ROBOTIC ARM: SHAPE-BASED OBJECT RECOGNITION AND MANIPULATION
The objective of this project is to Identify the object and classify the object using the robotic arm.

Addressing the challenges posed by dynamic environments. Through the fusion of machine learning, advanced object detection algorithms like YOLOv3, and the intricate integration of inverse kinematics, our project showcases a robotic arm's exceptional ability to identify, and manipulate objects.

Sensors:-

2D Vision Sensor – Intel real sense – 480 x 360 resolution
Pressure Sensors in Suction Gripper
IMPLEMENTATION

- Simulation Environment: CoppeliaSim
- Robot: GP7 Robot with an arm and Suction Gripper
- Perception: YOLO v3 (based on Darknet ROS)
• **darknet-ROS** :- This package integrates the Darknet neural network framework with ROS.
• **gp7-visualization** :- This is a MoveIt! configuration package for the GP7 robot model. MoveIt! is a middleware for robotic motion planning
• **my-robotic-arm** :- This is main folder of our project which will contain main functionalities and features tailored for our robot arm
• **simExtROS** :- This serves as bridge between ROS and the CoppeliaSim simulation environment.
EXPERIMENTS

Tests
- Single Object Detection vs Multiple Object Detection
- Correct Classifications vs Incorrect Classification

Observations
- Detection accuracy depends on the distance of the object
- Accuracy is not affected by having multiple objects in the frame
DEMO
FUTURE SCOPE

• **Error Recovery Mechanisms:**
  Implement error recovery strategies to enhance the system's robustness. Explore methods such as sensor fusion, redundant manipulation, or predictive algorithms to handle errors that may occur during object manipulation tasks.

• **Real-Time Object Tracking:**
  Develop real-time object tracking algorithms to monitor object movement on the table dynamically. Implement techniques such as visual odometry or sensor fusion to track objects' positions and velocities accurately.
THANK YOU