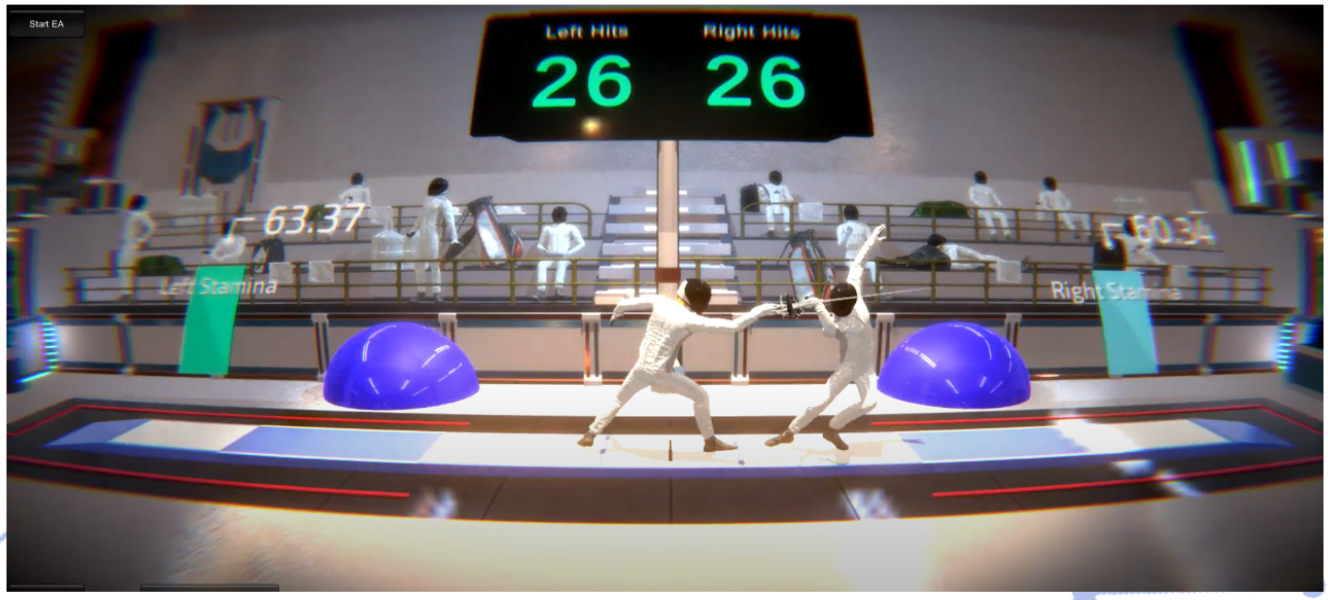
Fencing AI; NeuroEvolution of Augmenting Topologies (NEAT) towards Competition and Survival of the Fittest in a Fencing Simulation

by Abesamis et al.



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USER MANUAL

December 2021

DISCLAIMER

This simulation software project, its corresponding documentation entitled “Fencing AI; NeuroEvolution of Augmenting Topologies (NEAT) towards Competition and Survival of the Fittest in a Fencing Simulation”, and Manual is submitted to the College of Information and Communications Technology, West Visayas State University, in partial fulfillment of the requirements for the degree, Bachelor of Science in Computer Science. It is the product of our own work, except for the utilization of the already existing UnitySharpNEAT.

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Alyssa Danielle R. Magallanes

Neil Ryan S. Sustiguer

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1 GETTING STARTED

1.1 INTRODUCTION

Hello! This is a Unity3D Project created by BSCS Students of West Visayas State University - College of Information and Communications Technology. This Unity3D project utilizes UnitySharpNeat and serves as the algorithm for the Fencing Simulation the developers have made.

This document will serve as a channel to the paper, links to the Github repository & Executable file, and as a manual for use of the executable file and for the simulation within the Unity3D application.

Link to Github Thesis Repository:
https://github.com/FrozenSonar/Fencing3DNEAT

Link to the final build zipped file and paper:
https://drive.google.com/drive/folders/1mlEMZo0JCix7MH8l94t7D82uySp1KGjP?usp=sharing

2 SYSTEM REQUIREMENTS

2.1 FOR UNITY3D 2021.1.10f1 EDITOR:

(From the Unity-Manual: System Requirements Page, https://docs.unity3d.com/2021.1/Documentation/Manual/system-requirements)

Minimum requirements	Windows
Operating system version	Windows 7 (SP1+), Windows 10, and Windows 11, 64-bit versions only.
CPU	X64 architecture with SSE2 instruction set support
Graphics API	DX10, DX11, and DX12-capable GPUs
Additional requirements	Hardware vendor officially supported drivers
	For all operating systems, the Unity Editor is supported on workstations or laptop form factors, running without emulation, container or compatibility layer.

2.2 FOR UNITY NEAT PROJECT EXECUTABLE:

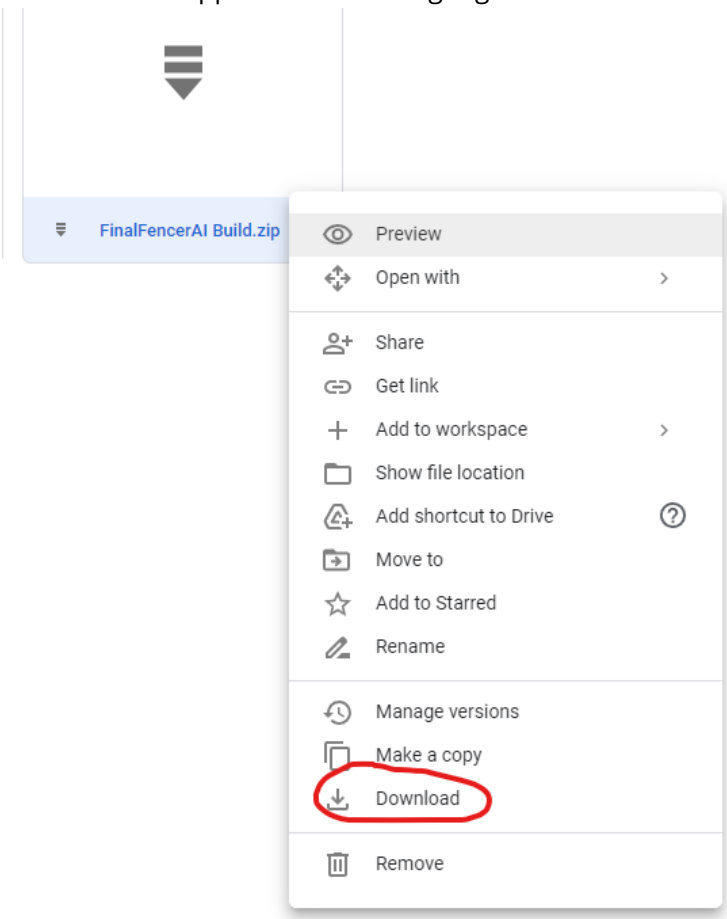
MINIMUM:
Requires a 32-bit processor and operating system
OS: Windows 7
Processor: Intel Core2Duo 2.66GHz
Memory: 2 GB RAM
Graphics: GTX 780
DirectX: Version 10
Storage: 400 MB available space

RECOMMENDED:
Requires a 64-bit processor and operating system
OS: Windows 10
Processor: Intel Core i5 6600 or AMD Ryzen 1600x
Memory: 4 GB RAM
Graphics: NVIDIA Geforce GTX 1060, 3 GB (Legacy: NVIDIA Geforce GTX 780, 4GB) or AMD RX 580, 4 GB (Legacy: AMD R9 290X, 4GB)
DirectX: Version 12
Storage: 400 MB available space

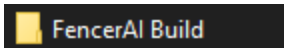
3 INSTALLATION & USAGE (PER MAIN FEATURE)

3.1 FOR UNITY NEAT PROJECT EXECUTABLE:

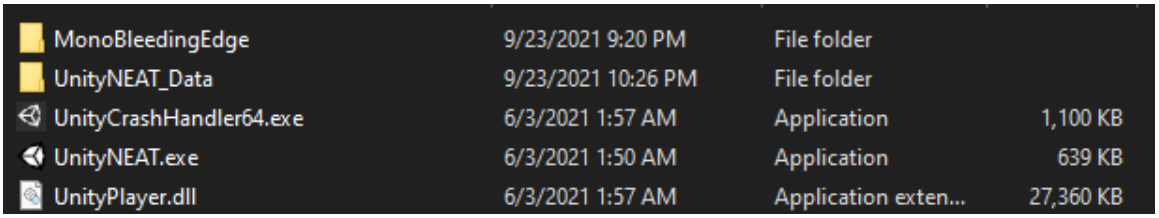
1. Download the zipped file from the google drive link of the final build.



2. Extract the folder and its content from the zipped file.

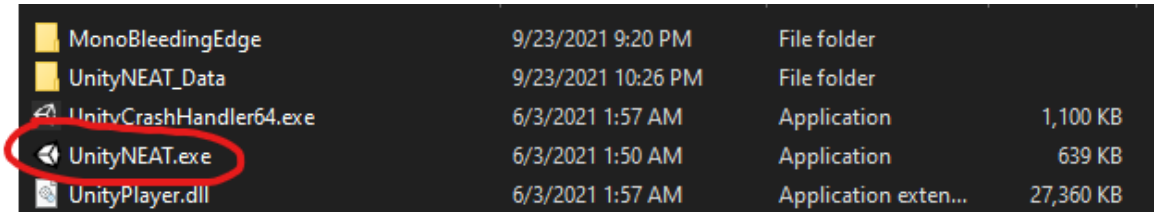


3. Go into the extracted FencerAIBuild Folder.



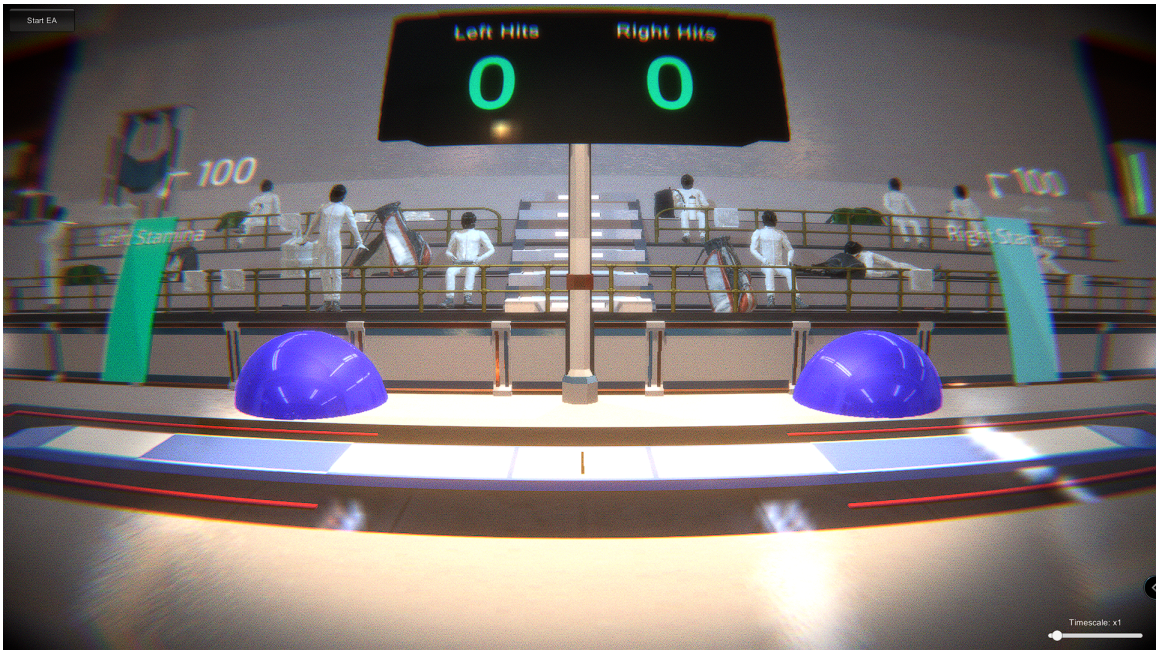
MonoBleedingEdge	9/23/2021 9:20 PM	File folder	
UnityNEAT_Data	9/23/2021 10:26 PM	File folder	
UnityCrashHandler64.exe	6/3/2021 1:57 AM	Application	1,100 KB
UnityNEAT.exe	6/3/2021 1:50 AM	Application	639 KB
UnityPlayer.dll	6/3/2021 1:57 AM	Application exten...	27,360 KB

4. Launch the UnityNEAT.exe file

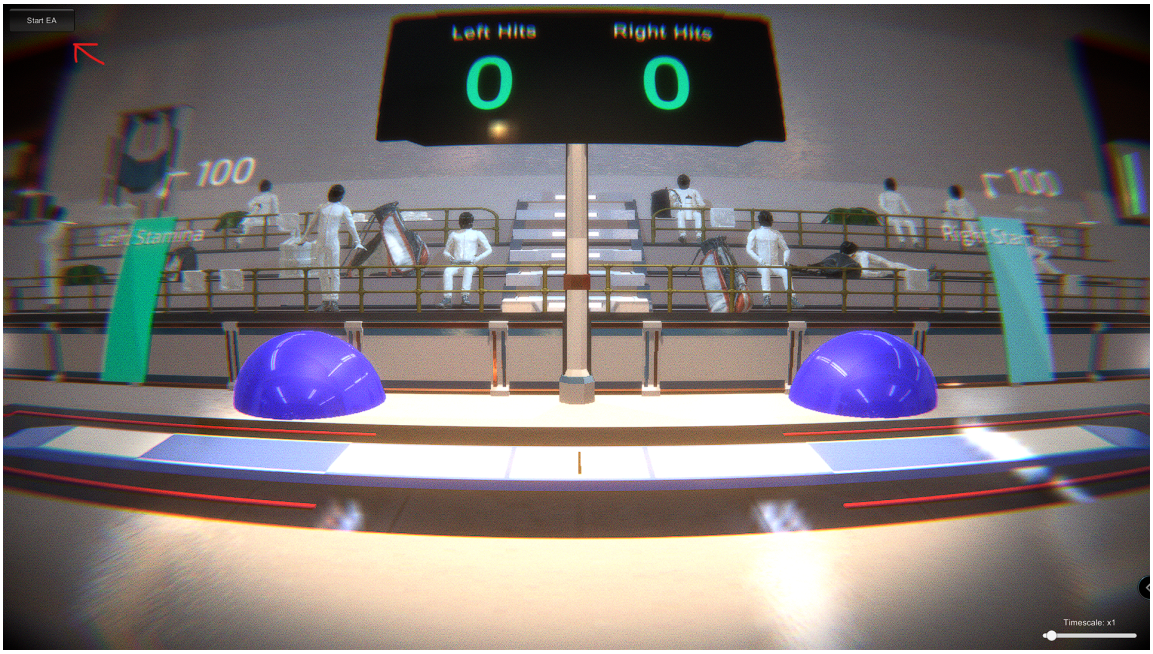


MonoBleedingEdge	9/23/2021 9:20 PM	File folder	
UnityNEAT_Data	9/23/2021 10:26 PM	File folder	
UnityCrashHandler64.exe	6/3/2021 1:57 AM	Application	1,100 KB
UnityNEAT.exe	6/3/2021 1:50 AM	Application	639 KB
UnityPlayer.dll	6/3/2021 1:57 AM	Application exten...	27,360 KB

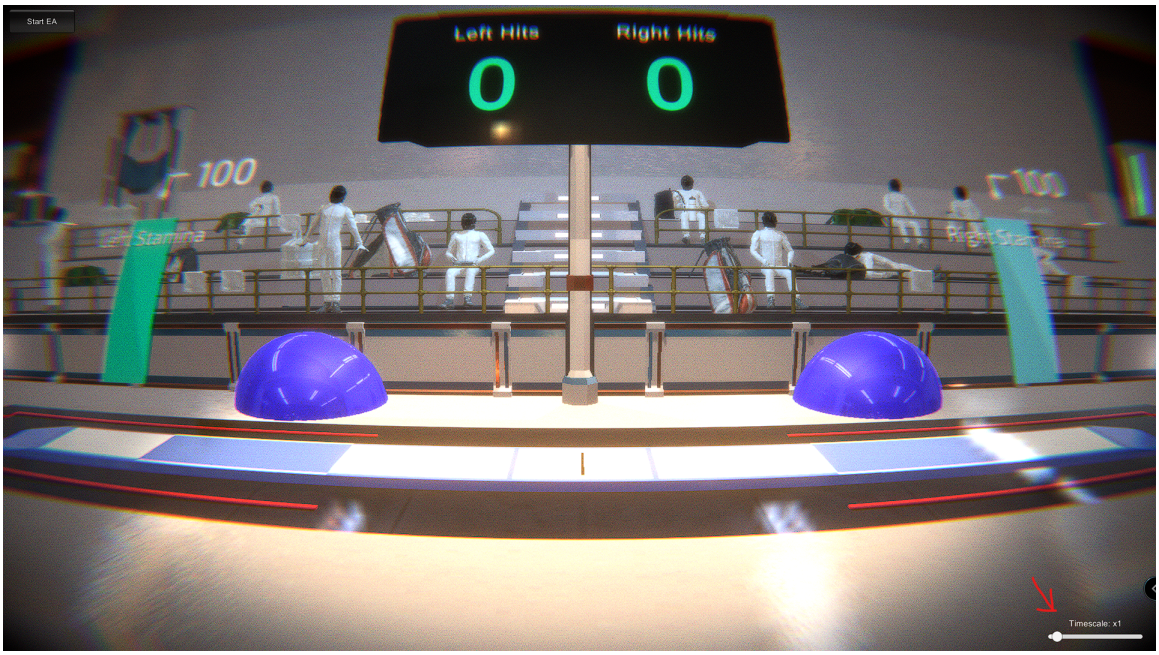
5. You will be greeted with a screen that shows the whole simulation in idle.



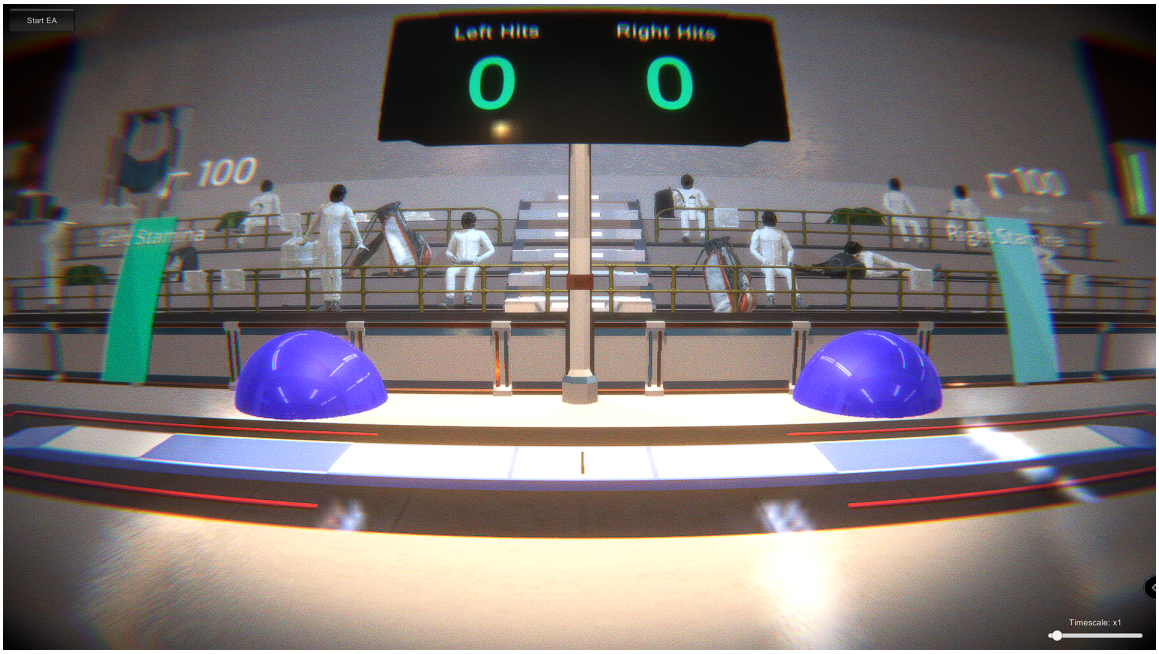
6. It has a button on the top left corner that says: Start EA (which starts the simulation).

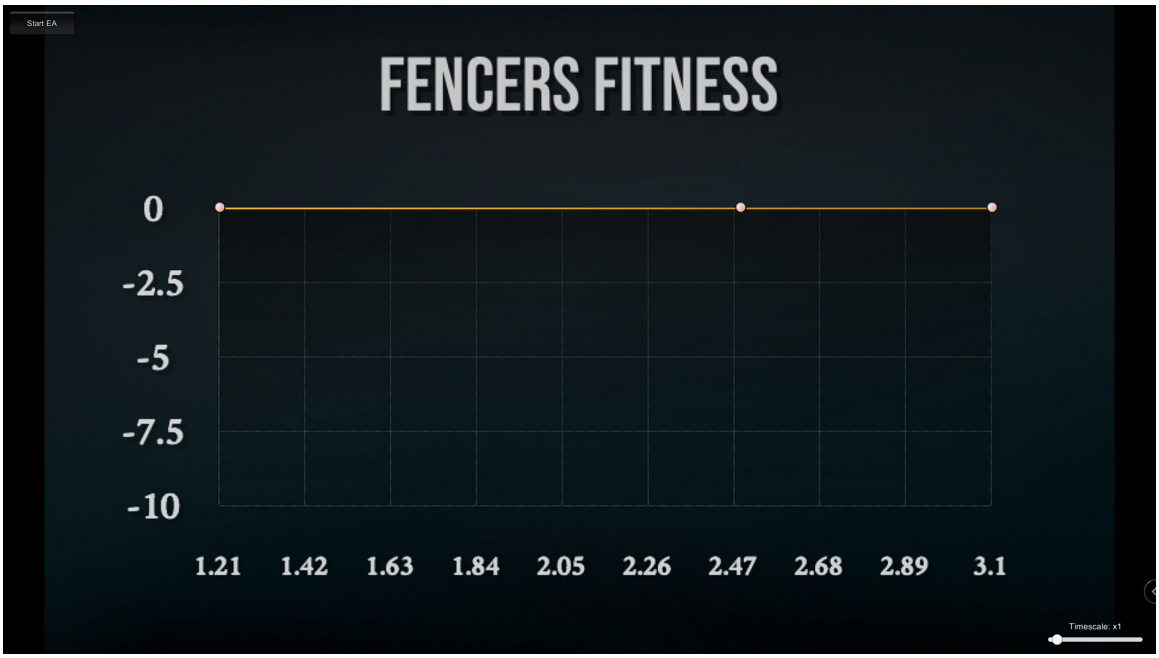


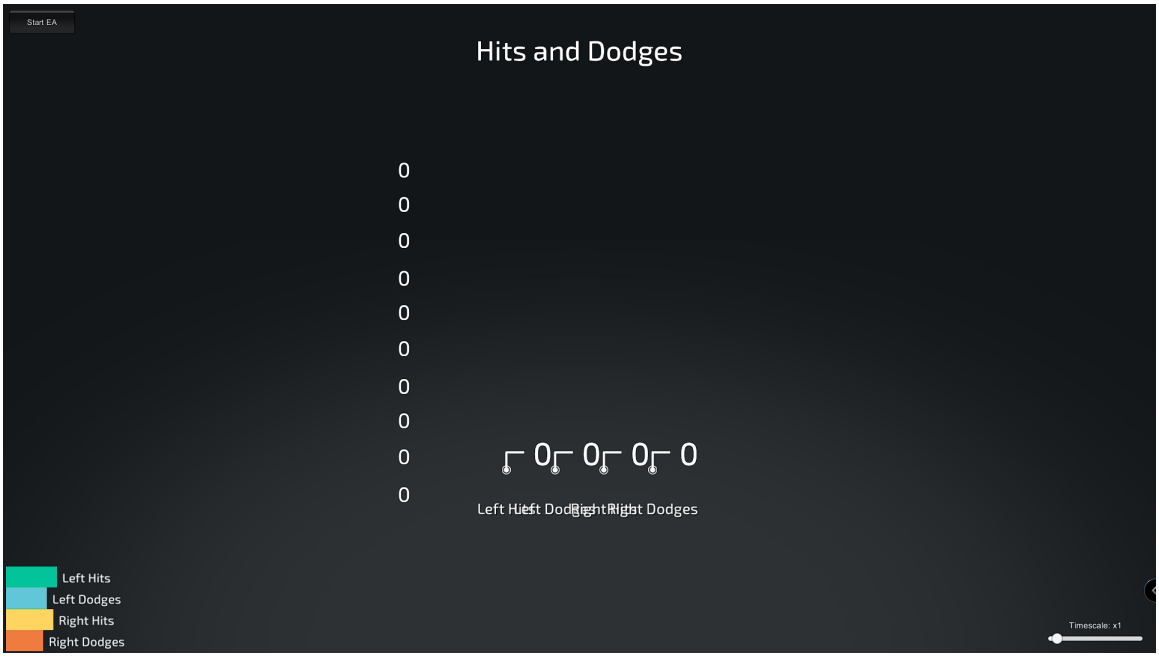
7. A draggable timescale on the bottom right corner to fast forward the simulation.

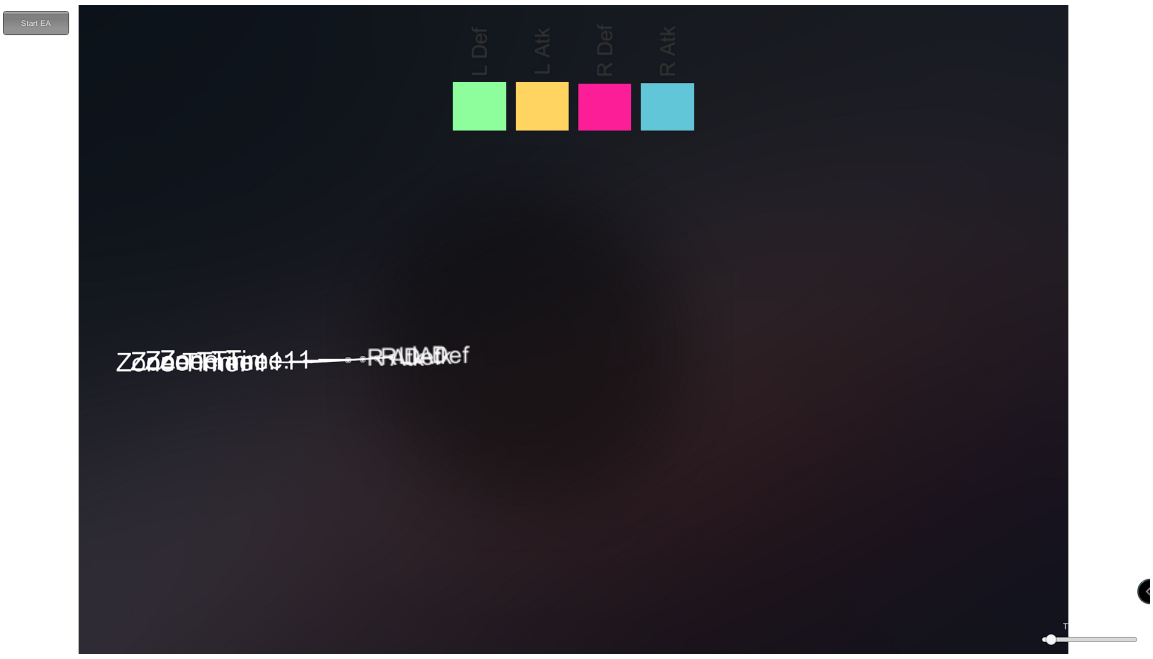


8. You can also press the numbers 1-4 to change the camera view from (#1) simulation in play, (#2) Graph View for Fencer Fitness, (#3) Bar Graph view for Fencer hits and dodges, (#4) Pie Graph view for fencer attack and defense zone times.




Start EA
FENCERS FITNESS
0
-2.5
-5
-7.5
-10
1.21
1.42
1.63
1.84
2.05
2.26
2.47
2.68
2.89
3.1
Timescale: x1


Start EA
Hits and Dodges
0
0
0
0
0
0
0
0
0
0
0
0
0
0
Left Hits
Left Dodges
Right Hits
Right Dodges
Timescale: x1

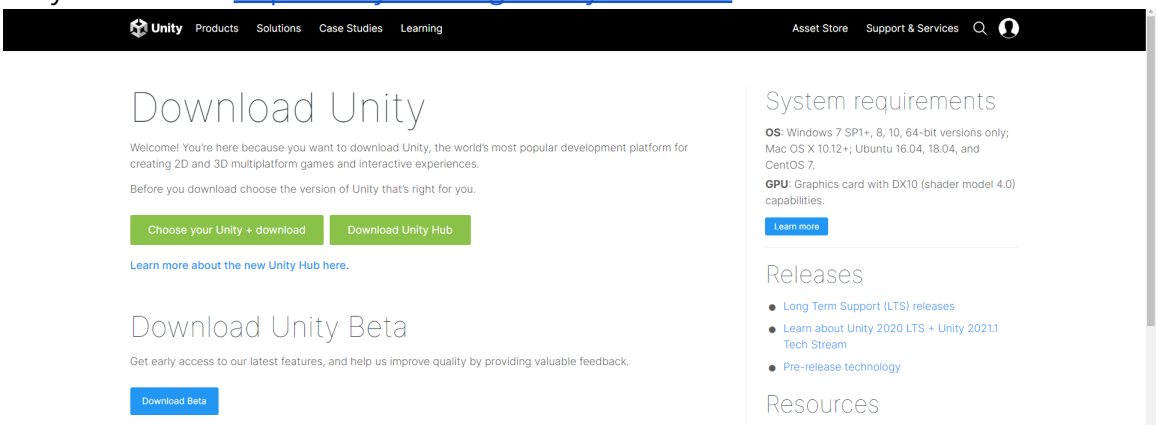


9. To reset the simulation you should exit the executable via the ALT + F4 command and for a rerun, you need to run the executable file again.

NOTE: This is just an application of the Algorithm, to get the data it has to be within the confines of the Unity3DEngine Application.

3.2 BEFORE USE IN UNITY3D APPLICATION:

1. Download the Unity3D Editor Application and the UnityHub for ease of access to Unity3D files. Link: https://unity3d.com/get-unity/download

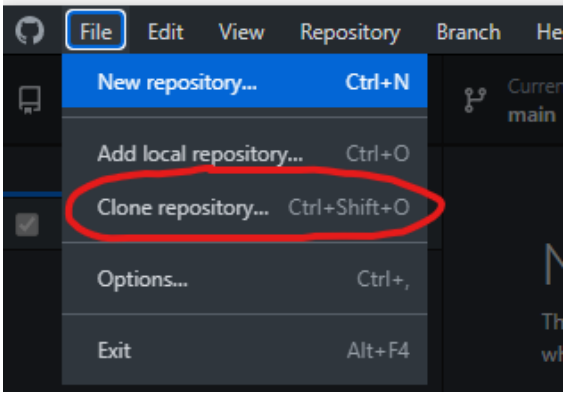


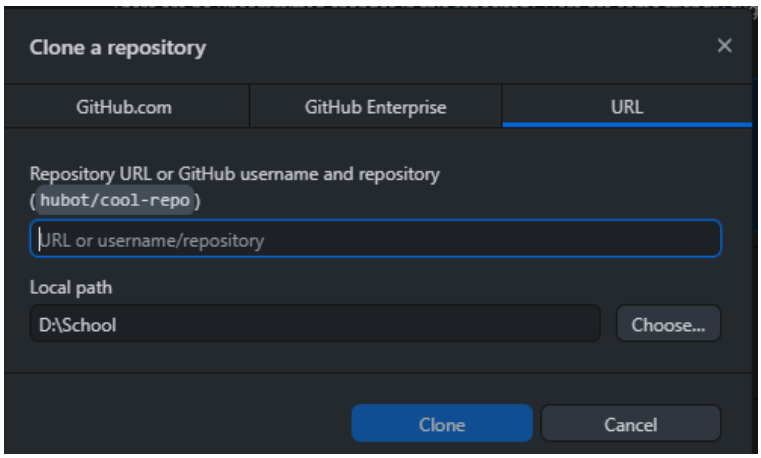
NOTE: For optimal performance the Unity Version we recommend is 2021.1.10f1

3.3 GET REPOSITORY FILES:

There are two ways to get the repository files:

2. Download the Github Desktop application and clone the main repository using the link of the Thesis Github Repository.
Link to Github Desktop: https://desktop.github.com/

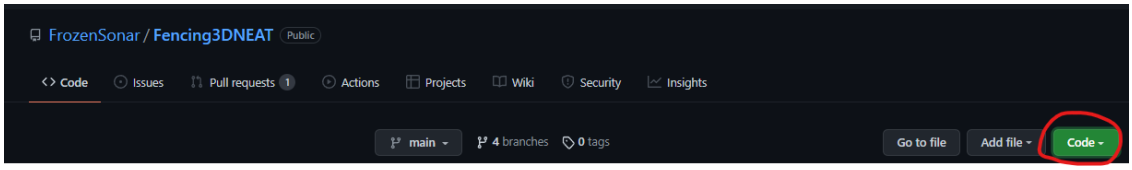


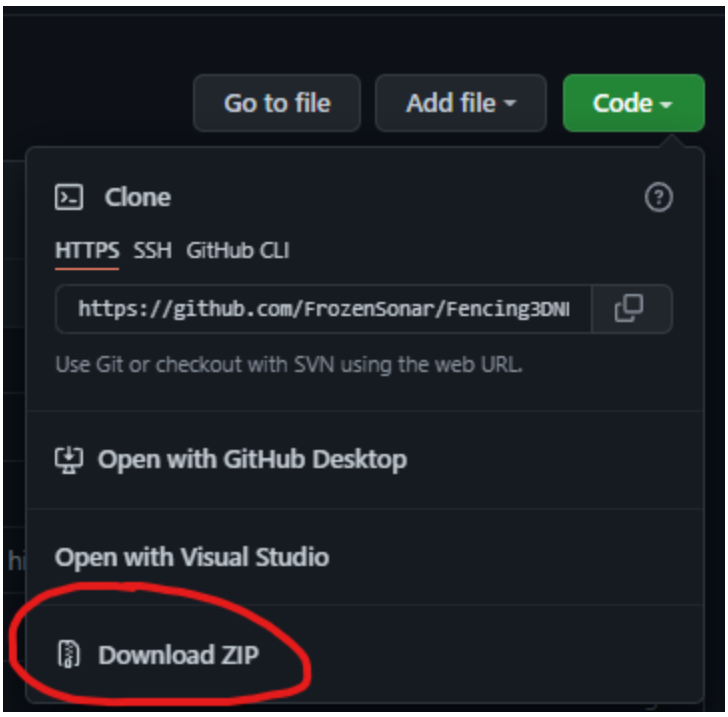


NOTE: Cloning a repository needs a constant internet connection, this may take several minutes to do so.

or

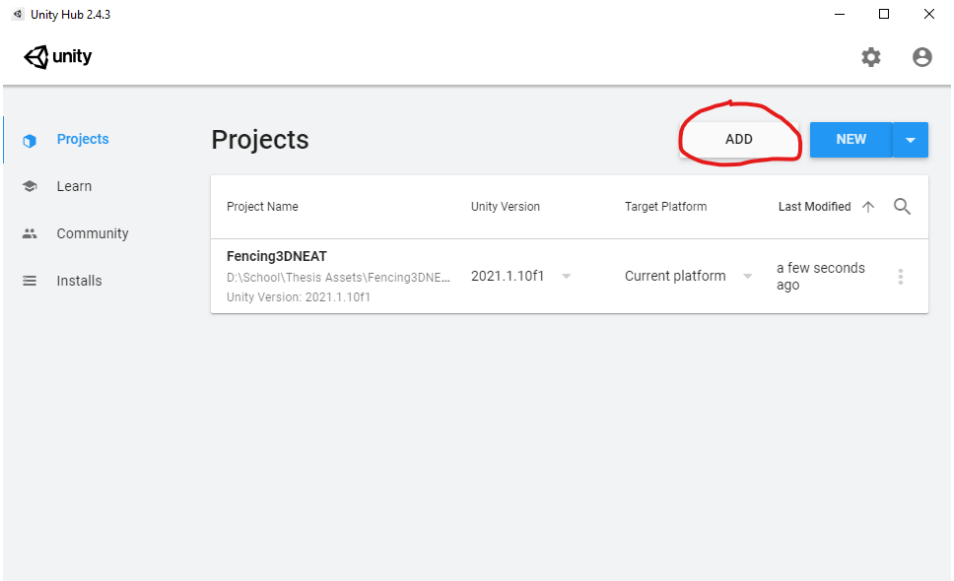
Click the Code button on the main page of the repository, download them, and then unpack them to the desired directory.

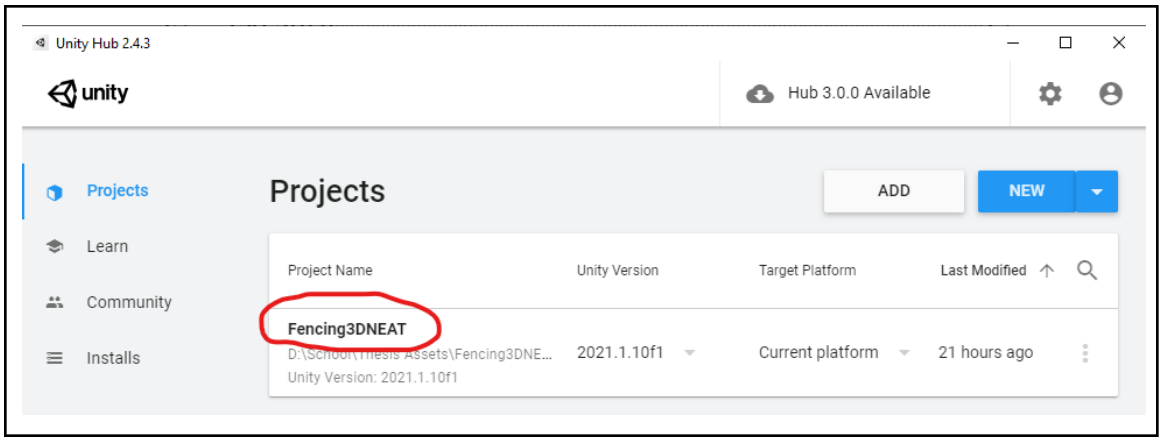




3.4 FOR USE IN UNITY3D EDITOR APPLICATION:

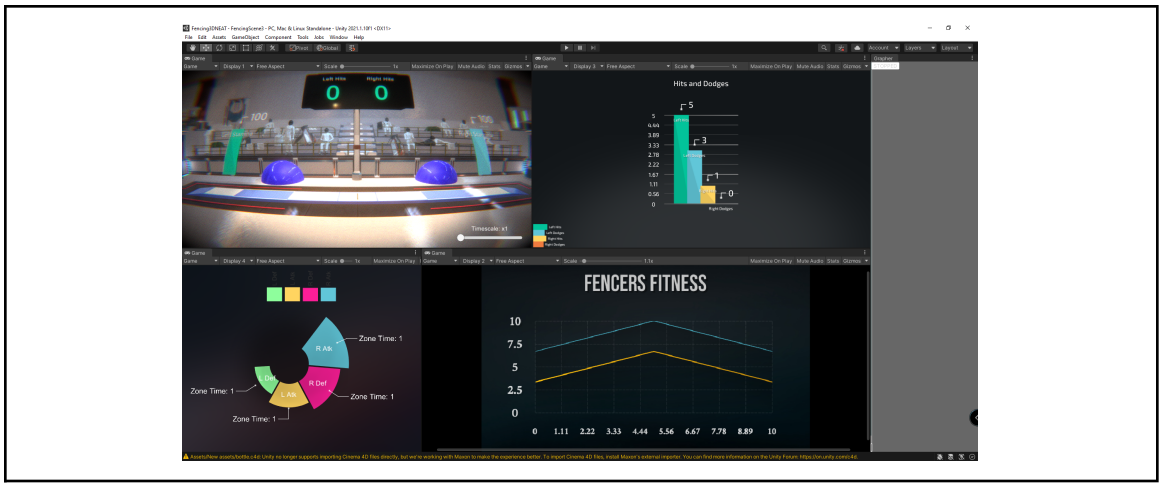
1. Add in the project by pressing the ADD button within UnityHub and locate the directory where you have put the project folder in.



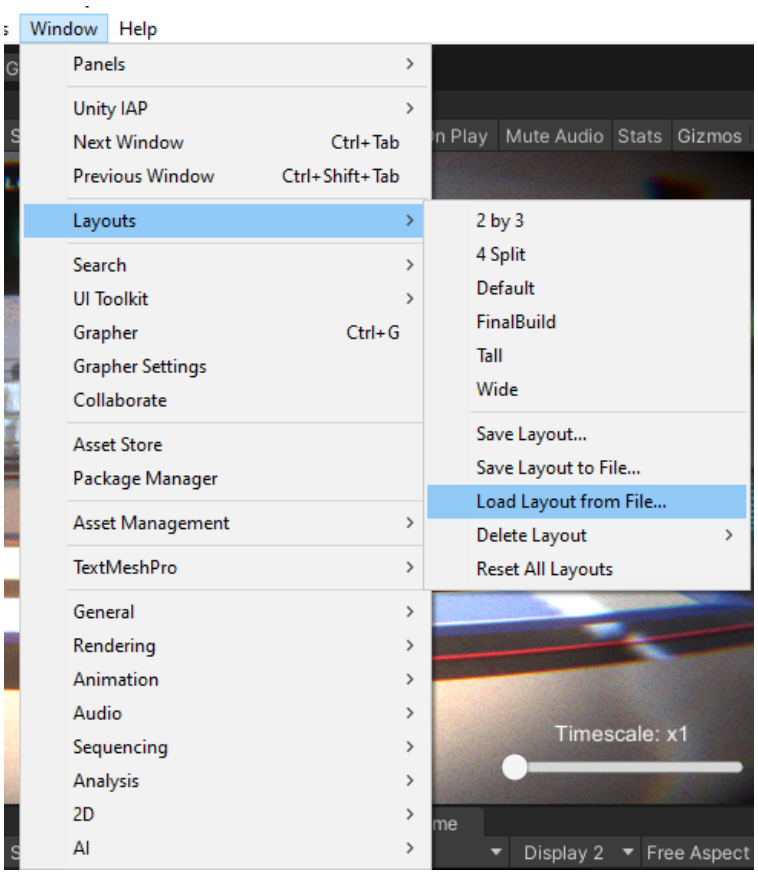


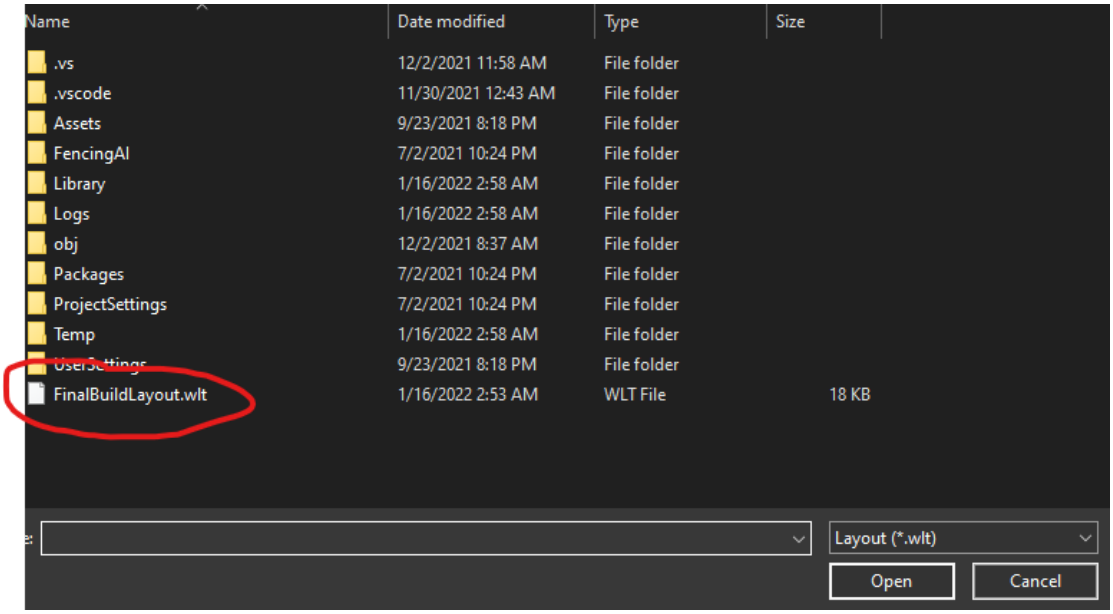
2. Open the project named 'Fencing3DNeat' from the Unity Hub.

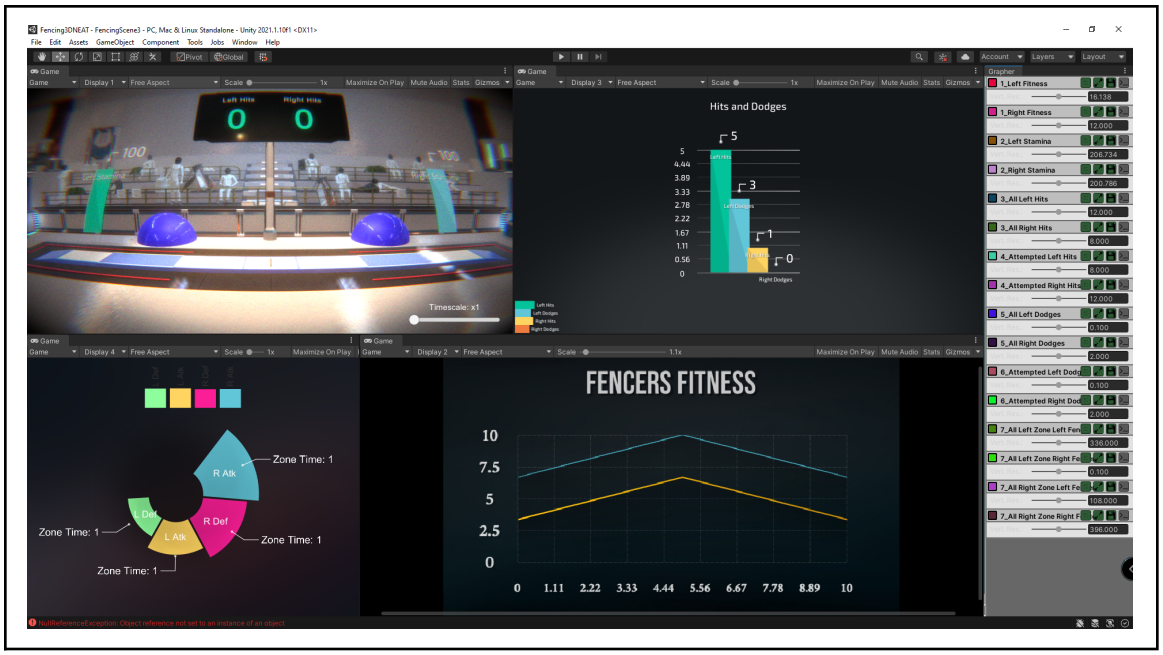
3. You should be greeted by the game project on idle.



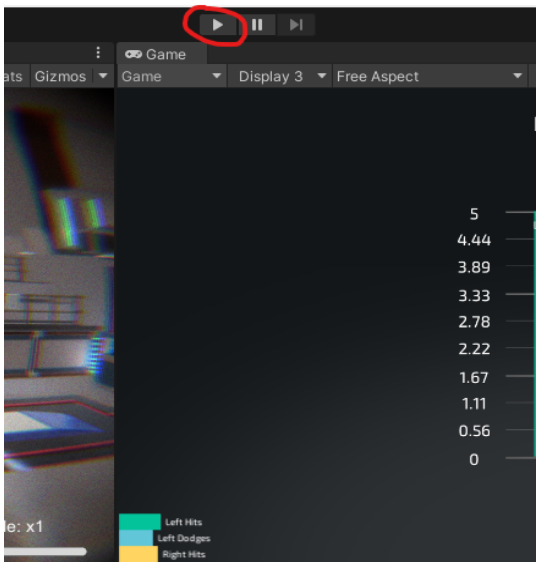
4. Position the project shown in the picture below or go to the window tab and select layouts -> Load Layout from file -> FinalBuildLayout.wlt


Window
Help
Panels
Unity IAP
Next Window Ctrl+Tab
Previous Window Ctrl+Shift+Tab
Layouts
Search
UI Toolkit
Grapher Ctrl+G
Grapher Settings
Collaborate
Asset Store
Package Manager
Asset Management
TextMeshPro
General
Rendering
Animation
Audio
Sequencing
Analysis
2D
AI
2 by 3
4 Split
Default
FinalBuild
Tall
Wide
Save Layout...
Save Layout to File...
Load Layout from File...
Delete Layout
Reset All Layouts
Mute Audio
Stats
Gizmos
Timescale: x1
Display 2
Free Aspect

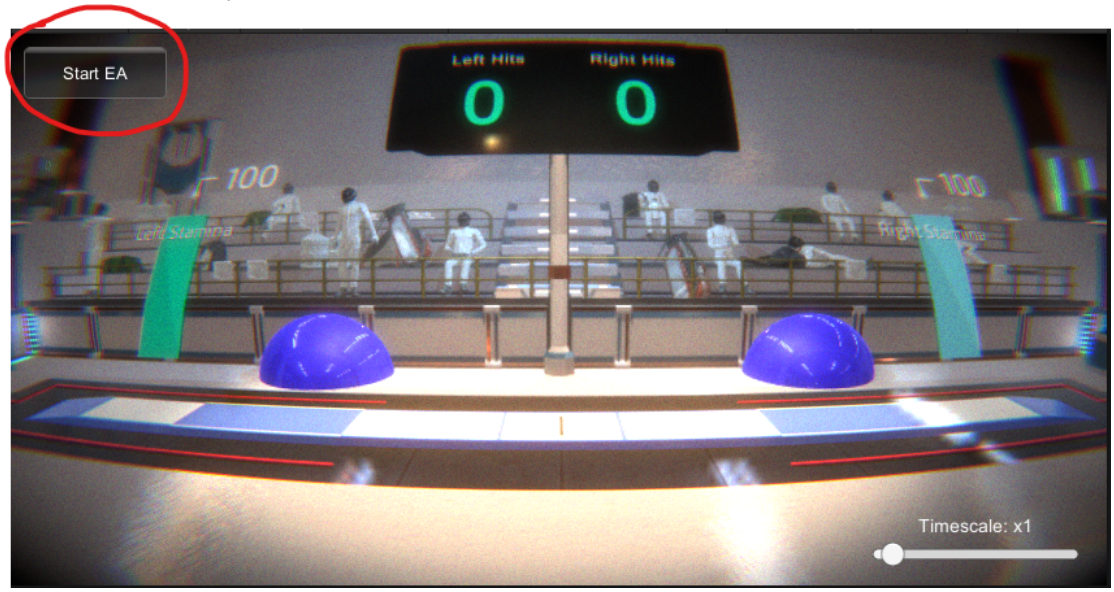

Name
Date modified
Type
Size
.vs 12/2/2021 11:58 AM File folder
.vscode 11/30/2021 12:43 AM File folder
Assets 9/23/2021 8:18 PM File folder
FencingAI 7/2/2021 10:24 PM File folder
Library 1/16/2022 2:58 AM File folder
Logs 1/16/2022 2:58 AM File folder
obj 12/2/2021 8:37 AM File folder
Packages 7/2/2021 10:24 PM File folder
ProjectSettings 7/2/2021 10:24 PM File folder
Temp 1/16/2022 2:58 AM File folder
UserSettings 9/23/2021 8:18 PM File folder
FinalBuildLayout.wlt 1/16/2022 2:53 AM WLT File 18 KB
Layout (*.wlt)
Open
Cancel



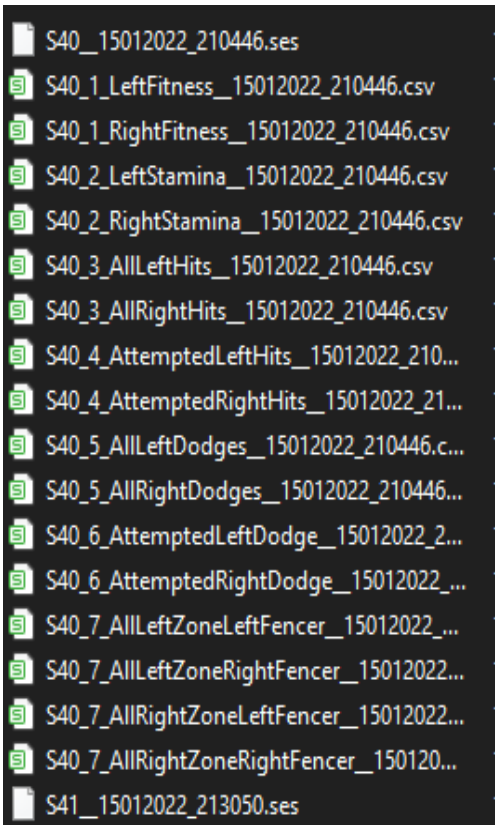
5. To start the simulation press the play button on top.



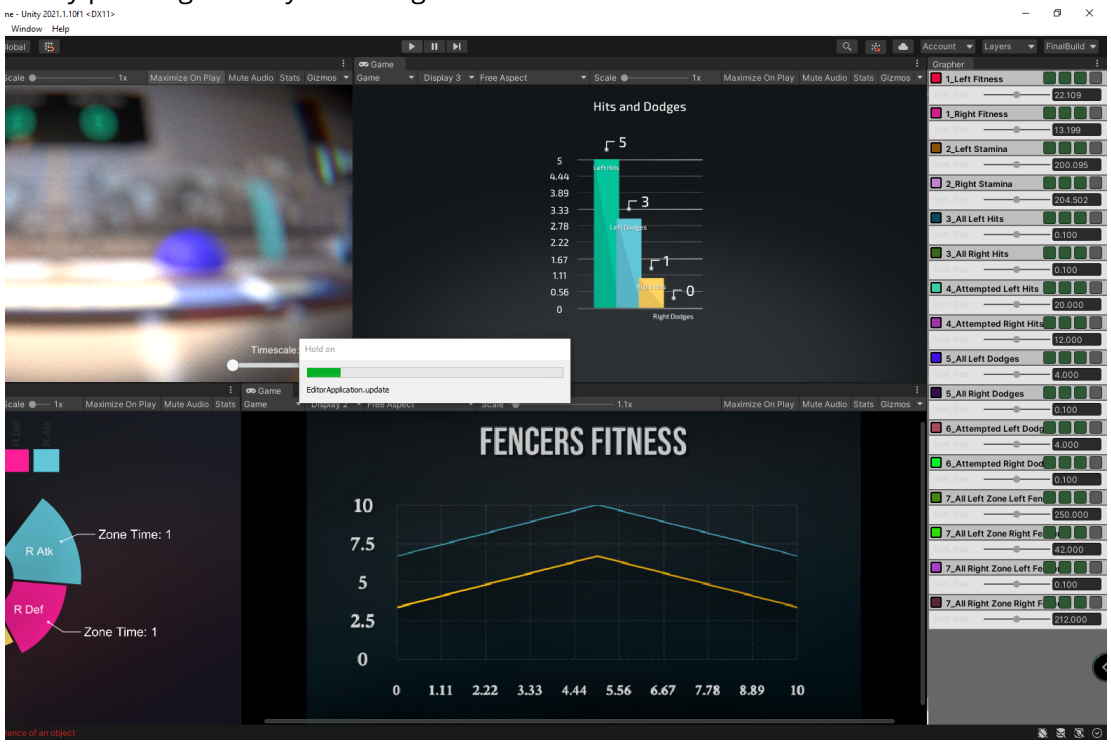
And then press Start EA within the main Game Window



6. When the "Start EA" button has been pressed make sure the Grapher window on the right side has the Save Icon on green for you to be able to save and check on the data later within the path: C:\Users\User\AppData\Local\Temp\DefaultCompany\UnityNEAT (path variables varies from system to system)



7. To stop the simulation and save the data just press the Play button on top again and wait while the application saves the data (this may take several minutes depending on how long you let the simulation go) shown in the picture below. After that, you may do another run by pressing the Play button again.



4 TROUBLESHOOTING FOR FIXING POSSIBLE BUGS

- If the fencing model's hitbox seems to clip or stack into each other, it's the animation's and unity's physics engine's limitations due to the complex system of NEAT

4.1 FOR UNITY NEAT PROJECT EXECUTABLE:

- So far there are no known bugs in the executable file, but if ever the application freezes or encounters a problem try these possible fixes:
  Closing (alt+f4) and reopening the application
- If you wish to refresh the simulation for a different model, just simply close (alt+f4) and reopen the application

4.2 FOR USE IN UNITY3D EDITOR APPLICATION:

- Make sure to use the **2021.1.10f1 Unity** version for best performance
- If the simulation has performance issues on your machine, make sure your machine reaches the minimum requirements.
- If the data isn't saved, make sure the Save icon on the Grapher is toggled on.

5 FAQ (Frequently Asked Questions)

- Do you need Unity to run the simulation?
  - For the executable, it's already stand-alone, so you don't have to install Unity.
  - If you want to gather the data though, installing Unity and cloning the repository above is required to get the data.

- Why is the simulation Slow/Fast?
  - You check the draggable time scale if you put it at the lowest possible or at the fastest possible time.

- Where did you find the animations, models, and assets?
  - The animations and graphics assets can be found in Mixamo and the Unity Asset Store.

- How are you able to extract the data from the fencers?
  - You cannot extract the data from the executable file, however, you may do so in the Unity Editor itself. Refer to the Step 3.4 FOR USE IN UNITY3D EDITOR APPLICATION

6 Contact details of the development team/thesis group

6.1 Thesis Members:

- Abesamis, Bryan Kent
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- Diosaban, Timothy
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- Sustiguer, Neil Ryan
  📧:neilryan.sustiguer@wvsu.edu.ph

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