Report Title: ***AI-Based Number Guessing Game Report***

Introduction:

AI-based number guessing games utilize artificial intelligence techniques to enhance traditional gameplay, making it more interactive and engaging. These games often involve the AI attempting to deduce a number chosen by the player through a series of guesses, leveraging algorithms to improve its guessing strategy over time. Overview of AI-Based Number Guessing Game.

- ***Game Concept****: The AI-based number guessing game involves a player selecting a secret number within a defined range, while the AI attempts to guess this number based on the player's feedback*.

- ***Gameplay Mechanics:***
  - ***The player sets a range (e.g., 1 to 100).***
  - ***The AI makes a guess and receives feedback indicating whether the guess is too high, too low, or correct.***
  - ***The AI uses this feedback to adjust its subsequent guesses, employing strategies such as binary search to minimize the number of attempts.***

Implementation Details

- ***Algorithm:***
  - ***The AI starts with a guess in the middle of the range.***
  - ***Based on the feedback, it narrows down the range:***
    - ***If the guess is too high, the AI adjusts the upper limit.***
    - ***If the guess is too low, the AI adjusts the lower limit.***
  - ***This process continues until the AI correctly identifies the number or exhausts its allowed attempts.***

Methodology:

The game employs a binary search algorithm, a highly efficient method for finding a target value within a sorted range. The algorithm works as follows:

- ***Initialization:***

- *The user selects a number within a predetermined range (e.g., 1 to 100).*
- *The computer initializes two variables, low and high, representing the lower and upper bounds of the search range.*

- ***Guessing:***
  - *The computer calculates the midpoint of the current search range: guess = (low + high) // 2.*
  - *The computer presents this guess to the user.*
- ***Feedback and Adjustment:***
  - *The user provides feedback:*
    - *"C" (Correct): The computer has guessed the number. The game ends.*
    - *"H" (High): The user's number is lower than the computer's guess. The computer updates the high variable to guess - 1.*
    - *"L" (Low): The user's number is higher than the computer's guess. The computer updates the low variable to guess + 1.*
  - *The process repeats from the "Guessing" step until the correct number is found.*

Programming Example:

```python
import random

def ai_guess_number(low, high):
    """
    Function for the AI to guess the number using a binary search approach.
    """
    while low <= high:
        guess = (low + high) // 2  # AI guesses the midpoint
        print(f"AI guesses: {guess}")

        feedback = input("Is the guess too high (H), too low (L), or correct (C)? ").strip().upper()

        if feedback == 'C':
            print(f"AI guessed your number {guess} correctly!")
            return
        elif feedback == 'H':
            high = guess - 1  # Adjust the upper bound
        elif feedback == 'L':
            low = guess + 1  # Adjust the lower bound
        else:
            print("Invalid input. Please enter H, L, or C.")

    print("Something went wrong. Please restart the game.")

def main():
    """
    Main function to start the AI-based number guessing game.
    """
    print("Welcome to the AI Number Guessing Game!")
    print("Think of a number between 1 and 100, and I will try to guess it!")
    input("Press Enter when you're ready...")  # Wait for user confirmation

    ai_guess_number(1, 100)  # AI starts guessing between 1 and 100

if __name__ == "__main__":
    main()
```

Benefits of AI Integration

- ***Enhanced User Experience: The AI can adapt its guessing strategy based on player interactions, making the game more engaging and challenging.***
- ***Learning Capability: Over time, the AI can learn from previous games, improving its guessing efficiency and accuracy.***

- ***Dynamic Difficulty Adjustment: The AI can adjust its difficulty level based on the player's skill, providing a tailored gaming experience.***

- ***Conclusion***

- ***AI-based number guessing games represent a fusion of traditional gameplay with modern technology, offering players a unique and interactive experience. By leveraging AI algorithms, these games can provide a more engaging challenge, adapting to player behaviour and preferences.***