

Submission Guidelines:

1. There are usually two types of questions: written and programming.
2. For written:
 - Scan your written solution or compile it as a pdf file
 - Submit the pdf to <https://www.gradescope.com/> under *written* solution assignment box (Entry Code: **4V24DD**)
3. For programming:
 - Write a readme file to describe how to compile and run your codes on which platform *Codes that do not run will not be graded!*
 - Save the readme and all your source codes (no binary) as a zip file.
 - Submit the archive to <https://www.gradescope.com/> under *programming* solution assignment box (Entry Code: **4V24DD**)
4. Some questions may be marked as **(UG Optional)**. They are voluntary for undergraduate students. Some other questions may be marked as **(Bonus)**. These questions are optional for all students. If answered, they will be graded and will count as bonus points; however, the maximum score can get from one assignment remains 100%. E.g., if you get 45/40 in total, you will get 100% instead of 112.5%. **Graduate students must answer all questions.**

Assignment 4: (Programming) Marker Tracking, Unity

In this assignment, you will convert the game you developed in *Assignment 1* into an Augmented Reality game with the help of the *Vuforia Engine Library*. This assignment will help you understand how to create Augmented Reality applications that integrate marker tracking capabilities and interact with the real world.

1 Installing the Necessary Tools [5 points]

The first step toward converting your Unity game into an Augmented Reality application will require the installation of the *Vuforia Engine Library*. To achieve this, please follow these steps:

1. Create a new Unity project.
2. Go to the *Vuforia Developer Portal* and register for a Developer Account.
3. Follow the *Getting Started with Vuforia Engine in Unity* instructions and download the Unity package necessary to update your Unity project (*Adding Vuforia Engine to a Unity Project*).

4. Create a 30 seconds video interacting with the marker and 3D models. The 3D models can be those pre-loaded by the application. However, you are encouraged to use different models for your submission.

2 Creating your Augmented Reality Game [10 points]

Now that you know how to import Vuforia into a Unity project. Follow the next steps to convert your *Assignment 1* into an augmented reality game.

1. Clone your *Assignment 1* Unity project.
2. Open the scene of your Unity project containing your game and install the *Vuforia Engine Library*.
3. Edit your Unity scene such that one of the pre-loaded Vuforia markers can be used to visualize your game in Augmented Reality.
4. Place a printed marker on a flat surface and bring your game to life.
5. Create a 30 to 60 seconds video demonstrating the capabilities of your augmented reality game.

3 Using Multi-Targets [10 points]

1. Follow the instruction in the *Vuforia Developer Library for Multi Targets*
2. Print and build a multi target and ensure your Unity project can track it.
3. Modify your game such that your virtual content can interact with the physical multi target. For instance, the physical marker should avoid the virtual content passing through it.
4. Place the printed multi target marker on a flat surface and create a 30 to 60 seconds video demonstrating the capabilities of your augmented reality game.

4 *(Bonus)* Deploy Your Game to Your Smartphone [5 points]

1. Follow the necessary steps to deploy your game to your smartphone or tablet.
2. Create a 30 to 60 seconds video demonstrating the functionality of your game.