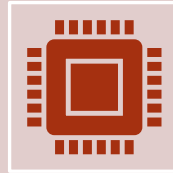


On-board Word Recognition and Sensor Monitoring System for Relay Control

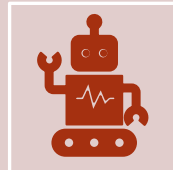
- Arashdeep Singh M23IRM003
- Chaitanya Shashikant Patil M23IRM004
- Parag Chourasia M23IRM010



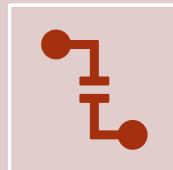
INTRODUCTION



Intelligent Voice Control: Integrate a speech recognition engine optimized for microcontrollers, allowing users to control appliances through spoken commands. Consider keyword spotting for a more streamlined experience.

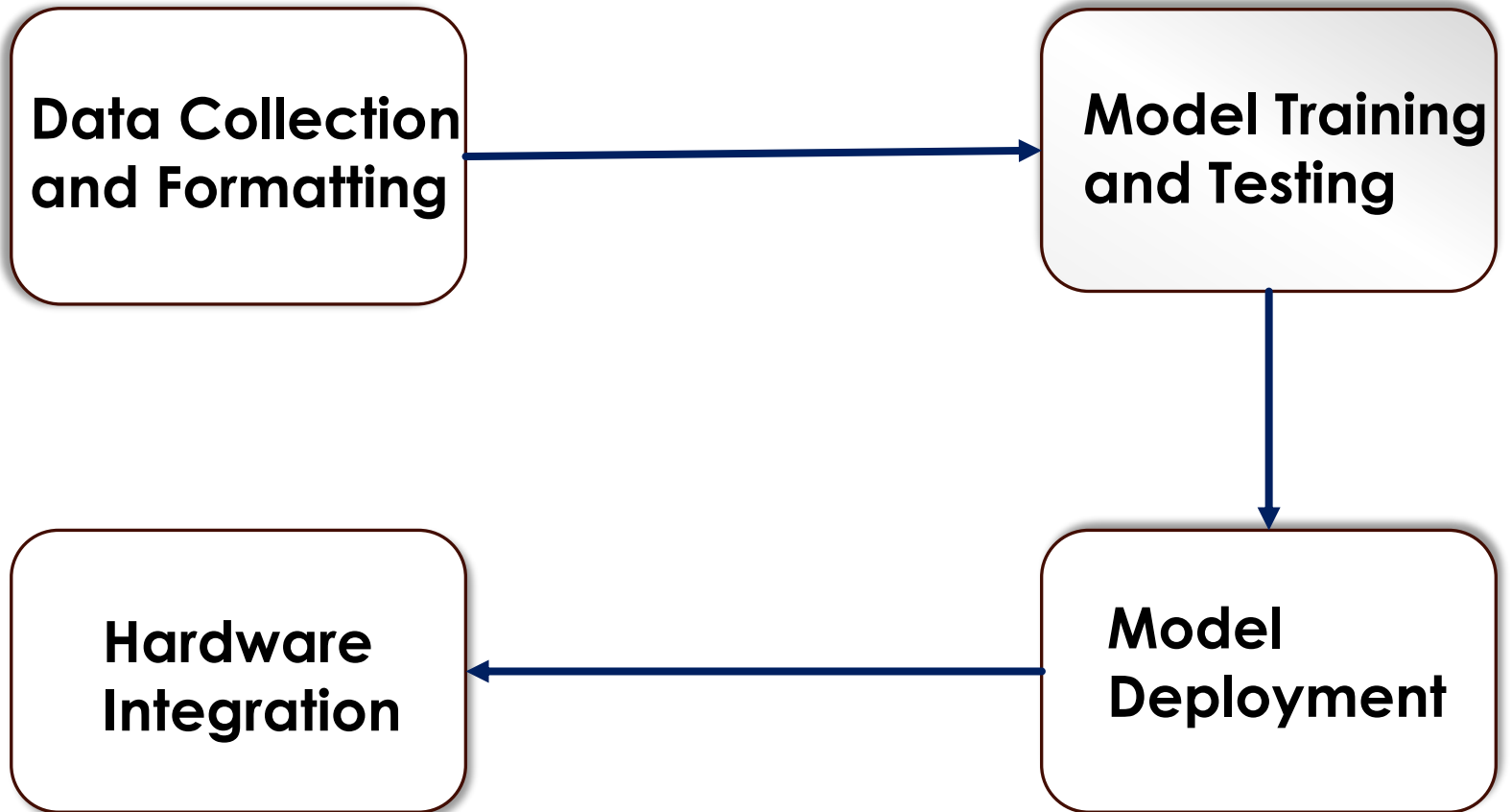


Sensor-Driven Automation: Equip the system with relevant sensors (temperature, light, etc.) to gather real-time environmental data. This data can be used independently to trigger actions (e.g., light turns on with motion) or combined with voice commands for more sophisticated control.



Relay Power Management: Utilize relays to bridge the gap between the microcontroller's low-power signals and the higher power requirements of appliances. Ensure chosen relays are properly sized for safe operation.

WORKFLOW



Data Set

Keywords

Light On, Light Off, Temperature, Pressure, Jalao(जालाओ),Bujao(बुजाओ)

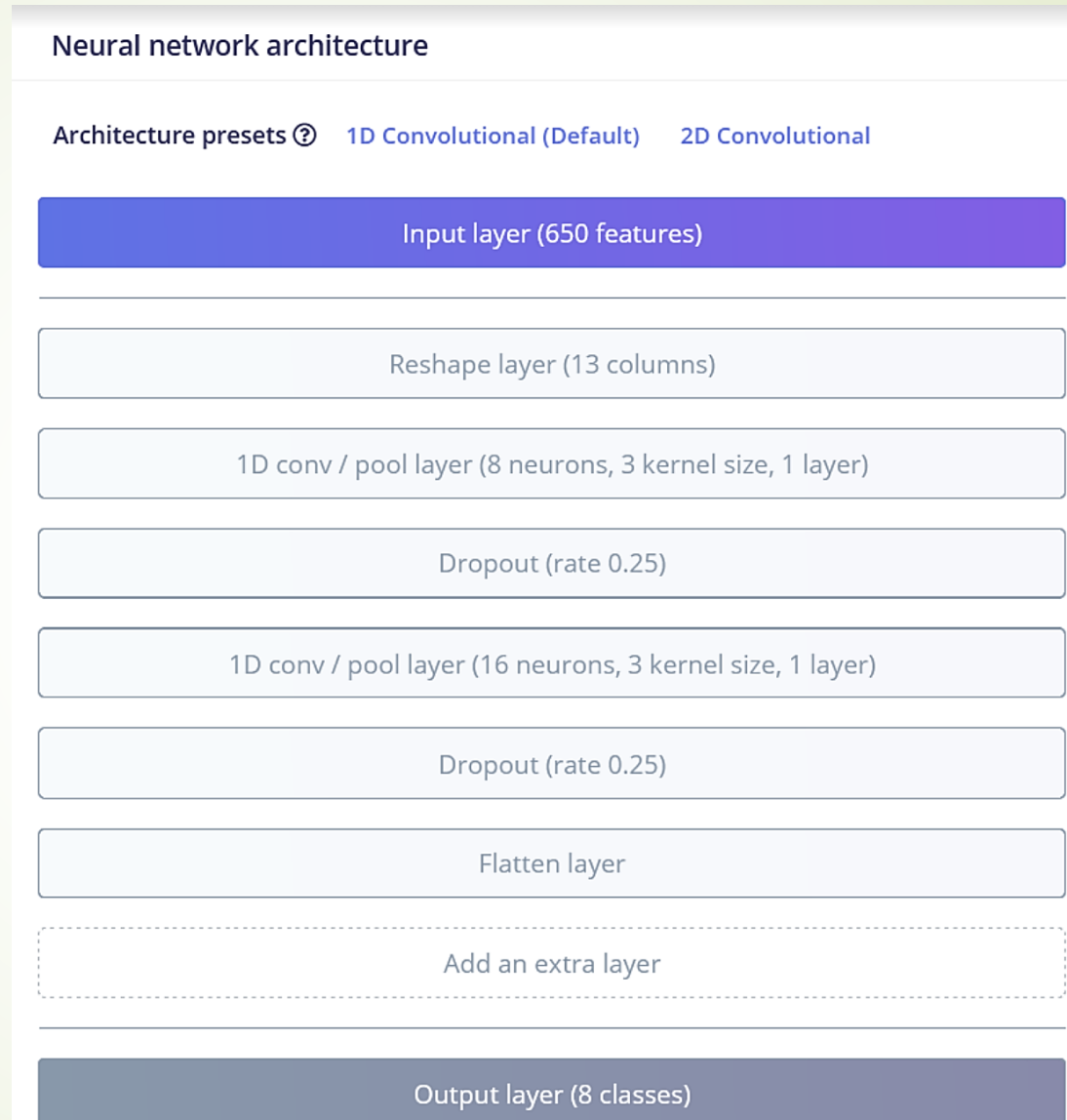


Multiplexing dataset



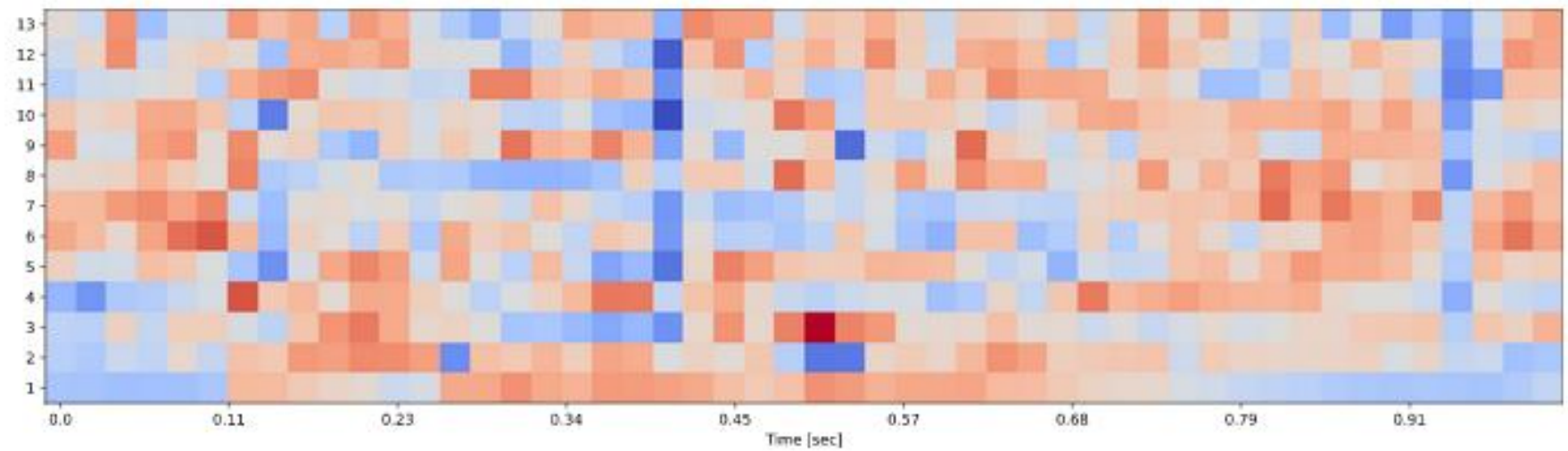
Adding Noise

Model



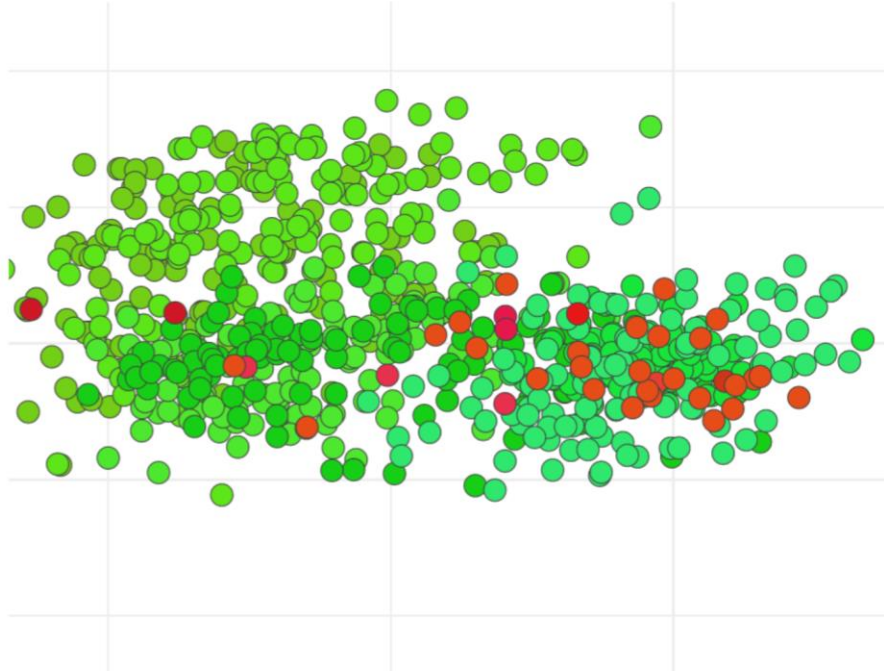
MFCC

Cepstral Coefficients



Data explorer (full training set) ?

- Bujao - correct
- Jalao - correct
- Light off - correct
- Light on - correct
- Pressure - correct
- Temperature - correct
- _noise - correct
- _unknown - correct
- Jalao - incorrect
- Light off - incorrect
- Light on - incorrect
- Pressure - incorrect
- Temperature - incorrect
- _noise - incorrect
- _unknown - incorrect



Model Training

Model Testing

Model testing results



ACCURACY
96.42%

	BUJAO	JALAO	LIGHT C	LIGHT O	PRESSU	TEMPER	_NOISE	_UNKNC	UNCERT
BUJAO	98.7%	0%	0%	0%	0%	0%	0%	0%	1.3%
JALAO	0%	99%	0%	0%	0%	0%	0.3%	0.3%	0.3%
LIGHT C	0%	0%	92.7%	0.7%	0.3%	0%	0%	2.7%	3.7%
LIGHT O	0%	0%	0%	99.7%	0%	0%	0%	0%	0.3%
PRESSU	0%	0%	0%	0%	98.0%	0.3%	0%	0%	1.7%
TEMPER	0%	0%	0%	0%	0.3%	98.7%	0.7%	0.3%	0%
_NOISE	0%	0%	0%	0%	0%	0.3%	98.3%	1.0%	0.3%
_UNKNC	0.7%	0.7%	0%	0%	0.3%	0%	7.0%	86.4%	5.0%
F1 SCORE	0.99	0.99	0.96	1.00	0.98	0.99	0.95	0.91	



Model Deployment

Model Conversion

Library Setup

Initialization

Audio Input

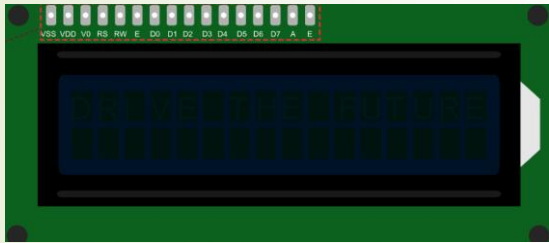
Preprocessing

Model Inference

Word Detection

Action Trigger

Devices Interfaced

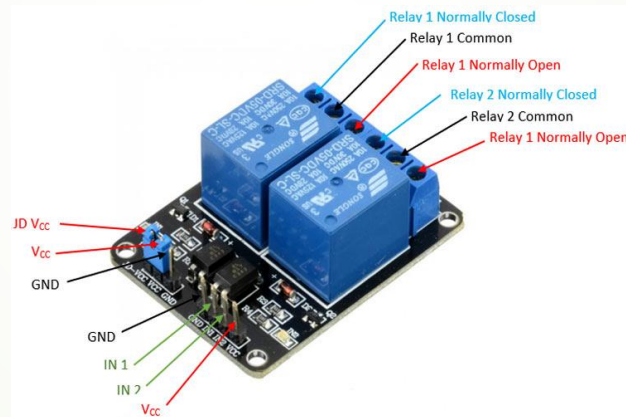


Display

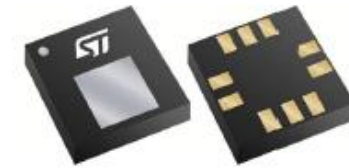


HLGA-6L
(2 x 2 x 0.9 mm)

Temperature and Humidity Sensor.

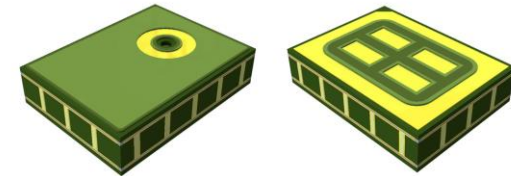


Relay



HLGA-10L
(2.0 x 2.0 x 0.76 mm)

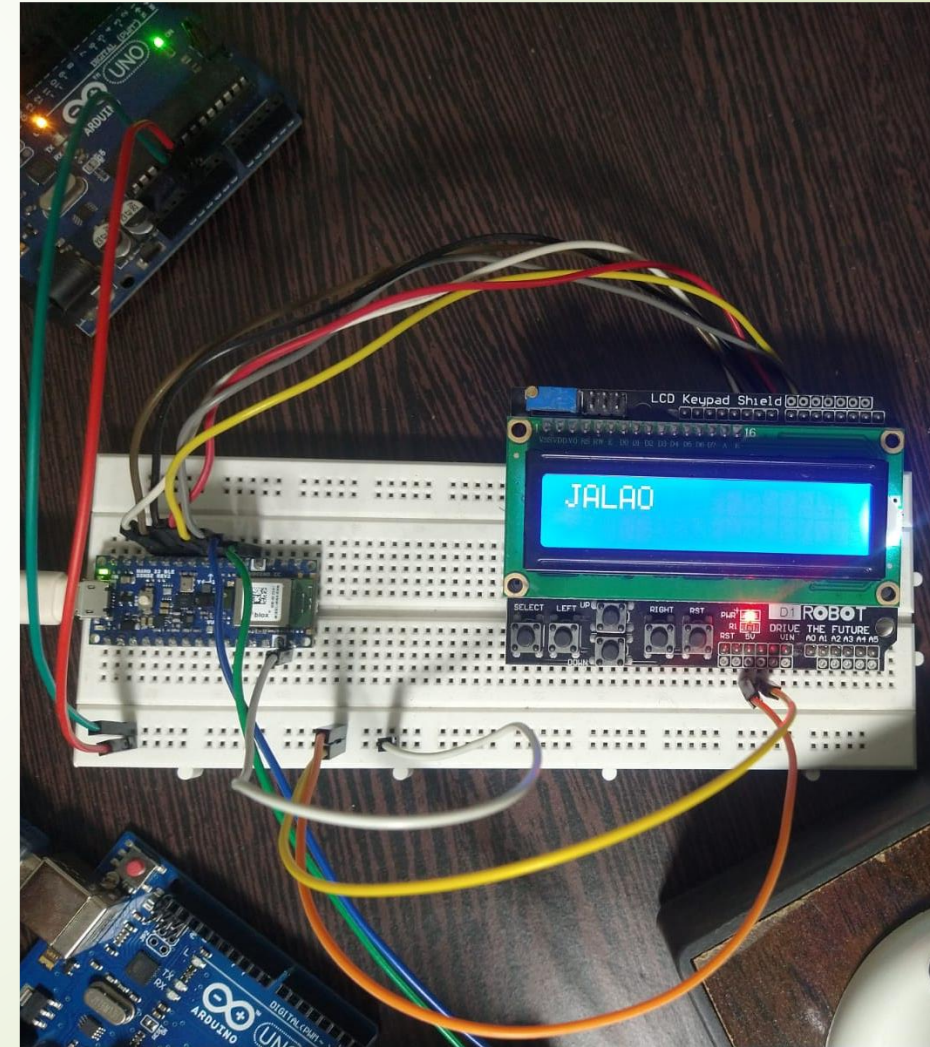
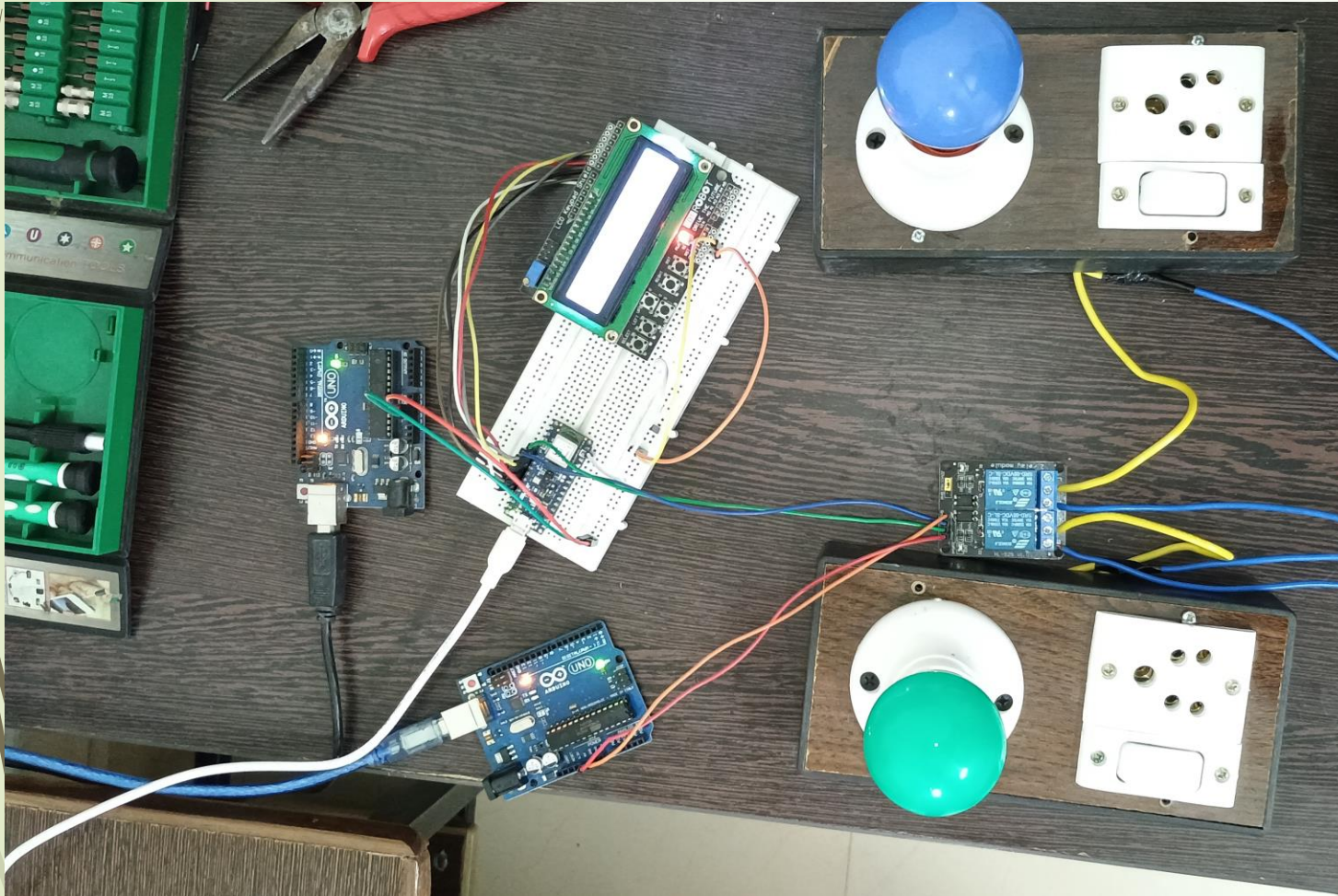
Pressure Sensor



HCLGA - 4LD (3 x 4 x 1 mm)

Microphone Sensor

ACTUAL SETUP





THANK YOU