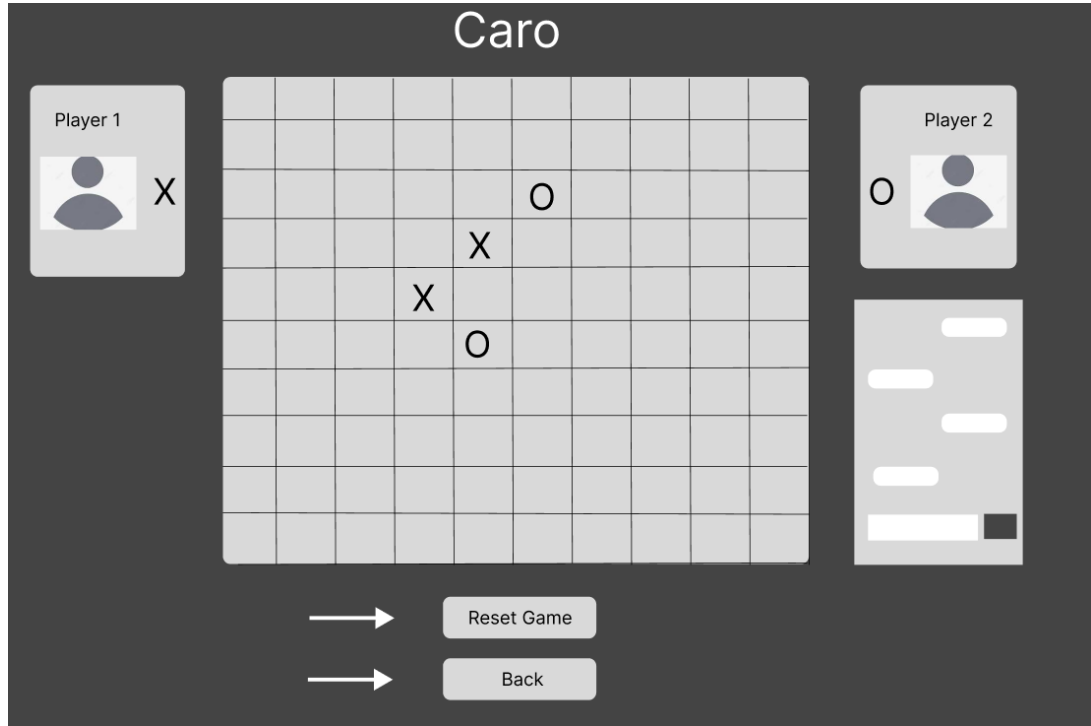


Figure 10:Players can click reset game or back to exit and refresh the board.

3.1.4. Game Rules

The game adheres to the traditional rules of Caro, which is a classic strategy board game also known as Gomoku. These rules are designed to ensure a fair and engaging gameplay experience, allowing players to immerse themselves in the rich tactical elements the game offers. By following these established rules, players can enjoy a familiar and competitive environment, whether they are seasoned veterans or newcomers to the game. The primary objective is straightforward yet challenging: players must strategically place their marks on the board with the ultimate goal of creating a line of five consecutive marks, thus requiring both foresight and strategic thinking.

Requirements

To facilitate a structured and enjoyable gameplay experience, the following rules and requirements must be implemented:

Turn-Based Play: Players will take turns placing their marks (either X or O) on the 10x10 grid. This alternating turn system promotes fairness and encourages strategic planning, as each player must carefully consider their moves while anticipating their opponent's actions. The structured turn-taking format also heightens the suspense and excitement of the game, making each move significant as players vie for dominance on the board.

Winning Condition: The primary objective of the game is to be the first player to align five marks in a row. This alignment can occur in three possible orientations: horizontally, vertically, or diagonally. This winning condition adds a layer of complexity, as players must not only work toward their own goal of creating a line of five but also remain vigilant to block their opponent's attempts to do the same. The tension and strategy inherent in this requirement make every game a thrilling contest of wits and foresight.

Draw Condition: In the event that all spaces on the board are filled and no player has achieved five consecutive marks, the game will declare a draw. This rule ensures that players are not left in a situation where the game can continue indefinitely without a resolution. Declaring a draw not only maintains the pace of the game but also encourages players to strive for victory rather than simply filling the board without intent. This aspect of the rules emphasizes the importance of strategic placement and foresight, as players must work diligently to avoid a stalemate while pursuing their ultimate goal of winning.

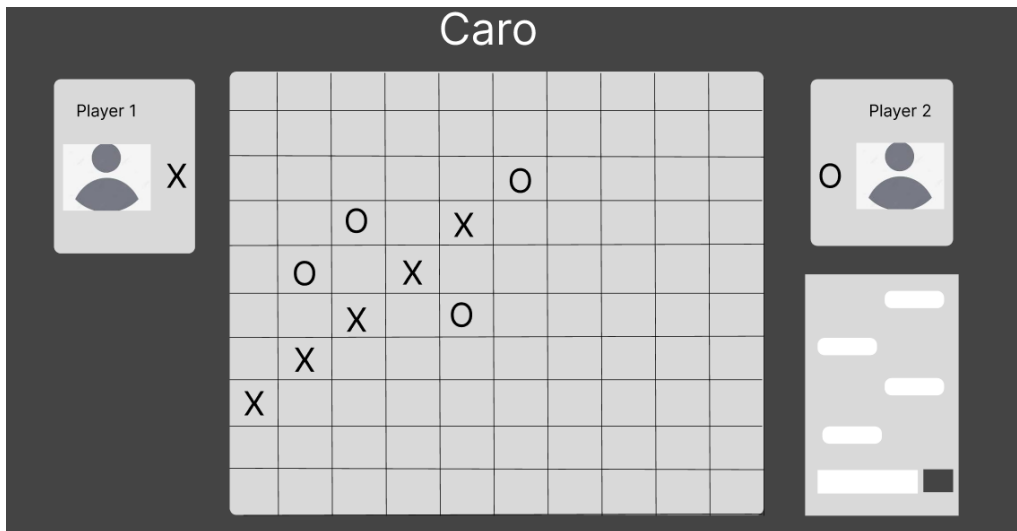


Figure 11:When you have 5 rows in a row, the game will end.

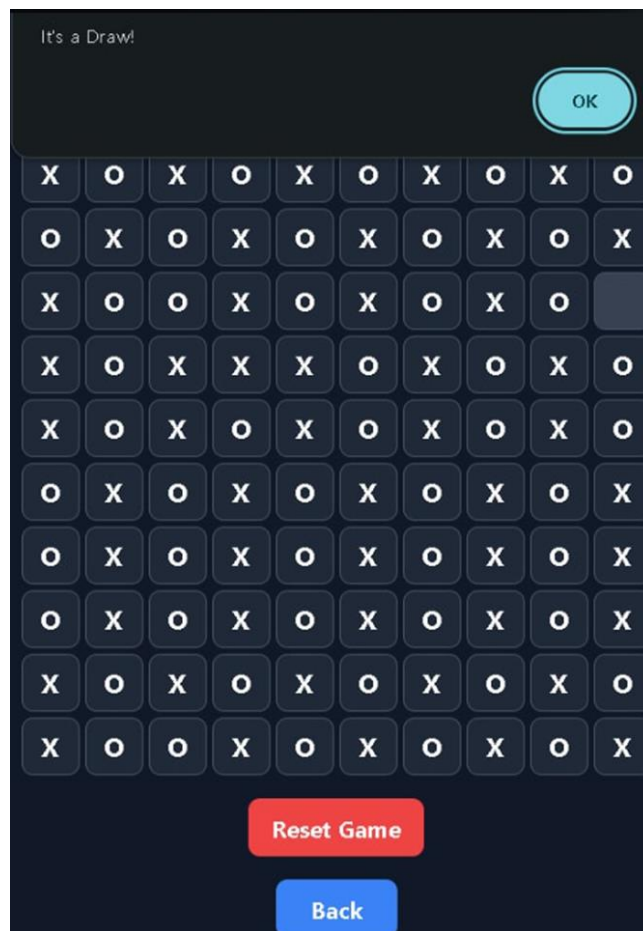
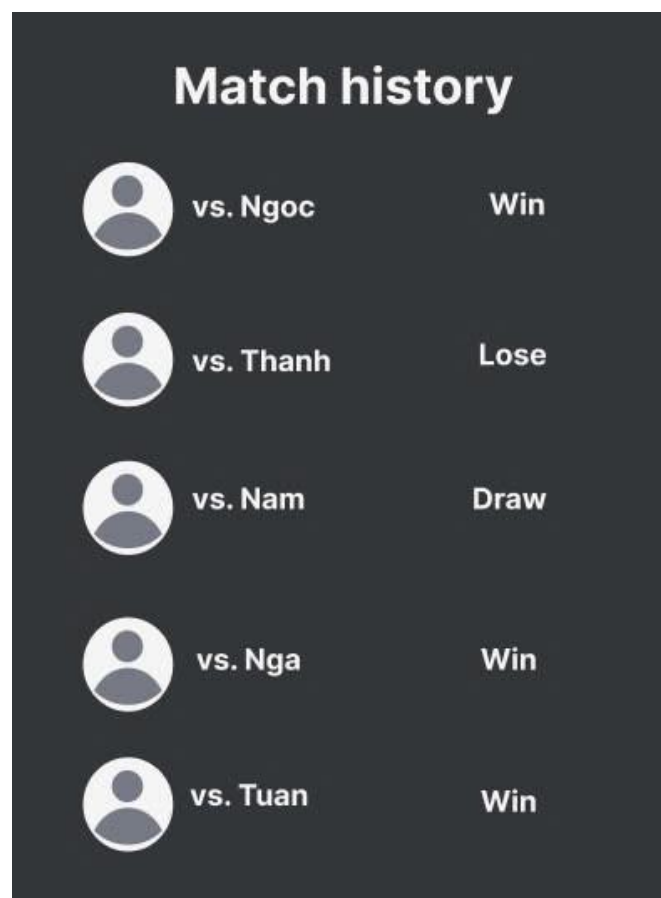


Figure 12:In case both players cannot make a five.

3.1.5. User Profiles

User profiles on the Caro game website are designed to enhance the gaming experience by providing players with valuable insights into their gameplay and allowing for personal expression through customization. These features not only foster a sense of ownership and engagement but also contribute to the overall community feel of the platform.

Game History: Users can easily access their game history, which includes detailed records of all their past matches, highlighting wins, losses, and draws. This comprehensive history allows players to track their performance over time, offering insights into their strengths and areas for improvement. By analyzing their past games, users can identify patterns in their play style, such as frequently winning or losing against certain opponents or under specific conditions. This feature promotes a reflective gaming experience, encouraging players to learn from their experiences and refine their strategies for future matches. Additionally, users can view statistics such as their win percentage, longest winning streak, and average game duration, further enriching their understanding of their gaming journey.








Match history		
	vs. Ngoc	Win
	vs. Thanh	Lose
	vs. Nam	Draw
	vs. Nga	Win
	vs. Tuan	Win

Figure 13:Game History.

Profile Customization: Users have the ability to personalize their profiles by selecting unique avatars and providing personal information, which helps to create a distinctive identity within the gaming community. The avatar selection process offers a variety of designs and styles, allowing users to choose one that reflects their personality or gaming style. This customization enhances user engagement, as players can express themselves visually and make their profiles more memorable to others. In addition to avatars, users can input personal information such as a display name, a short bio, and their favorite strategies or game modes. This added layer of personalization fosters connections between players, as they can share insights and experiences, further enriching the community atmosphere of the platform.

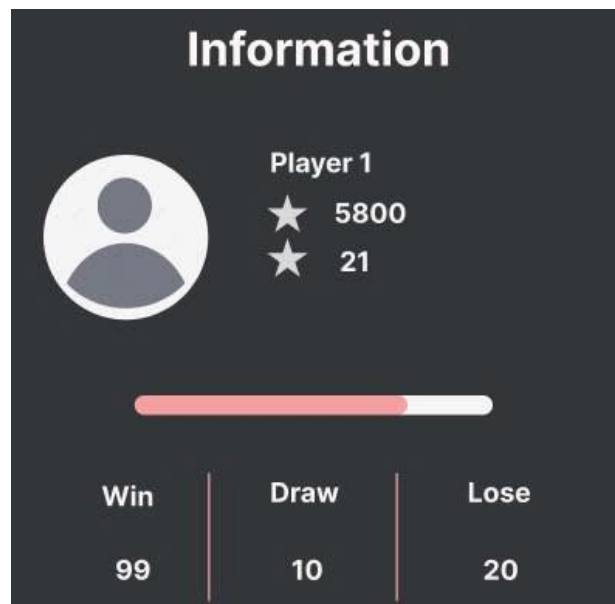


Figure 14: Profile Customization.

3.2. Non-Functional Requirements

3.2.1. Performance

Ensuring optimal performance is crucial for the overall user experience on the Caro game website. To create a seamless and enjoyable environment for players, the website must be designed to load quickly and respond promptly to user interactions. Specifically, the website should load within 3 seconds on standard broadband connections. This time frame is essential, as users expect immediate access to content, and longer load times can lead to frustration and a negative perception of the platform. To achieve this goal, the website will utilize efficient coding practices, optimized images, and content delivery networks (CDNs) to minimize loading times and ensure that all elements of the site are readily accessible.

In addition to fast loading times, the game itself must be highly responsive, with a target response time of 100 milliseconds for user inputs. This responsiveness is critical for maintaining the flow of gameplay, as delays can disrupt concentration and diminish the overall enjoyment of the game. When players click to place their marks, the game should reflect this action almost instantaneously, providing immediate visual feedback that confirms their move. Such quick responses not only enhance the gaming experience but also foster a sense of immersion, allowing players to fully engage with the game without distractions.

3.2.2. Security

Ensuring the security of user data is of paramount importance for the Caro game website. To protect sensitive information, all user data must be stored securely using advanced encryption techniques. This means that personal information, game history, and account credentials will be encrypted both at rest and in transit, making it difficult for unauthorized individuals to access or interpret the data. By employing strong

encryption algorithms, the platform can safeguard user information against potential breaches and cyber threats, thereby instilling confidence in players about the safety of their data.

In addition to secure data storage, implementing SSL (Secure Socket Layer) encryption for data transmission is essential. This encryption protocol establishes a secure connection between the user's device and the server, ensuring that all data exchanged—such as login credentials and gameplay information—remains confidential and protected from interception by malicious actors. SSL encryption not only enhances the security of user transactions but also helps to build trust, as users are more likely to engage with a platform that visibly prioritizes their privacy and security.

To further bolster the website's security framework, regular security audits must be conducted. These audits will involve thorough assessments of the website's infrastructure, application code, and overall security policies. By systematically identifying and mitigating vulnerabilities, the development team can proactively address potential security issues before they can be exploited. This ongoing commitment to security is essential in an ever-evolving digital landscape, where new threats and vulnerabilities can emerge rapidly. The results of these audits should be documented, and any necessary updates or patches should be implemented promptly to ensure that user data remains protected at all times.

3.2.3. Usability

The user interface (UI) of the Caro game website is a critical component that directly influences the overall user experience. It should be designed to be intuitive and user-friendly, ensuring that players can navigate the site with ease.

To further enhance the user experience, especially for new players who may be unfamiliar with the game mechanics, the site will provide tooltips and guided tutorials. These tooltips will appear when users hover over specific elements, offering concise explanations of functions and features without overwhelming them with information.

3.2.4. Compatibility

Ensuring that the Caro game website is compatible with major web browsers is essential for reaching a wide audience and providing a consistent user experience. Specifically, the website must function seamlessly on popular browsers such as Chrome, Firefox, Safari, and Edge.

In addition to browser compatibility, the design of the website must be highly responsive, adapting gracefully to various screen sizes and resolutions. This responsiveness ensures that the website is functional and visually appealing on a range of devices, including desktops, tablets, and smartphones. As users increasingly access content from mobile devices, it is imperative that the layout adjusts appropriately, maintaining usability regardless of the screen size.

To achieve this, the website design will utilize fluid grids, flexible images, and media queries that allow for dynamic adjustments based on the user's device. This approach

not only enhances the overall user experience but also promotes engagement, as players can enjoy the game on their preferred devices—whether they are at home on a desktop or on the go with a smartphone. Additionally, the site should prioritize touch-friendly interactions for tablet and smartphone users, ensuring that buttons are adequately sized for easy tapping and that gestures are supported for navigation.

IV. External Interface Requirements

4.1. User Interfaces

The user interface of the Caro game website is thoughtfully organized into several key components, each designed to enhance the user experience and streamline navigation.

Main Menu: The main menu serves as the gateway to the entire platform, providing users with essential options such as registration, login, and game modes. During the registration process, new users can easily create their accounts by filling out a straightforward form that collects basic information, ensuring a quick and hassle-free onboarding experience. For returning players, the login option is prominently displayed, allowing them to access their accounts with minimal effort. Additionally, the main menu offers a selection of game modes, catering to various preferences and skill levels. Players can choose between casual games, competitive matches, or even tournaments, enabling them to engage with the game in a way that suits their desires and availability. This organized structure not only makes navigation intuitive but also encourages users to explore all that the platform has to offer.

Game Interface: Once users enter a game, the game interface comes to life, displaying the game board prominently at the center of the screen. This board is designed for clarity and ease of use, ensuring that players can quickly identify available spaces and their own marks. Alongside the board, player scores are clearly visible, allowing participants to keep track of their performance throughout the match. This feature enhances competitiveness and motivates players to improve their skills. Additionally, the interface includes a chat feature that facilitates real-time communication between players. This chat function not only fosters a sense of community but also allows players to discuss strategies, share tips, or simply engage in friendly banter, enriching the overall gaming experience.

Profile Page: Each user has a dedicated profile page that showcases vital information about their gaming journey. This page displays user statistics, including total wins, losses, and draws, giving players insight into their performance and progress. Additionally, users can view their chosen avatar, which adds a personal touch and reflects their identity within the gaming community. The profile page is also equipped with settings that allow players to customize their experience further, such as adjusting notification preferences, changing their display name, or updating their password. This level of personalization ensures that users feel a sense of ownership over their profiles, making their experience more enjoyable and tailored to their individual needs.

4.2. Hardware Interfaces

The Caro game application is designed with accessibility in mind, ensuring that it can run smoothly on standard user hardware equipped with internet access. This means that players can enjoy the game without the need for expensive or specialized equipment, making it widely available to a broad audience. Whether users are on a desktop computer, laptop, tablet, or smartphone, they can easily access the application as long as they have a reliable internet connection. This approach not only lowers the barriers to entry for new players but also ensures that existing users can engage with the game from various devices, accommodating different preferences and lifestyles.

Moreover, the application is optimized to function well on a range of operating systems, including Windows, iOS, and Android. By supporting multiple platforms, the game can reach a diverse user base, allowing friends and family to play together regardless of the devices they own. This inclusivity is further bolstered by the application's lightweight design, which does not demand high-end specifications or excessive processing power. Users can enjoy a seamless gaming experience without needing to invest in the latest hardware, making it an attractive option for casual gamers and those who may not have access to high-performance machines.

4.3. Software Interfaces

The technical architecture of the Caro game website is designed to ensure efficient operation, scalability, and a dynamic user experience.

Back-End: The back-end of the website will utilize a robust web server, such as Node.js, to effectively handle incoming requests from users. Node.js is particularly well-suited for this application due to its non-blocking, event-driven architecture, which allows it to manage multiple connections simultaneously and respond to user actions with minimal latency. This capability is crucial for maintaining a smooth gaming experience, especially during peak usage times when many players may be online simultaneously. In addition to the web server, the application will employ a powerful database management system, such as MongoDB, to securely store user data and maintain comprehensive game history records. MongoDB's flexibility as a NoSQL database allows for easy scaling and efficient data retrieval, which is essential for managing the varied and potentially large datasets associated with user profiles, game statistics, and match histories. By implementing these technologies, the back-end will not only support current demands but also be prepared to accommodate future growth as the user base expands.





IntelliJ IDEA

Front-End: On the front-end, the website will be crafted using a combination of HTML, CSS, and modern JavaScript frameworks, such as React or Vue.js. These frameworks are known for their ability to create highly interactive and dynamic user interfaces, which are essential for engaging players in real-time gameplay. React, for instance, allows for the development of reusable components, which can streamline the coding process and improve maintainability, while Vue.js offers a more flexible approach with a gentle learning curve for developers. Utilizing these frameworks will enable the site to provide a responsive and visually appealing experience, as users can interact with the game seamlessly, receiving immediate feedback for their actions. Furthermore, the integration of CSS will ensure that the design is not only functional but also aesthetically pleasing, enhancing the overall user experience.



Visual Studio Code

V. Usecase and Diagram

Usecase:

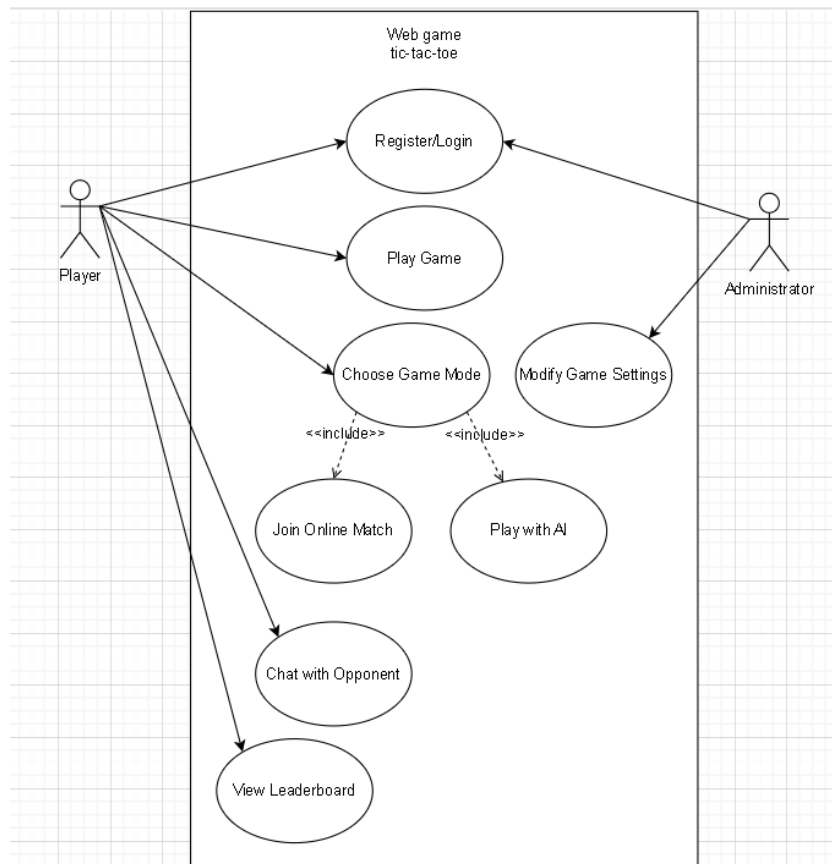


Figure 15:Usecase web game caro.

Actors:

- Player – A user who plays the tic-tac-toe game.
- Administrator – A user who manages the system (moderation, maintenance).

Usecase:

- Register/Login – Players can create accounts and log in.
- Play Game – Players can play tic-tac-toe matches.
- Choose Game Mode – Players can select between PvP (player vs. player) and AI (player vs. computer).
- Join Online Match – Players can enter an online multiplayer game.
- Play with AI – Players can challenge an AI opponent.
- View Leaderboard – Players can check the top-ranked users.
- Chat with Opponent – Players can chat in-game.
- Modify Game Settings (Admin) – Admins can adjust difficulty levels, matchmaking rules, etc.

Context Diagram:

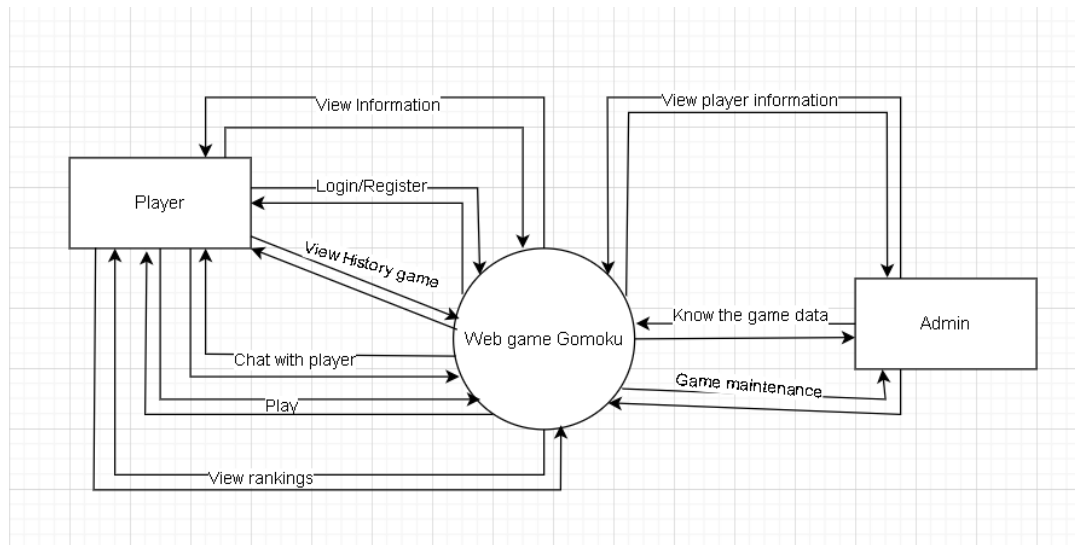


Figure 16:Context Diagram for a Web Game of Checkers.