Bulls and Cows game: Business Requirements

What is this project? This project is a modern adaptation of the classic Bulls and Cows game, allowing users to guess either numbers or characters in an interactive, engaging manner. The game provides instant feedback and supports multiple difficulty levels to cater to both casual and competitive players.

Core Features:

- **Dual Mode Guessing:** Players can opt to guess either numbers (e.g., "1234") or characters (e.g., "ABCD"), with case insensitivity.
- **Real-Time Feedback:** The game will instantly return the number of Bulls (correct character in the correct position) and Cows (correct character in the wrong position) after each guess.
- **Customizable Difficulty Levels:** Users can choose different sequence lengths (e.g., 3, 4, or 5 characters/numbers).
- **Leaderboard System:** A scoring system to track the fastest or least-attempts victories.

Target Audience

- Casual gamers looking for a fun and logical challenge.
- Competitive players interested in improving their deductive skills.
- Educators using the game as a tool to enhance logical reasoning in students.
- Puzzle enthusiasts who enjoy brain teasers and problem-solving games.

Rules

1. The game randomly generates a secret sequence of numbers or characters.
2. Players submit guesses, attempting to determine the correct sequence.
3. The game provides feedback:
    - **Bull:** Correct character in the correct position.
    - **Cow:** Correct character in the wrong position.
4. Players continue guessing until they determine the correct sequence.
5. Scores are based on the number of attempts taken to solve the puzzle.

Challenge Questions

- How can we ensure a balance between challenge and accessibility for different players?
- What mechanisms can be added to prevent guessing based on brute force rather than logical deduction?
- How can we make the game more engaging through leaderboard systems, time-based challenges, or multiplayer modes?

Noun is purple, Verb is yellow

Nouns List

- Game
- Player
- Sequence
- Number
- Character
- Guess
- Feedback
- Bull
- Cow
- Score
- Difficulty Level
- Leaderboard
- Attempt
- Mode
- Time Limit
- System
- Position
- Educators
- Puzzle
- Challenge
- Gamer
- Length
- Victories
- Case Insensitivity

Verbs List

- allowing
- guess
- provides
- supports
- opt
- choose
- track
- looking
- interested
- using
- enjoy
- generates
- submit
- attempting
- determine
- continue
- are based
- ensure
- added
- prevent
- make

Summary of Classes, Attributes, and Associations

Class	Attributes	Associations
Game	mode, difficulty, leaderboard	Manages Player, Sequence

Player	name, score, attempts	Plays Game
Sequence	length, type, value	Generated by Game
Guess	input, feedback	Submitted by Player
Feedback	bulls, cows	Provided by Game
Leaderboard	rankings	Tracks Players

User Personas and User Stories

Emma, the Casual Solver

- **Age:** 25
- **Background:** Works as a teacher, enjoys light mental challenges to relax.
- **Engagement Level:** Low – Plays occasionally as a way to unwind.
- **Guessing Strategy:** Random – Guesses casually without deep strategic planning.
- **Game Mode Preference:** Characters – Finds letter-based sequences more fun and engaging.
- **Competitive Play Level:** Low – Plays for fun rather than leaderboard ranking.
- **Scenario:** Wants to play a short round of Bulls and Cows when she has free time, without pressure.
- **Reason to play the game:** Enjoys quick brain exercises without long-term commitment.
- **Pain Points:**
    - Gets frustrated when difficulty increases too much.
    - Prefers a simple UI without too many distractions.
- **Key Features Needed:**
    - Quick-play mode with easy settings.
    - A hint system for guidance.
    - Simple and intuitive interface.

Story Points:

- "As a casual gamer, I want to play a short round of Bulls and Cows so that I can relax and have fun."
- As a casual gamer, I want the game to provide instant feedback on my guesses so that I can improve my strategy.
- "As a casual gamer, I want a simple UI that is easy to navigate so that I can quickly understand the game mechanics."

James, the Competitive Thinker

- **Age:** 30
- **Background:** Software engineer, enjoys strategy games and logical puzzles.
- **Engagement Level:** High – Plays regularly to improve problem-solving skills.
- **Guessing Strategy:** Strategic – Uses deductive reasoning to optimize guesses.
- **Game Mode Preference:** Numbers – Prefers numeric sequences for analytical thinking.
- **Competitive Play Level:** High – Wants to improve ranking on the leaderboard.
- **Scenario:** Wants a challenging experience where he can track progress and refine his approach.
- **Reason to play the game:** Enjoys competing and measuring progress through analytics.
- **Pain Points:**
    - Gets frustrated when leaderboards are not well-implemented.
    - Wants more statistics on past performances.
- **Key Features Needed:**
    - Leaderboard system to track rankings.
    - Detailed statistics on past games.
    - Competitive modes with ranking challenges.

Story Points:

- "As a competitive player, I want a leaderboard so that I can compare my performance with others."
- "As a competitive player, I want an attempts-based challenge mode so that I can improve my problem-solving speed."
- "As a competitive player, I want to analyze my past guesses so that I can refine my strategy."

UML Class Diagram

Associations
- Player submits Guess → A Player makes multiple Guess objects.
- Game provides Feedback → Game calculates bulls & cows for Guess.

- GameManager creates Player → GameManager is responsible for player creation.
- GameManager starts and tracks multiple Games → GameManager manages multiple Game instances.

Aggregation

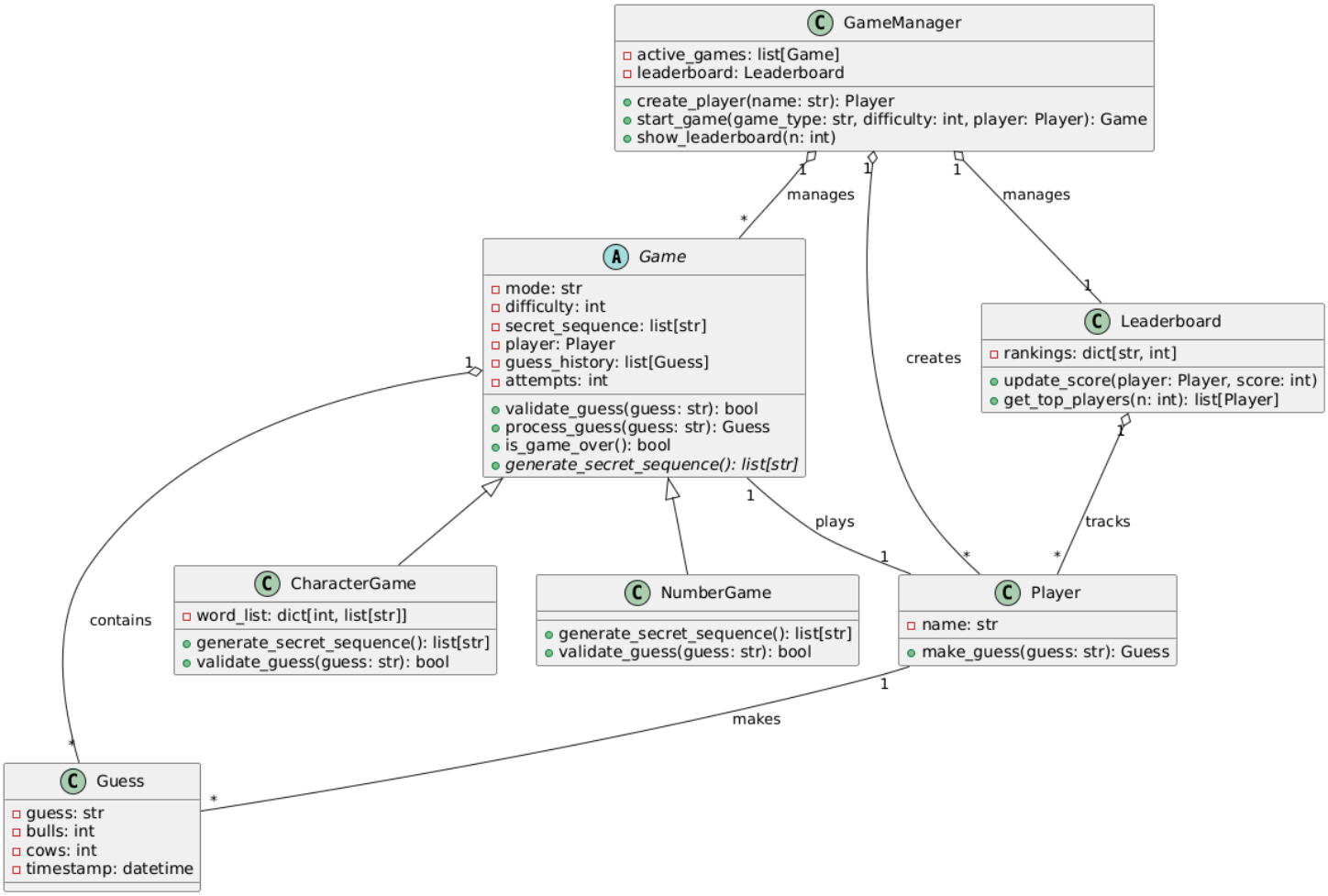
- GameManager manages Leaderboard → Leaderboard exists separately but is managed by GameManager.
- Game contains multiple Guesses → Guess objects exist independently but are tracked by Game.
- Leaderboard tracks multiple Players → Leaderboard maintains Player rankings.

Composition

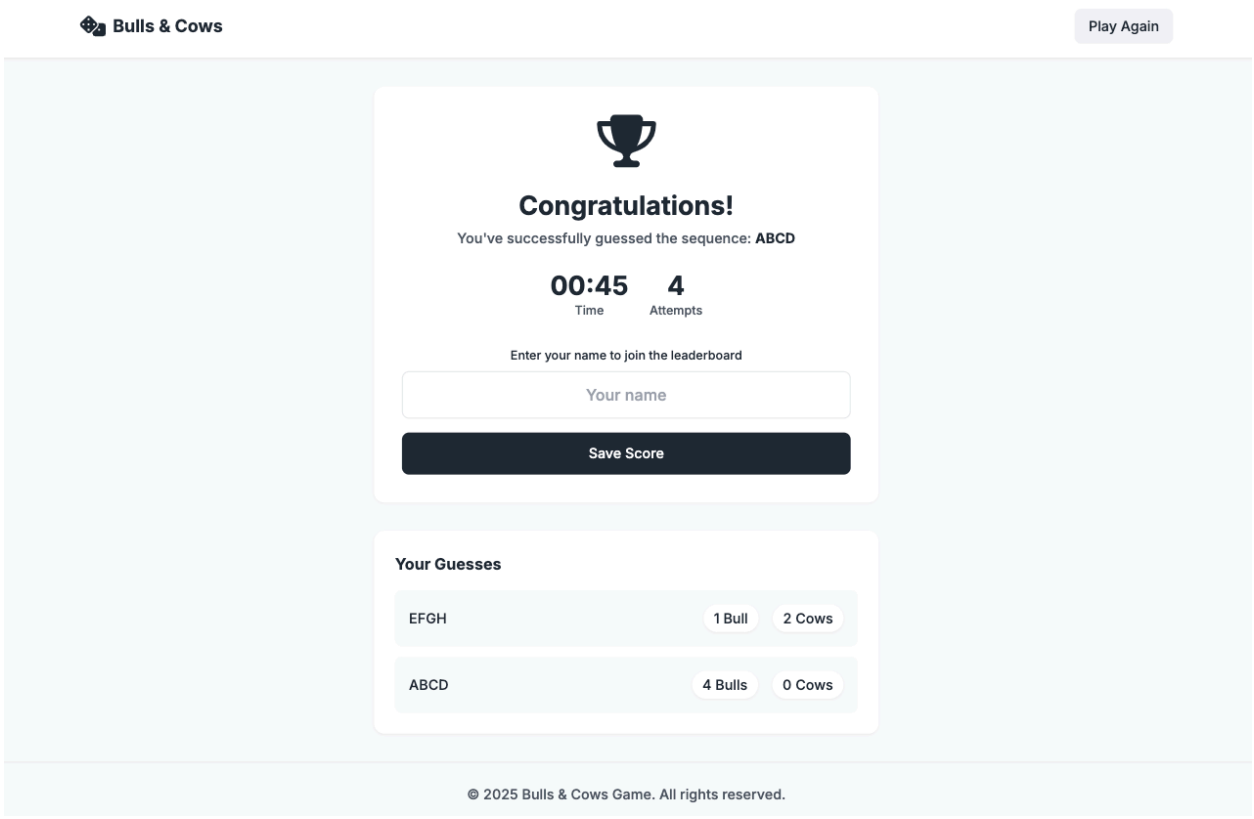
- Game owns Player → Player is directly tied to a Game, and they exist together.

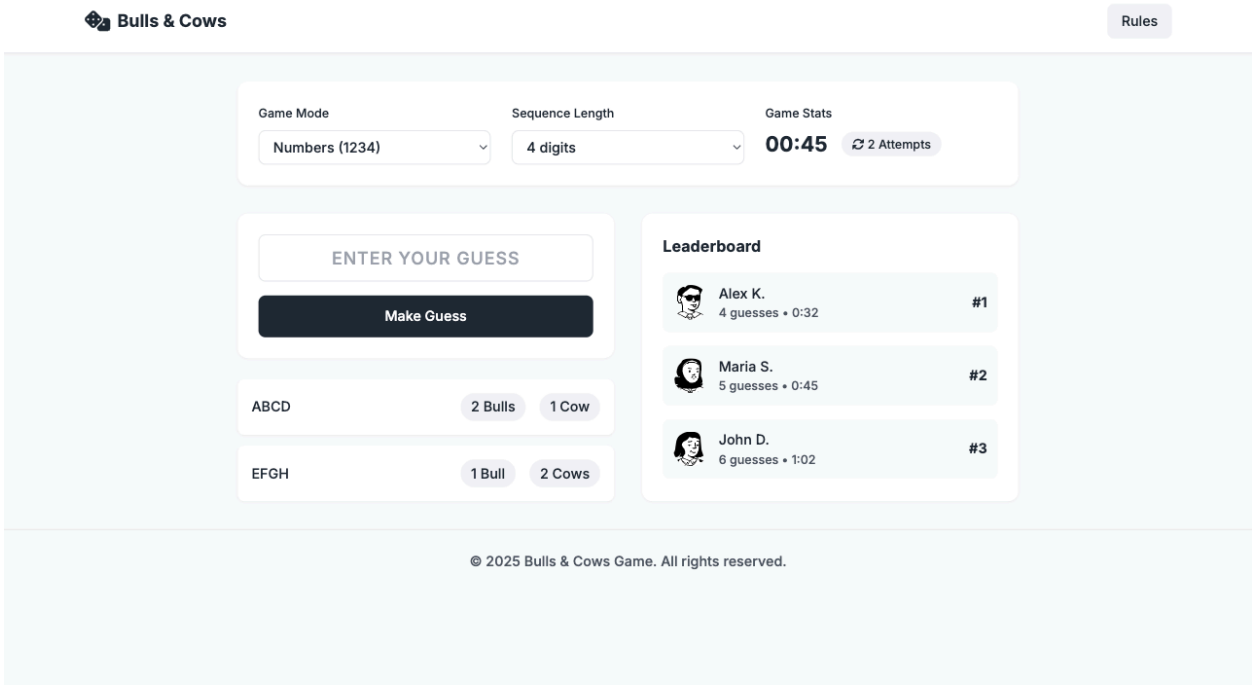
Generalization

- Different game modes inherit from Game → NumberGame and CharacterGame extend Game.



User Interface mockup:





AI Usage

ChatGPT 4o

Prompt: create a business requirement documentation includes intro, Nouns-verbs, Target audience, Rules, Challenge Questions, Summary of Classes, Attributes and Associations (from nouns and verbs) Based on this project proposal. “For the project, I'd like to implement a Bulls and Cows game where users can guess either numbers or characters. This game will provide an interactive and engaging experience by challenging players to deduce a hidden sequence based on feedback. Core Features: Dual Mode Guessing: Players can opt to guess either numbers (e.g., "1234") or characters (e.g., "ABCD") (case insensitive) Real-Time Feedback: The game will instantly return the number of Bulls (correct character in the correct position) and Cows (correct character in the wrong position) after each guess. Customizable Difficulty Levels: Users can choose different sequence lengths (e.g., 3, 4, or 5 characters/numbers). Leaderboard System: A scoring system to track the fastest or least-attempts victories. User Stories: "As a player, I want to choose between number and character-based guessing so that I can enjoy different challenges." "As a player, I want to receive instant feedback on my guesses so that I can refine my strategy and improve my performance." "As a competitive player, I want to see my performance on a leaderboard so that I can track my progress and compete with others." "As a casual gamer, I want to adjust the game difficulty so that I can have a balanced challenge suited to my skill level."