




# 4-BY-4

A project by Andrea Petruzzi, Elisabetta Russo  
and Niccolò Buonfiglio



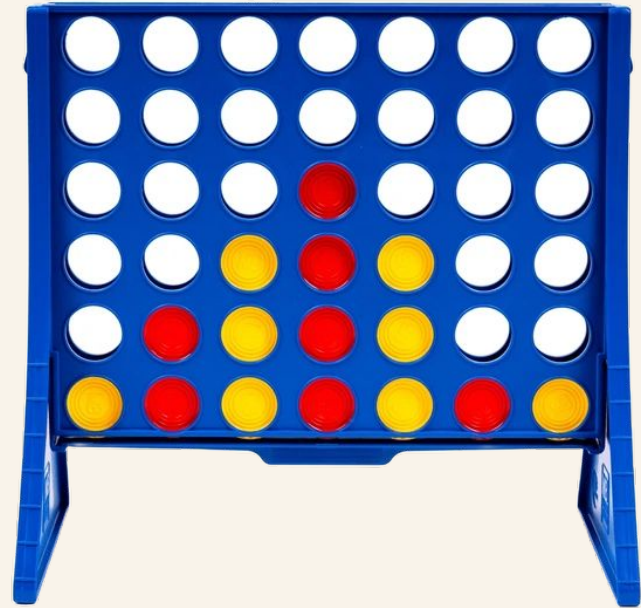
# WHAT IS 4-BY-4?

4-by-4 is an online platform that allows users to play the classic adversarial games with gravity in a digital environment.

The website features a standard login system, enabling users to create accounts, log in, and track their game statistics.

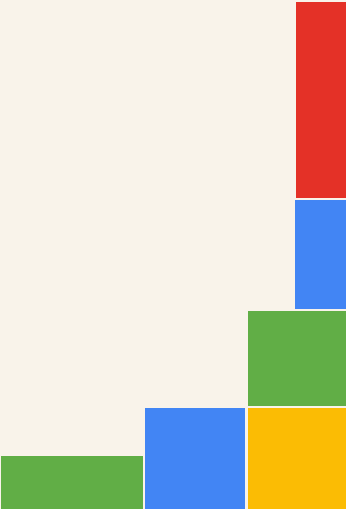
Players can customize their gaming experience by adjusting board sizes and implementing chess-like timing settings to add a competitive edge.

The platform is designed to provide a seamless and engaging experience for enthusiasts of all skill levels.





# Methodologies used

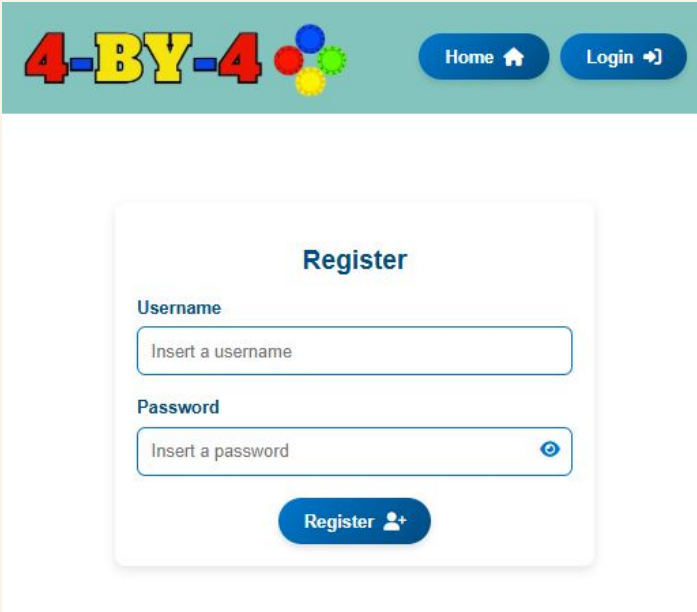
- Requirements are expressed as **User Stories**
  - Story size is estimated using **Function Points Analysis**
  - Effort estimation is done using **CoCoMo II**
  - Development is structured in **Scrum**
- 



# USER STORIES

# User Authentication and Session Management

**As a player,**  
**I want to** be able to register to the site  
**so that** I can customize my username.



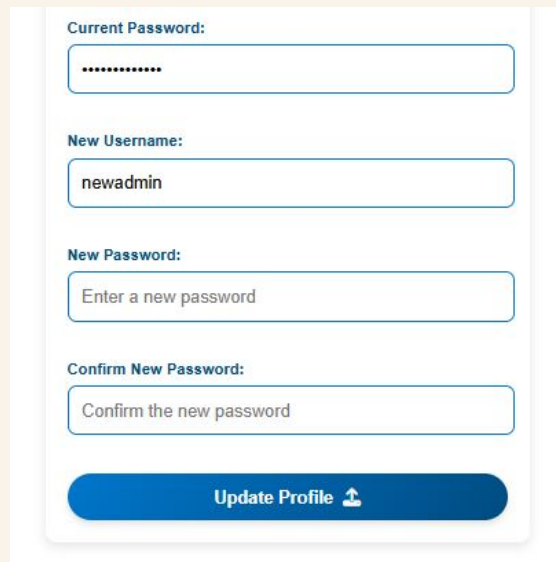
The screenshot displays a web application interface. At the top, there is a teal header bar containing the logo "4-BY-4" with colorful geometric shapes to its right. To the right of the logo are two dark blue buttons: "Home" with a house icon and "Login" with a right-pointing arrow icon. Below the header, the main content area is white and features a "Register" form. The form has a title "Register" in bold blue text. It contains two input fields: "Username" with the placeholder text "Insert a username" and "Password" with the placeholder text "Insert a password" and a toggle icon (an eye) to its right. At the bottom of the form is a dark blue button labeled "Register" with a person icon and a plus sign.

# Profile Management

**As a** a user,

**I want to** be able to to change my username,

**so that** I am not bound to a single name option forever.



Current Password:

.....

New Username:

newadmin

New Password:

Enter a new password

Confirm New Password:

Confirm the new password

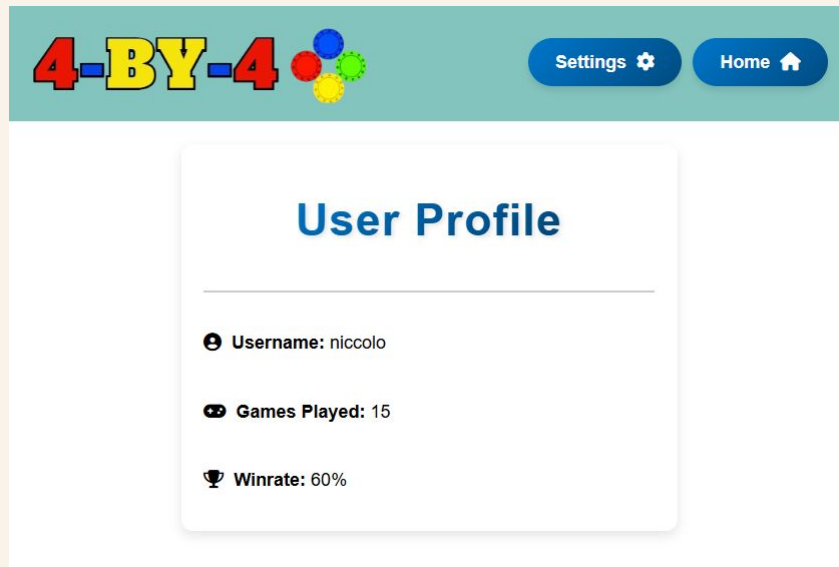
Update Profile ↑

# Profile Management

**As a casual player**

**I want to** be able to look at my aggregate statistics

**so that** I can estimate my skills and track my performance over time.



# Profile Management

**As a competitive player,**  
**I want to** look at replays of my previous matches,  
**so that** I can improve my gameplay.

Previous Games					
CREATOR	JOINER	DIMENSION	TIMING	WINNER	ACTIONS
niccolo	admin	6x7	10 min + 30 sec	niccolo	<a href="#">View Replay</a>
niccolo	admin	6x7	10 min + 30 sec	niccolo	<a href="#">View Replay</a>
niccolo	admin	6x7	10 min + 30 sec	niccolo	<a href="#">View Replay</a>
niccolo	admin	6x7	10 min + 30 sec	niccolo	<a href="#">View Replay</a>
niccolo	admin	6x7	10 min + 30 sec	niccolo	<a href="#">View Replay</a>
admin	niccolo	6x7	10 min + 30 sec	niccolo	<a href="#">View Replay</a>
admin	niccolo	6x7	10 min + 30 sec	niccolo	<a href="#">View Replay</a>
admin	niccolo	6x7	10 min + 30 sec	niccolo	<a href="#">View Replay</a>

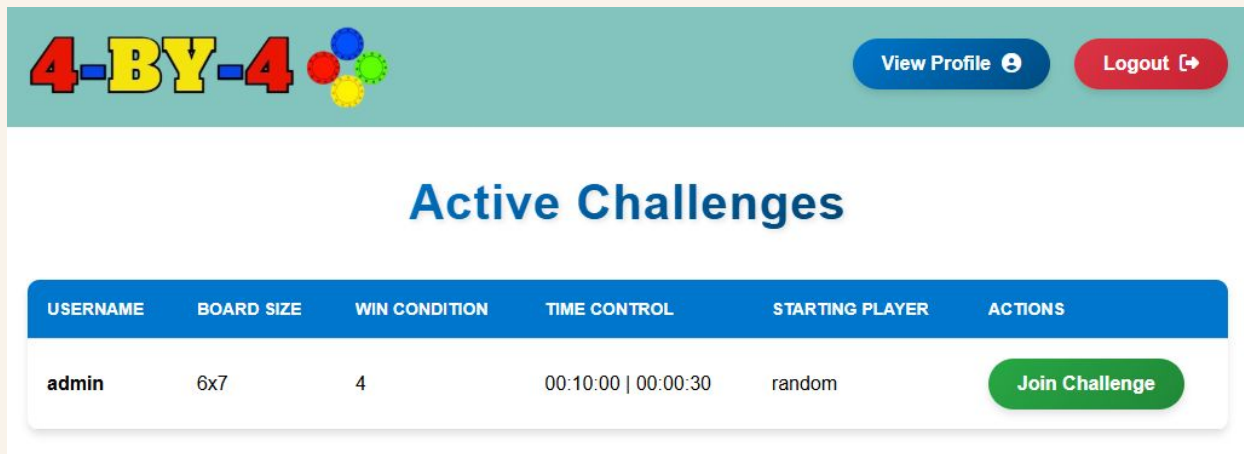


# Game Creation and Matchmaking

As a player,

I **want to** be able to look at active challenges,

**so that** I can see if there's any open match I can join.



The screenshot shows the user interface of the 4-BY-4 game. At the top, there is a header bar with the game logo "4-BY-4" on the left, which includes four colored gears (blue, red, yellow, green). On the right side of the header are two buttons: "View Profile" in a blue rounded rectangle and "Logout" in a red rounded rectangle with an external link icon. Below the header, the main content area has a title "Active Challenges" in blue. Underneath the title is a table with a blue header and one data row. The table columns are: USERNAME, BOARD SIZE, WIN CONDITION, TIME CONTROL, STARTING PLAYER, and ACTIONS. The data row shows the user "admin" with a "6x7" board, a win condition of "4", a time control of "00:10:00 | 00:00:30", and a starting player of "random". In the ACTIONS column, there is a green "Join Challenge" button.

USERNAME	BOARD SIZE	WIN CONDITION	TIME CONTROL	STARTING PLAYER	ACTIONS
admin	6x7	4	00:10:00   00:00:30	random	<button>Join Challenge</button>

# Profile Management

**As a** competitive player,

**I want to** set chess-like timing settings (e.g., blitz, rapid, or custom time limits)

**so that** I can challenge myself and others under time pressure.

## Create New Challenge

Size Settings

Rows:

Columns:

Win Condition:

Timer Settings

Initial Time:

Time Increment Per Move:

Other Settings

Starting player: ☒ Random ☐ Creator ☐ Joiner

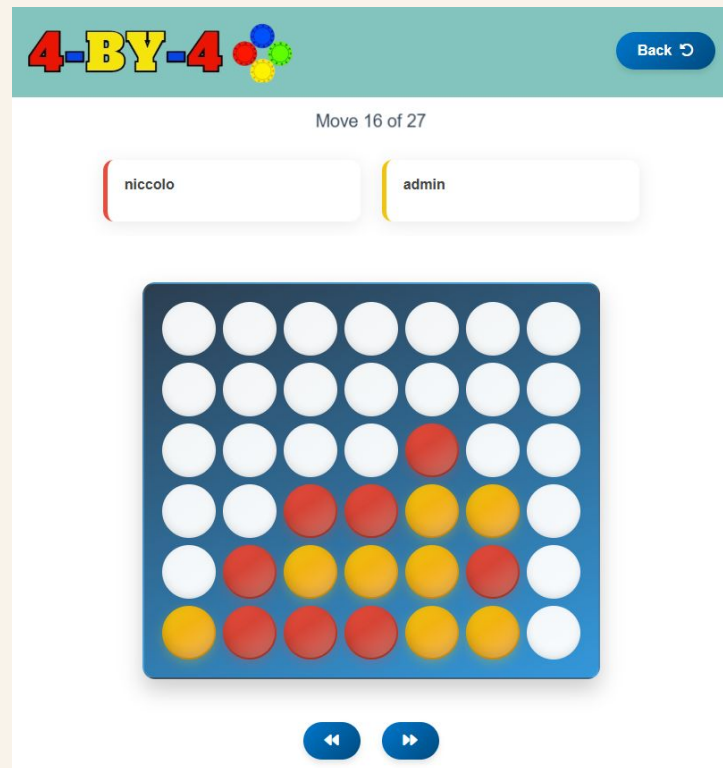
[Create Challenge](#)

# Game Replay and Analysis

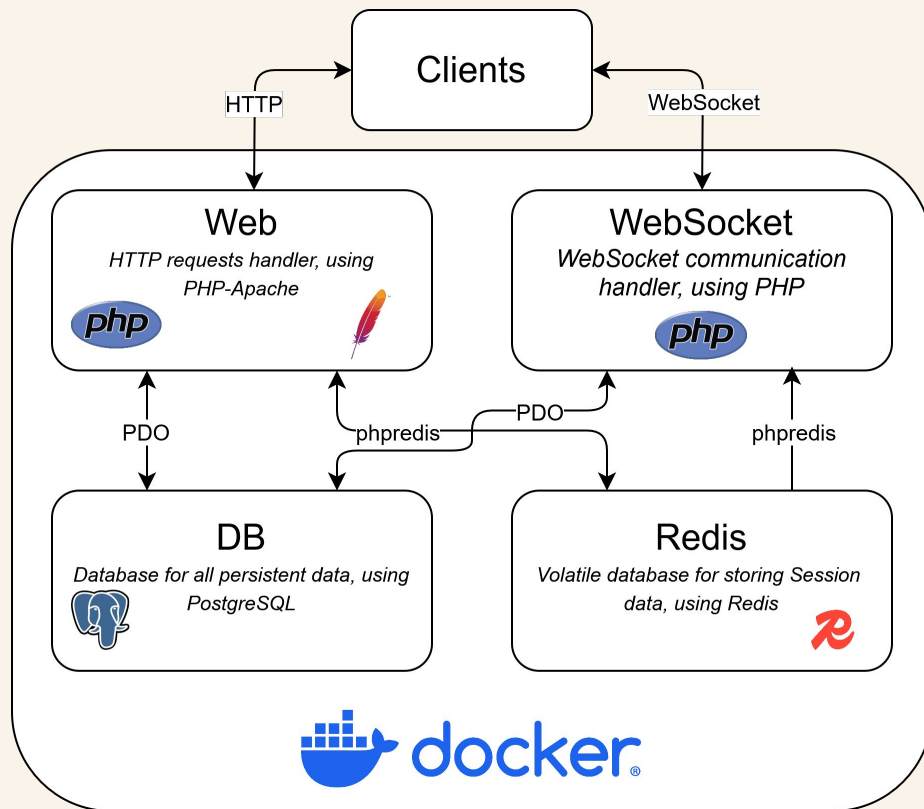
**As a player,**

**I want to** know how many moves there were in the replay of a previous match

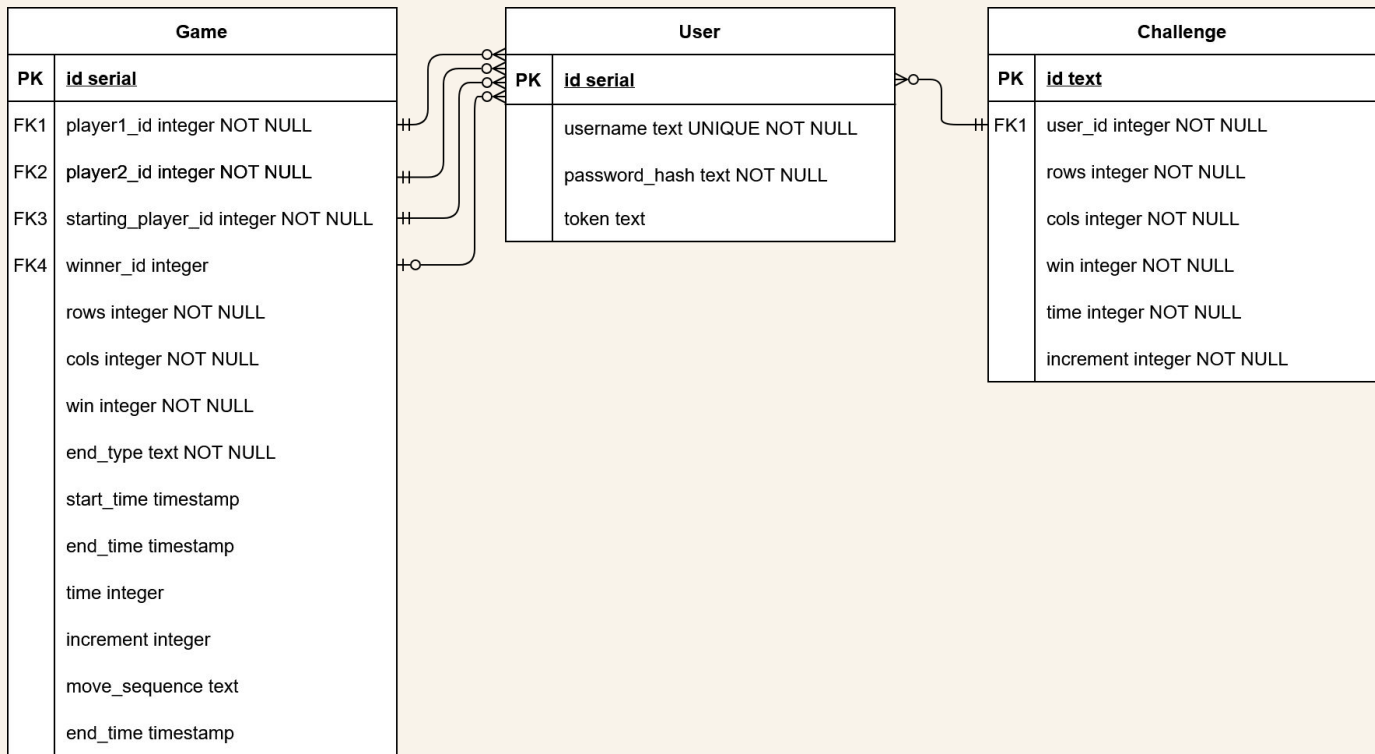
**so that** I know how long it's going to take.



# INFRASTRUCTURE

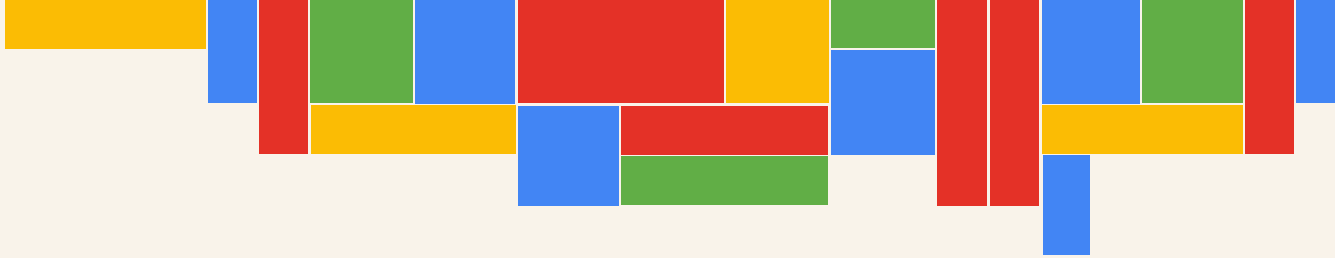


# ER SCHEMA

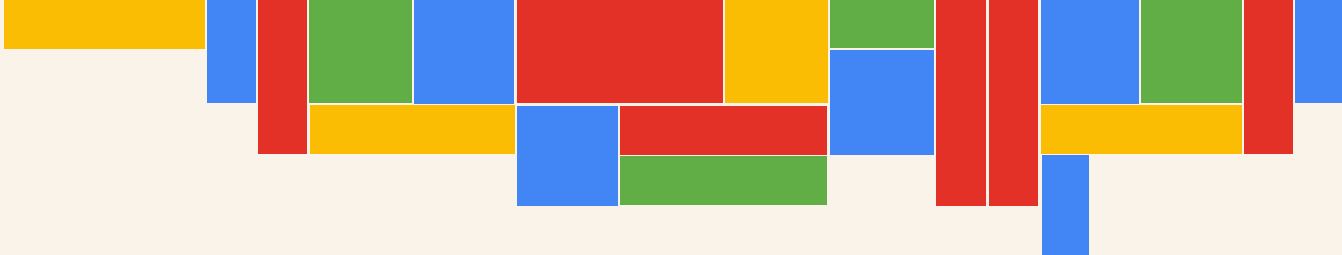




# FUNCTION POINTS



User stories	Function Point Classification	DET	FTR	FP
Player Registration	EI	3	1	3 (Low)
Username Customization	EI	1	1	3 (Low)
Aggregate Statistics View	EO	4	1	4 (Low)
Match Replay Access	EQ	3	1	3 (Low)



User stories	Function Point Classification	DET	FTR	FP
Active Challenges Overview	EQ	8	2	4 (Medium)
Timing Settings Configuration	EI	2	1	3 (Low)
Replay Move Count	EO	1	1	4 (Low)

▪

▪

▪





# COCOMO II

## Analysis

Convert Function Points to SLOC  
Convert SLOC to effort

Effort  $\approx$  253 person-months



The word "SCRUM" is centered in a large, bold, white sans-serif font within a solid red rectangular box. This central element is surrounded by a light beige background decorated with various colorful geometric shapes (squares and rectangles) in red, yellow, blue, and green, arranged in a pixelated or mosaic-like pattern along the edges.

**SCRUM**

# SPRINT 1: Foundation and Authentication

**Goal: Set up infrastructure, database, and authentication.**

Key Tasks:

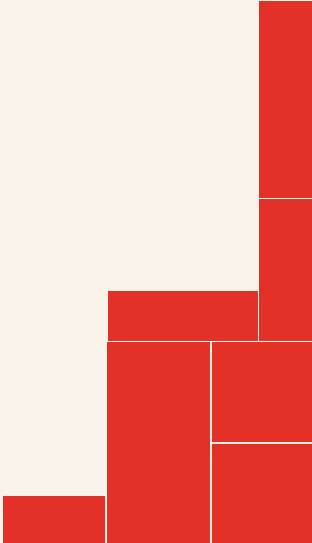
- Set up PostgreSQL database and tables.
- Implement token-based authentication.
- Develop frontend for login and registration.
- Configure Redis for session storage.



# **SPRINT 2: User Profile and Basic Game Setup**

**Goal: Implement user profiles and basic game setup.**

Key Tasks:

- Create profile handling service and frontend.
  - Set up WebSocket for real-time communication.
  - Develop frontend for challenge creation and joining.
- 

# SPRINT 3: Game Logic and Real-Time Play

**Goal:** Implement the core game logic, real-time gameplay, and basic game features.

Key Tasks:

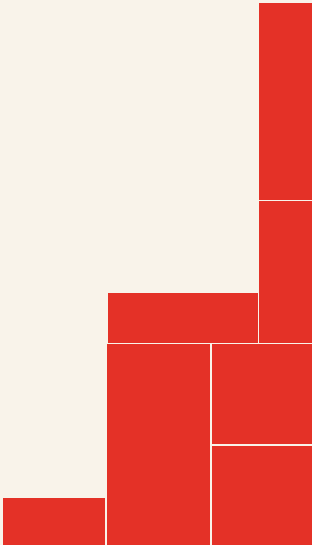
- Implement Game Logic in WebSocket Service
- Develop Frontend for Game Page
- Implement Chat Feature
- Implement Timing Settings



# **SPRINT 4: Replays, Statistics, and Polish**

**Goal: Implement game replays, statistics, and final polish for the platform.**

Key Tasks:

- Implement Replay Functionality
  - Develop Frontend for Replay Page
  - Implement Aggregate Statistics
  - Polish and Bug Fixes
- 

# SPRINT 5: Testing and Deployment

**Goal:** Conduct thorough testing, fix any remaining issues, and prepare for deployment.

Key Tasks:

- End-to-End Testing
- Performance Optimization
- Deployment Preparation
- Final Documentation

The background features a light beige field with abstract geometric patterns of red, yellow, green, and blue squares and rectangles scattered along the top, bottom, and side edges. A large, solid red rectangle is centered in the image, containing the text "TIME FOR A DEMO" in white, bold, sans-serif capital letters.

**TIME FOR A  
DEMO**