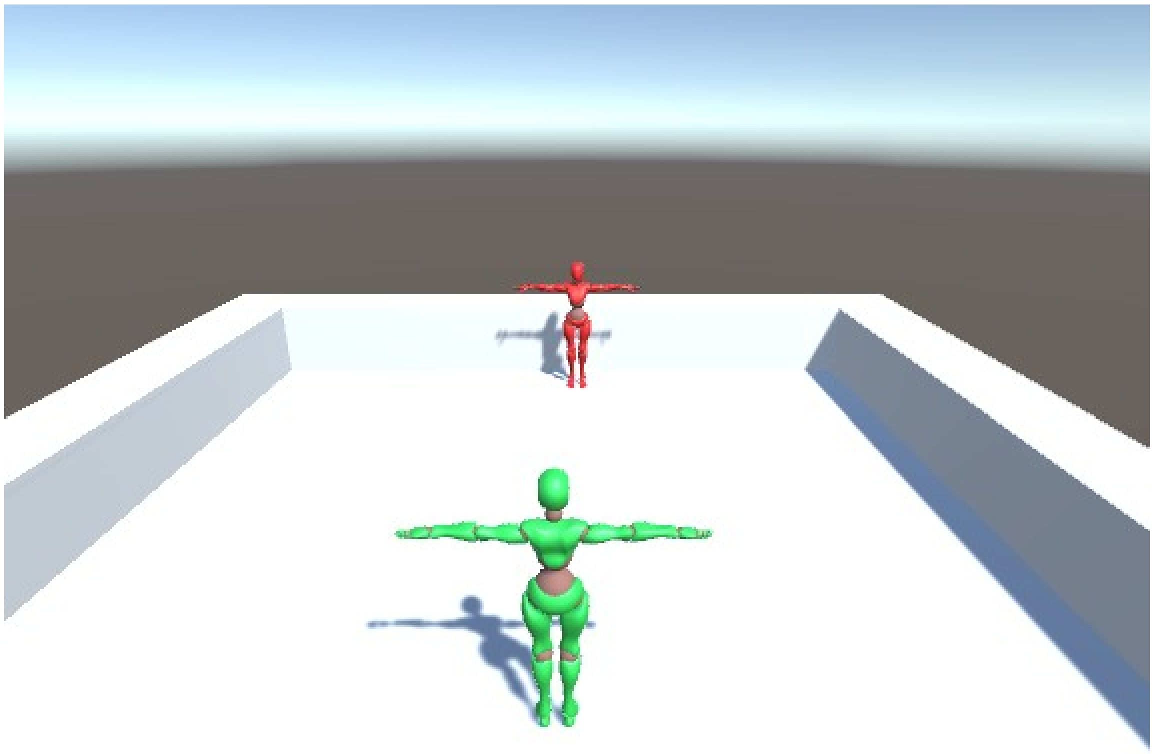
Lab 5 : Setting Up Animations and Game Mechanics

Follow these step-by-step instructions to complete the lab tasks.

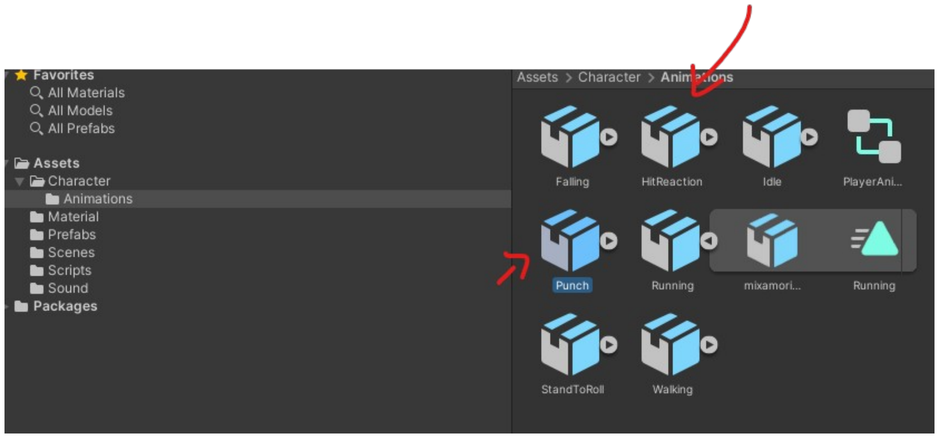
Open the git assignment :
https://classroom.github.com/a/u1C4vjaH



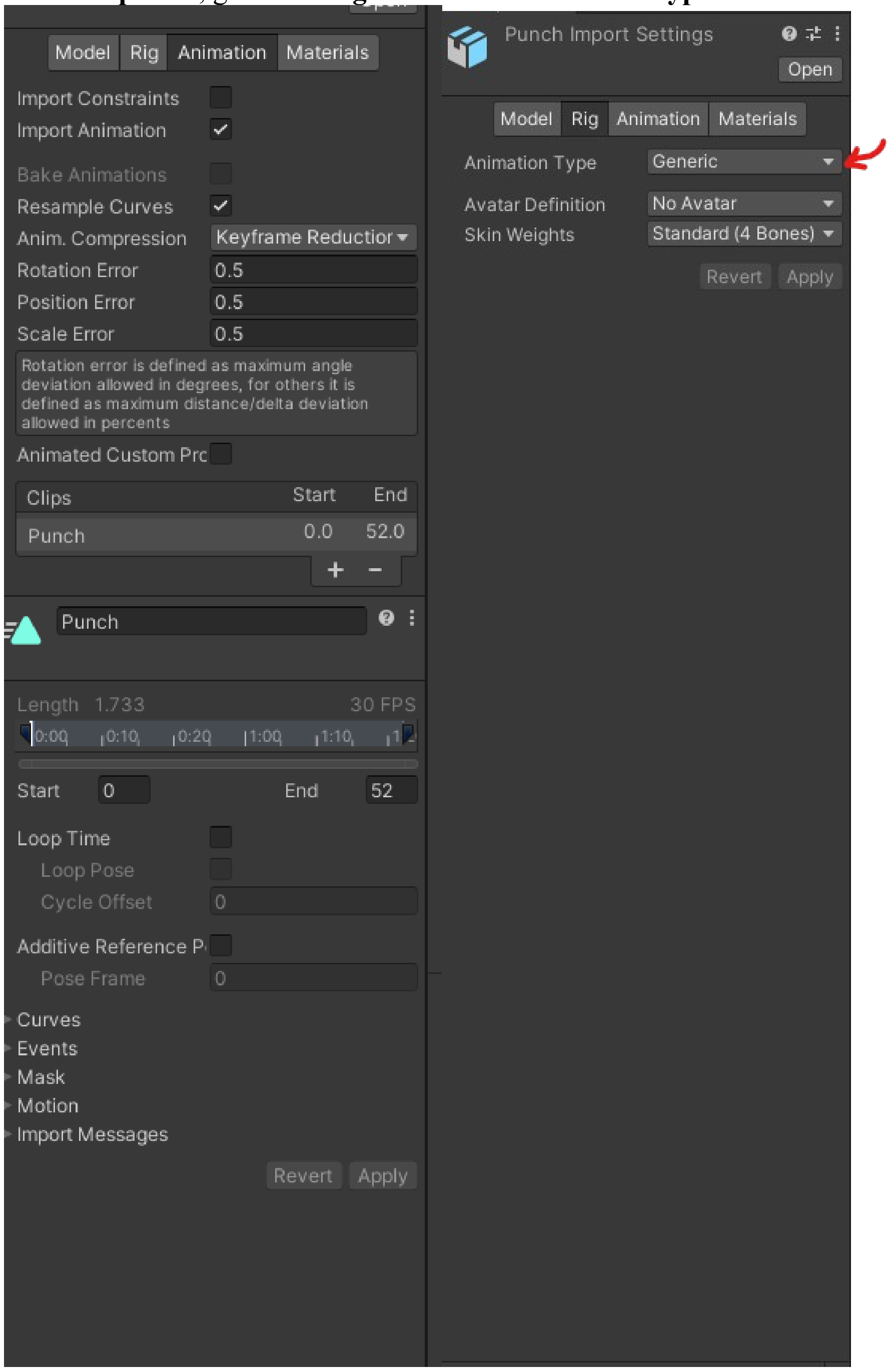
Setup the Punch and Hit Reaction Animation

1. **Set Up Animations:**

- Select each animation file.



In the **Inspector**, go to the **Rig** tab and set **Animation Type** to **Humanoid**.



Import Constraints ☐
Import Animation ✓
Bake Animations ☐
Resample Curves ✓
Anim. Compression: Keyframe Reductior
Rotation Error: 0.5
Position Error: 0.5
Scale Error: 0.5

Rotation error is defined as maximum angle deviation allowed in degrees, for others it is defined as maximum distance/delta deviation allowed in percents

Animated Custom Prc ☐

Clips	Start	End
Punch	0.0	52.0

Punch

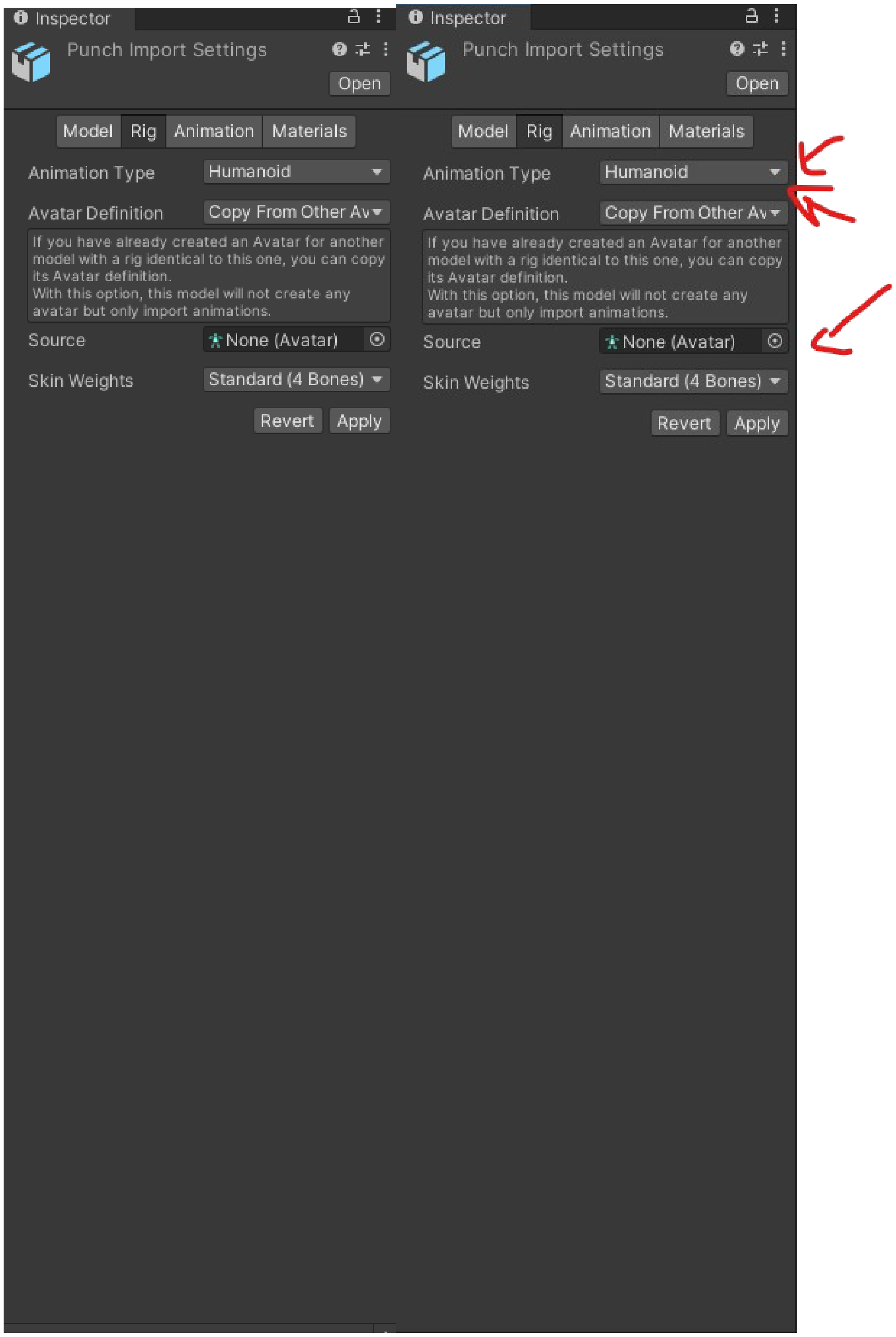
Length 1.733 30 FPS

Start 0 End 52

Loop Time ☐
Loop Pose ☐
Cycle Offset 0
Additive Reference P ☐
Pose Frame 0

Animation Type: Generic
Avatar Definition: No Avatar
Skin Weights: Standard (4 Bones)

Set **Avatar Definition** to **Copy From Other Avatar**.



Inspector

Punch Import Settings

Open

Model | Rig | Animation | Materials

Animation Type: Humanoid

Avatar Definition: Copy From Other Av

If you have already created an Avatar for another model with a rig identical to this one, you can copy its Avatar definition.
With this option, this model will not create any avatar but only import animations.

Source: None (Avatar)

Skin Weights: Standard (4 Bones)

Revert | Apply

Inspector

Punch Import Settings

Open

Model | Rig | Animation | Materials

Animation Type: Humanoid

Avatar Definition: Copy From Other Av

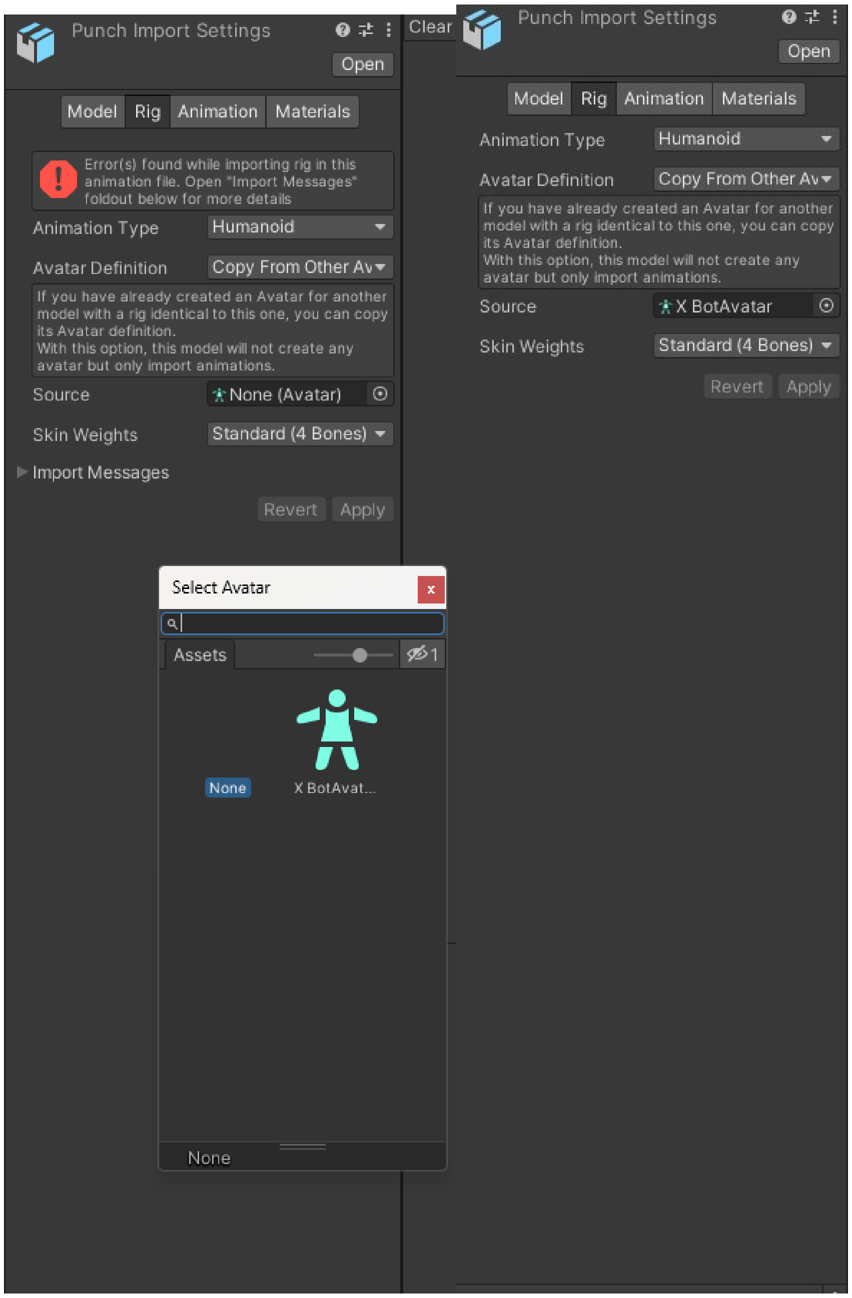
If you have already created an Avatar for another model with a rig identical to this one, you can copy its Avatar definition.
With this option, this model will not create any avatar but only import animations.

Source: None (Avatar)

Skin Weights: Standard (4 Bones)

Revert | Apply

Select the enemy avatar or create one if not existing. Click **Apply**.


Punch Import Settings

Open

Model | Rig | Animation | Materials

Error(s) found while importing rig in this animation file. Open "Import Messages" foldout below for more details

Animation Type: Humanoid

Avatar Definition: Copy From Other Av

If you have already created an Avatar for another model with a rig identical to this one, you can copy its Avatar definition.
With this option, this model will not create any avatar but only import animations.

Source: None (Avatar)

Skin Weights: Standard (4 Bones)

Import Messages

Revert Apply

Clear

Select Avatar

Assets

None

X BotAvat...

None

Punch Import Settings

Open

Model | Rig | Animation | Materials

Animation Type: Humanoid

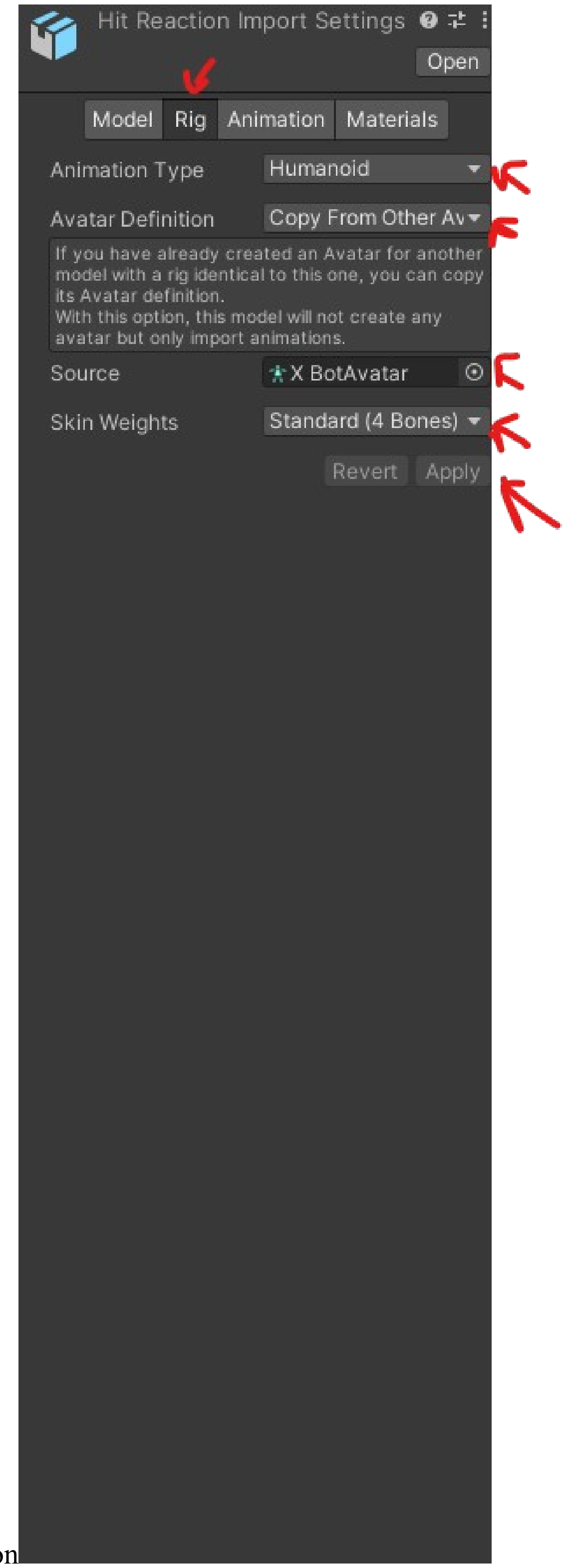
Avatar Definition: Copy From Other Av

If you have already created an Avatar for another model with a rig identical to this one, you can copy its Avatar definition.
With this option, this model will not create any avatar but only import animations.

Source: X BotAvatar

Skin Weights: Standard (4 Bones)

Revert Apply


Hit Reaction Import Settings

Open

Model | Rig | Animation | Materials

Animation Type: Humanoid

Avatar Definition: Copy From Other Av

If you have already created an Avatar for another model with a rig identical to this one, you can copy its Avatar definition.
With this option, this model will not create any avatar but only import animations.

Source: X BotAvatar

Skin Weights: Standard (4 Bones)

Revert | Apply

Do the same thing for the HitReaction Animation

Bake the rotation into the pose

Select the Animation Clip

- In the **Project** window, navigate to the folder where your character's animations are stored. In this case it is under Character/Animations.
- Click on the **Punch** animation clip so its **Inspector** details appear.

Open the Rig Settings

- In the **Inspector**, you'll see the animation import settings (these are visible if the animation is part of an FBX model).
- Across the top, click on the **Animations** tab.

Locate the Root Transform Rotation Section

- Scroll down until you find the section called **Root Transform Rotation**.
- You'll see options like:
  - **Based Upon (Original/Root Node/Body Orientation)**
  - **Offset**
  - **Bake Into Pose** (the checkbox we need).

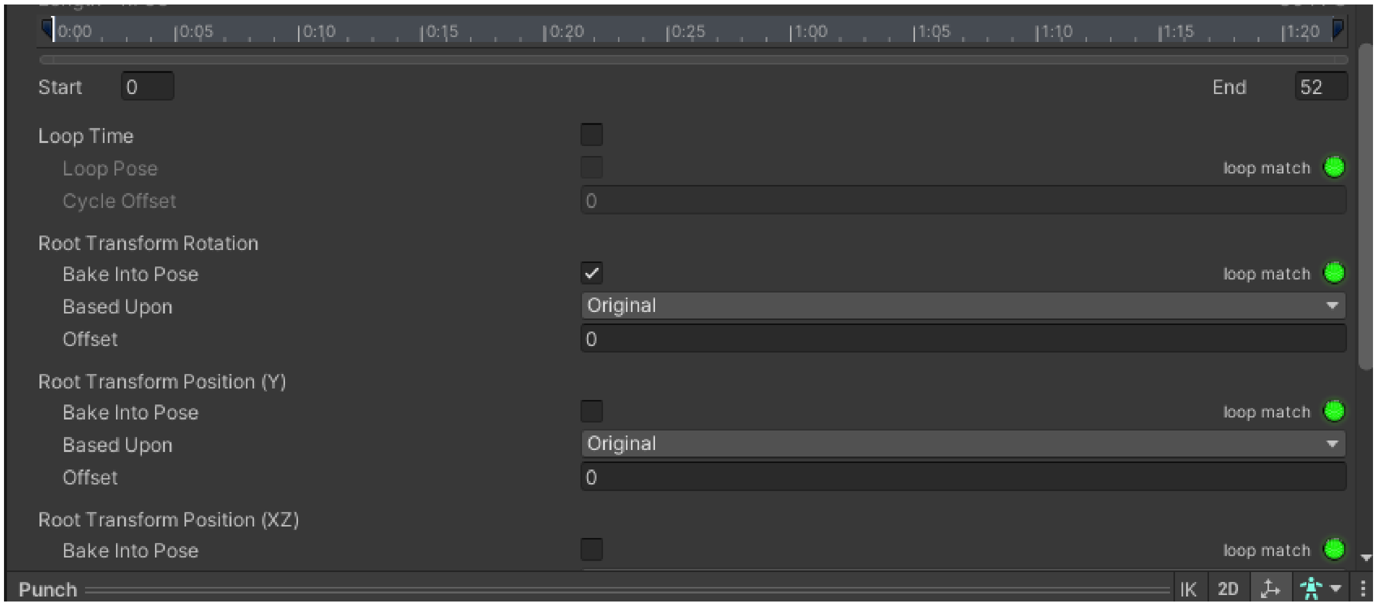
Enable Bake Into Pose

- Check the box **Bake Into Pose**.
- This tells Unity to remove any root rotation from the animation curves and instead apply it directly to the character's pose.

Apply Changes

- Scroll back up and click **Apply** (bottom-right of the Import Settings Inspector).
- Unity will re-import the FBX/animation with the updated settings.

That will make Unity ignore the root rotation curve and apply the rotation directly to the character's pose, preventing unwanted turning or spinning during the Punch animation.



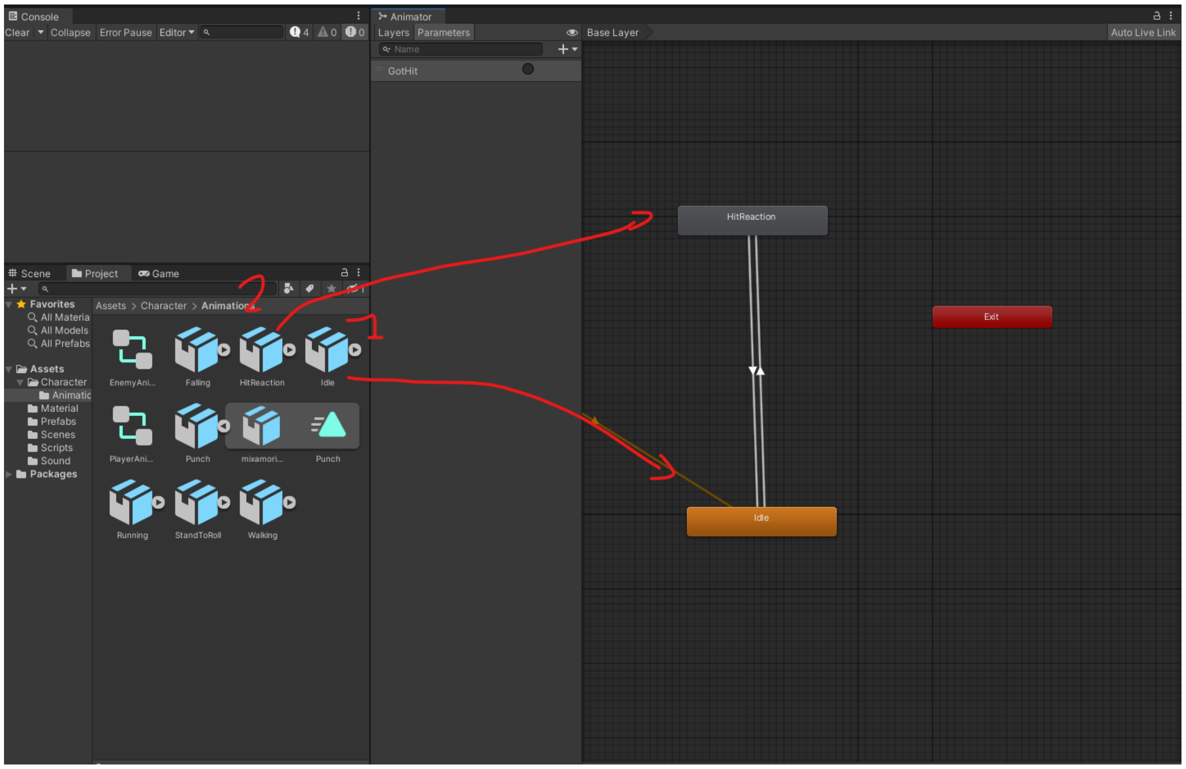
Start 0 End 52

Loop Time ☐
Loop Pose ☐ loop match ●
Cycle Offset 0
Root Transform Rotation
Bake Into Pose ✓ loop match ●
Based Upon Original
Offset 0
Root Transform Position (Y)
Bake Into Pose ☐ loop match ●
Based Upon Original
Offset 0
Root Transform Position (XZ)
Bake Into Pose ☐ loop match ●

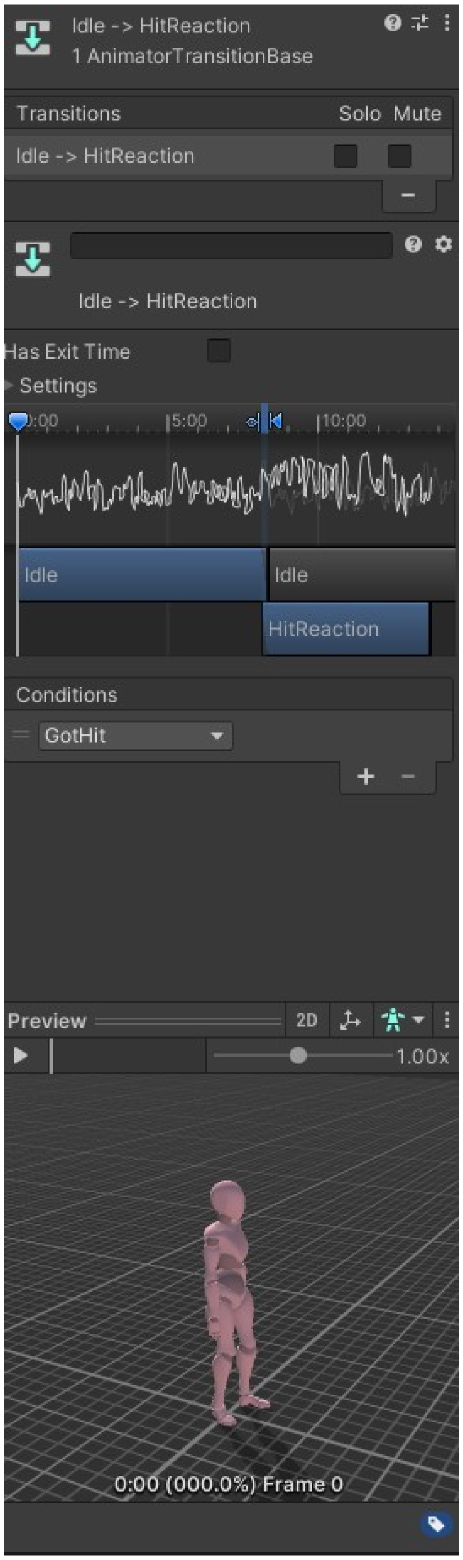
Create an Animator for the Enemy

2. **Create Animator Controller:**
   - Right-click in the **Project** window and select **Create > Animator Controller**.
   - Name it EnemyAnimator.

3. **Assign Animator to Enemy:**
   - Select your enemy GameObject in the **Hierarchy**.
   - In the **Inspector**, click **Add Component** and choose **Animator**.
   - Drag and drop the EnemyAnimator onto the **Controller** field of the Animator component.
4. **Open Animator Window:**
   - Select EnemyAnimator.
   - Go to **Window > Animator** to open the Animator window.

5. **Add Idle Animation:**
   - Drag the idle animation clip from the **Project** window into the Animator.
   - Set it as the **Default State** by right-clicking and selecting **Set as Layer Default State**.
   - 

6. **Add Hit Reaction Animation:**
   - Drag the hit reaction animation clip into the Animator.
7. **Create Transition with Trigger:**
   - Select the transition from **Idle** to **Hit Reaction**.
   - In the **Inspector**, under **Conditions**, add a new **Trigger** parameter (e.g., GotHit).
   - Set the condition for the transition to the GotHit trigger.

◦ 
Idle -> HitReaction
1 AnimatorTransitionBase

Transitions | Solo | Mute
Idle -> HitReaction

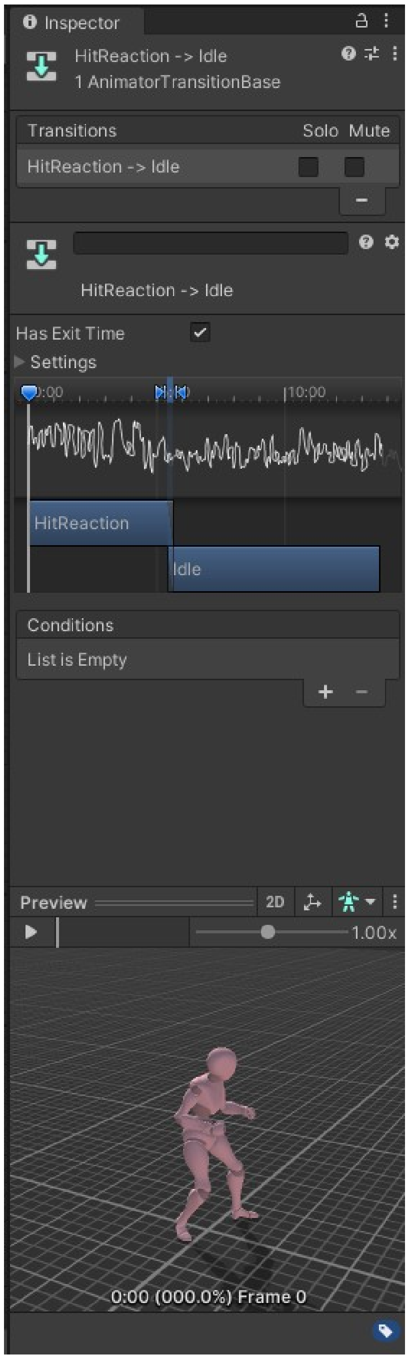
Idle -> HitReaction

Has Exit Time
Settings

Conditions
GotHit

Setup a Transition Back to Idle:

Create a transition from **Hit Reaction** back to **Idle**.Make sure the only condition is HasExitTime for the Transition back to Idle.


Inspector

HitReaction -> Idle
1 AnimatorTransitionBase

Transitions Solo Mute
HitReaction -> Idle

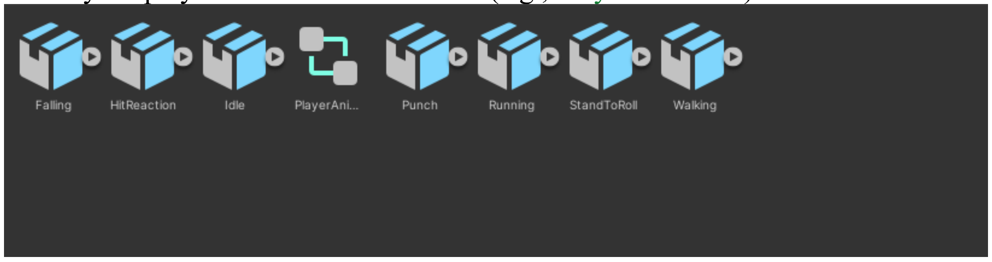
HitReaction -> Idle

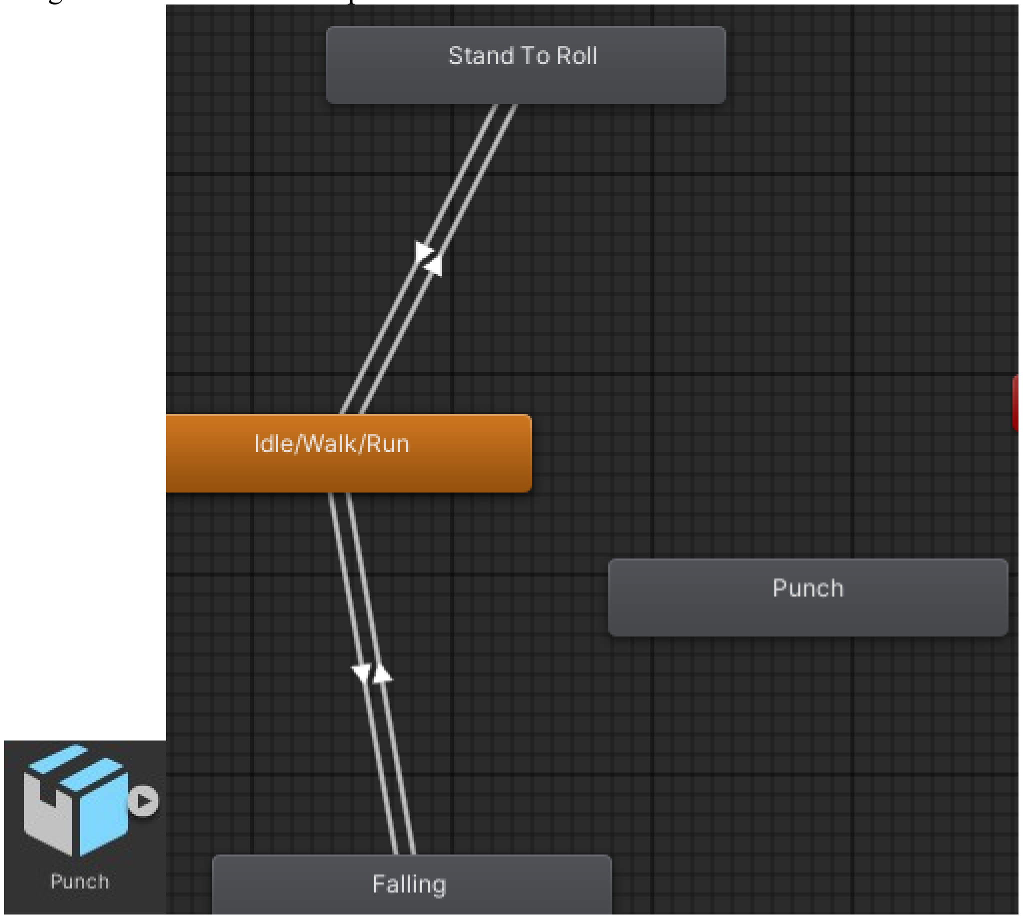
Has Exit Time ✓
Settings

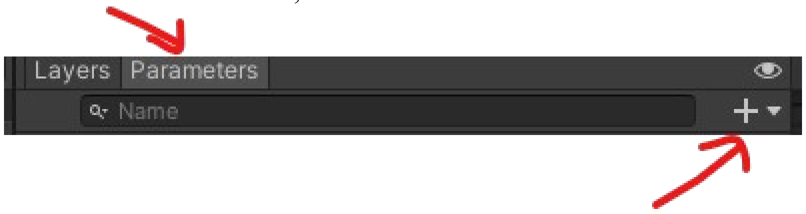
Conditions
List is Empty

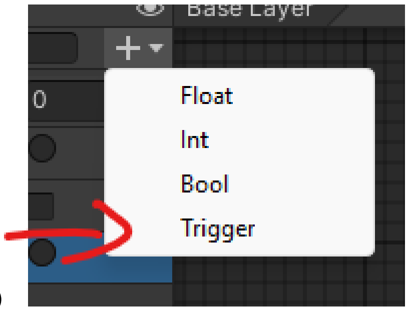
Preview
0:00 (000.0%) Frame 0

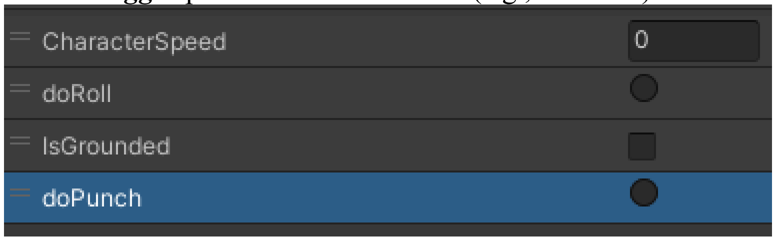
Modify the Player Animator to Add the Attack (Punch) Animations

1. **Open Player Animator Controller:**
   - Select your player's Animator Controller (e.g., PlayerAnimator).
   - 

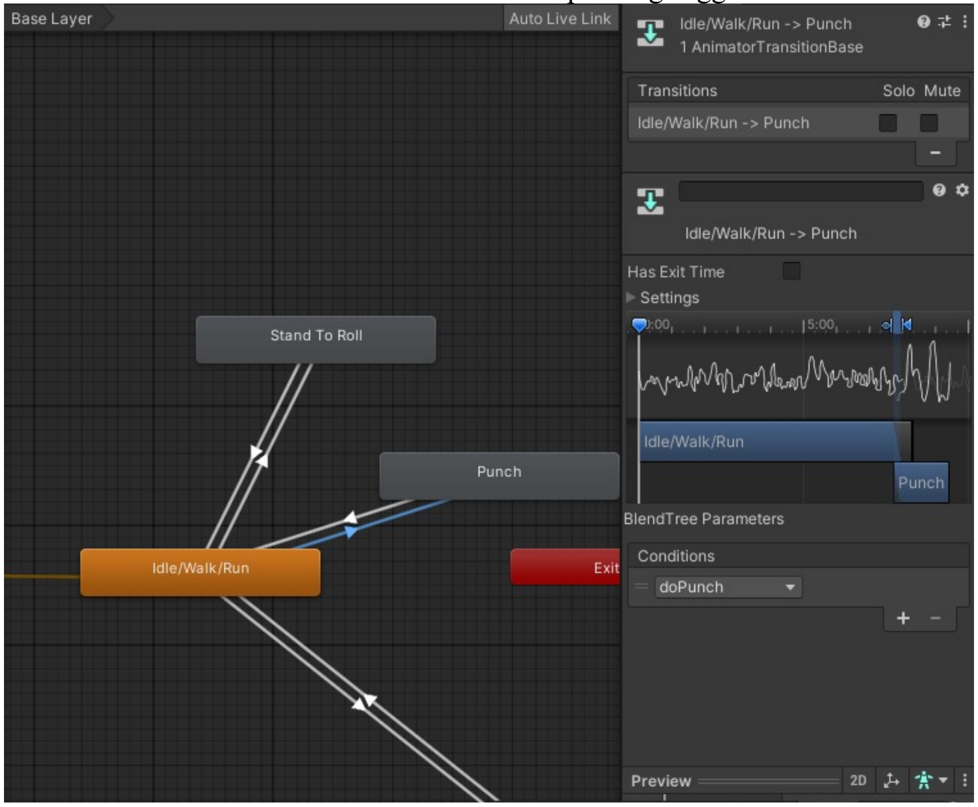
   - Open the Animator window.
2. **Add the Punch Animations:**
   - Drag the Punch animation clips into the Animator.
   - 

3. **Create Parameters:**
   - In the Animator window, click the **Parameters** tab.
   - 



- Add a **Trigger** parameter for the attack (e.g., doPunch)
- 

CharacterSpeed	0
doRoll	●
IsGrounded	▢
doPunch	●

4. **Set Up Transitions:**
   - Create transitions from **Idle/walk/run** to the Punch animation.
   - Set the condition for each transition to its corresponding trigger.
   - 

5. **Transition Back to Idle/walk/run:**
   - Create transitions from each attack animation back to **Idle/walk/run** or **Movement**.
   - Make sure to enable HasExitTime for the transition back to idle.

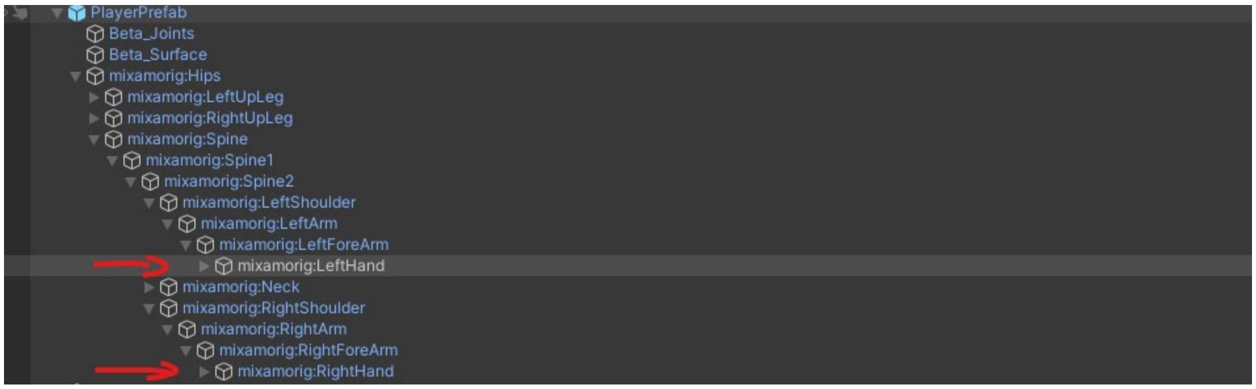
6. Modify the PlayerAnimationManager to add your Trigger like so :

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;
public class PlayerAnimationManager : MonoBehaviour
{
   private Animator animator;

   private PlayerMovement movement;

   private Rigidbody rb;

   public void Start()

   {

       animator = GetComponent<Animator>();

       movement = GetComponent<PlayerMovement>();

        rb = GetComponent<Rigidbody>();

   }



   public void Update()

   {

      animator.SetFloat("CharacterSpeed", rb.velocity.magnitude);

     animator.SetBool("IsGrounded",movement.isGrounded);
     if (Input.GetButtonUp("Fire1"))
     {
       animator.SetTrigger("doRoll");
     }
     if (Input.GetButtonUp("Fire2"))
     {
       animator.SetTrigger("doPunch");
     }
  }

}
```

Add to the Colliders to the fists

Access the Character's Bone Hierarchy

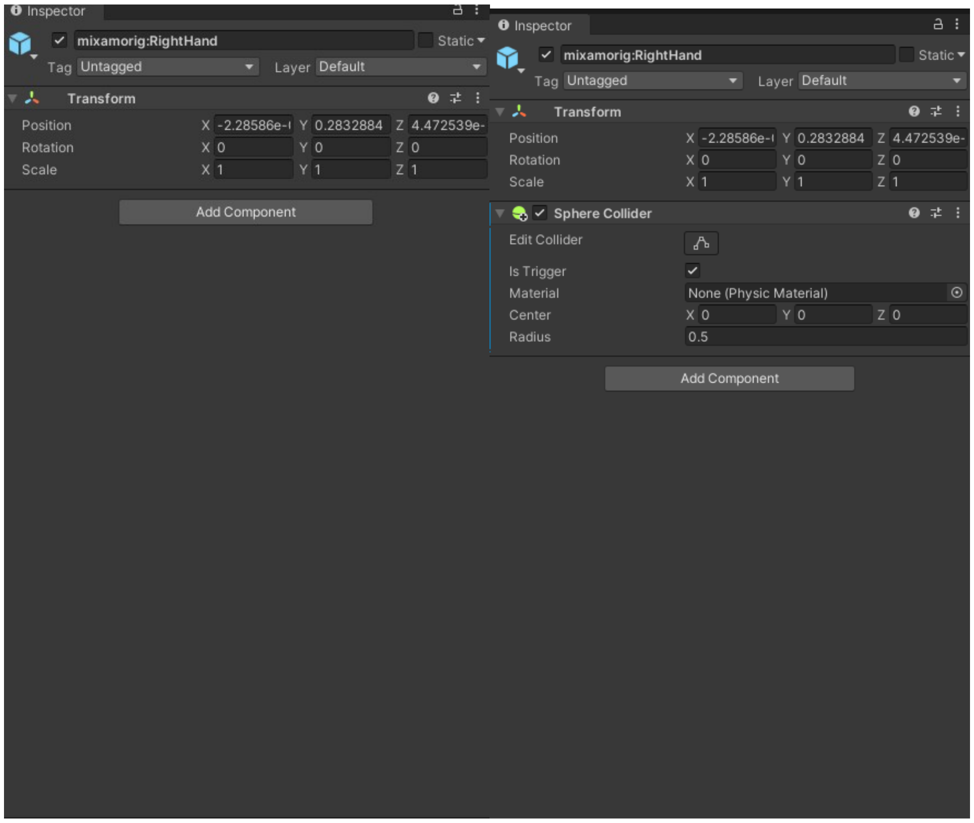
1. **Expand the Character's Hierarchy:**
   - In the **Hierarchy** window, expand your character's GameObject by clicking the arrow next to its name.
   - Continue expanding the child objects until you reach the hand bones.
2. **Locate the Hand Bones:**
   - Typically, the path to the hand bones is:
     - **CharacterName**
       - **Hips**
         - **Spine**
           - **Chest**
             - **UpperChest** (if available)
               - **LeftShoulder / RightShoulder**
               - **LeftArm / RightArm**
               - **Left ForeArm/RightForearm**
               - **LeftHand/RigthHand,**



```
▼ PlayerPrefab
    Beta_Joints
    Beta_Surface
  ▼ mixamorig:Hips
    ▶ mixamorig:LeftUpLeg
    ▶ mixamorig:RightUpLeg
    ▼ mixamorig:Spine
      ▼ mixamorig:Spine1
        ▼ mixamorig:Spine2
          ▼ mixamorig:LeftShoulder
            ▼ mixamorig:LeftArm
              ▼ mixamorig:LeftForeArm
                ▶ mixamorig:LeftHand
          ▶ mixamorig:Neck
          ▼ mixamorig:RightShoulder
            ▼ mixamorig:RightArm
              ▼ mixamorig:RightForeArm
                ▶ mixamorig:RightHand
```

1. **Select the RightHand Bone:**
   - **Click on the RightHand GameObject in the Hierarchy.**
   - **Note : If you want to add a weapon to a Character you would add it as a child of the RightHand object**
2. **Add a Collider Component:**
   - **In the Inspector, click on Add Component.**
   - **Type Capsule Collider in the search bar and select it.**
3. **Adjust the Collider:**

   - **Center: Adjust the Center values to align the collider with the hand mesh.**
   - **Radius and Height: Modify the Radius and Height to encompass the hand.**
   - **Direction: Set the Direction (X, Y, or Z) based on the orientation of the hand bone.**
4. **Make sure it is a Trigger**



Inspector

mixamorig:RightHand Static

Tag Untagged Layer Default

Transform

	X	Y	Z
Position	-2.28586e-(	0.2832884	4.472539e-
Rotation	0	0	0
Scale	1	1	1

Add Component

Inspector

mixamorig:RightHand Static

Tag Untagged Layer Default

Transform

	X	Y	Z
Position	-2.28586e-(	0.2832884	4.472539e-
Rotation	0	0	0
Scale	1	1	1

Sphere Collider

Edit Collider

Is Trigger ✓

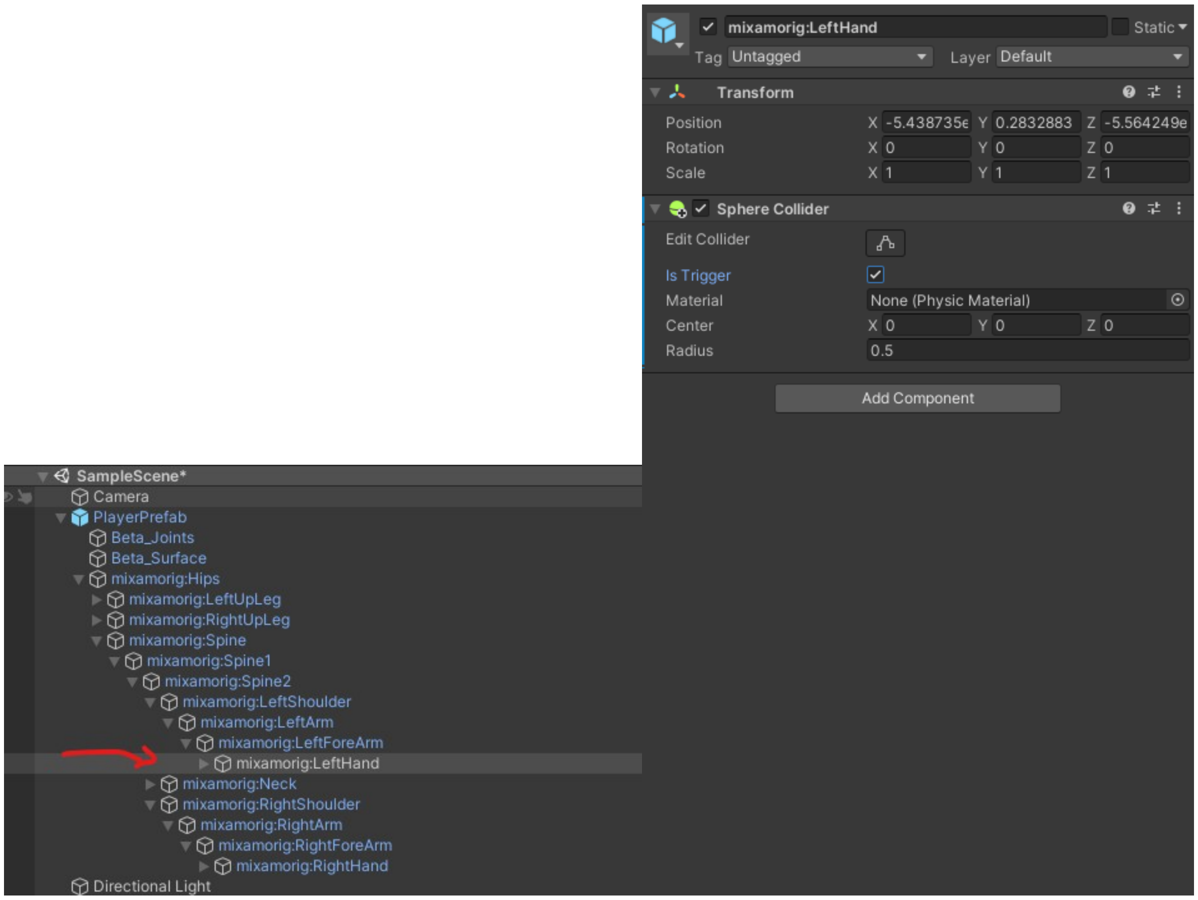
Material None (Physic Material)

Center X 0 Y 0 Z 0

Radius 0.5

Add Component

1. **Select the LeftHand Bone:**
   - **Click on the LeftHand GameObject in the Hierarchy.**
2. **Add a Collider Component:**
   - **Repeat the same steps as for the right hand.**
3. **Adjust the Collider:**
   - **Configure the collider to fit the left hand, similar to how you did for the right hand.**



mixamorig:LeftHand
Static
Tag: Untagged
Layer: Default

Transform

Position	X -5.438735e	Y 0.2832883	Z -5.564249e
Rotation	X 0	Y 0	Z 0
Scale	X 1	Y 1	Z 1

Sphere Collider

Edit Collider	
Is Trigger	✓
Material	None (Physic Material)
Center	X 0 Y 0 Z 0
Radius	0.5

Add Component

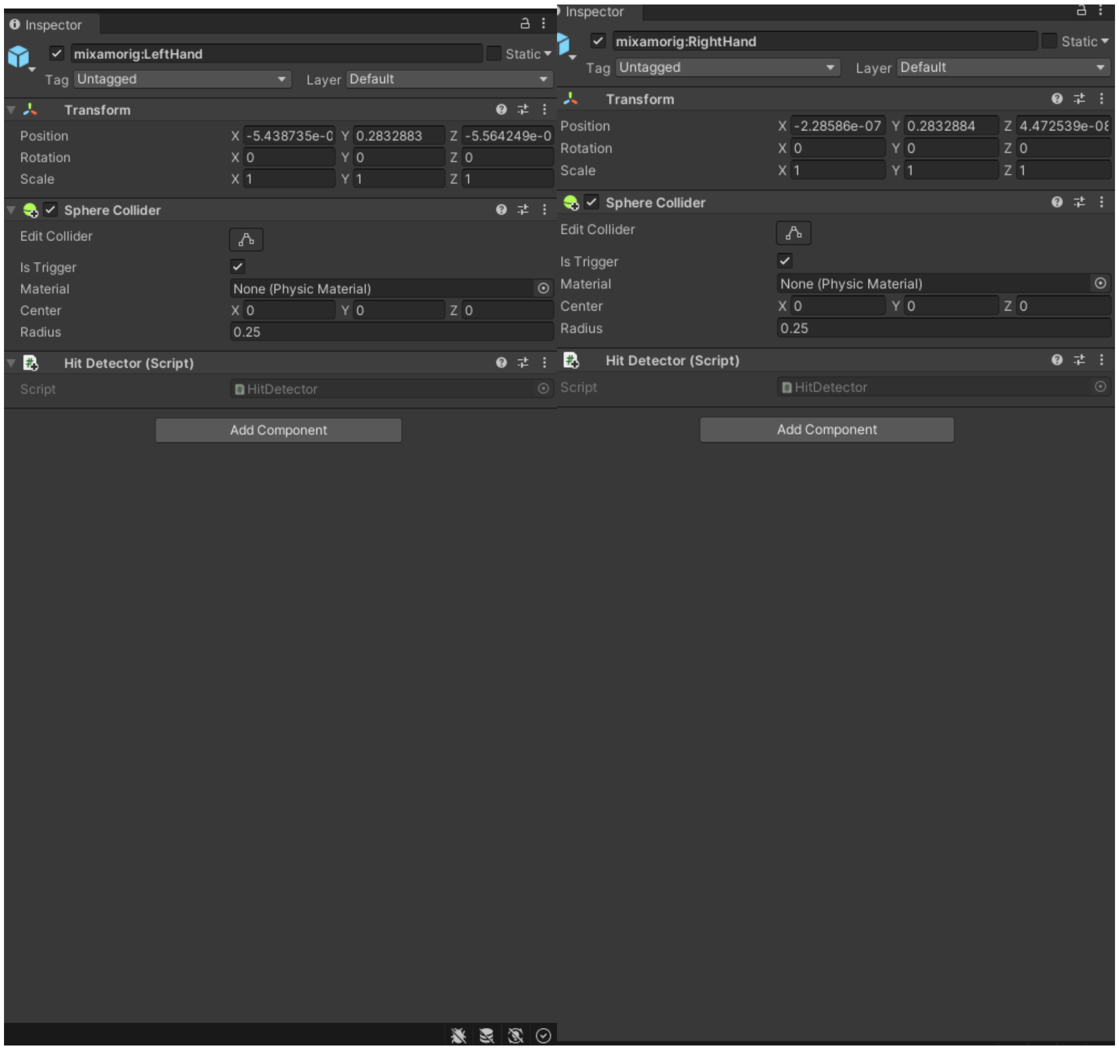
```
SampleScene*
  Camera
  PlayerPrefab
    Beta_Joints
    Beta_Surface
    mixamorig:Hips
      mixamorig:LeftUpLeg
      mixamorig:RightUpLeg
      mixamorig:Spine
        mixamorig:Spine1
          mixamorig:Spine2
            mixamorig:LeftShoulder
              mixamorig:LeftArm
                mixamorig:LeftForeArm
                  mixamorig:LeftHand
            mixamorig:Neck
            mixamorig:RightShoulder
              mixamorig:RightArm
                mixamorig:RightForeArm
                  mixamorig:RightHand
  Directional Light
```

Implement the Hit Detection Logic

Open the script and write the following code:

```
using UnityEngine;


public class HitDetector : MonoBehaviour
{
    private void OnTriggerEnter(Collider other)
    {
        if (other.CompareTag("Enemy"))
        {


        }
    }

}
```

Add this script to both fists we will finish modifying it later.


Inspector
mixamorig:LeftHand Static
Tag Untagged Layer Default
Transform
Position X -5.438735e-0 Y 0.2832883 Z -5.564249e-0
Rotation X 0 Y 0 Z 0
Scale X 1 Y 1 Z 1
Sphere Collider
Edit Collider
Is Trigger ✓
Material None (Physic Material)
Center X 0 Y 0 Z 0
Radius 0.25
Hit Detector (Script)
Script HitDetector
Add Component

Inspector
mixamorig:RightHand Static
Tag Untagged Layer Default
Transform
Position X -2.28586e-07 Y 0.2832884 Z 4.472539e-08
Rotation X 0 Y 0 Z 0
Scale X 1 Y 1 Z 1
Sphere Collider
Edit Collider
Is Trigger ✓
Material None (Physic Material)
Center X 0 Y 0 Z 0
Radius 0.25
Hit Detector (Script)
Script HitDetector
Add Component

Make sure to set the Collider as Trigger by enabling the IsTrigger Checkbox and also scale down the collider so that they are roughly the size of your player hands.

Synchronizing Hit Detection with Animations

Disabling the Collider by Default

Create a **PlayerHitboxManagerScript** script, modify the Start method to disable the colliders initially we will want to add this script on the Player :

```
public Collider[] attackColliders;
void Start()
{
    foreach( Collider attackCollider in attackColliders)
    {
        attackCollider.enabled = false; // Disable collider at start
    }


}
```

Creating Functions to Enable/Disable the Collider

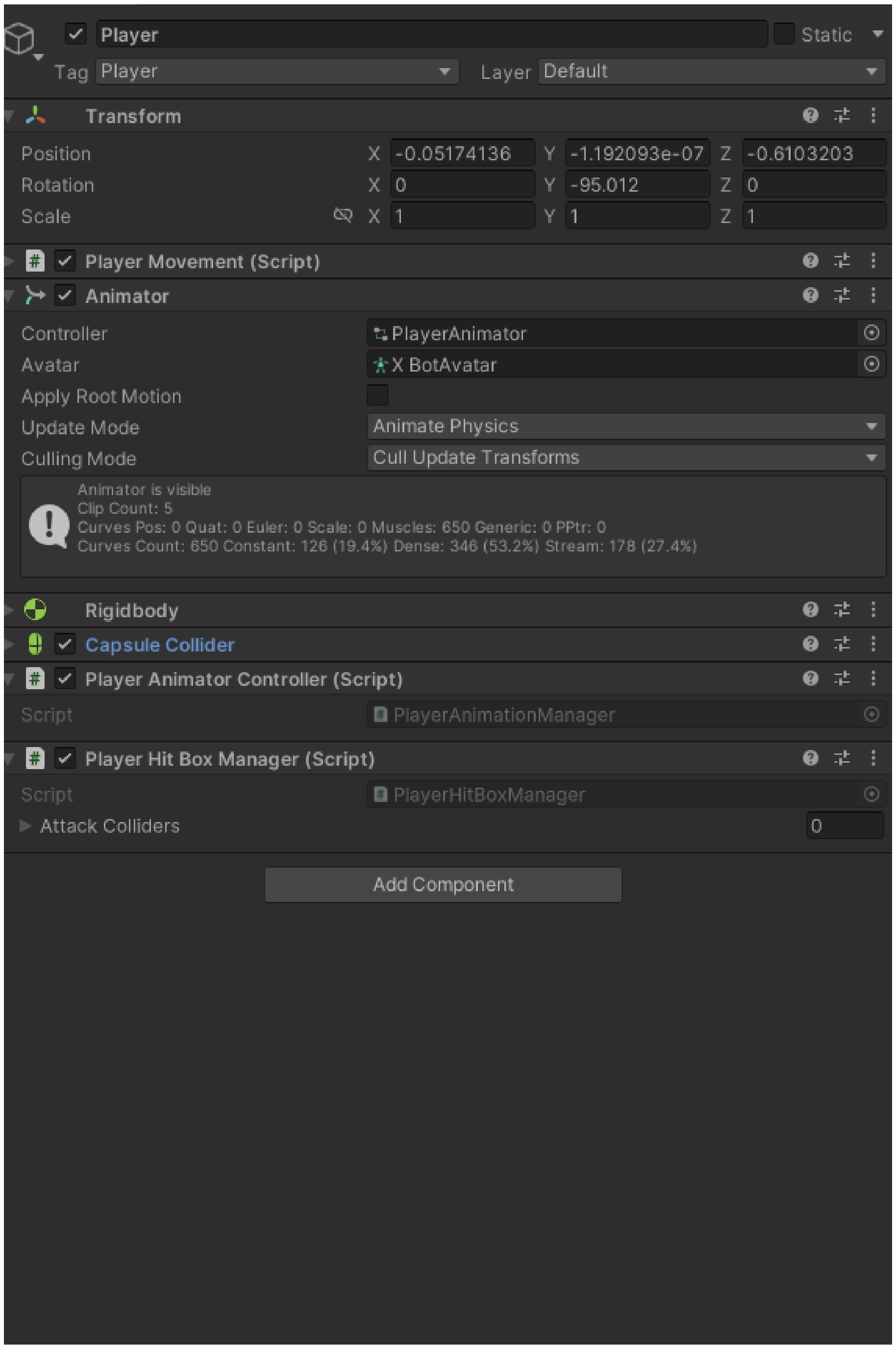
Add the following methods to the script:

```
public void EnableHitbox()
{
    foreach( Collider attackCollider in attackColliders)
    {
        attackCollider.enabled = true;
    }
}

public void DisableHitbox()
{
    foreach( Collider attackCollider in attackColliders)
    {
        attackCollider.enabled = false;
    }
}
```

The full script should look like this :

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class PlayerHitBoxManager : MonoBehaviour
{
    // Start is called before the first frame update
    public Collider[] attackColliders;
    void Start()
    {
        foreach( Collider attackCollider in attackColliders)
        {
            attackCollider.enabled = false; // Disable collider at start
        }

    }

    public void EnableHitbox()
    {
        foreach( Collider attackCollider in attackColliders)
        {
            attackCollider.enabled = true;
        }
    }

    public void DisableHitbox()
    {
        foreach( Collider attackCollider in attackColliders)
        {
            attackCollider.enabled = false;
        }
    }
}
```

Add the script to the Player



Player   Static
Tag Player   Layer Default

Transform
Position X -0.05174136 Y -1.192093e-07 Z -0.6103203
Rotation X 0 Y -95.012 Z 0
Scale X 1 Y 1 Z 1

Player Movement (Script)

Animator
Controller PlayerAnimator
Avatar X BotAvatar
Apply Root Motion
Update Mode Animate Physics
Culling Mode Cull Update Transforms

```
Animator is visible
Clip Count: 5
Curves Pos: 0 Quat: 0 Euler: 0 Scale: 0 Muscles: 650 Generic: 0 PPtr: 0
Curves Count: 650 Constant: 126 (19.4%) Dense: 346 (53.2%) Stream: 178 (27.4%)
```

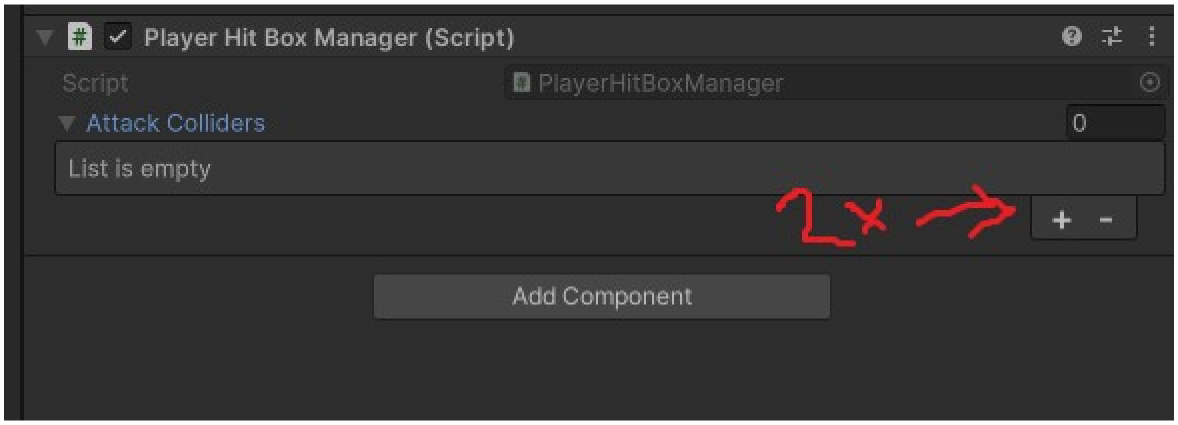
Rigidbody

Capsule Collider

Player Animator Controller (Script)
Script PlayerAnimationManager

Player Hit Box Manager (Script)
Script PlayerHitBoxManager
Attack Colliders 0

Add Component

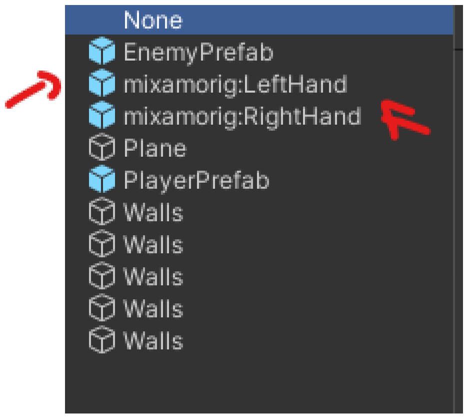

Player Hit Box Manager (Script)

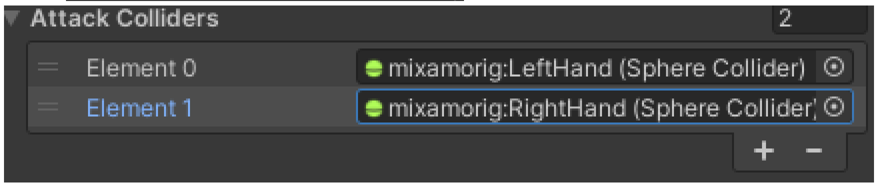
Script	PlayerHitBoxManager
Attack Colliders	0

List is empty

Click the button on the right

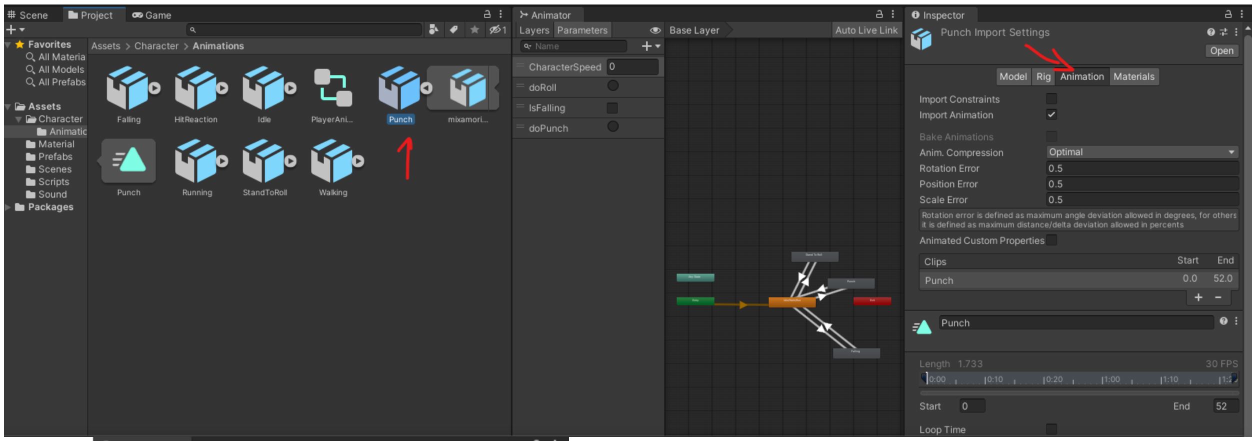
Select the two hand colliders you created




Attack Colliders 2

Element 0	mixamorig:LeftHand (Sphere Collider)
Element 1	mixamorig:RightHand (Sphere Collider)

Adding Animation Events

- Select the Punch animation in the project Hierachy
- In the animation Tab go down to the section called Events
- 

Assets > Character > Animations

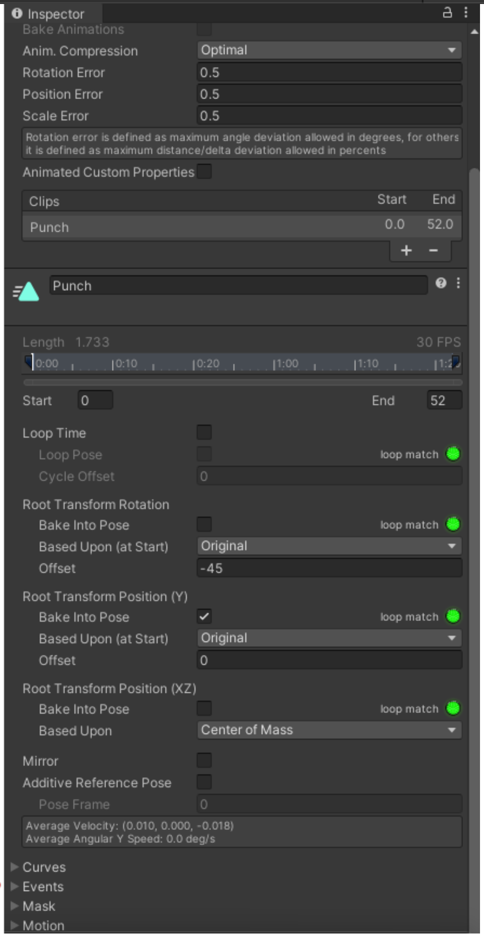
Falling, HitReaction, Idle, PlayerAni..., Punch, mixamori..., Punch, Running, StandToRoll, Walking

CharacterSpeed	0
doRoll	
IsFalling	
doPunch	

Punch Import Settings

Model Rig Animation Materials

Import Constraints	
Import Animation	✓
Bake Animations	
Anim. Compression	Optimal
Rotation Error	0.5
Position Error	0.5
Scale Error	0.5

- 

Inspector

Bake Animations	
Anim. Compression	Optimal
Rotation Error	0.5
Position Error	0.5
Scale Error	0.5

Rotation error is defined as maximum angle deviation allowed in degrees, for others it is defined as maximum distance/delta deviation allowed in percents

Animated Custom Properties

Clips	Start	End
Punch	0.0	52.0

Punch

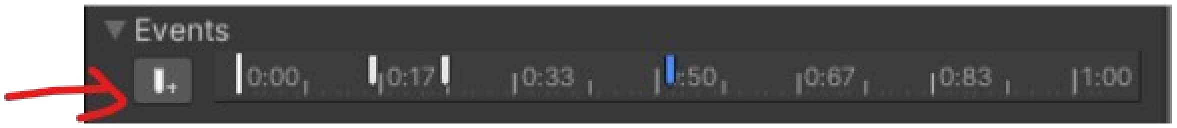
Length 1.733 30 FPS

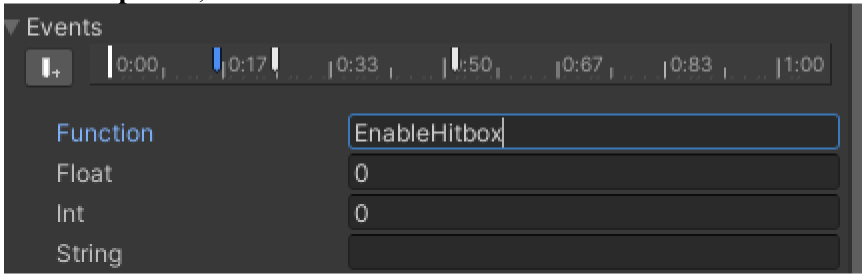
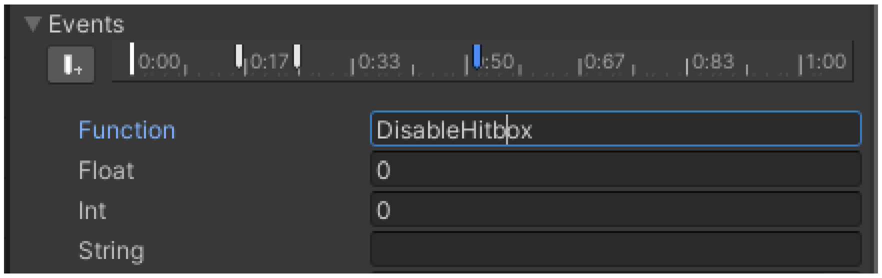
Start 0 End 52

Loop Time		
Loop Pose		loop match
Cycle Offset	0	
Root Transform Rotation		
Bake Into Pose		loop match
Based Upon (at Start)	Original	
Offset	-45	
Root Transform Position (Y)		
Bake Into Pose	✓	loop match
Based Upon (at Start)	Original	
Offset	0	
Root Transform Position (XZ)		
Bake Into Pose		loop match
Based Upon	Center of Mass	
Mirror		
Additive Reference Pose		
Pose Frame	0	

Average Velocity: (0.010, 0.000, -0.018)
Average Angular Y Speed: 0.0 deg/s

- Click the **Add Event** button (looks like a white marker).

- 

- In the **Inspector**, set the first marker to around 0:17 and set the function to EnableHitbox.

Events
Function: EnableHitbox
Float: 0
Int: 0
String:
- Move to the frame where the attack should stop dealing damage around 0:50 Add another event and set the function to DisableHitbox.

Events
Function: DisableHitbox
Float: 0
Int: 0
String:

Creating the Enemy Animation Controller

1. **Create Hit Sound:**
   - Import the hit sound effect into the **Project** window.
2. **Add Audio Source to Enemy:**
   - Select the enemy GameObject.
   - Click **Add Component** and choose **Audio Source**.
   - Uncheck **Play On Awake**.
3. **Create Enemy Script:**
   - In the **Project** window, create a new C# script named EnemyController.
4. **Edit the Enemy Script:**

```
using UnityEngine;

public class EnemyController : MonoBehaviour
{
   private Animator animator;

   void Start()
   {
      animator = GetComponent<Animator>();
   }
```

```
    public void GotHit()
    {
        animator.SetTrigger("GotHit");
    }
}
```

Modify the Hit detector logic to so that it communicates with the enemy controller

```
using UnityEngine;

public class HitDetector : MonoBehaviour
{
    private void OnTriggerEnter(Collider other)
    {
        if (other.CompareTag("Enemy"))
        {
            EnemyController enemyController =  other.GetComponent<EnemyController>();
            if (enemyController  != null)
            {
                enemyController.GotHit();
            }
        }
    }
```

Then drag and drop your EnemyController Script on your Enemy Gameobject in your Scene graph.

Your Enemy should now react to getting hit by your punch animation.

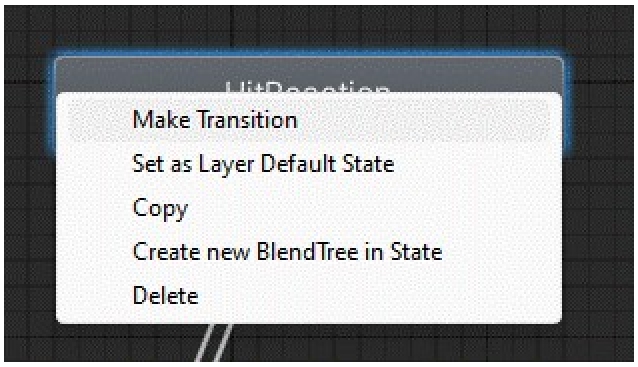
What happens if you punch the enemy multiple times. Does he react every single time you hit him ?

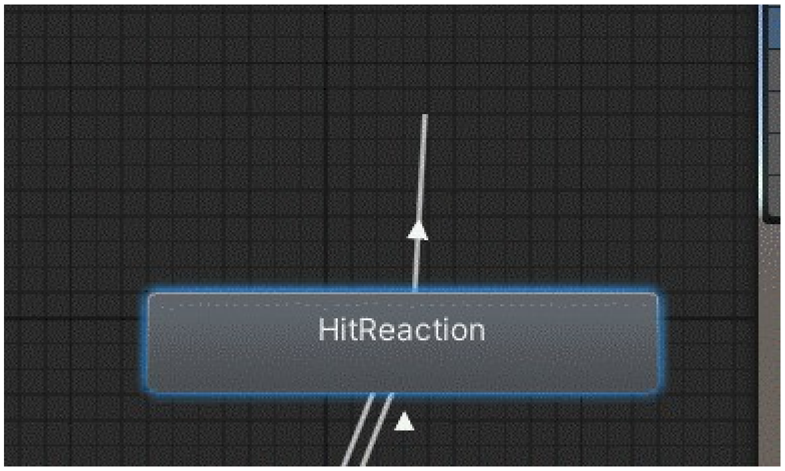
When you punch an enemy multiple times they only react to the first punch until the animation finished. So punching is only applies the animation when it is in Idle.

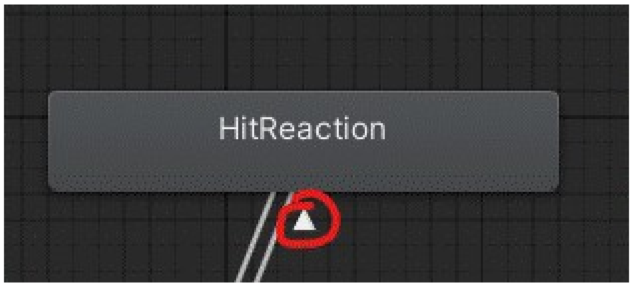
I did not work no matter what I did, all the fix would do was make the enemy stop any animations and if I did give him a transition duration he would make an infinite loop without ever stopping.

Lets fix this

Make the Enemy Hit Reaction Play Even If Already Playing

1. **Open the Animator Window**:
   - Select your enemy character in the Hierarchy.
   - Open the Animator window by navigating to Window > Animation > Animator.
2. **Locate the Hit Reaction Animation**:
   - Find the "Hit Reaction" animation node in the Animator graph.
3. **Set Up the Transition**:
   - Right-click on the Hit Reaction animation node and select Make Transition.
   - **Drag the arrow back to the same** Hit Reaction animation node (creating a loop transition).
   - 

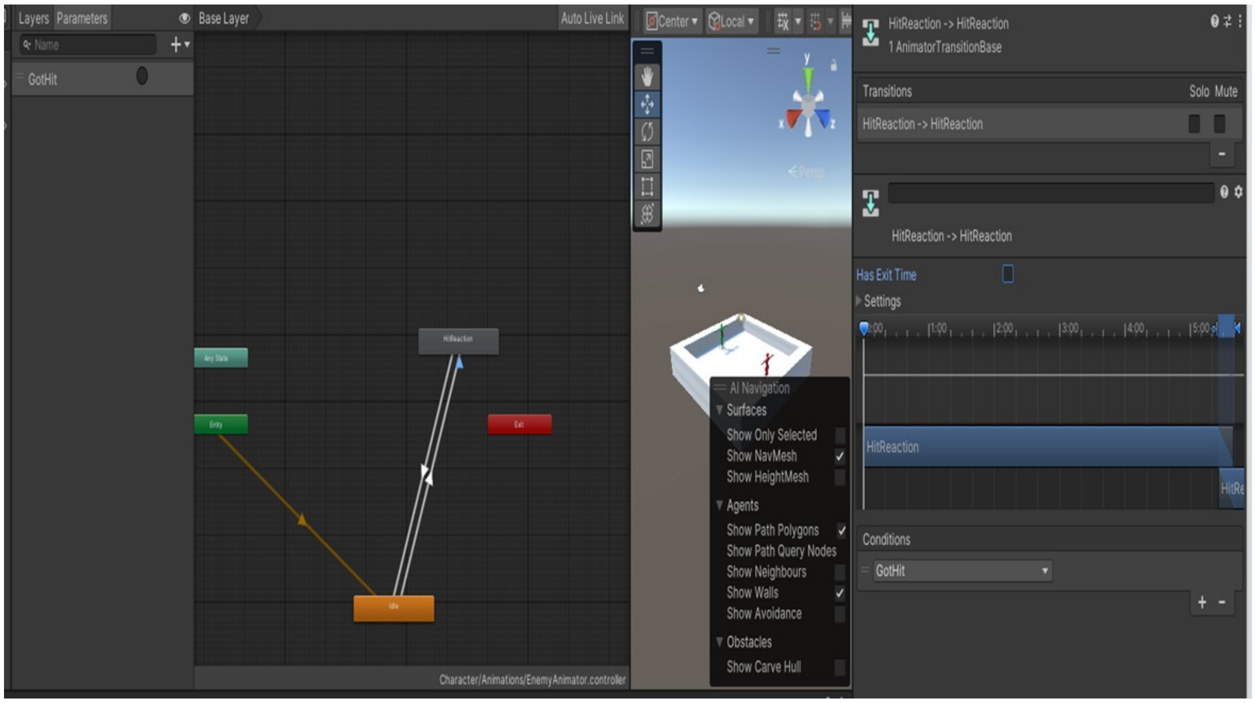
   - 

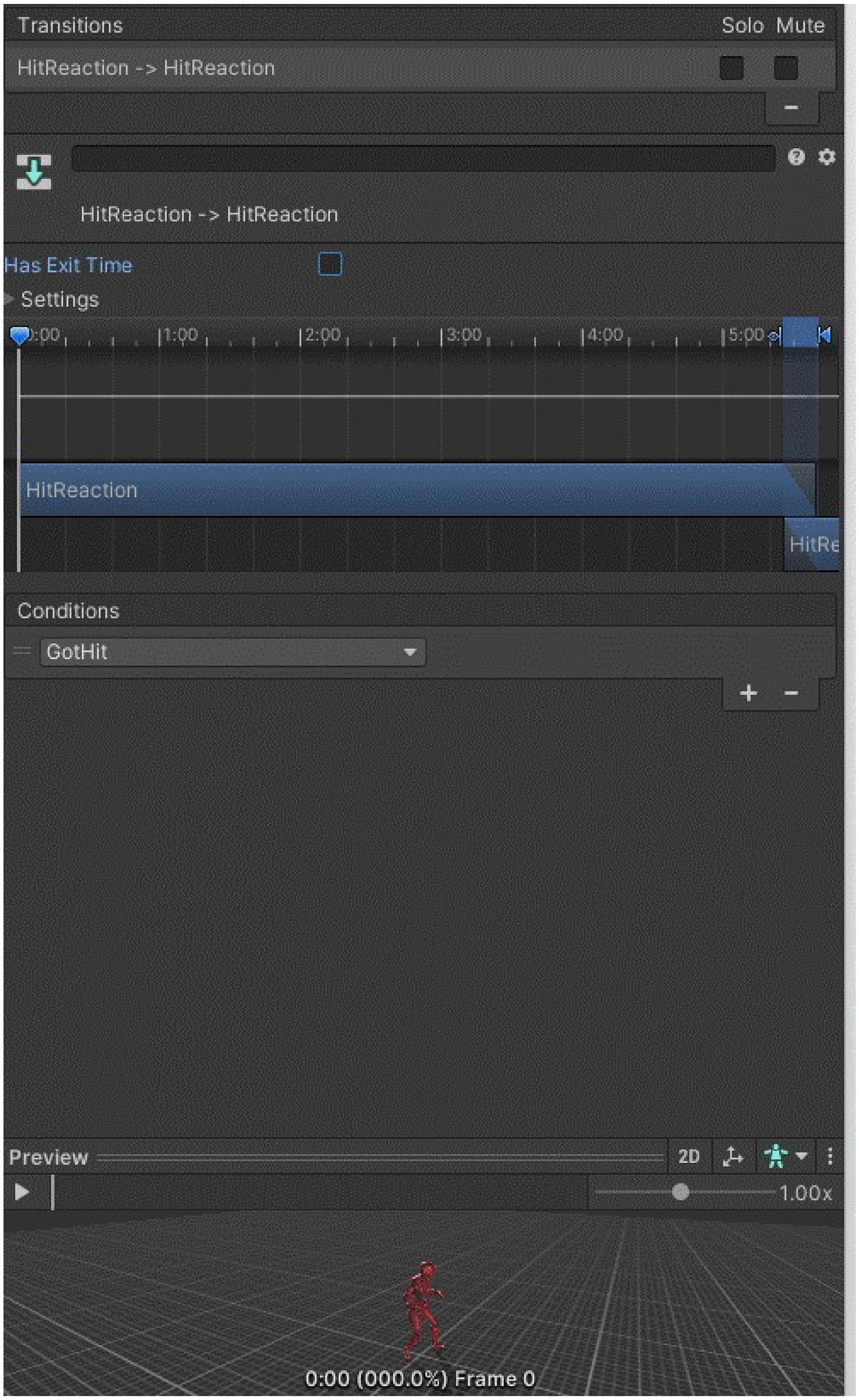


- If it work it will have a little arrow.

Configure the Transition Conditions:

- Click on the newly created transition arrow.
- In the Inspector window, find the Conditions section.
- Set the condition to GotHit
- Disable Has Exit Time and set the Transition Duration to 0 to ensure the animation can interrupt itself instantly.




Transitions Solo Mute

HitReaction -> HitReaction

HitReaction -> HitReaction

Has Exit Time ☐

Settings

Conditions

GotHit

Test the Transition:

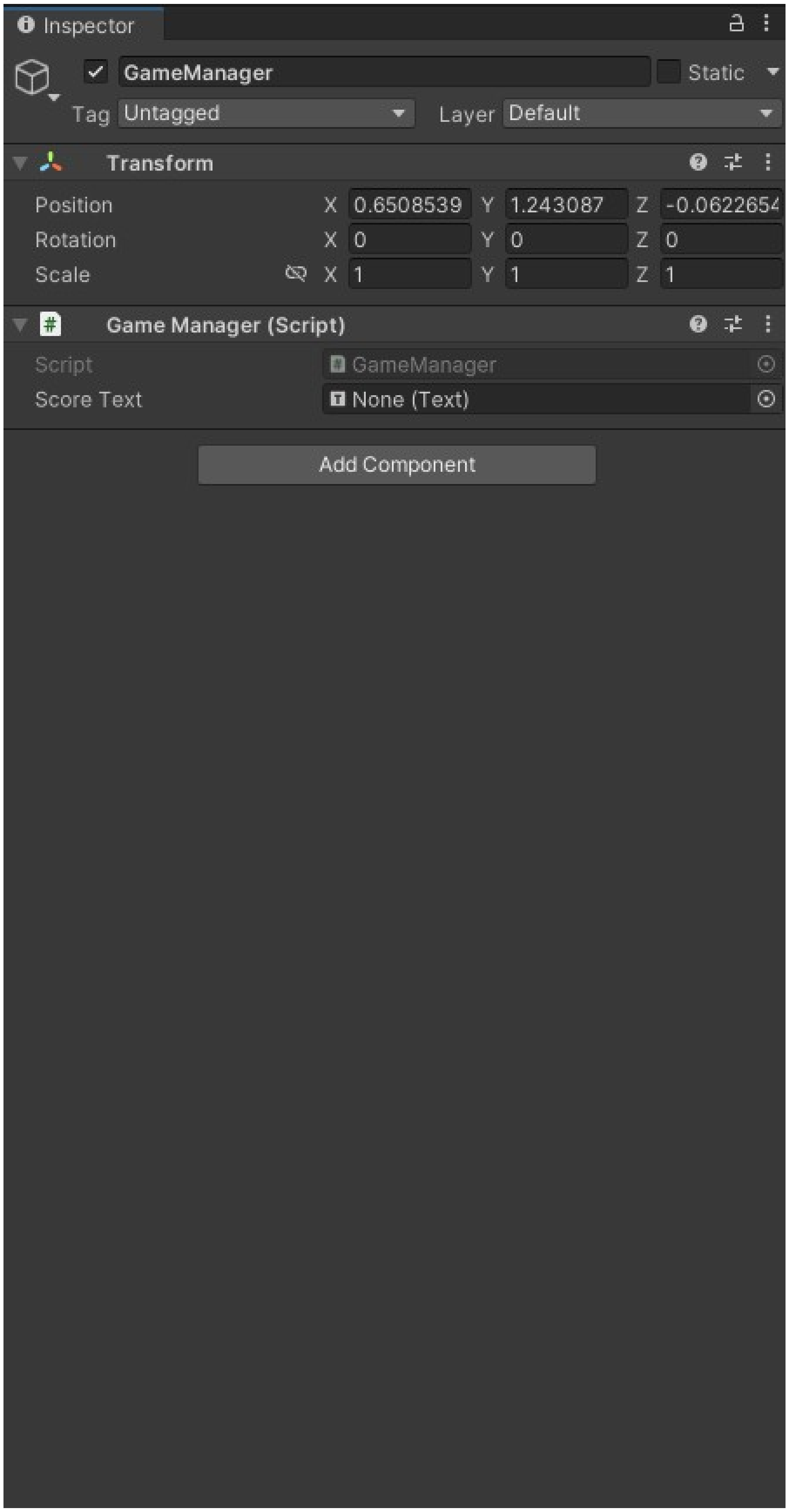
- Play the game and ensure that hitting the enemy multiple times triggers the Hit Reaction each time, even if it was already playing.

Lets add some simple UI to our game.

Now lets a create a Game Manager and make it track our score. Our score will increase every time I hit the Enemy.

On the game object GameManager add the following script :

```
using UnityEngine;
using UnityEngine.UI;

public class GameManager : MonoBehaviour
{
    public static GameManager Instance { get; private set; }

    public Text scoreText;
    private int score = 0;

    private void Awake()
    {
        // Enforce one instance
        if (Instance != null && Instance != this)
        {
            Destroy(gameObject);
            return;
        }
        Instance = this;
    }

    public void AddScore(int amount)
    {
        score += amount;
        UpdateUI();
    }

    private void UpdateUI()
    {
        if (scoreText != null)
        {
            scoreText.text = $"Score: {score}";
        }
    }
}
```


Inspector

GameManager Static

Tag Untagged Layer Default

Transform

Position X 0.6508539 Y 1.243087 Z -0.0622654

Rotation X 0 Y 0 Z 0

Scale X 1 Y 1 Z 1

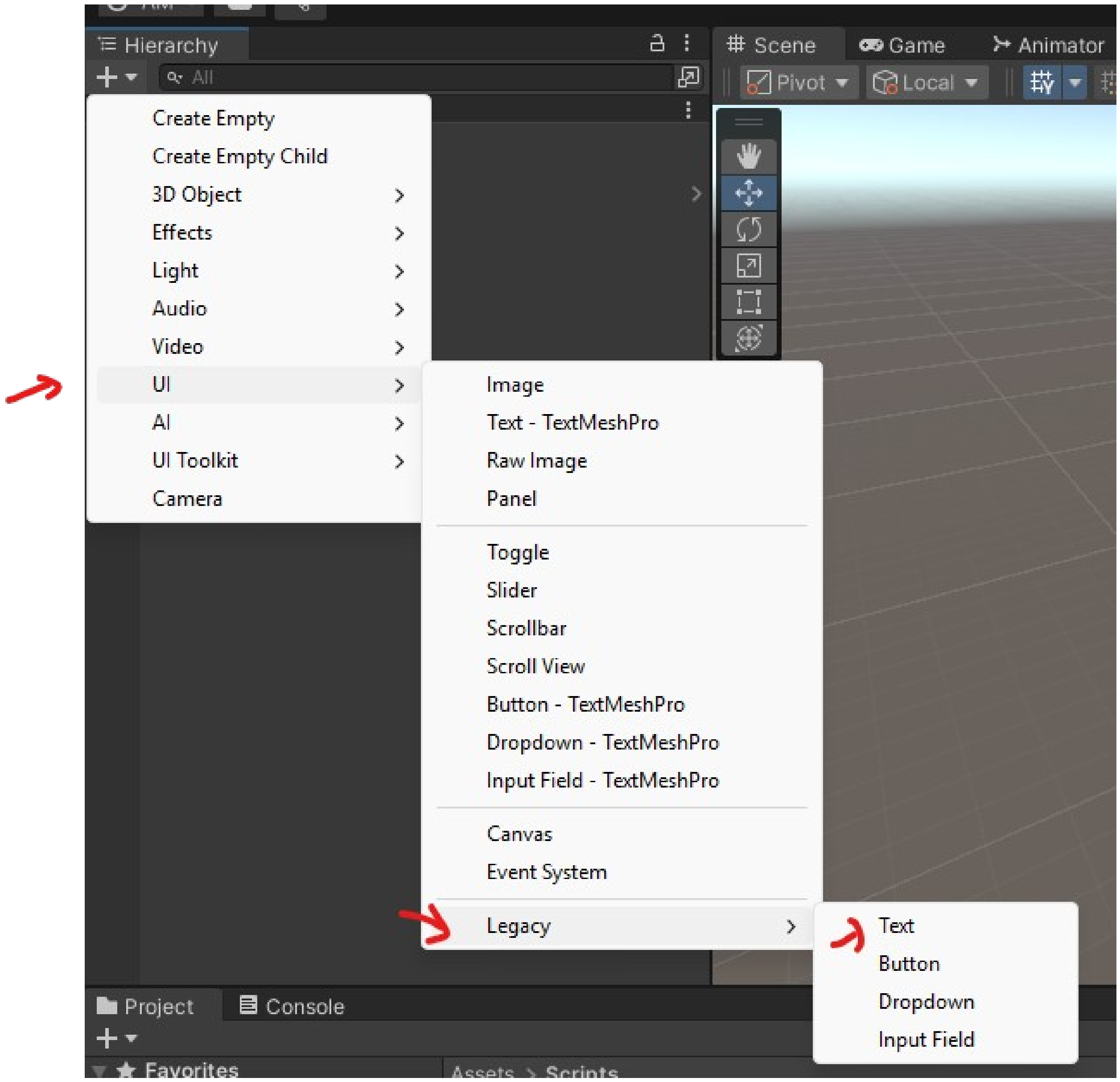
Game Manager (Script)

Script GameManager

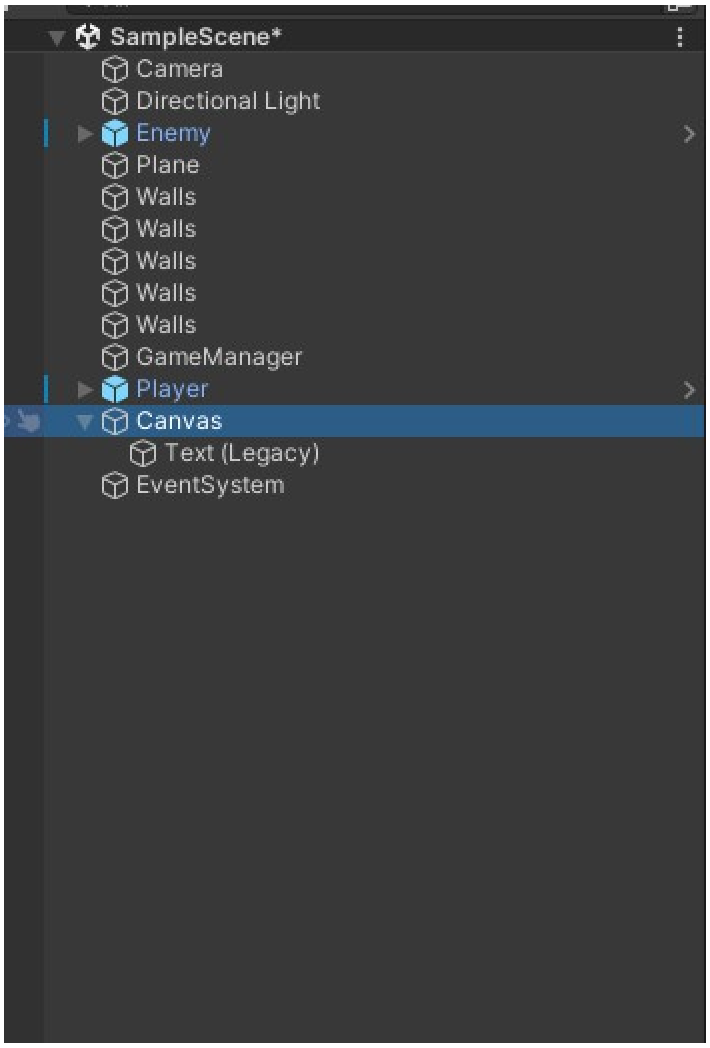
Score Text None (Text)

This will hold the score and update the UI. It is a singleton so it's easy to access.

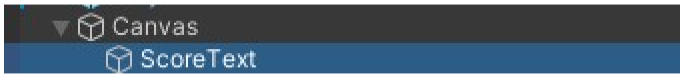
Now lets create the UI element that we will use for the Score :



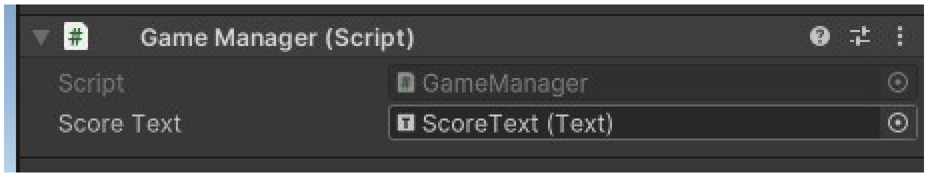
You should see



Rename Text (Legacy) with ScoreText.



And drag the ScoreText game object in the GameManager script



Script	GameManager
Score Text	ScoreText (Text)

---

2) Enemy notifies the GameManager

Update your `EnemyController` so it calls the GameManager when you hit the enemy like so.

```
using UnityEngine;

public class EnemyController : MonoBehaviour
{
    private Animator animator;

    void Start()
    {
        animator = GetComponent<Animator>();
    }

    public void GotHit()
    {
        animator.SetTrigger("GotHit");

        // Notify GameManager
        if (GameManager.Instance != null)
        {
            GameManager.Instance.AddScore(1); // Add 1 point per hit
        }
    }
}
```

Your Game should now have a score that keeps getting up everytime you hit the Enemy and the Enemy Should react to your punches.

Submit your project on github.