1. Students will submit a teaser video that shows the progress of the project. The video will be used to get feedback on the scope of the project and the students will discuss the project in a Q&A session.

The video should have a length of 3 to 5 minutes and needs to cover the following topics:
- Group composition
- What is the project about
- What data are you planning to use
- What component of the course
- Strategy to validate intermediate grade wrt the marking criteria

We are the [StackBot/Cinnamorolled] *Title Card roll*

Group intro + member roles
Our project combines artificial intelligence and robotics to tackle intelligent stacking challenges using a robotic arm.
Our team consists of Luis, who is developing the computer vision system using convolutional neural networks; Minh, leading simulation development and reinforcement learning; Lauren, managing the modelling and control of the robotic arm; and Michele, focusing on camera setup and data acquisition.
Together, we are building both a simulation environment and a real-world robotic system based on the uArm Metal.

Project Description

The goal of our project is to enable a robotic arm to autonomously recognise and stack boxes of different sizes in an optimal and stable arrangement.
Using a webcam, the system captures visual data which is processed by a CNN to classify each box by size.
Based on this information, a Deep Q-Network reinforcement learning agent plans the stacking actions, optimising for stability and space efficiency.
We are first developing and testing this pipeline inside a simulation environment, and once stable, transferring it to the uArm Metal using trajectory planning in Robotics Toolbox.

Data plan

For perception, we are training our CNN using coloured paper boxes, where each colour represents a specific size; red for small, green for medium, and blue for large.
This method simplifies early classification tasks and accelerates initial training.
Once stable, we can extend the system to handle more complex visual recognition, such as text labels or different shapes.

Techniques used

Our work brings together several major course components: supervised learning through CNNs for object classification, reinforcement learning using DQNs for autonomous decision-making, and robotic simulation and control using PyBullet and Robotics Toolbox.
We are directly using Robotics Toolbox to handle both the simulation modelling and the real hardware control, maintaining a lightweight and portable system.

Validation strategy

To validate our progress, we are focusing on measurable outcomes at each stage.
In simulation, stacking performance will be evaluated based on defined reward metrics — penalising boxes that fall or go outside a target area, and rewarding stable, successful stacks.
CNN classification accuracy will be tested against labelled datasets, and complete system integration will be demonstrated through autonomous stacking behaviours, both in simulation and on the uArm Metal.
Success will be tracked by monitoring reward improvements over time and the rate of stable stack completions.

Closing

We are excited to continue refining our models, improving system robustness, and preparing for real-world demonstrations.
Thank you for watching, and we look forward to receiving your feedback to further strengthen and shape our project."