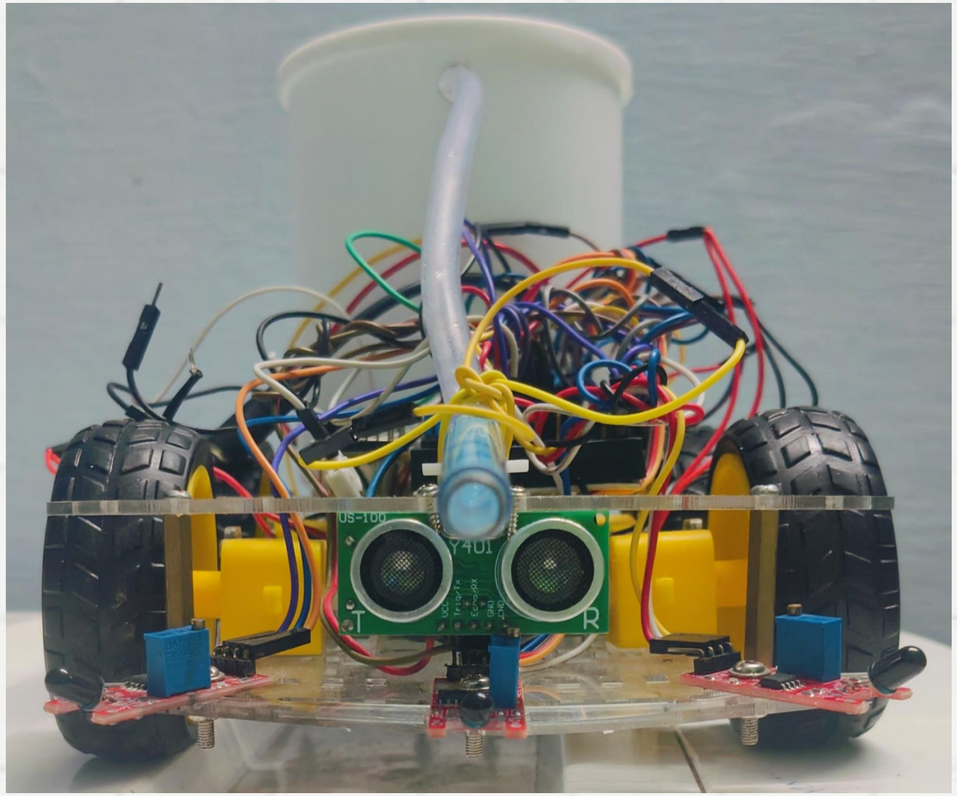


# Automatic Fire Extinguisher Vehicle

# FireFront AI Team


**IIIT Gwalior**

- **Sahil Jaiswal（Leader）**
- **Rushikesh Kusuma**
- **Vamshidhar Narsingoji**
- **Rajashekar Maloth**

# Introduction

•**Project Goal**: Develop an autonomous fire extinguisher vehicle that leverages AI for real-time fire detection and suppression.

•**Key Feature**: The AI-driven vehicle reduces response time by automatically navigating to and addressing fire incidents, even in complex or hazardous environments.

•**Why It Matters**:
•**India**: Over 16,000 fire accidents occur annually.
•**Global**: Approximately 180,000 fire-related deaths worldwide each year.

•**Sources**:
•**CITF Reports**: https://shorturl.at/pPD4j
•**Our World in Data**: https://shorturl.at/3rAd8

# Project vision and mission

A low cost diagrammatic model Design is Required before developing the Model.

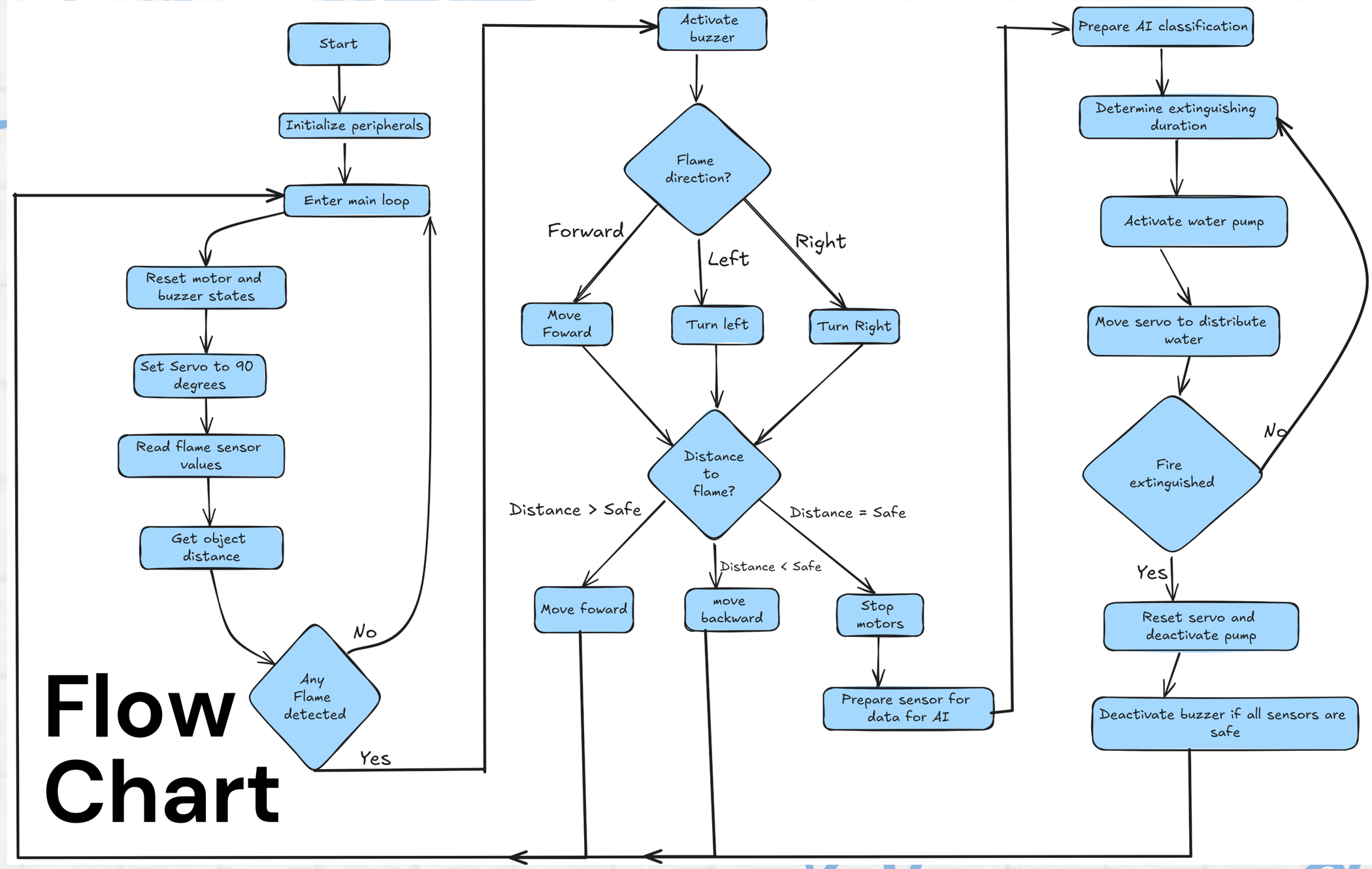
Develop an Autonomous Fire Extinguisher Vehicle that leverages Artificial Intelligence for real-time fire detection and suppression.

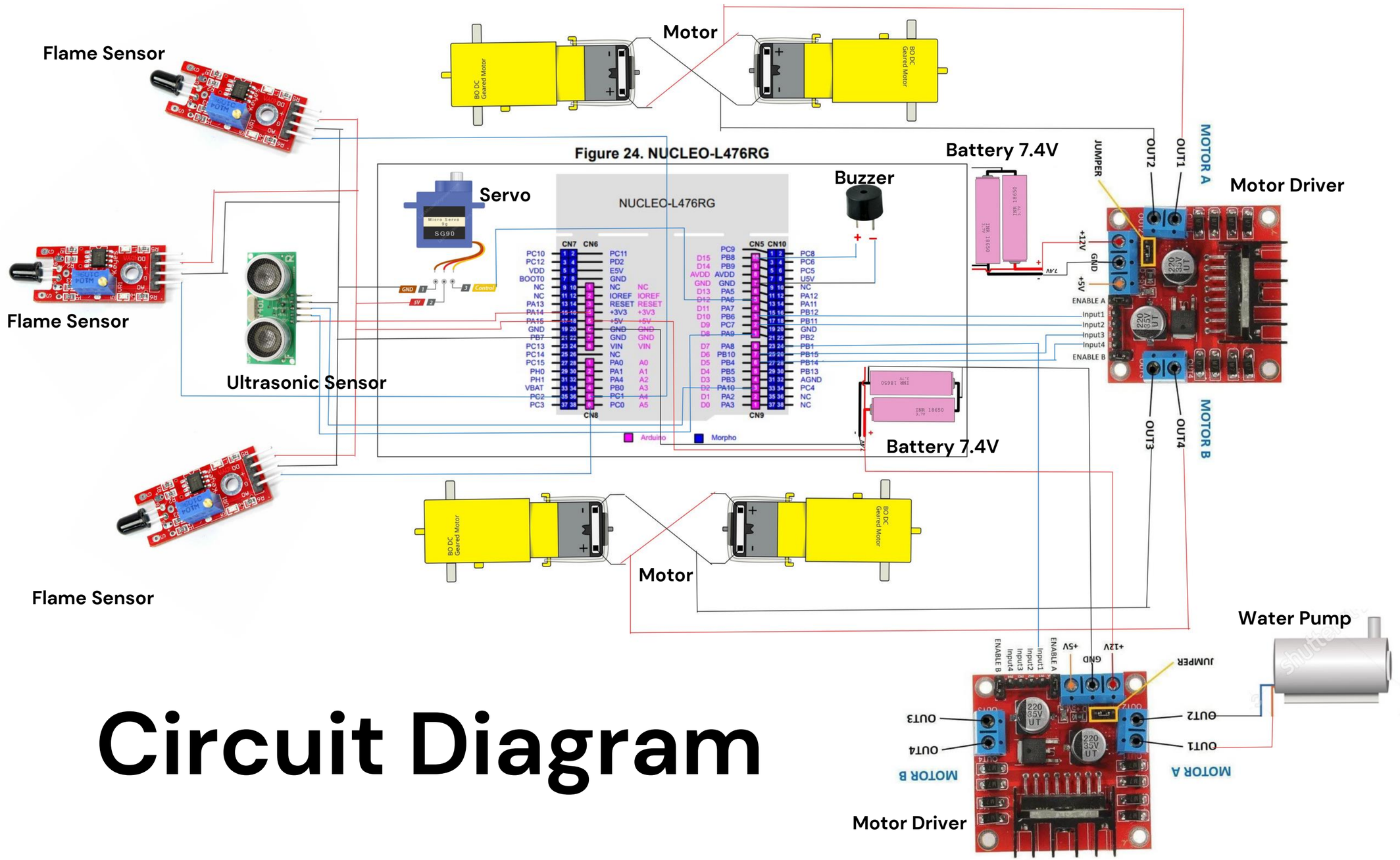
Optimal Amount of water is used according to the requirements which is managed automatically.

# Hardware Components

- STM32 Nucleo L476RG
- Flame Sensors ( Analog )
- Ultrasonic Sensor ( Y401 )
- Chassis
- L298 Motor Driver
- Bread board
- Buzzer
- Servo
- Battery ( 7.4V )
- Water pump
- BO motor

# Flow Chart


Start
Initialize peripherals
Enter main loop
Reset motor and buzzer states
Set Servo to 90 degrees
Read flame sensor values
Get object distance
Any Flame detected
No
Yes
Activate buzzer
Flame direction?
Forward
Left
Right
Move Foward
Turn left
Turn Right
Distance to flame?
Distance > Safe
Distance < Safe
Distance = Safe
Move foward
move backward
Stop motors
Prepare sensor for data for AI
Prepare AI classification
Determine extinguishing duration
Activate water pump
Move servo to distribute water
Fire extinguished
No
Yes
Reset servo and deactivate pump
Deactivate buzzer if all sensors are safe




# Circuit Diagram

# Key Features

- **Autonomous Navigation**: Moves freely in any environment.
- Fire Detection: Equipped with flame sensors for real-time detection.
- **AI-Driven Decisions**: Edge AI for instant fire detection and suppression response.
- **Fire Suppression Mechanism**: Water spray system.
- **Reduced Human Risk** : minimizes the need for human firefighters to enter dangerous zones, reducing injury and death risks.

# 98.37%

# AI Model Accuracy Rate

**Intelligent Classification:** Our AI model, employing a **n-classification** approach, effectively categorizes fire intensity into four distinct levels based on real-time sensor data.

**Data-Driven Training:** To enhance model accuracy, we conducted extensive training using **real-time data**. This dataset was meticulously curated through **controlled experiments** involving a wide range of flame intensities, simulating various **fire scenarios**. By exposing the model to diverse training examples, we ensured its ability to accurately classify fire intensity in real-world conditions.

**Performance Metrics:** The trained model achieved **98.37% accuracy rate** in classifying fire intensity, demonstrating its effectiveness in distinguishing between different levels of fire severity.

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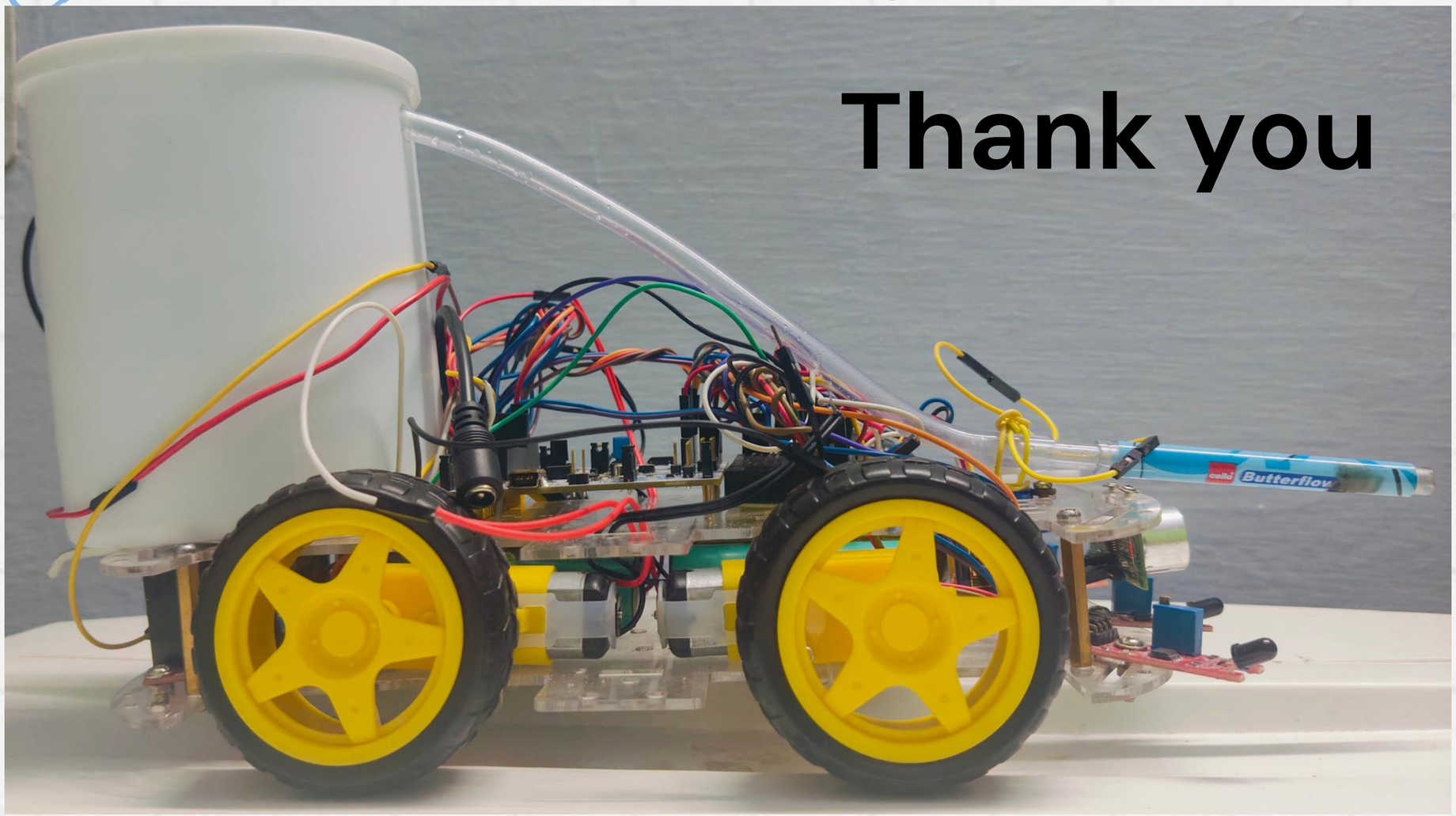
# Novelty

- **AI-powered fire extinguisher vehicle**: Revolutionizes real-time hazard response.

- **Key Innovations**:
  - **Autonomous operation**: Operates without human intervention.
  - **AI-driven analytics**: Enables intelligent decision-making.
- **Dynamic water discharge**:
  - Adjusts water flow based on fire intensity.
  - Utilizes a sophisticated **n-classification algorithm** to analyze sensor data.
- **Efficiency and sustainability**:
  - Ensures **optimal water flow** for effective fire suppression.
  - **Reduces response time** and **minimizes water wastage**.
  - Contributes to a **sustainable, environmentally friendly solution**.


Thank you