# 3D Touch Install Instruction
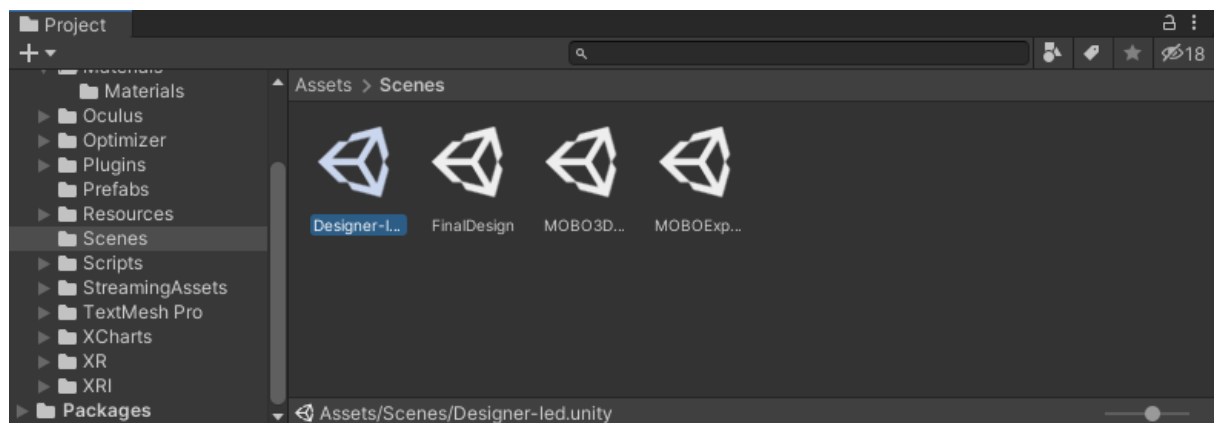
# Unity

1. Install Unity Hub and install the Unity version 2019.4.30f1
2. Install Oculus app on PC (only tested on Windows 10)
3. Download and open the Unity project [3DTouch_CHI2022]
4. Enable Oculus Link in the Oculus Quest 2.
5. Make sure the Quest 2 is connected to your PC by a USB Type-C cable.
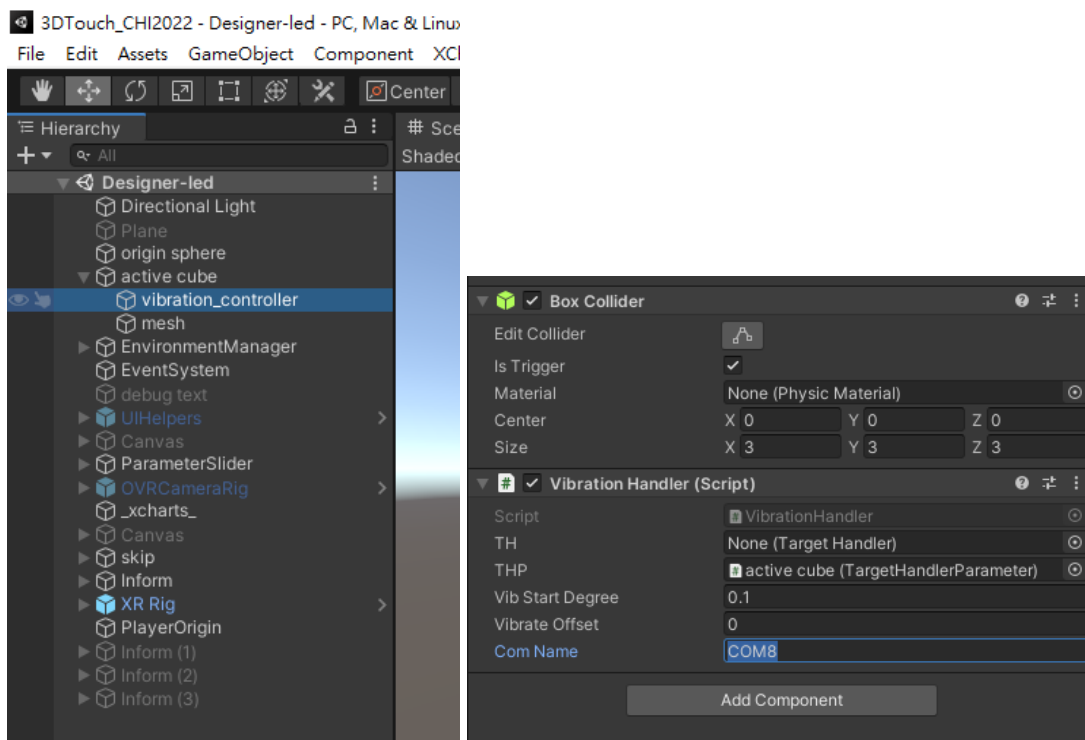
## Designer-led

1. Open the scene [**Designer-led**.unity] in the folder Scenes



2. Click on  GameObject [EnvironmentManager] and select the VR user's dominant hand in the Hand field.
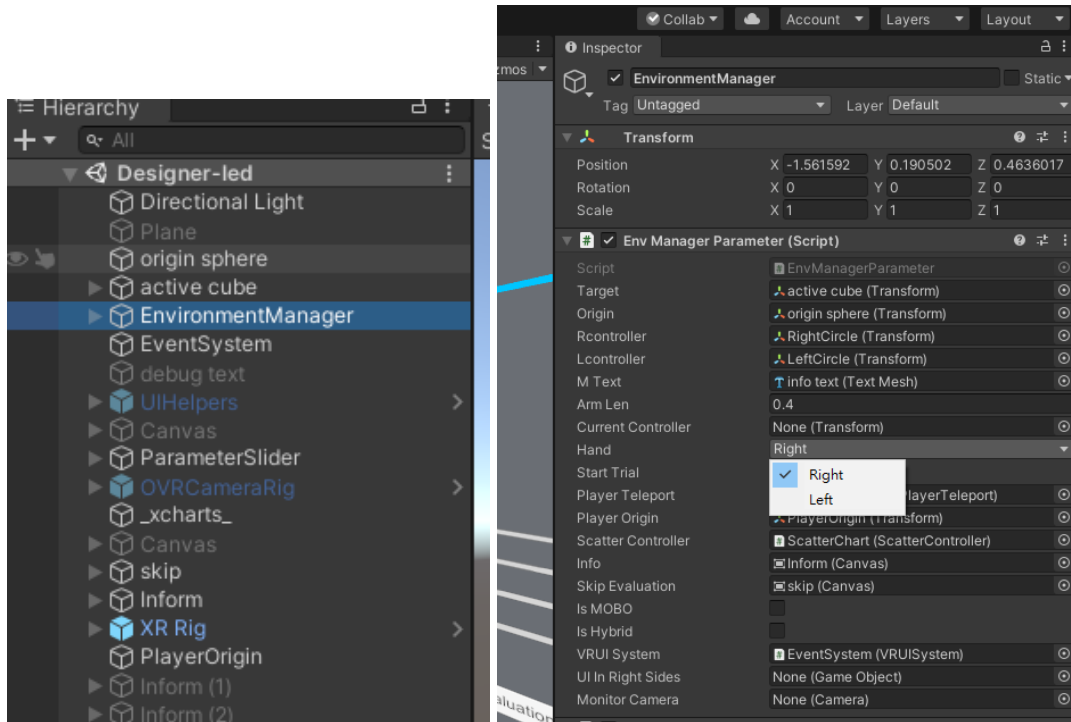
3. In the GameObject [vibration_controller], make sure the field [Com Name] indicates the com port of the Arduino connecting the vibration module.



4. Press Play.
5. Make the VR user sit still on a chair and press "R" to align the scene with the VR user.
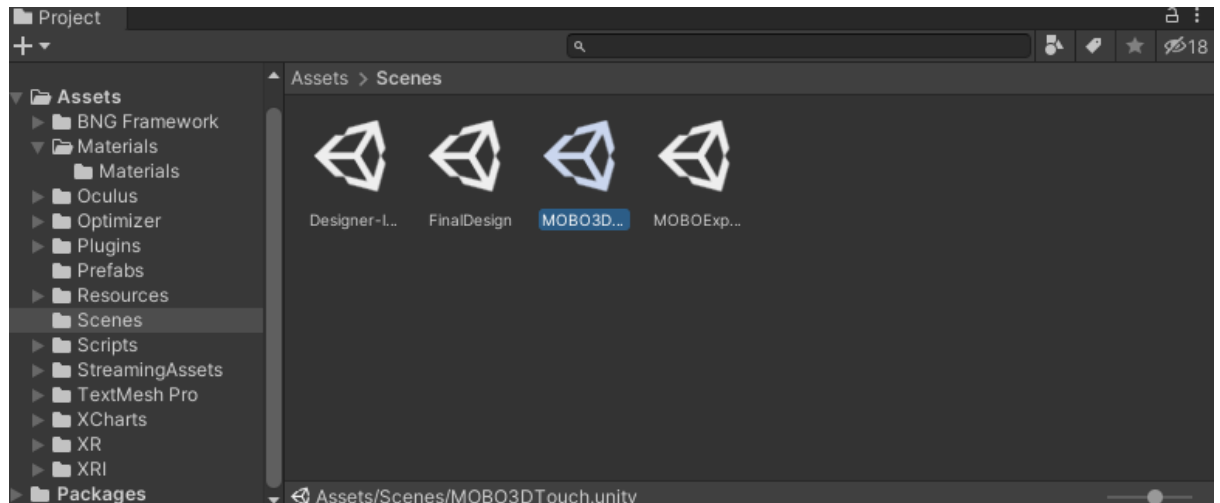
6. Make the VR user fully retract the dominant hand to their shoulder and press "T" to set the reference point of 3D touch interaction.
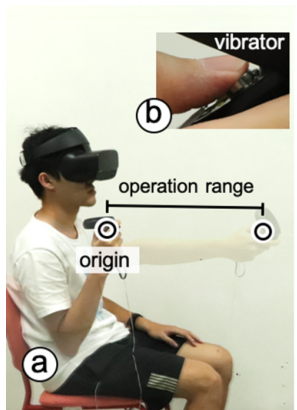


7. Make the VR user fully stretch their hand and press "A" to record the operation range.
8. The VR user can start to design the 3D Touch Interaction.

## Optimizer-led

1. Open the scene [**MOBO3DTouch**.unity] in the folder Scenes/



2. If you use conda, you need to initiate the Python environment with "conda activate botorch" in the command prompt.
3. Once the Python environment is set up, run the python file "BoTorch/mobo.py" in the command prompt.
4. Repeat step 2 to step 7 in Designer-led condition.
5. The VR user can start to practice 3D touch interaction in the practice session.
6. Once the practice session is done, press "S" to start the optimization session.

7. Click on the start button to start an iteration, where the user needs to complete 36 trials.
8. The user will be prompted to take a break every 10 iterations.

# Python

We recommend using conda to install the python environment.

We use [BoTorch](#) as our BO library.

Installation Requirements

1. Python >= 3.7
2. PyTorch >= 1.9
3. gpytorch >= 1.6
4. botorch
5. scipy
6. numpy
7. matplotlib
8. pandas

**Quick installation**

1. Create conda environment, the environment setting is in yml file (yml file is in MOBOPlus/environment.yml, env name is botorch)

   ```
   conda env create -f environment.yml
   ```

2. activate the new environment:

   ```
   conda activate botorch
   ```
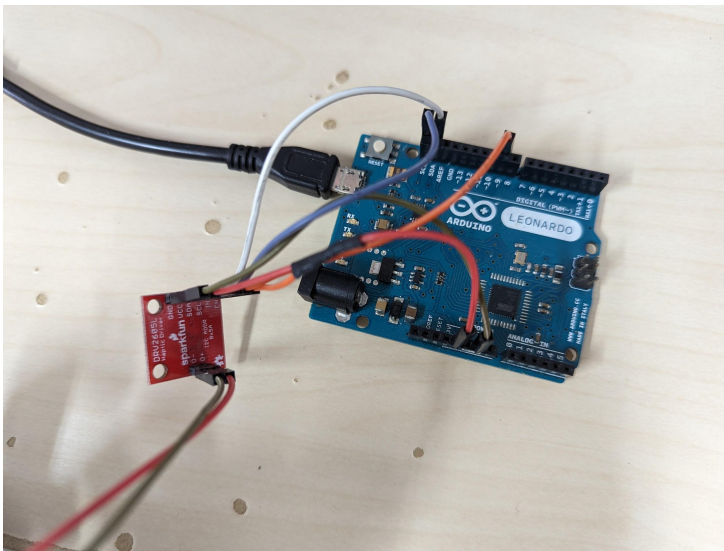
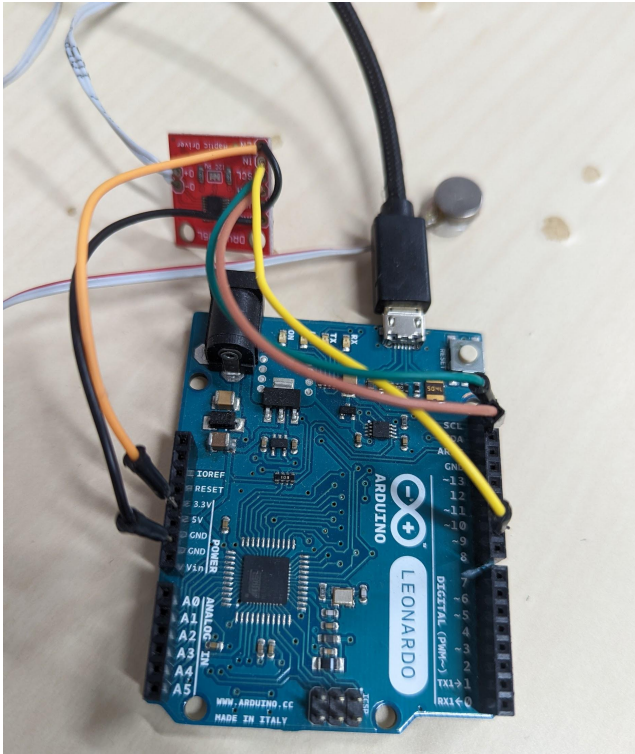3. run botorch/mobo.py

# Arduino

1. Download Arduino IDE in [Arduino web page](#).
2. Upload the [code](#) to the Arduino Uno

3.  Hardware and circuit:

    Vibrator ([Precision Microdrives 310-117](#))

    Vibration [Driver Board](#)





# Saved file

## Designer-led

Assets/Resources/DesignerLed/ObservationsPerEvalution.csv

- observations [parameters, objectives] for each evaluation

Assets/Resources/DesignerLed/DataPerTargetPerEvalutions.csv

- detailed data for each target acquisition in each evaluation

## Optimizer-led

Assets/Resources/MOBOLed/ObservationsPerEvalution.csv

- observations [parameters, objectives] for each evaluation

Assets/Resources/MOBOLed/HypervolumePerEvalution.csv

- hypervolume after each evaluation

Assets/Resources/MOBOLed/DataPerTargetPerEvalutions.csv

- detailed data for each target acquisition in each evaluation