

# Project Proposal: Design and simulation of an Autonomous Harvesting Robot for Indoor Farms.

## Project Goal:

The primary objective of our project is to design and implement an autonomous robot capable of harvesting strawberries, tomatoes, and leafy vegetables in indoor farms. The robot will be equipped with a 4-wheeled mobile base, a 6-degree-of-freedom (6-DOF) robotic arm with a gripper, and potential additional tools for various farming tasks.

## Design:

The robot's mechanical design will be executed using SolidWorks, ensuring precision and efficiency. The integration of a 6-DOF arm allows for versatile movements and precise harvesting. The gripper and additional tools will be modular, facilitating adaptability for different crops and farming activities.

## Ambitious Goal:

Our ambitious goal is to automate the entire farming process, from sowing seeds to harvesting ripe produce. This entails developing subsystems for seed planting, monitoring plant growth, and implementing intelligent decision-making algorithms. Achieving this would revolutionize indoor farming, enhancing efficiency and reducing labor requirements.

## Fall-Back Plan:

In case of time constraints, our fall-back plan is to focus on automating the harvesting process. The robot will navigate the farm autonomously, identify ripe produce using computer vision (utilizing external OpenCV libraries), and perform precise cuts. Harvested crops will be collected in a tray attached to the robot. This ensures a functional and impactful outcome even if the full automation timeline is not feasible.

## Workflow Overview:

**Mechanical Design (SolidWorks):** Develop a detailed design of the robot, considering mobility, stability, and adaptability to various crops.

**URDF Export:** Export the Unified Robot Description Format (URDF) of the robot to define its kinematics and dynamics accurately.

**Simulation (Gazebo):** Develop and implement the code, simulate the robot's behavior in Gazebo to validate its performance in a controlled environment.

**Computer Vision Integration:** Utilize external OpenCV libraries to enable the robot to visually identify and locate ripe produce within the farm.

**Controller Development:** Implement controllers for both the mobile base and the robotic arm, ensuring smooth and precise movements during navigation and harvesting.

**BY: Group No 37**

**1. Raghu dharahas kotla-120378935 – Dir id (raghu17)**

**2. Sai Dinesh Gelam -120167140- Dir id (sgelam)**