Project Summary for Group LEGO BUILDER:

This project is a super fun first-person Lego builder powered by Unity and Leap Motion, letting users dive into a creative 3D world where they can stack and customize Lego bricks with their hands! The core idea was to make a playful, interactive experience where players feel like they're physically building Lego creations, using Leap Motion's hand-tracking tech to make it all feel natural and intuitive.

The project has three main modes: **Play Mode**, **Build Mode** and **Menu Mode**. In Play Mode, users can play around in the scene, discovering the controlling functions using Leap Motion hand detection. In Build Mode, users can grab, rotate, place, and snap Lego bricks together in a vibrant 3D scene. The Leap Motion controller tracks hand movements, so you can control all these motions using moving hands or sticking fingers out. Switching to Menu Mode, users can customize their bricks. This mode lets you pick different brick shapes and colors. The menu's simple to navigate with hand gestures, making it easy to jump between designing and building. Whether you're crafting a tiny house or a wild sculpture, this project's all about sparking creativity and having a good time in a Lego wonderland!

Work Distribution – Unity (JinYu Xie, YanRui Chen):

In the construction mode, users can complete the building operations of Lego bricks, including grasping, rotating, placing and automatically aligning and assembling the virtual bricks. When it is detected that the building blocks are placed in the same position, they will be automatically aligned and stacked. When it is detected that new building blocks fall beside the existing ones, they will be automatically aligned. To facilitate users' inspection and construction of complex structures, Build Mode provides flexible perspective control. Users can switch between the first-person perspective and the free perspective. When more precise operations are needed, the system allows users to zoom in and out of the view, thereby observing the setup details up close.

Menu Mode provides an intuitive roulette menu interface, allowing users to select the types, sizes and colors of building blocks. The ring menu is divided into various shape and size options of Lego bricks by sector, and each sector is displayed with a small icon to show the corresponding building blocks. When the user selects a certain brick shape in the roulette menu, they can further select the color through gestures.

Work Distribution – Leap Motion (Rui Hu):

The communication between the Unity and the Leap Motion controller needs to be done by main the C# script. Previously, all controlling functions are finished by keyboards and mouse such as WASD for movement, mouse for view rotation and place/delete bricks. I have written a new script to implement the hand pose detection, but since we need dynamic hand position detection, I use fingers and palms to determine the trigger instead

of simple Leap Motion Plugin function (Pose Detector). In addition, I have created some surroundings and added some audios in our Playground scene just to increase the vide. I have also created a cover scene acts as the main menu of our game.
I added 2 extra scenes besides the **Playground** Scene, which are **MainMenu** Scene and **Tutorial** Scene, to finish our project more like a real game. In the MainMenu page, players can choose go through the tutorial before entering the playground, or directly enter the playground and skip the tutorial. It depends on the familiarity of players to our game. We strongly suggest those of who have never experienced our games to follow the tutorial first. Just to have a rough understanding on what are basic controls. If you finished the tutorial but still feel confused after entering the game, there is completely fine. We understand that hand detection technology may not be easy to handle, so we provide the check-up table for you to find your intended poses. Just don't be panic. Calm down, and check the table.

Motivation:

Our motivation to start this theme, as a completely free playground instead of a winning-losing game, is that we enjoy the moment of building real Lego without considering what is right and what is wrong. It acts like a Minecraft-like game, allowing players to follow their minds without setting any limitation. Another reason is that we don't want to make our players being frustrated when they are playing the game. To be more specific, players who have never experienced leap motion or any other hand detection controller may not be skilled as we do. Maybe a game is lose even before they know what should they do. Therefore, we cared about our players' feelings and decided to abandon the idea of winning and losing. If you are confused, everything is fine. No one is rushing you or giving you press. Players can just enjoy the process of exploring, bricking, and having fun.