User Instructions:

To survey the project, we recommend you first run the .exe version of the game to navigate between the various menus and get a feel for the gameplay. The Game Build folder contains an executable file named Bigfoot\_Breakout.exe. Open the file and after a brief Unity loading screen you will see the games main menu shown below. Watch AI will show just the trained model playing the game. The paddle will play indefinitely, resetting after the ball hits the bottom or when it breaks all of the bricks. To return to the main menu hit the “Return to Main Menu” button located below the game box.

Play Vs AI will take you to the side by side game screen where you will play as the paddle on the right. Use the left and right arrow keys to control your paddle. The game ends when either ball hits the bottom edge of the arenas or when the player has broken all of their bricks. Note: if the test mode option was turned on from the Options page loss conditions are disabled. With this option turned on, return to the main menu by clicking the return button located between the two arenas that is only visible in this mode. After winning or losing the game you will see a game over screen.

From these game over screens you can start a new game by clicking the “Play Again? / Try Again?” buttons, return to the main menu by clicking the “Return to Main Menu” button, or submit your score before picking one of the previous two options. To save a high score simply click on the empty text box and type your name up to 11 characters and then click the submit score button. To view your high scores return to the main menu and click the “High Scores” button which will bring you to this screen:

Scores are shown as Rank: Name: Score, from highest to lowest. Scores are maintained across play sessions but are local to your computer. Clicking the “Clear Highscores” button will erase all saved scores and is irreversible. Return to the main menu by clicking the button underneath the score window.

The Option menu, found by clicking on the “Options” button from the main menu, allows you to turn the player game sounds on and off, change the difficulty level of the AI, and turn test mode on and off. Options are changed by clicking on the On/Off or Easy/Medium/Hard text to the right of their listing. Sound is on by default and only affects the player arena on the Player Vs AI screen. The difficulty level is Easy by default and affects the performance of the AI on both the Watch AI and Player Vs AI screens. To view/play against different difficulty settings you must return to this options menu first. As mentioned, test mode disables loss conditions for both player and AI and is turned off by default.

The “About” Button on the main menu screen will take you to the About page which has written instructions for controlling the paddle in Player Vs AI and information about the project. A button at the bottom of the screen returns you to the main menu. Lastly at the bottom of the main menu screen is the “Exit Program” button. When you are satisfied with your Breakout experience, click this to close the program.

The Zip also contains a folder of the entire Unity project named Bigfoot\_Breakout. To open the project in the Unity editor launch the Unity Hub application, then click the ADD button in the top right corner. Navigate to the Bigfoot\_Breakout folder and click “Select Folder”. Click on the now populated Bigfoot\_Breakout project in Unity to access and inspect the project files. Code can be found within the Assets/Scripts folder, accessed through a file explorer or within the assets window at the bottom of the Unity application. The bulk of the game logic is found within the Ball.cs and Bricks.cs files (Assets/Scripts). The code to initialize and train the agent is found in the PaddleBot.yaml (Assets/Config) file and the AgentTrainer.cs file (Assets/Scripts). The hierarchy of GameObjects can be seen on the left panel, and clicking on individual objects allows for inspection of their component attributes such as Box Collider 2D, which dictate built-in Unity physics and display properties. In the editor, navigate between the game arena and the menus by double clicking on either MainScene or StartMenus within the Assets/Scenes folder. To run the game within the editor, start the project in Unity and press the play button at the top of the screen. Navigate to the training scene (Assets/Scenes) and press play to see the actual ML agent learning environment in action with 12 AI controlled paddles. Navigate to the prefabs folder (Assets/Prefabs) to see the objects we instantiated multiple times throughout the project. We have also included a results file for the Hard difficulty brain (/Results).