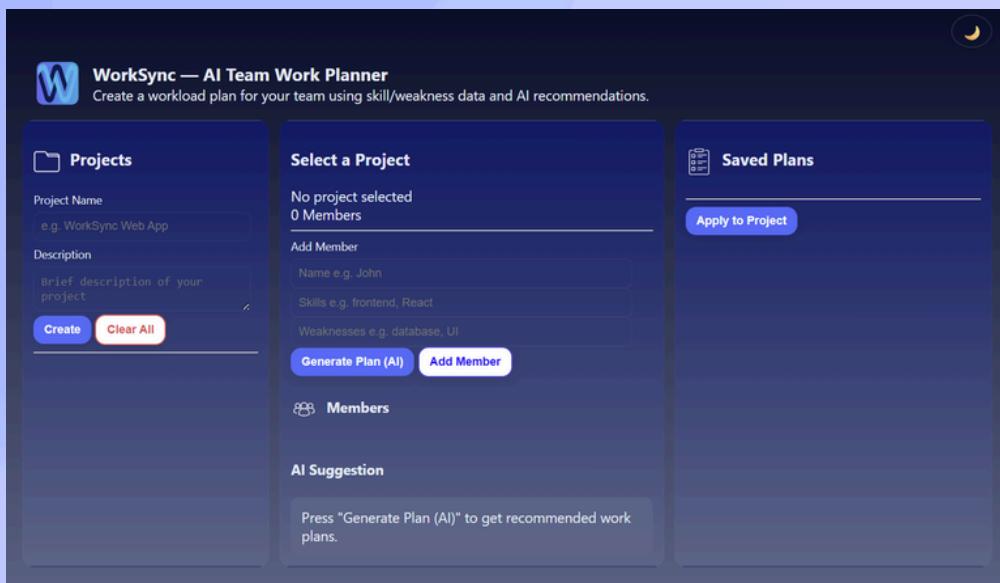


# ACADEMIC PROJECT

ryu49th/i2cedt\_project

**WORKSYNC**



**Tech Stack : MongoDB, Node.js , Express/API, Git, PM2.**

## WHAT IS WORKSYNC

An intelligent task delegation platform that optimizes team workflows. The application analyzes task constraints (deadlines, descriptions) against team member profiles (skills, weaknesses, and availability) to automatically generate high-efficiency work schedules.

## TECHNICAL DESCRIPTION

The system utilizes a Node.js and Express backend to manage data flow. It retrieves task requirements and team member profiles (skills/availability) from MongoDB. This data is formatted and sent to Google Gemini AI, which acts as the reasoning engine. Gemini analyzes the constraints to determine the optimal task distribution strategy, effectively deciding "who does what" to maximize efficiency. The AI's generated schedule is then parsed by the backend and returned to the client.

## MY ROLE

Backend Development, API Architecture & AI Model Integration

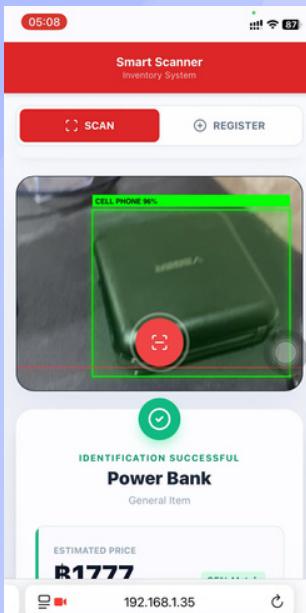
## WHAT I GOT

**Technical Skills:** Backend Development, API Integration, MongoDB, Git/GitHub, PM2

**Concepts & Soft Skills:** Design Thinking, Team Communication, Full-Cycle Development (Frontend-Backend Integration).

# ACADEMIC PROJECT

## SMART SCANNER WEB APP



[ryu49th/SmartScannerAPP](#)

**Tech Stack: NodeJS, React, Computer Vision, Docker, Python, MongoDB**

### WHAT IS THIS

An AI-powered Visual Search Engine that bridges physical retail products with digital inventory systems. The application integrates a React frontend with a hybrid Node.js and Python backend, utilizing YOLO for real-time object detection and vector similarity algorithms to instantly identify products via mobile camera feeds, deployed securely using Docker containers.

### TECHNICAL DESCRIPTION

The system utilizes a Node.js and Express backend to orchestrate the application's logic and data flow. It accepts image uploads from the client and retrieves product metadata from MongoDB. The backend then spawns a Python process equipped with YOLOv8, which acts as the visual reasoning engine. This engine performs feature extraction and calculates similarity scores to match the uploaded image against a vector database of known products.

### WHAT I GOT

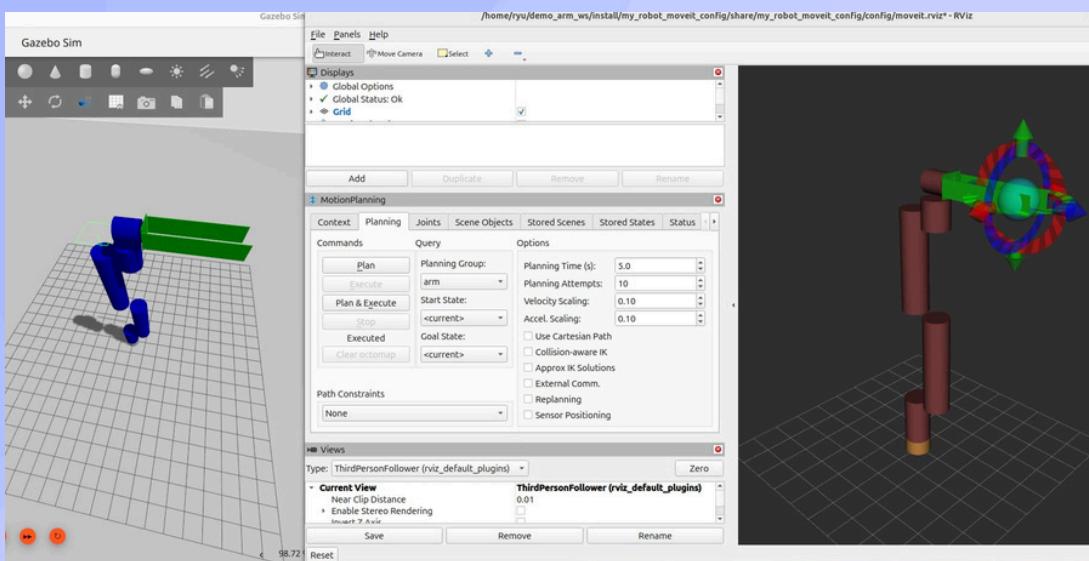
**Technical Skills:** Docker, Node.js (Express), Python, YOLO (Computer Vision), MongoDB, Linux

**Concepts & Soft Skills:** System Debugging & Troubleshooting

# ACADEMIC PROJECT

ryu49th/demo\_arm\_ros2\_control

## ROS ARM CONTROL



**Tech Stack: ROS2, MoveIt, RViz2, Gazebo, XML**

### WHAT IS THIS

An autonomous robotic simulation platform that validates complex manipulation strategies. The application analyzes target goals against physical constraints (collisions, joint limits, and gravity) to automatically calculate optimal, collision-free trajectories for precise mechanical execution.

### TECHNICAL DESCRIPTION

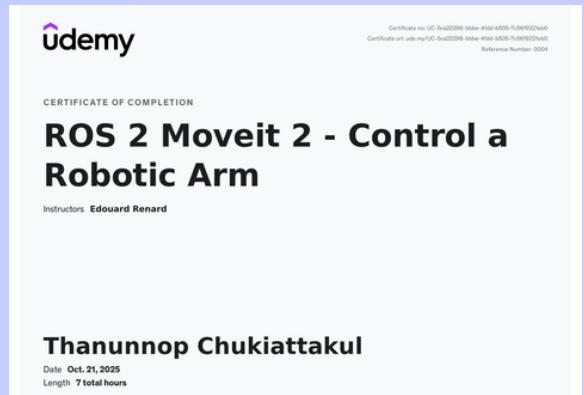
The platform leverages ROS 2 Jazzy and Gazebo Harmonic to control the robotic arm. It captures target goals and sensor data from the simulation and sends them to MoveIt 2. MoveIt acts as the motion planner, checking for obstacles and physical limits to calculate the safest path.

### WHAT I GOT

- Technical Skills: ROS2, Gazebo Harmonic, RViz, MoveIt 2, Python (Launch Systems) XML (URDF/SRDF/SDF), ros2\_control.
- Concepts & Soft Skills: Kinematic Modeling & Simulation, Inverse Kinematics (IK) & Path Planning, Full-Stack Robotics Integration, Real-time System Synchronization, Root Cause Analysis & Debugging.



**Robotic and AI Ventures 2024 Camp | KMITL**  
Focused on Mobile Robots, Drones, and Embedded Systems, 3D modeling.



**ROS 2 & Moveit 2: Control a Robotic Arm | Udemy**  
Focused on Robotic Arms, Motion Planning, ROS 2, Moveit 2, URDF, C++, and Python.



Thailand Open ROS & Smart Robot Competition 2025  
Industrial Logistics | IMake Thailand  
Focused on Mobile Robots, Design Thinking, and Industrial Robotics.



**Guest Speaker: Basic Robotics Workshop**  
**September 28 - 29, 2024 | Ban Rom Klao 4 School, Phop Phra District, Tak Province**  
Role: Served as a guest speaker and trainer, providing basic robotics training to teachers and students.



**Guest Speaker: Basic Robotics Workshop**  
**May 11 - 12, 2024 | Ratwittaya School (Ti Ming), Mae Sot District, Tak Province**  
Role: Served as a guest speaker and trainer, providing basic robotics training to teachers and students.



**STEM & ROBOTICS CAMP Workshop**  
**September 9 - 10, 2023 | Sapphawittayakhom School, Mae Sot District, Tak Province**  
Description: Participated in the workshop led by Assoc. Prof. Dr. Chailerd Pichitpornchai, M.D., Director of the Institute for Innovative Learning, Mahidol University.



Robo Challenge Beijing 2024 | Beijing, China  
Awards : Bronze Medal (2nd Runner-Up): Mini Sumo Remote Control  
First Prize (3rd Runner-Up): Mini Sumo Auto Senior

#### Knowledge & Experience Gained:

- Iterative Design: Applied insights from the previous year to completely redesign the robot structure using Nylon material for superior durability and structural integrity.
- System Upgrades: Enhanced the Mega Sumo robot by integrating a new generation of motors and a high-voltage battery system to maximize power output.
- Adaptive Programming: Developed flexible code logic capable of handling various competitive scenarios and integrated updated sensors for better environmental awareness.



World Robot League Festival 2024 | Seoul, South Korea  
Awards: 1st Runner-Up: A.I. Line Tracing Vision (Open)  
1st Runner-Up: Robo Futsal (Open)  
2nd Runner-Up: Robot Battle Lightweight Pro (Open)  
2nd Runner-Up: Line Coding Mission (Open)

#### Knowledge & Experience Gained:

- A.I. & Control Systems: Integrated PID Control with Image Processing algorithms to achieve precise line tracking using an AI Camera.
- Mechanical Durability: For Robo Futsal, focused on designing a chassis capable of withstanding high-impact collisions while maintaining agility.
- Rapid Prototyping: The Line Coding Mission required designing and programming a robot within a strict time limit, sharpening time-management and rapid implementation skills.
- Agility & Stability: Designed the Battle Robot for maximum maneuverability and developed stable control logic for the pilot.



Robo Challenge Beijing 2023  
Role: Thailand National Representative August 9 - 14, 2023 | Beijing, China  
Award : Silver Medal (1st Runner-Up): Mega Sumo 3KG Remote Control

#### Knowledge & Experience Gained:

- International Standards: Gained exposure to advanced robotic designs and complex engineering standards from international competitors.
- Magnetic Downforce System: Developed a Sumo robot equipped with strong magnets to increase traction (downforce) on the steel dohyo (ring).



### Participate in the POSN Camp 2 in the Computer Science field at the Olympiad Academic Center, Naresuan University.

**Knowledge and Experience Gained:** I significantly increased my knowledge during this camp. I learned about searching, the concept of Big O, and studied various types of data structures such as Queue, Priority Queue, Stack, and Linked List. Additionally, I explored different algorithms like Graph Traversal and Dynamic Programming, which enhanced my understanding of the complexity involved in writing more advanced programs.



### OBEC Advanced Robotics Competition The 70th National Student Arts and Crafts Activity Achievement: Ranked 2nd Highest Score

#### Knowledge & Experience Gained:

- Sensor Integration: Gained expertise in using RGB Color Sensors for precise environmental detection.
- Mechanical Design: Designed a robot chassis capable of navigating steep slopes and obstacle-ridden terrains. Developed a precision cube-release mechanism to fulfill specific mission requirements.
- Automation & Teamwork: Successfully built a fully automatic robot to complete assigned missions and practiced effective task delegation, enabling the team to assemble the robot rapidly under time pressure.



### 2023 TPA-OBEC Youth Robotics Competition (Game: Robo Rescue) | Diamond Hall, Zeer Ran Achievement: 1st Runner-Up Award

#### Knowledge & Experience Gained:

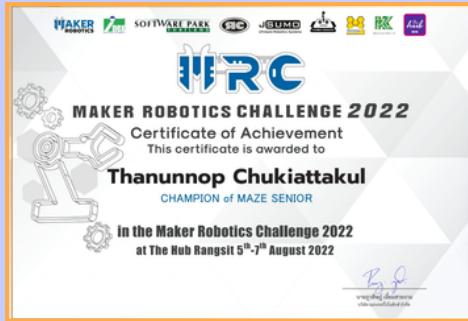
- Computer Vision & AI: Implemented an AI Camera to perform Image Processing, enabling real-time detection of object coordinates and color classification.
- Algorithmic Problem Solving: Developed complex logic for the robot to autonomously identify and collect specific colored balls, then deposit them into designated bins.
- Precision Navigation: Programmed the robot to accurately follow track lines while navigating through dynamic obstacles on the course.



## 2022 TPA-OBEC Youth Robotics Competition Competition: Rescue Line Game May 28 - 29, 2022 | The Mall Bangkapi Achievement: 2nd Runner-Up Award

### Knowledge & Experience Gained:

- Constraint-Based Problem Solving: Developed a robot to collect all required balls and deposit them into a bin while navigating obstacles, strictly adhering to limited hardware specifications.
- Algorithmic Logic: Designed logic to solve dynamic pathfinding problems on the field.



### World Robot Game 2023

#### Achievement: Gold PRIZE (Rescue Challenges Category)

### Knowledge & Experience Gained:

- Advanced Mechanism Design: Designed a mechanism to scoop, store, and release balls effectively.
- AI Integration: Implemented an AI Camera to detect ball locations and optimized complex code to automate the entire process.

### Maker Robotic Challenge 2022

#### Achievement: Winner (Champion) - Maze Solver Category

### Knowledge & Experience Gained:

- Maze Solving Logic: Built an autonomous exploration robot using Wall-Following algorithms (checking left/right walls) to navigate the maze.
- Optimization: Fine-tuned the robot's movement to find the exit path in the shortest possible time.



### Maker Robotic Challenge 2024

#### Achievement: Winner (Champion) - Line Tracing Vision (Open Category)

### Knowledge & Experience Gained:

- Control Systems: Integrated PID Control with Image Processing techniques to create a smooth line-following robot.
- Computer Vision: Gained expertise in tuning camera threshold values to detect track lines efficiently under various lighting conditions.



### Maker Robotic Challenge Charity 2023

- Winner (Champion) - Maker Logistic (Open Category)
- 1st Runner-Up - Legs Sumo 1KG Remote Control (Open Category)

### Knowledge & Experience Gained:

- Legged Robotics: Constructed and programmed a walking robot using Servo Motors for the Sumo category.
- Coordinate Systems: For the Logistic category, designed a gripper and navigation system based on X-axis and Y-axis movement.
- Pattern Recognition: Implemented logic to identify object placement positions based on black-and-white strip codes.



### 1st TO BE NUMBER ONE Youth Robotics Championship

Achievement: - Winner (Royal Trophy) - Sumo 1500g Remote Control (Senior)  
2nd Runner-Up - Line Tracing (Senior)

### Knowledge & Experience Gained:

- Structural Engineering: Focused on building a robot with high stability and a durable chassis for collision-heavy competitions (Sumo).
- Precision Control: Applied PID Control algorithms to the Line Tracing robot to ensure high precision and responsive movement