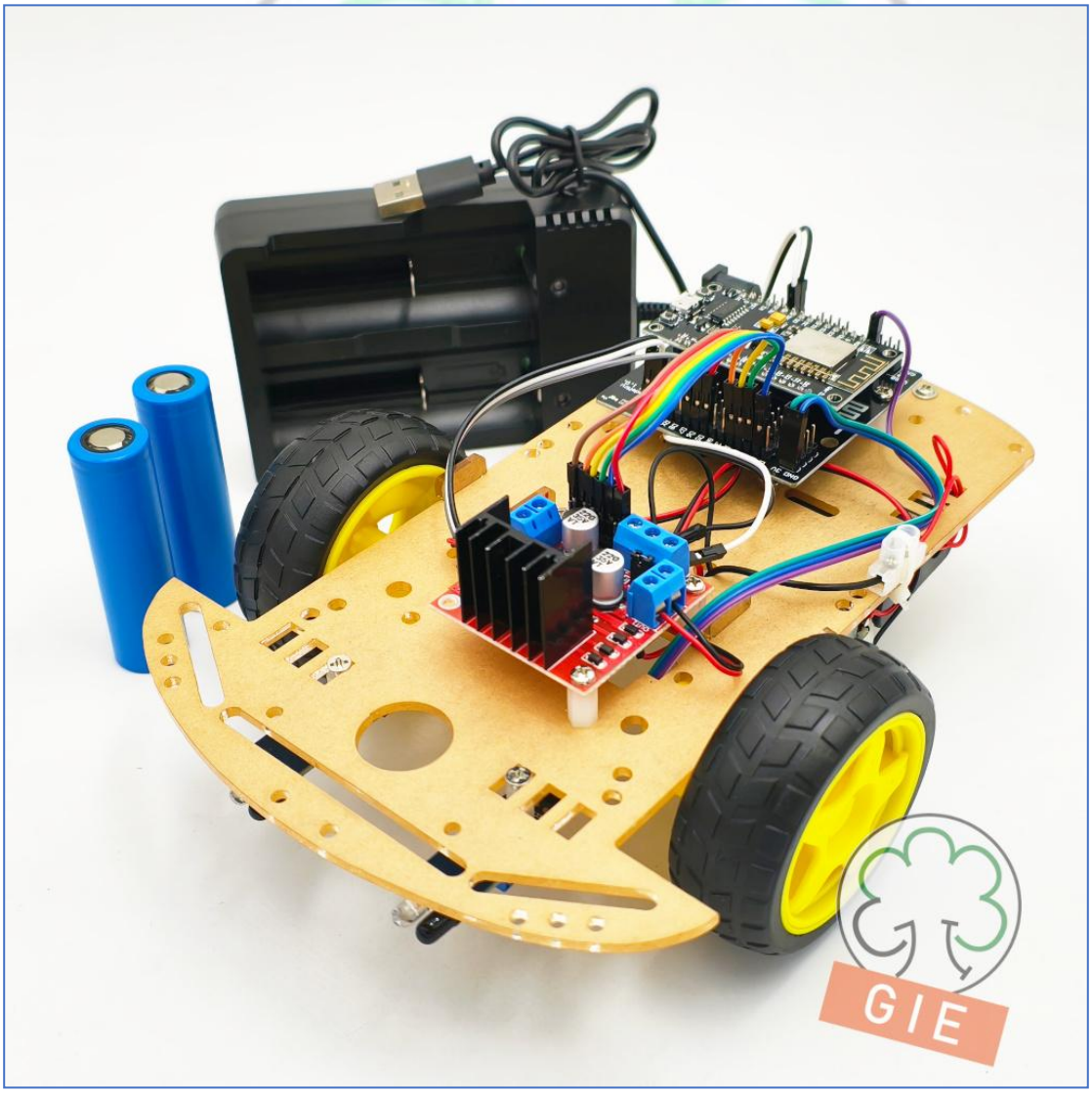
NodeMCU WiFi Control Robot Kit

User Manual



Battery Safety & Usage Precautions

To ensure safe operation and longevity of your robot car, follow these critical precautions when using AA or 18650 batteries:

A. Battery Specifications

Battery Type	*Voltage*	*Capacity*	*Max Current*	*Notes*
4x AA Alkaline	6V (1.5V each)	Depend	~ 1A	Low cost, but weak for motor loads
2x 18650 Li-ion	7.4V (3.7V each)	2000mAh	5A +	High power

B. Critical Precautions

- **General Safety**
  - **Never short-circuit batteries** (causes overheating/fire)
  - **Do not mix old/new or different battery** types (uneven discharge risks leakage).
  - **Insert batteries correct** (+/- polarity). Reverse polarity can damage electronics.

- **For 18650 Li-ion Batteries (High Risk if Misused!)**
  - **Never over-discharge below 2.5V/cell** (permanently damages batteries)
  - **Avoid extreme temperature** (<0°C or >45°C reduces lifespan)
  - **Store in a fireproof container** if unused for long periods.

- **For AA Batteries**
  - **Alkaline AAs may struggle under high load** (motors can cause voltage drops)
  - **Remove batteries when not in use** to prevent leakage.

- **Charging (18650 Only)**
  - **Use a dedicated Li-ion charger** (never charge without protection circuit).
  - **Do not leave charging unattended** (fire risk if defective).

C. Warning Signs

Stop using immediately if:

- Batteries get **hot** (>50°C / 122°F).
- **Swelling or leakage** occurs (AA alkaline).
- Robot behaves erratically (low voltage causes WiFi disconnections).

D. Maintenance Tips

Check battery voltage regularly with a multimeter.

- **4x AA:** Replace if voltage drops below **4.**8V (under load).
- **2x 18650:** Recharge if below **6.0V** total (3.0V/cell).

E. Emergency Response

If a battery leaks: Wear gloves, remove batteries, and clean with vinegar (for alkaline).

If an 18650 overheats/swells: Place in sand or a metal container away from flammables. Do **NOT use water** (Li-ion reacts violently).

Contents

NodeMCU WiFi Control Robot Kit

1. Description

This manual provides instructions for assembling, setting up, and operating a WiFi-controlled 2-wheel robot car with obstacle avoidance using:

- NodeMCU ESP8266 (WiFi microcontroller)
- L298N Motor Driver (for motor control)
- 2x IR Obstacle Sensors (for detecting obstacles)
- 2x DC Motors (for movement)
- Battery (4xAA batteries/2x18650 batteries)

The robot can be controlled via a web interface and will automatically avoid obstacles when in Avoidance Mode.

2. Packing List

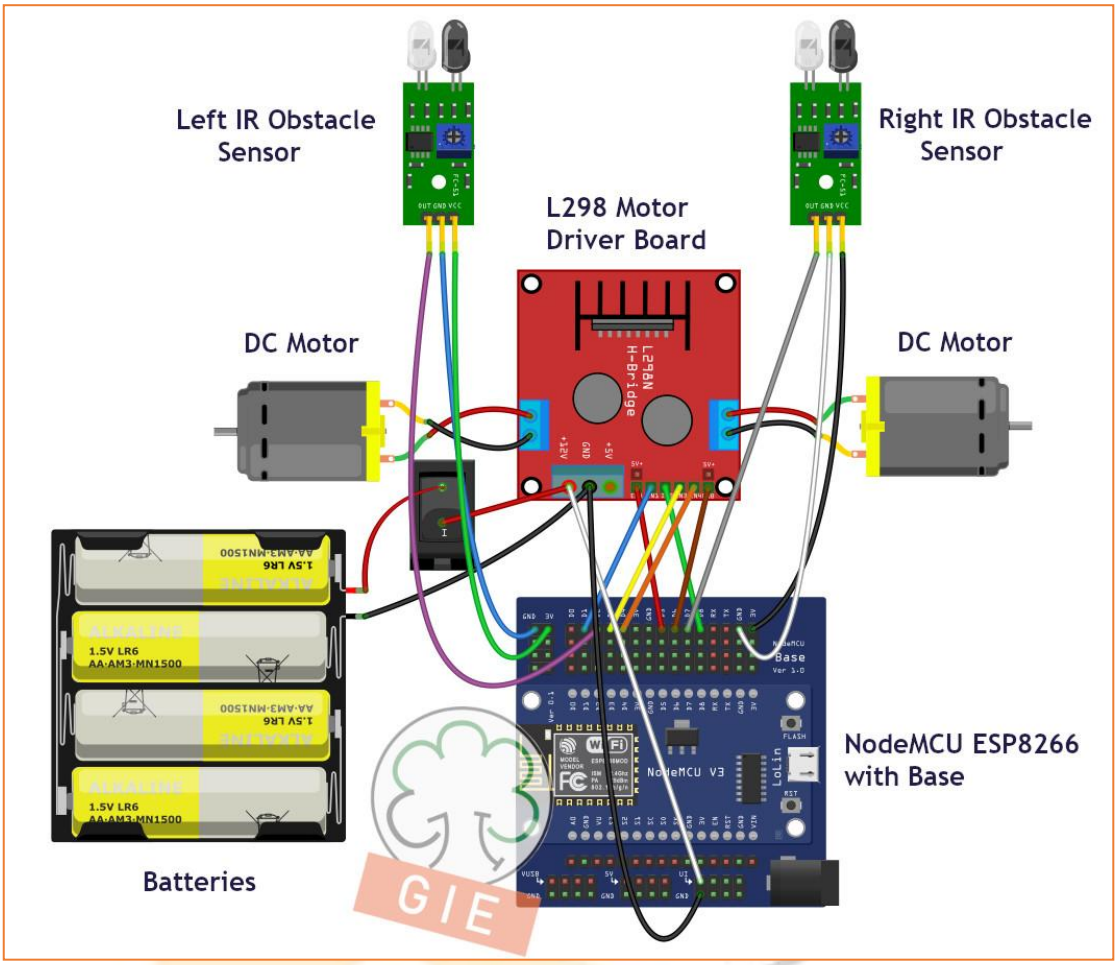
a) NodeMCU ESP8266 x 1pcs
b) NodeMCU ESP8266 Base x 1pcs
c) L298 Motor Driver Board x 1pcs
d) IR Obstacle Sensor Module x 2pcs
e) DC Geared Motor x 2pcs
f) Rubber Wheel x 2pcs
g) Hammer Caster x 1pcs
h) AAx4 Battery Box/18650x2 Battery Box x 1pcs
i) AAx4 Batteries/18650x2 Batteries
j) Acrylic chassis x 1 pcs
k) Mounting standoff, screws and nuts x 1 set
l) Female to female jumper wires 10cm x 10pcs
m) Female to female jumper wires 20cm x 8pcs
n) Male to female jumper wires 20cm x 4pcs
o) Screw driver x 1pcs
p) Cable tie x 3pcs

3. Required Tools

a) Mini Screw driver (cross)

b) Wire cutter (NOT INCLUDED)

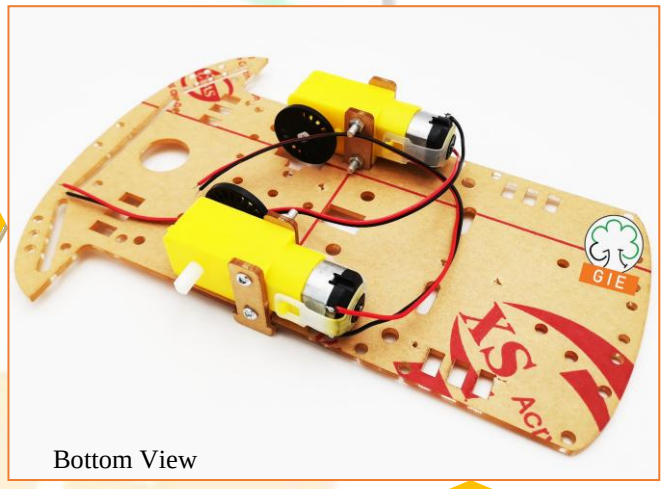
4. Circuit Diagram



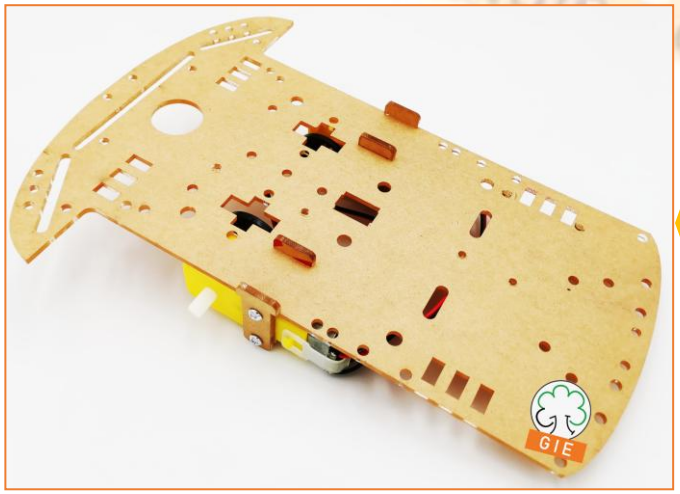
5. Assembly

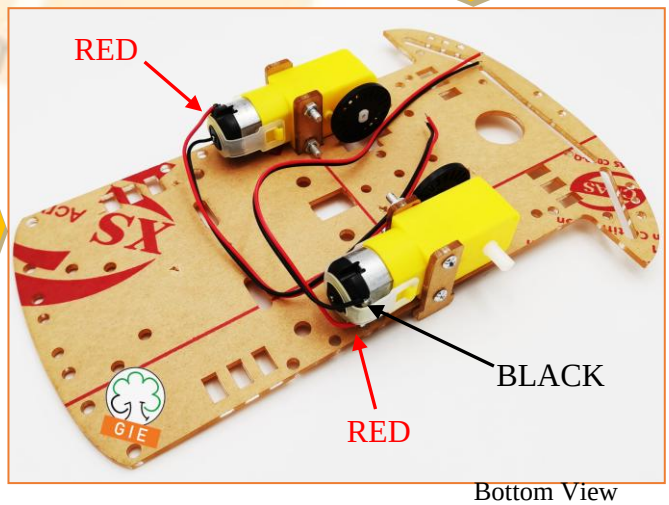
Step 1 – Assemble DC gear motor

Bottom View



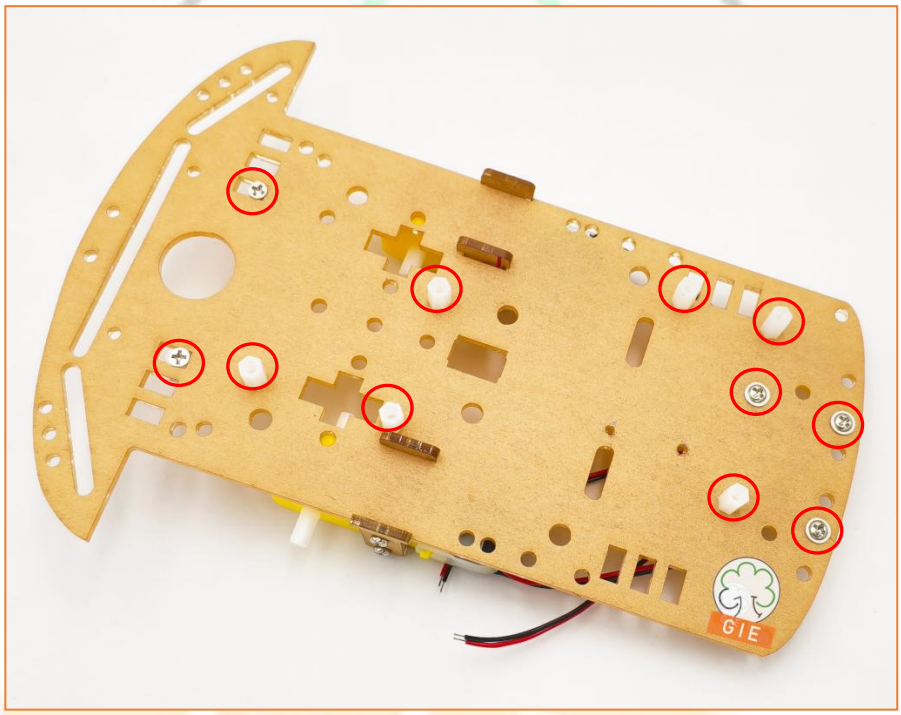
Bottom View

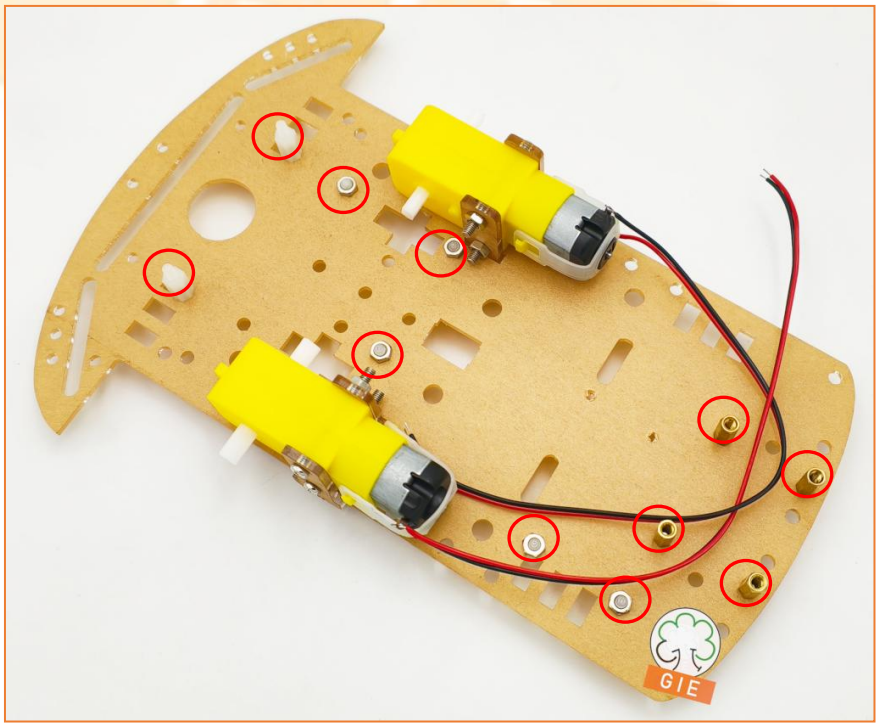




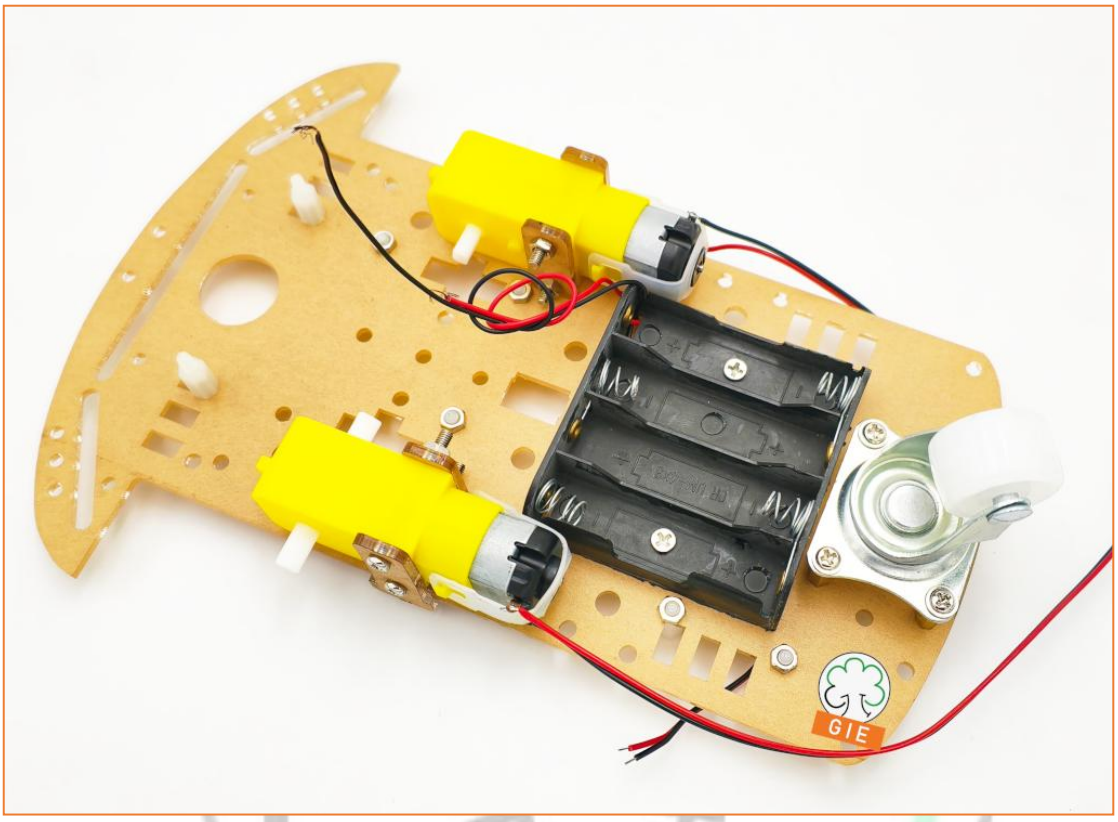
Bottom View

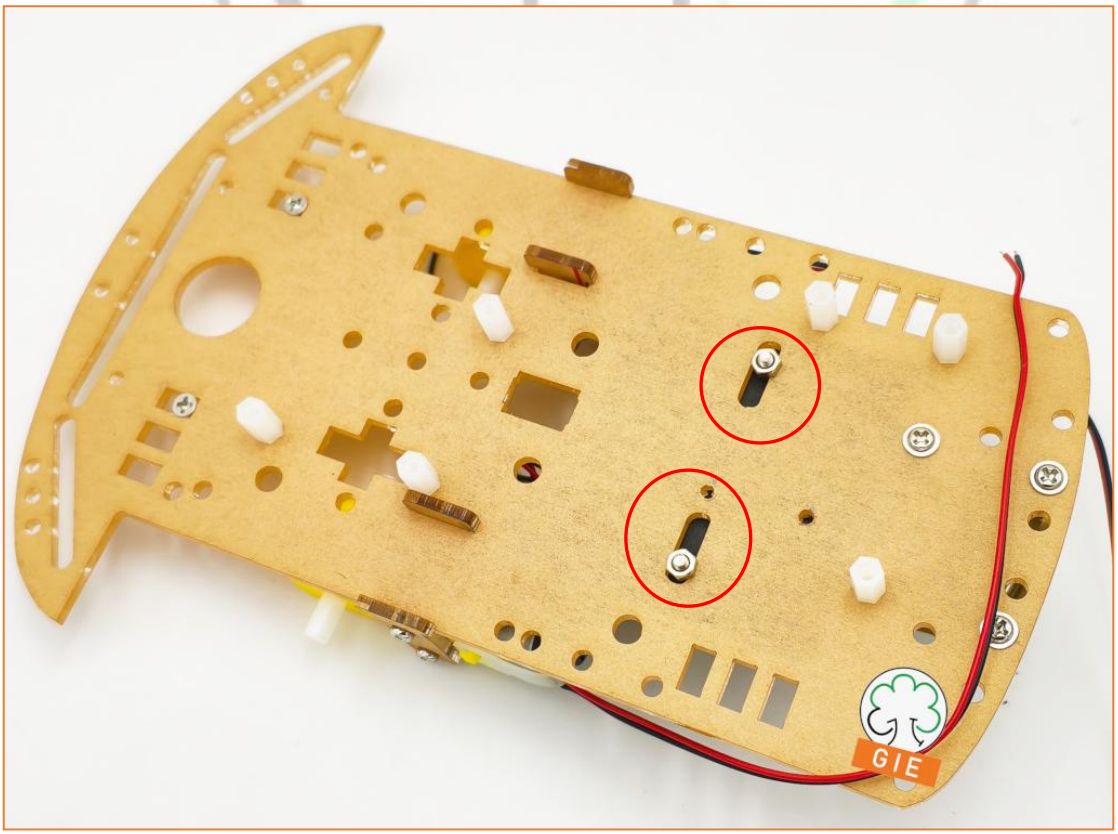
Step 2 – Assemble Stand-off



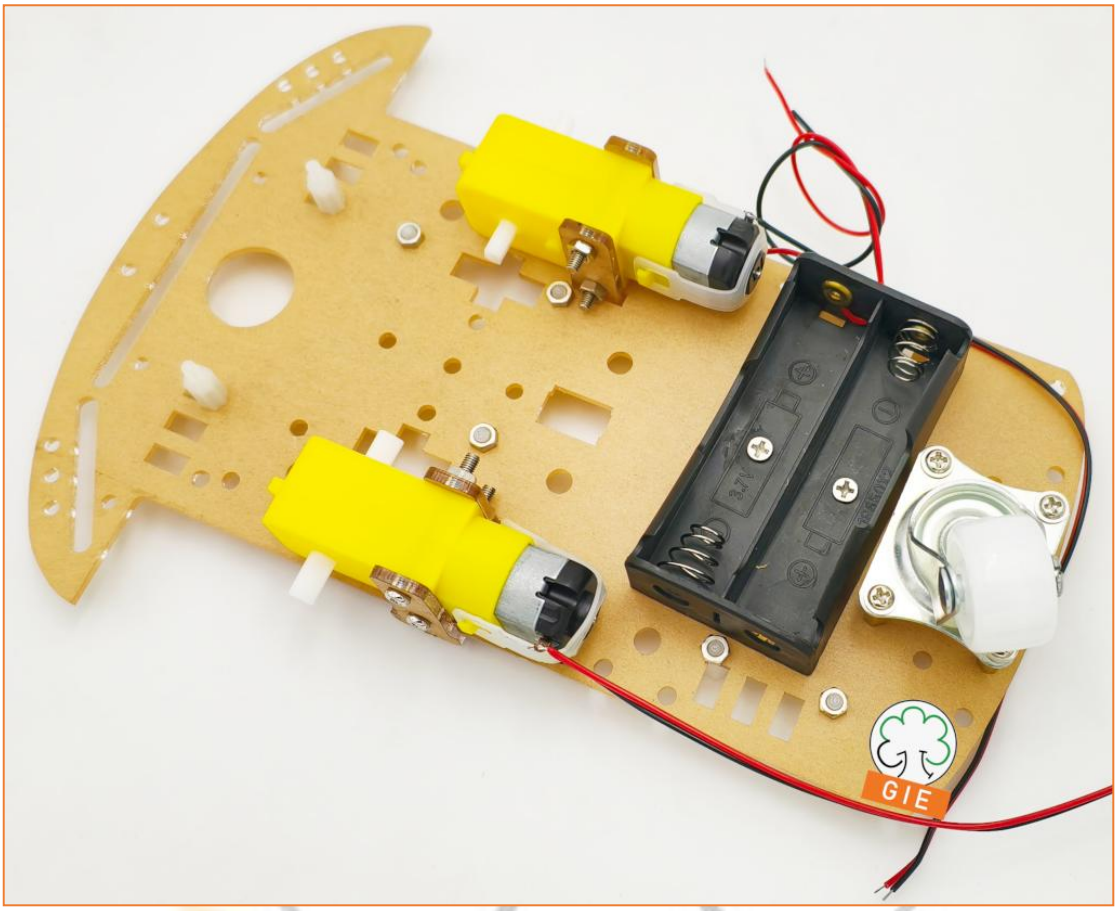


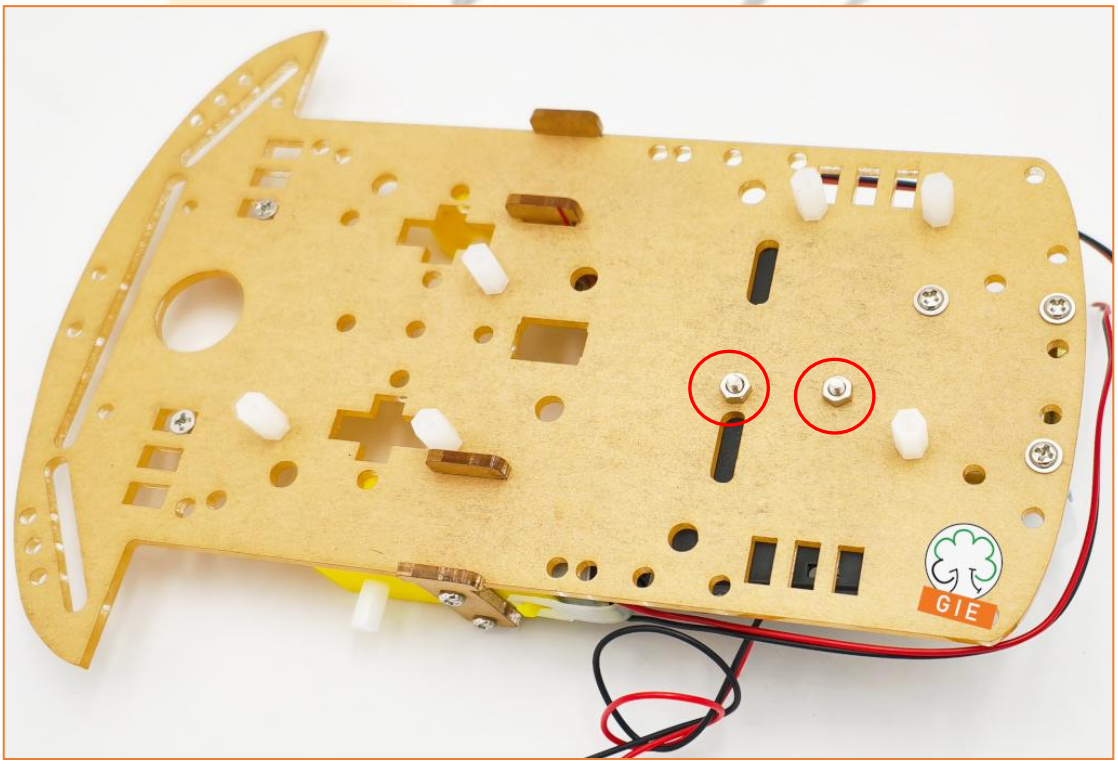
Step 3A – Assemble AA Battery Box and Castor



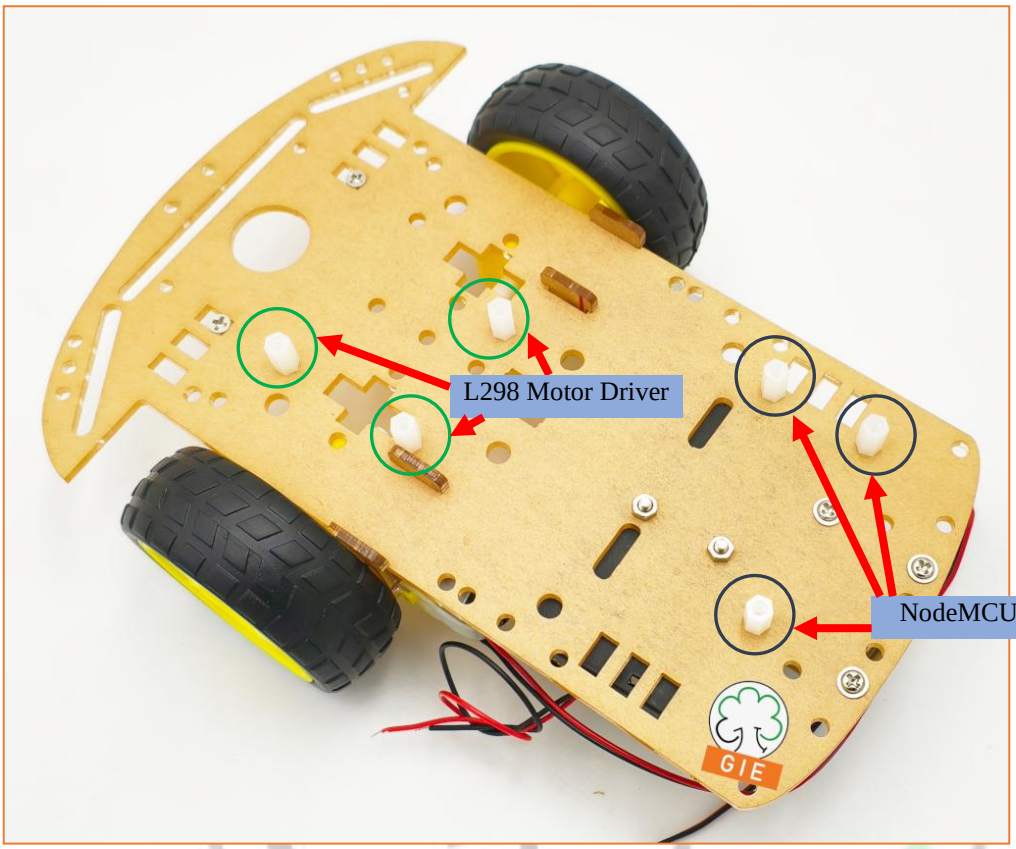


Step 3B – Assemble 18650 Battery Box and Castor

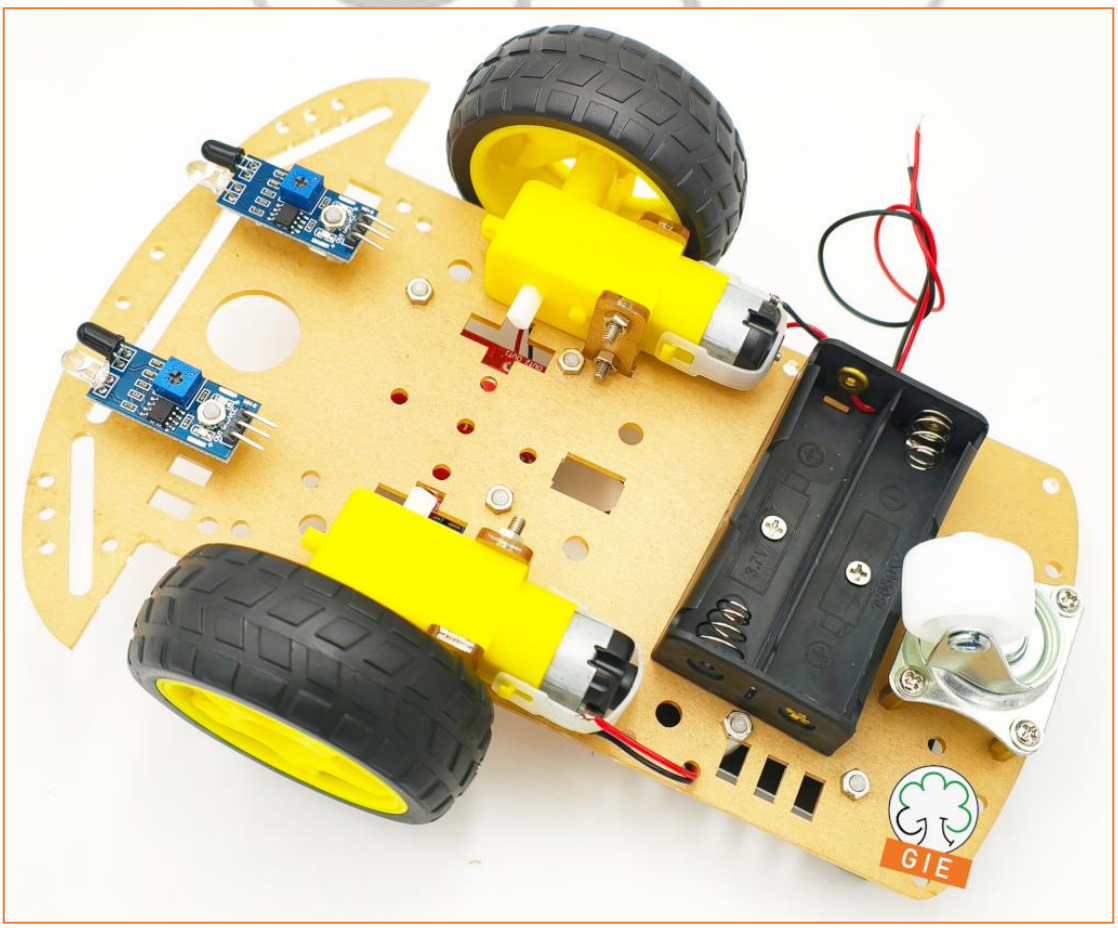




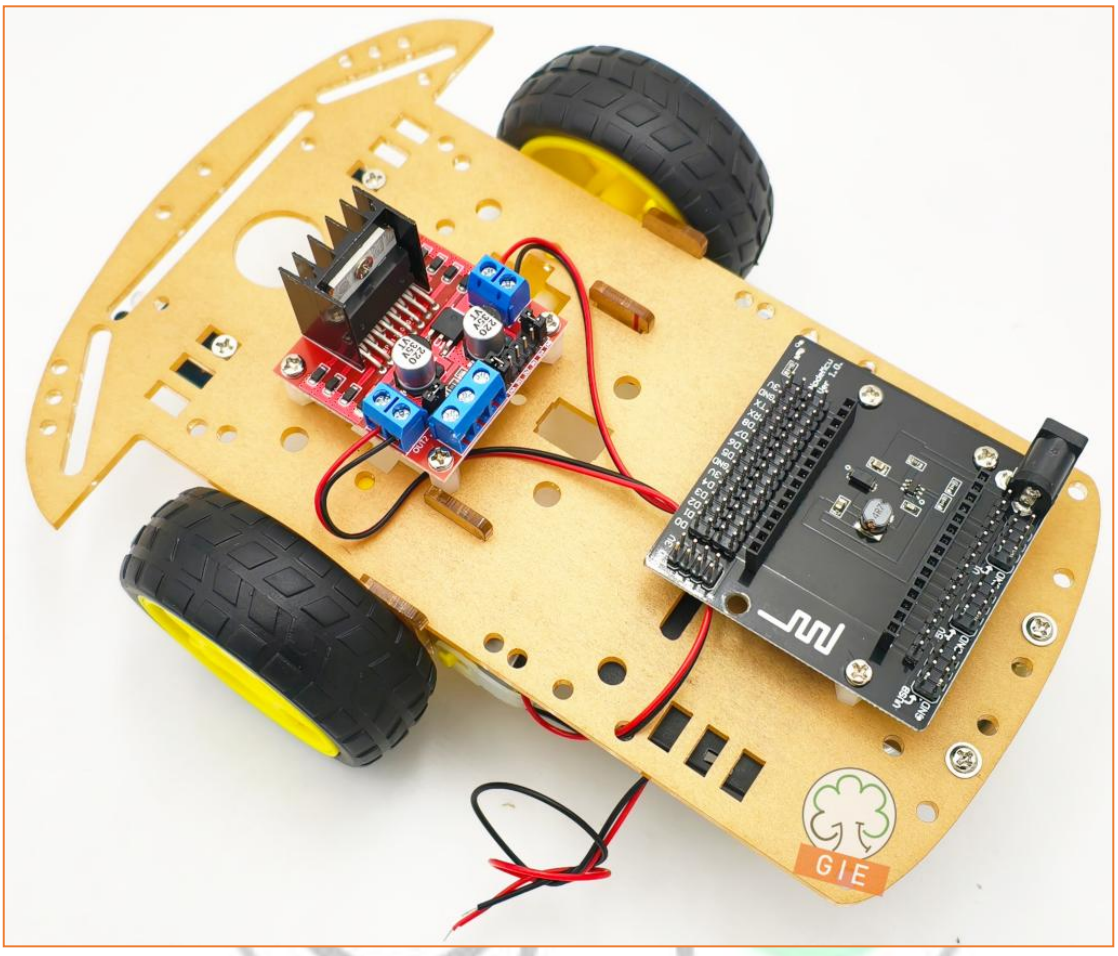
Step 4 – Assemble Wheels



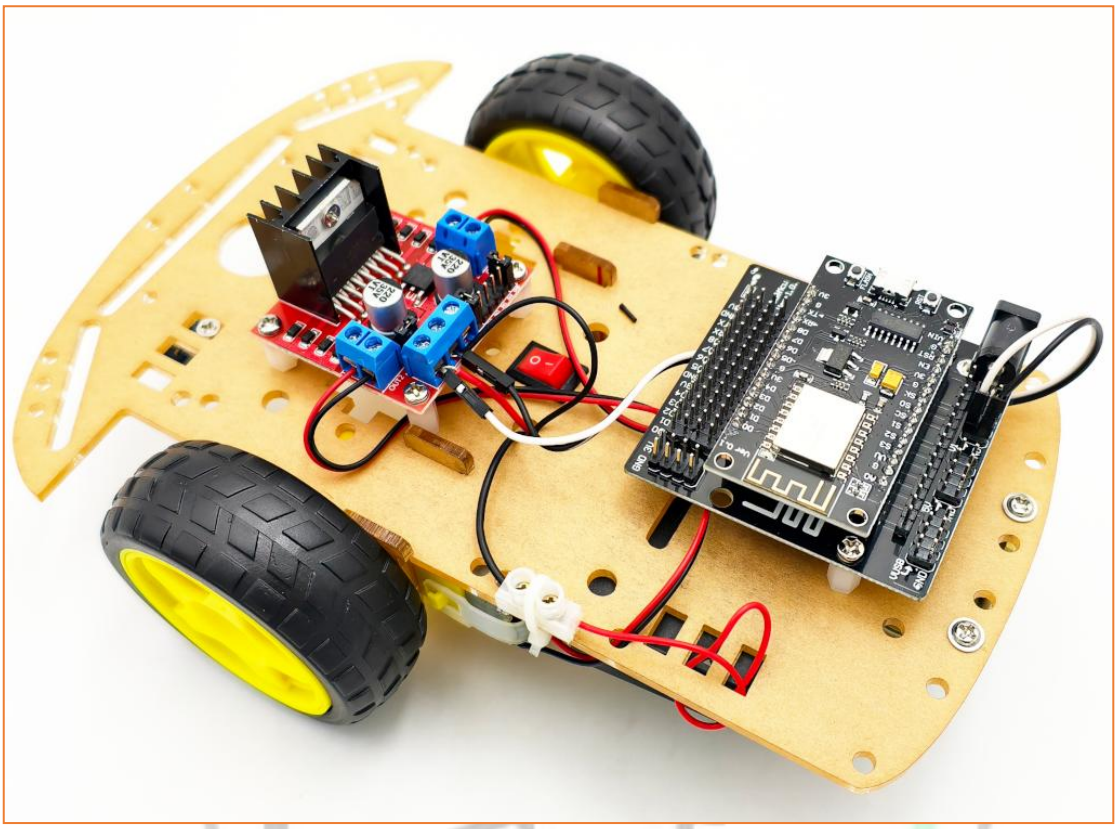
Step 5 – Assemble IR Obstacle Sensors



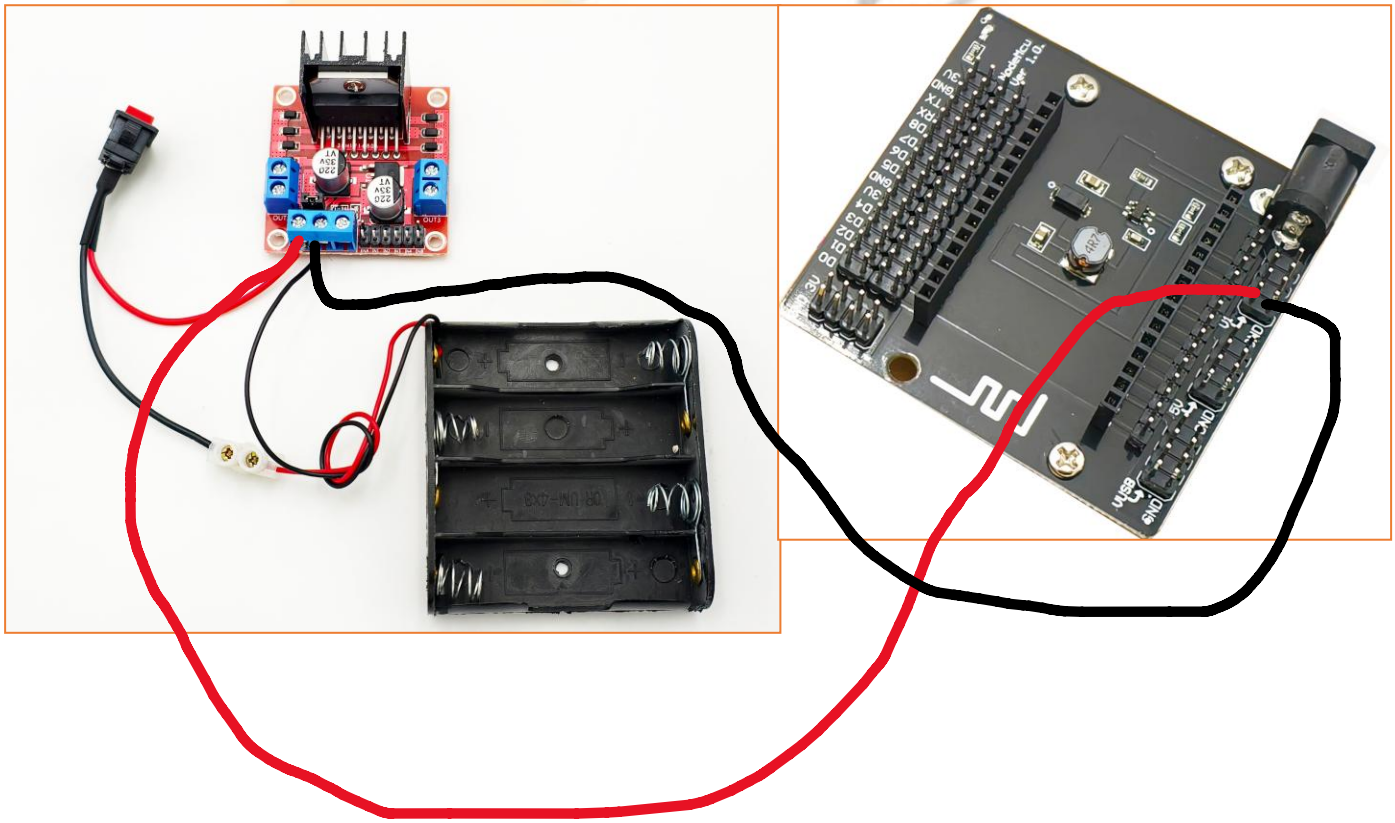
Step 6 – Assemble L298N Motor Driver Board and NodeMCU Base



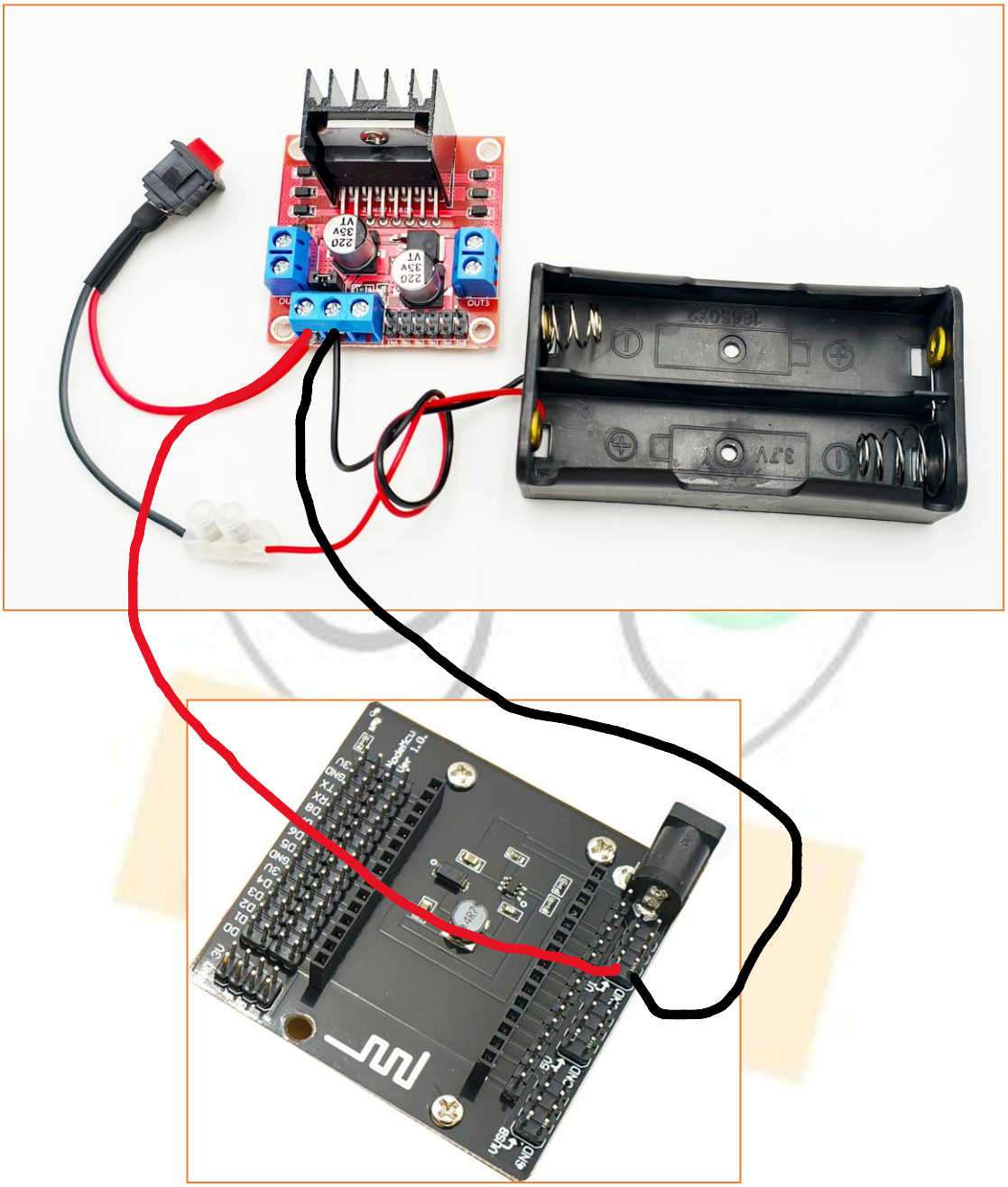
Step 7 – Assemble NodeMCU and On/Off Switch



Connection between L298N, On/off Switch, AA Battery Box and NodeMCU Base :

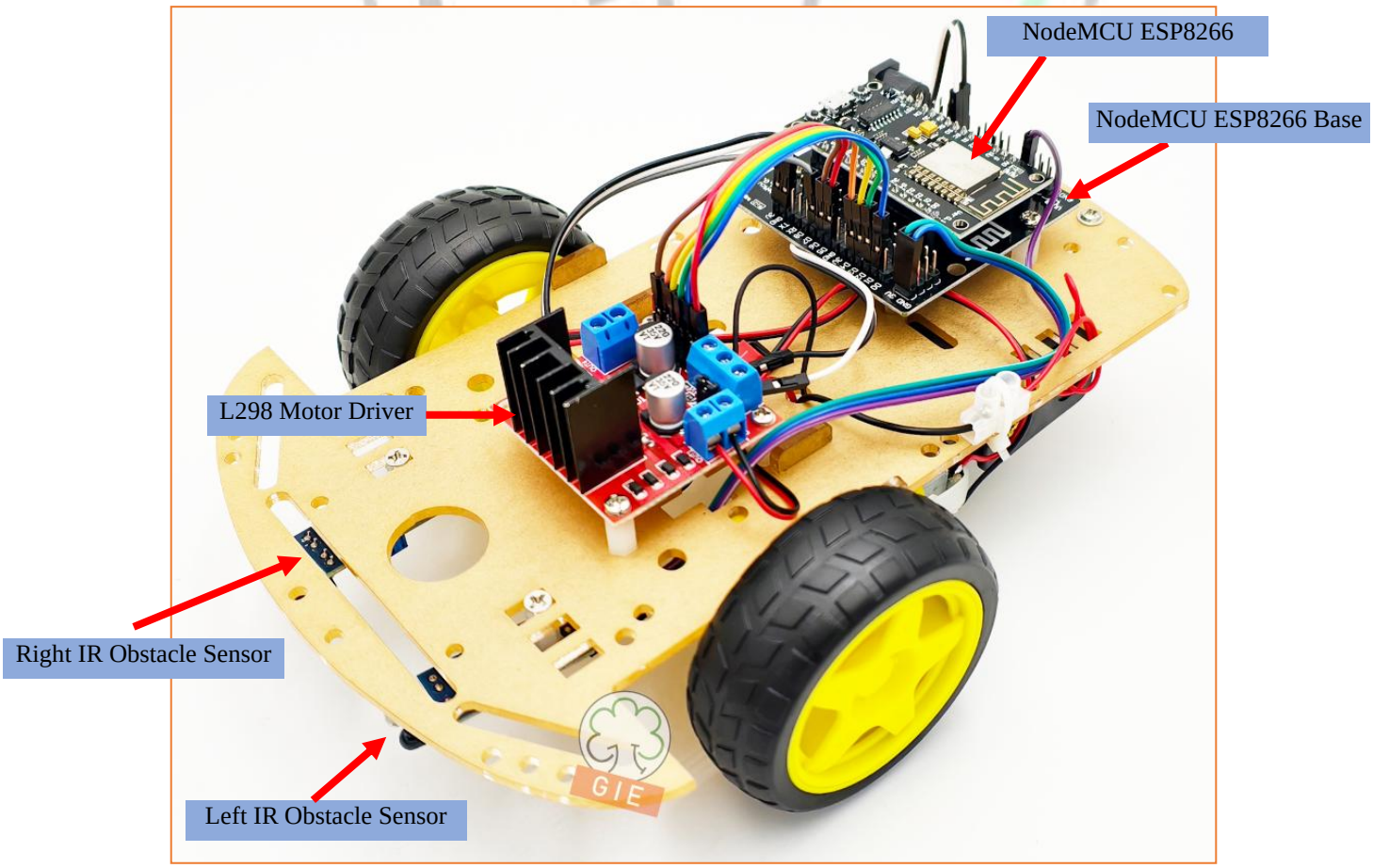


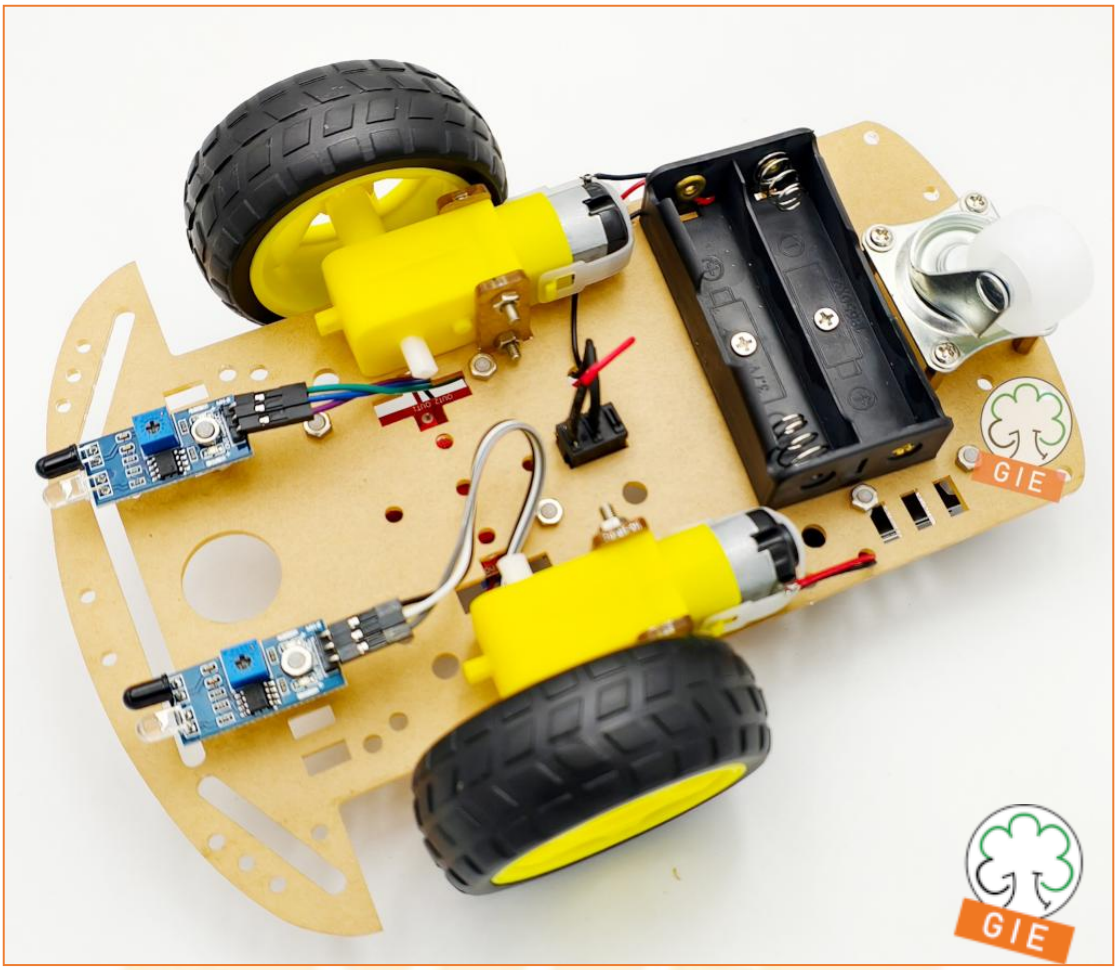
Connection between L298N, On/off Switch, 18650 Battery Box and NodeMCU Base:



Step 8 – Wiring

NodeMCU ESP8266 Base	L298 Motor Driver Board	IR Sensor Left	IR Sensor Right
D5	ENA		
D1	IN1		
D8	IN2		
D3	IN3		
D4	IN4		
D6	ENB		
D2		OUT	
GND		GND	
3V		VCC	
D7			OUT
GND			GND
3V			VCC
V1	12V		
GND	GND		





Step 9 – Adjusting the IR Obstacle Sensor

a) Power on the sensor (connect USB cable to nodeMCU)

- Connect the IR sensor VCC to NodeMCU Base's 3V.
- Connect the IR sensor GND to NodeMCU Base's GND.

b) Place an Obstacle in front of sensor at about 20cm

- Place an obstacle in front of the sensor at about 20 cm, then remove the obstacle.
- Observe the LED indicator on the module.

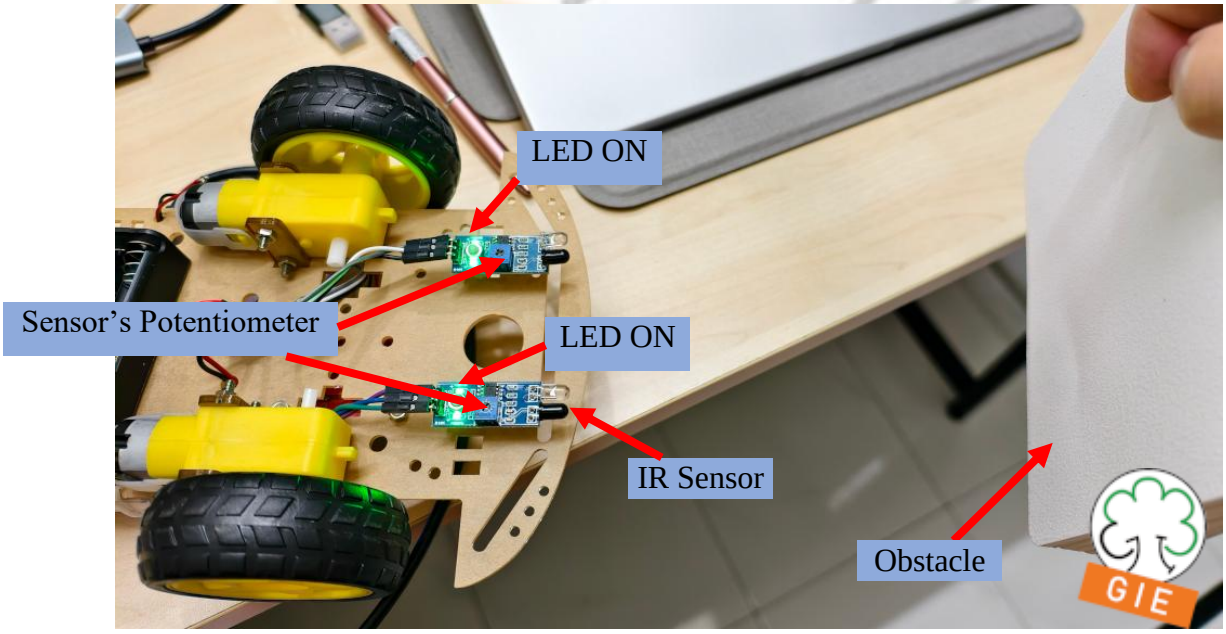
c) Adjust the Potentiometer

- Use a small screwdriver to turn it clockwise/counterclockwise.

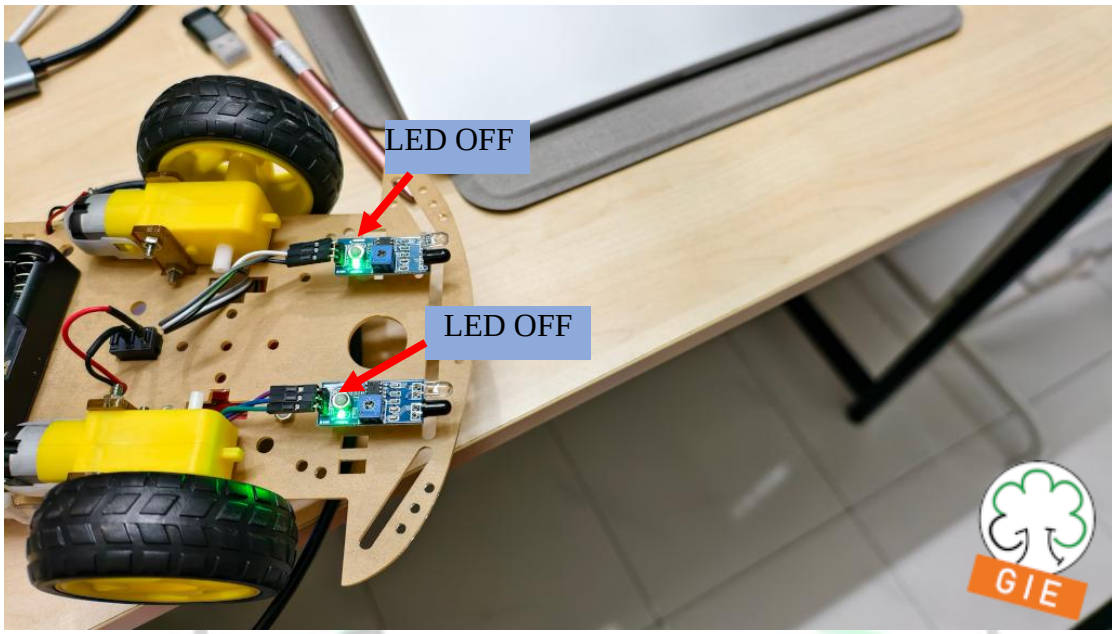
d) Observe LED and Output Behaviour:

- Turn the potentiometer until the LED turn ON while there is obstacle in front of the sensor, and turns OFF when no obstacle in front of the sensor.

Obstacle in front of the IR Sensor – LED turn ON



No obstacle in front of the IR Sesnor – LED Turn Off



6. Software Setup

a) Install Arduino IDE
- Download and install the Arduino IDE from the official Arduino website.
- Install the version compatible with your operating system (Windows, macOS, Linux).

b) Add ESP8266 Board Support to Arduino
Since NodeMCU is based on the ESP8266, you need to add support for this board in Arduino IDE.

i) Open Arduino IDE
- Open the Arduino IDE on your computer.

ii) Go to Preferences
- In the Arduino IDE, navigate to **File > Preferences** (Windows) or **Arduino > Preferences** (macOS).

iii) Add Board Manager URL
- In the **"Additional Boards Manager URLs"** field, add the following URL:

```
http://arduino.esp8266.com/stable/package_esp8266com_index.json
```

- If there are already other URLs in the box, simply separate them with a comma and add the new URL.

iv) Open Boards Manager
- Go to **Tools > Board > Boards Manager**.

v) Install ESP8266 Package
- In the Boards Manager window, type **ESP8266** into the search bar.
- Find the **ESP8266 by ESP8266 Community** package and click **Install**.
- Once installed, close the Boards Manager.

c) Select NodeMCU Board

i) Go to Tools
- Navigate to **Tools > Board > NodeMCU 1.0 (ESP-12E Module)**.

Now you've successfully added NodeMCU support to the Arduino IDE.

d) Install USB-to-Serial Driver
- **CH340**: Download and install the driver from here.

Once installed, restart your computer if necessary.

e) Connect NodeMCU to Computer

- Use provided **micro-USB cable** to connect your NodeMCU to your computer.

f) Select the Correct COM Port

After connecting the NodeMCU to your computer:

- Go to **Tools > Port**.

- Select the port where your NodeMCU is connected (e.g., **COM3**, **COM4**, etc., on Windows Device Manager or **/dev/cu.usbserial** on macOS).

7. Upload demo code

Now that your setup is ready, let's upload given demo code to your NodeMCU.

a) Open the given coding

- Go to **File > Open > nodemcu-robot-v0.ino**.

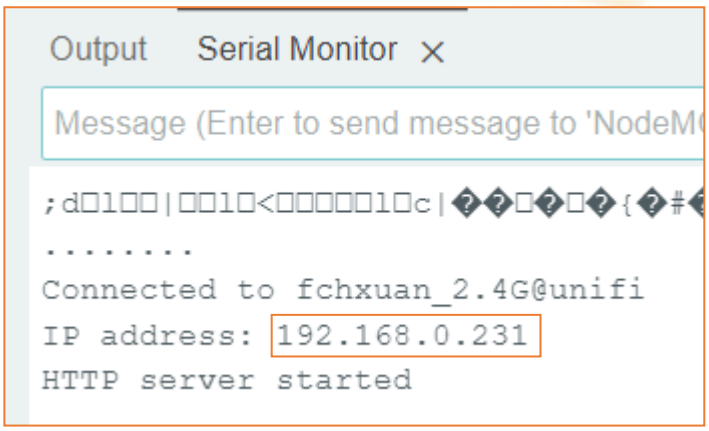
b) Key in your WiFi Credentials

```
int irSensorLeftValue = 0;
int irSensorRightValue = 0;
int operationMode = 0;

// WiFi credentials
const char* ssid     = "xxx_2.4G@unifi";  // Replace with your WiFi SSID
const char* password = "12345678";        // Replace with your WiFi password
```

c) Upload the Sketch

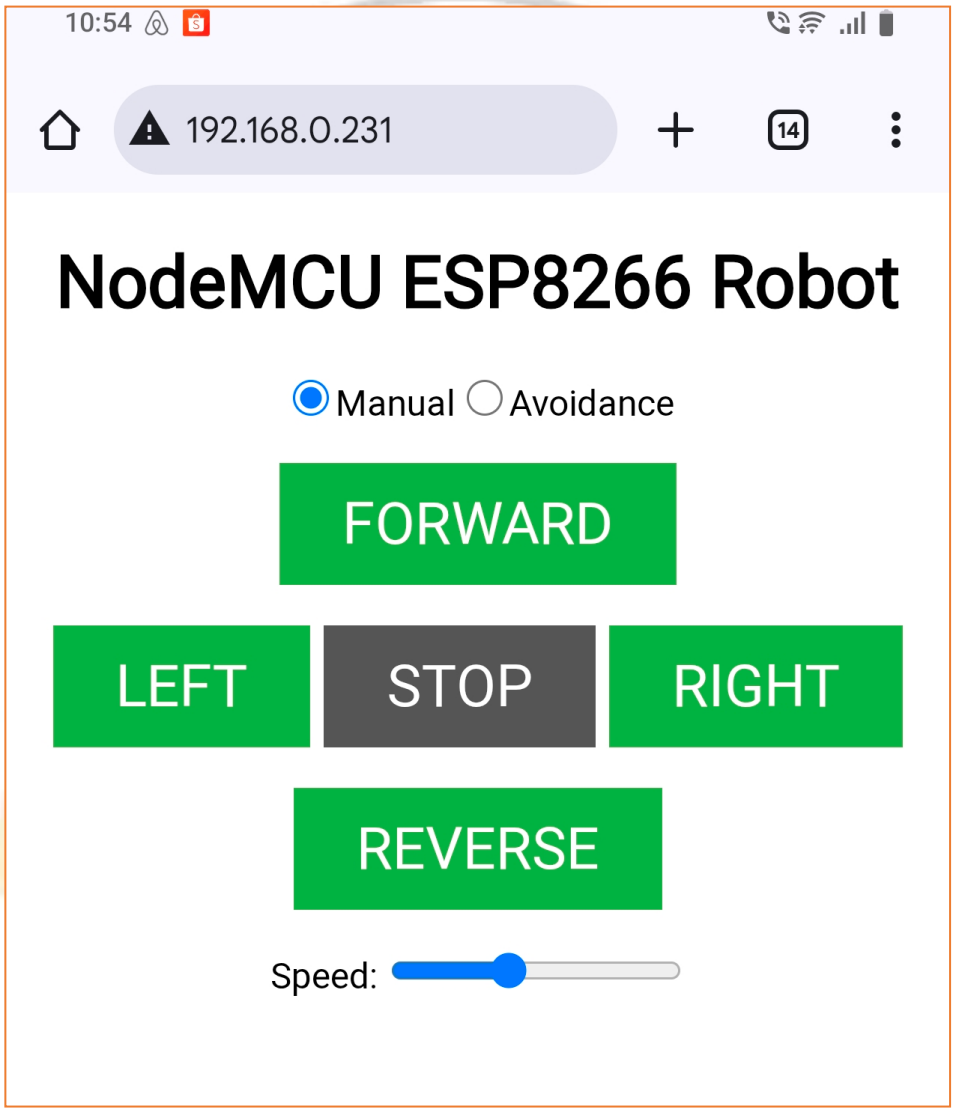
- Click on the **Upload** button (the right arrow icon) or go to **Sketch > Upload**.
- You should see a "Compiling..." message at the bottom, followed by an "Uploading..." message.
- After successful upload, click on **Serial Monitor**, set baud rate to **115200**.



d) Access Web Interface

- Refer message output from Serial Monitor, note the **IP address** (e.g., **192.168.0.231**)
- At your phone, open a browser and enter this IP to control the robot!

  NOTE Your phone and nodeMCU must connected to same network.**
- Web Interface as below:



- By default, the robot run in Manual mode, where you can control it by pressing “FORWARD”, “LEFT”, “RIGHT”, “REVERSE” and “STOP” button.
- Select the “Avoidance”, robot will auto run in obstacle avoidance mode.

8. Troubleshooting Common Upload Issues

If the sketch doesn't upload, here are some tips.

- **Error: Failed to connect to ESP8266**: Press and hold the **FLASH** button on the NodeMCU while clicking the upload button in the Arduino IDE. Release it once uploading starts.
- **Baud Rate Mismatch**: Ensure the correct baud rate is set in the **Tools > Port > Serial Monitor** (usually 115200).
- **Port Not Found**: If you don't see your NodeMCU's COM port, try a different USB cable or reinstall the drivers.