

# **EDUCAN**

## Ground Station setup

# Ground Receiver

- It is used to collect the data transmitted from CanSat.
- The received data can be stored locally or can be transmitted to the nearest device for analysis.

# Receiving Component

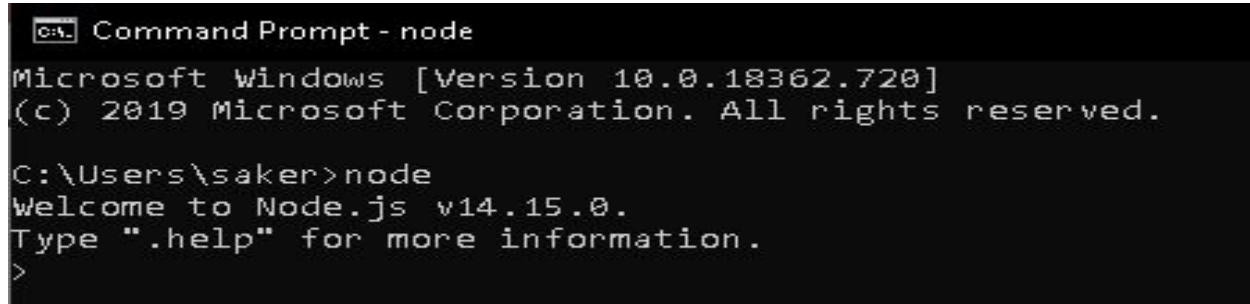
## SX1278 LoRa Module

- 137MHz to 525MHz Long Range Low Power Transceiver
- The SX1278 RF module is mainly used for long-range spread spectrum communication
- high sensitivity of -148 dBm with a power output of +20 dBm
- long transmission distance and high reliability.
- Consume low current.



# Software Installation

- Install node js from <https://nodejs.org/en/download/>
- Enter command 'node' in command prompt to check installation



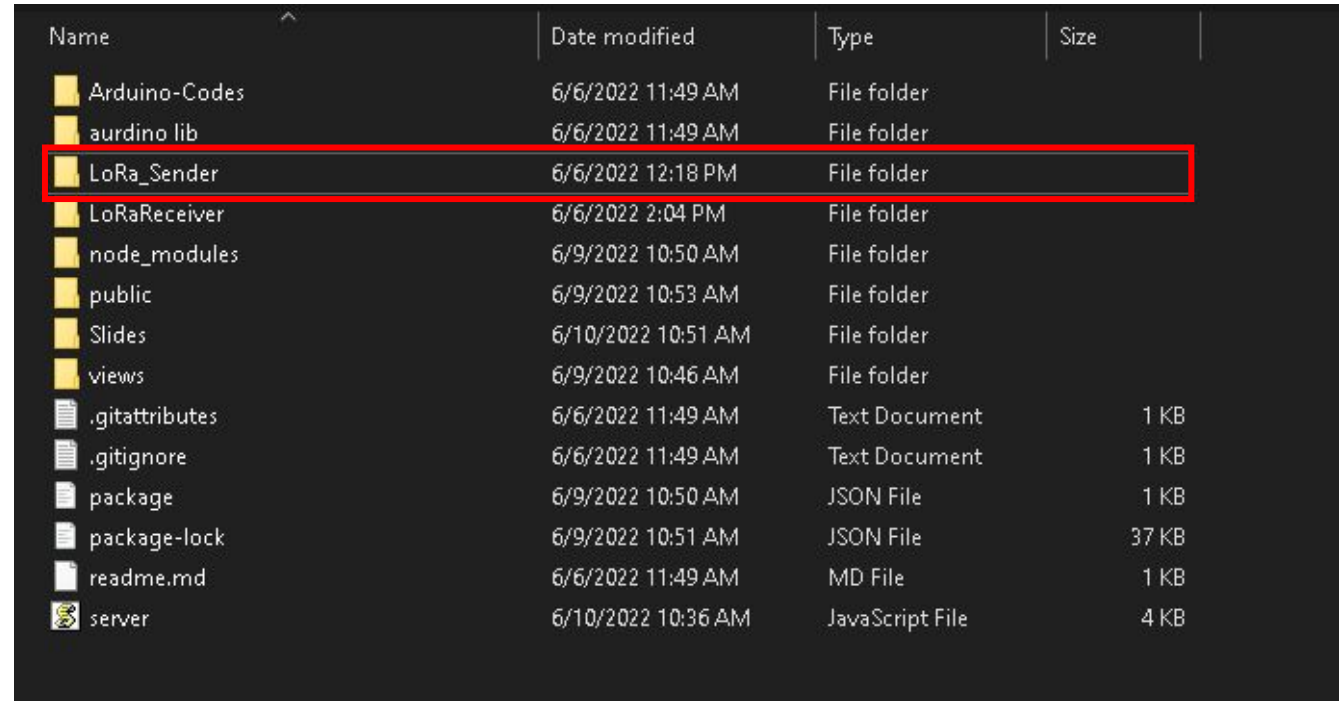
```
Command Prompt - node
Microsoft Windows [Version 10.0.18362.720]
(c) 2019 Microsoft Corporation. All rights reserved.

C:\Users\saker>node
Welcome to Node.js v14.15.0.
Type ".help" for more information.
>
```

- The downloaded version will appear in command prompt

# Step-1:

- Download CanSat folder
- Connect CanSat transmitter module on the computer
- Open the folder LoRa\_sender and open .ino file in Arduino ide



A screenshot of a file explorer window showing a directory listing. The 'LoRa\_Sender' folder is highlighted with a red rectangle. The table below represents the data shown in the screenshot.

Name	Date modified	Type	Size
Arduino-Codes	6/6/2022 11:49 AM	File folder	
arduino lib	6/6/2022 11:49 AM	File folder	
LoRa_Sender	6/6/2022 12:18 PM	File folder	
LoRaReceiver	6/6/2022 2:04 PM	File folder	
node_modules	6/9/2022 10:50 AM	File folder	
public	6/9/2022 10:53 AM	File folder	
Slides	6/10/2022 10:51 AM	File folder	
views	6/9/2022 10:46 AM	File folder	
.gitattributes	6/6/2022 11:49 AM	Text Document	1 KB
.gitignore	6/6/2022 11:49 AM	Text Document	1 KB
package	6/9/2022 10:50 AM	JSON File	1 KB
package-lock	6/9/2022 10:51 AM	JSON File	37 KB
readme.md	6/6/2022 11:49 AM	MD File	1 KB
server	6/10/2022 10:36 AM	JavaScript File	4 KB

## Step-2:

- Upload required library files from the Arduino Library file
- Compile the code to check whether all library file are uploaded or not.



The screenshot shows the Arduino IDE interface. At the top, there's a toolbar with icons for checking, running, and uploading, along with a 'Verify' button. Below the toolbar, the sketch name 'LoRa\_Sender' is displayed. The main area shows the source code for the sketch, which includes several library headers and variable declarations. A red arrow points to a status bar at the bottom that says 'Done compiling.' Below this, a black box contains the compilation output, which lists the libraries used and their versions, and the memory usage of the sketch.

```
#include <SPI.h>
#include <LoRa.h>
#include <Wire.h>
#include <OneWire.h>
#include <DallasTemperature.h>
#include <Adafruit_BMP085.h>

#define ONE_WIRE_BUS 5
#define LDR A1

OneWire oneWire(ONE_WIRE_BUS);
DallasTemperature TemprSensor(&oneWire);

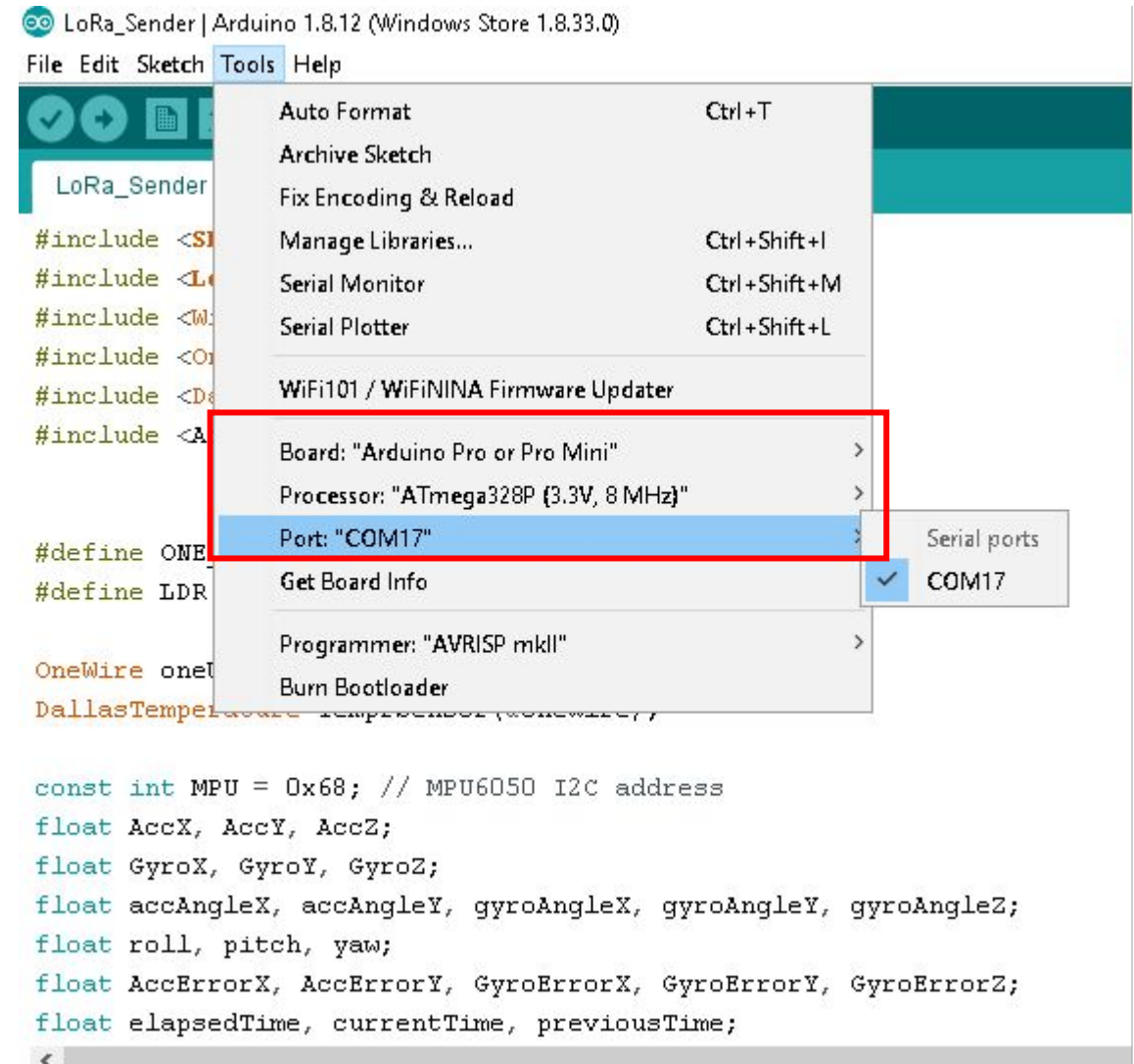
const int MPU = 0x68; // MPU6050 I2C address
float AccX, AccY, AccZ;
float GyroX, GyroY, GyroZ;
float accAngleX, accAngleY, gyroAngleX, gyroAngleY, gyroAngleZ;
float roll, pitch, yaw;
float AccErrorX, AccErrorY, GyroErrorX, GyroErrorY, GyroErrorZ;
float elapsedTime, currentTime, previousTime;
```

Done compiling.

Using library DallasTemperature at version 3.8.0 in folder: C:\Us  
Using library Adafruit\_BMP085\_Library at version 1.2.1 in folder:  
Using library Adafruit\_BusIO-1.11.4 at version 1.11.4 in folder:  
"C:\\Program Files\\WindowsApps\\\\ArduinoLLC.ArduinoIDE\_1.8.33.0\_>  
Sketch uses 14906 bytes (48%) of program storage space. Maximum 1  
Global variables use 817 bytes (39%) of dynamic memory, leaving 1

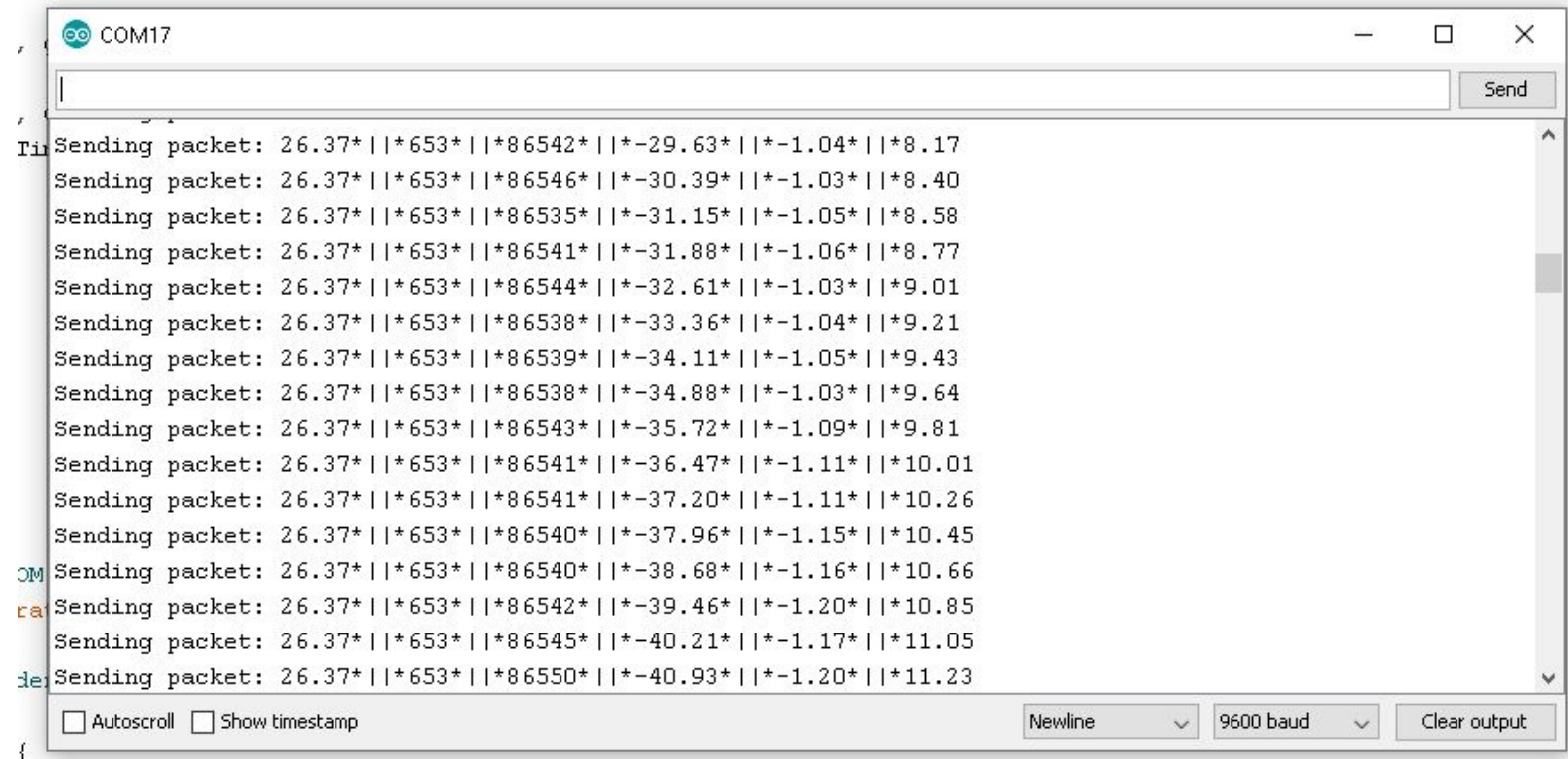
## Step-3:

- Select port from the tools
- Choose board from the tools to Arduino pro mini
- Select processor to atmega328p (3.3v, 8 MHz)
- Upload code to the Arduino pro mini board



## Step-4:

- Open serial monitor to see the transmitted data
- It should look like as in the figure,



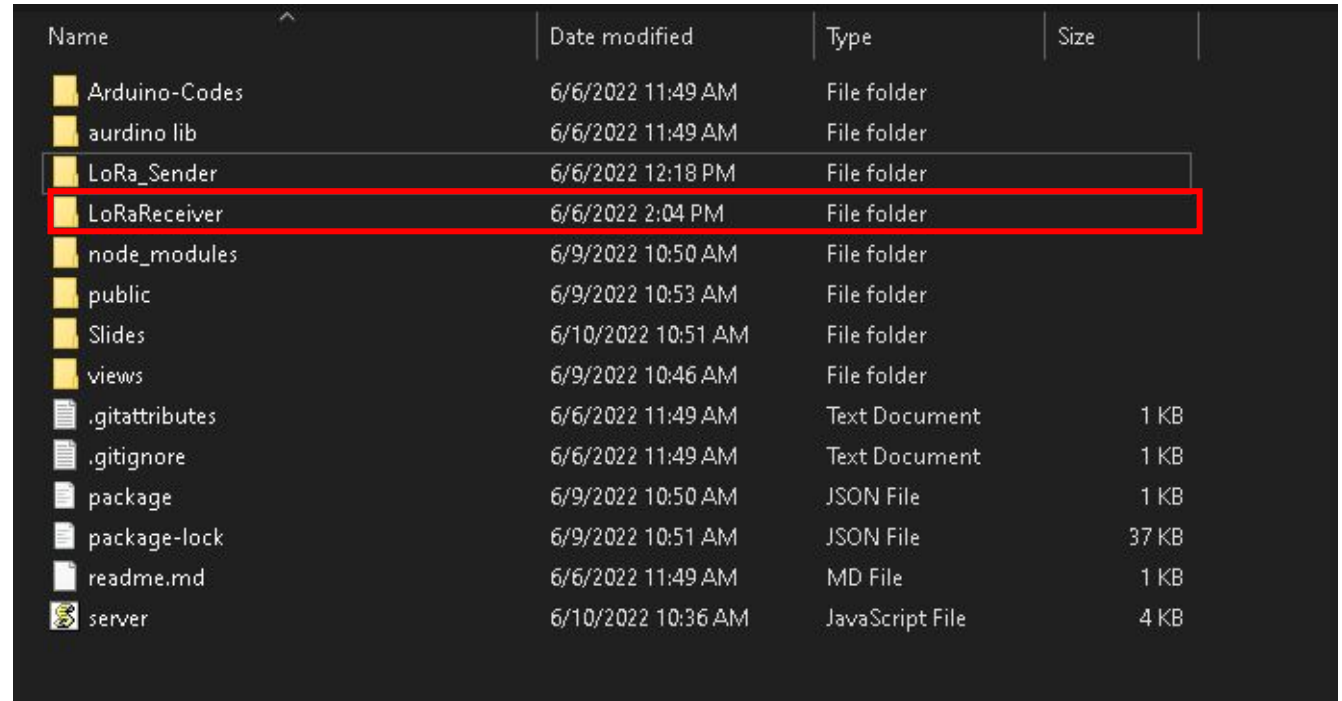
```
COM17
Sending packet: 26.37*||*653*||*86542*||*-29.63*||*-1.04*||*8.17
Sending packet: 26.37*||*653*||*86546*||*-30.39*||*-1.03*||*8.40
Sending packet: 26.37*||*653*||*86535*||*-31.15*||*-1.05*||*8.58
Sending packet: 26.37*||*653*||*86541*||*-31.88*||*-1.06*||*8.77
Sending packet: 26.37*||*653*||*86544*||*-32.61*||*-1.03*||*9.01
Sending packet: 26.37*||*653*||*86538*||*-33.36*||*-1.04*||*9.21
Sending packet: 26.37*||*653*||*86539*||*-34.11*||*-1.05*||*9.43
Sending packet: 26.37*||*653*||*86538*||*-34.88*||*-1.03*||*9.64
Sending packet: 26.37*||*653*||*86543*||*-35.72*||*-1.09*||*9.81
Sending packet: 26.37*||*653*||*86541*||*-36.47*||*-1.11*||*10.01
Sending packet: 26.37*||*653*||*86541*||*-37.20*||*-1.11*||*10.26
Sending packet: 26.37*||*653*||*86540*||*-37.96*||*-1.15*||*10.45
Sending packet: 26.37*||*653*||*86540*||*-38.68*||*-1.16*||*10.66
Sending packet: 26.37*||*653*||*86542*||*-39.46*||*-1.20*||*10.85
Sending packet: 26.37*||*653*||*86545*||*-40.21*||*-1.17*||*11.05
Sending packet: 26.37*||*653*||*86550*||*-40.93*||*-1.20*||*11.23

☐ Autoscroll ☐ Show timestamp Newline 9600 baud Clear output
```



## Step-5:

- Connect ground receiver board to the computer
- Open folder LoRaReceiver folder and open the .ino file in Arduino ide

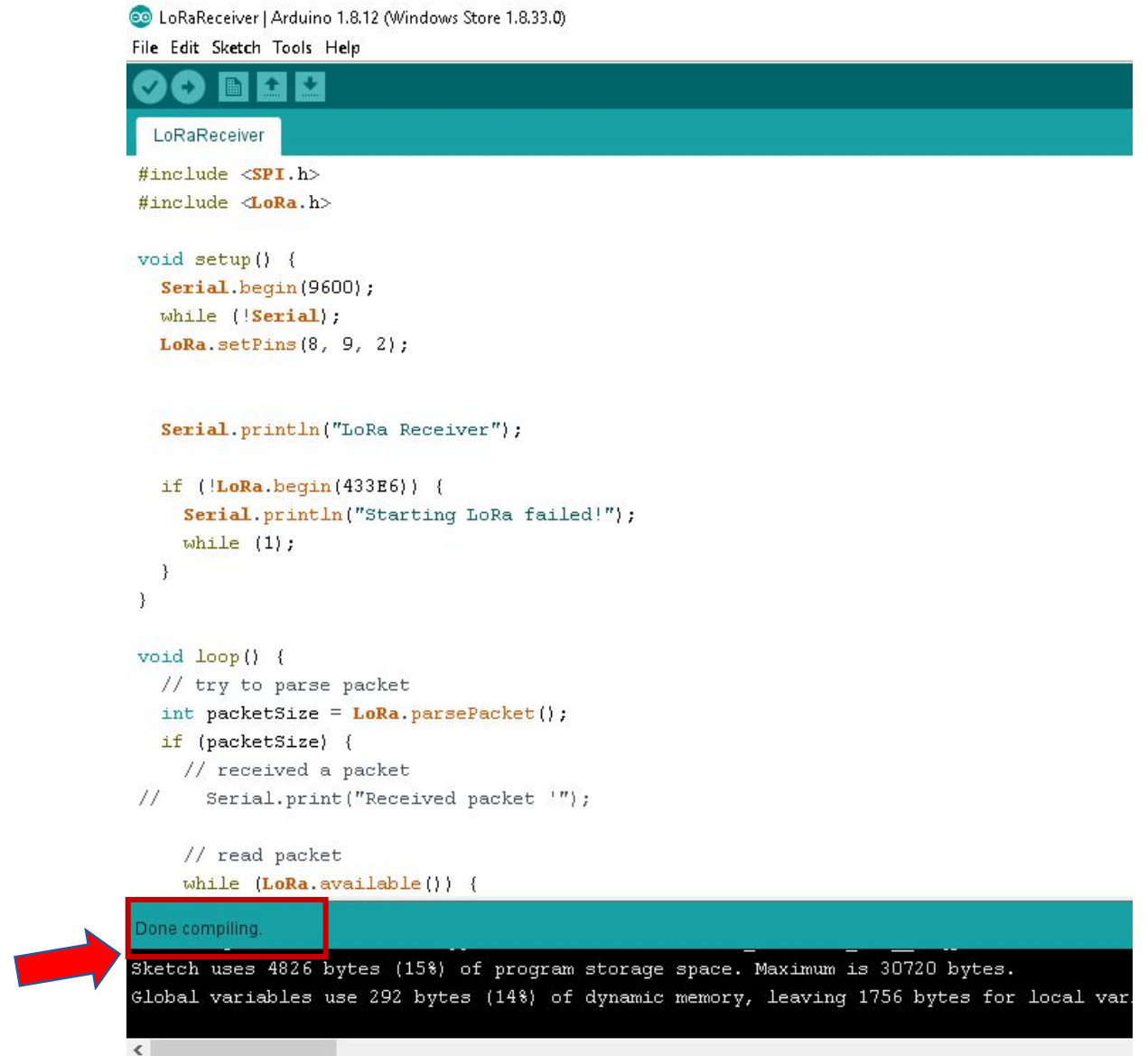


A screenshot of a file explorer window with a dark theme. The window displays a list of files and folders. The 'LoRaReceiver' folder is highlighted with a red rectangular border. The table below represents the data shown in the screenshot.

Name	Date modified	Type	Size
Arduino-Codes	6/6/2022 11:49 AM	File folder	
arduino lib	6/6/2022 11:49 AM	File folder	
LoRa_Sender	6/6/2022 12:18 PM	File folder	
LoRaReceiver	6/6/2022 2:04 PM	File folder	
node_modules	6/9/2022 10:50 AM	File folder	
public	6/9/2022 10:53 AM	File folder	
Slides	6/10/2022 10:51 AM	File folder	
views	6/9/2022 10:46 AM	File folder	
.gitattributes	6/6/2022 11:49 AM	Text Document	1 KB
.gitignore	6/6/2022 11:49 AM	Text Document	1 KB
package	6/9/2022 10:50 AM	JSON File	1 KB
package-lock	6/9/2022 10:51 AM	JSON File	37 KB
readme.md	6/6/2022 11:49 AM	MD File	1 KB
server	6/10/2022 10:36 AM	JavaScript File	4 KB

## Step-6:

- Compile code to check whether it will compile or not
- Upload code to the receiver board
- Select the port before uploading



```
LoRaReceiver | Arduino 1.8.12 (Windows Store 1.8.33.0)
File Edit Sketch Tools Help

LoRaReceiver

#include <SPI.h>
#include <LoRa.h>

void setup() {
  Serial.begin(9600);
  while (!Serial);
  LoRa.setPins(8, 9, 2);

  Serial.println("LoRa Receiver");

  if (!LoRa.begin(433E6)) {
    Serial.println("Starting LoRa failed!");
    while (1);
  }
}

void loop() {
  // try to parse packet
  int packetSize = LoRa.parsePacket();
  if (packetSize) {
    // received a packet
    // Serial.print("Received packet ");

    // read packet
    while (LoRa.available()) {
```

Done compiling.

Sketch uses 4826 bytes (15%) of program storage space. Maximum is 30720 bytes.  
Global variables use 292 bytes (14%) of dynamic memory, leaving 1756 bytes for local variables.

## Step-8:

- open command prompt inside the downloaded folder
- enter command: "npm install" to install require dependencies

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.18362.720]
(c) 2019 Microsoft Corporation. All rights reserved.

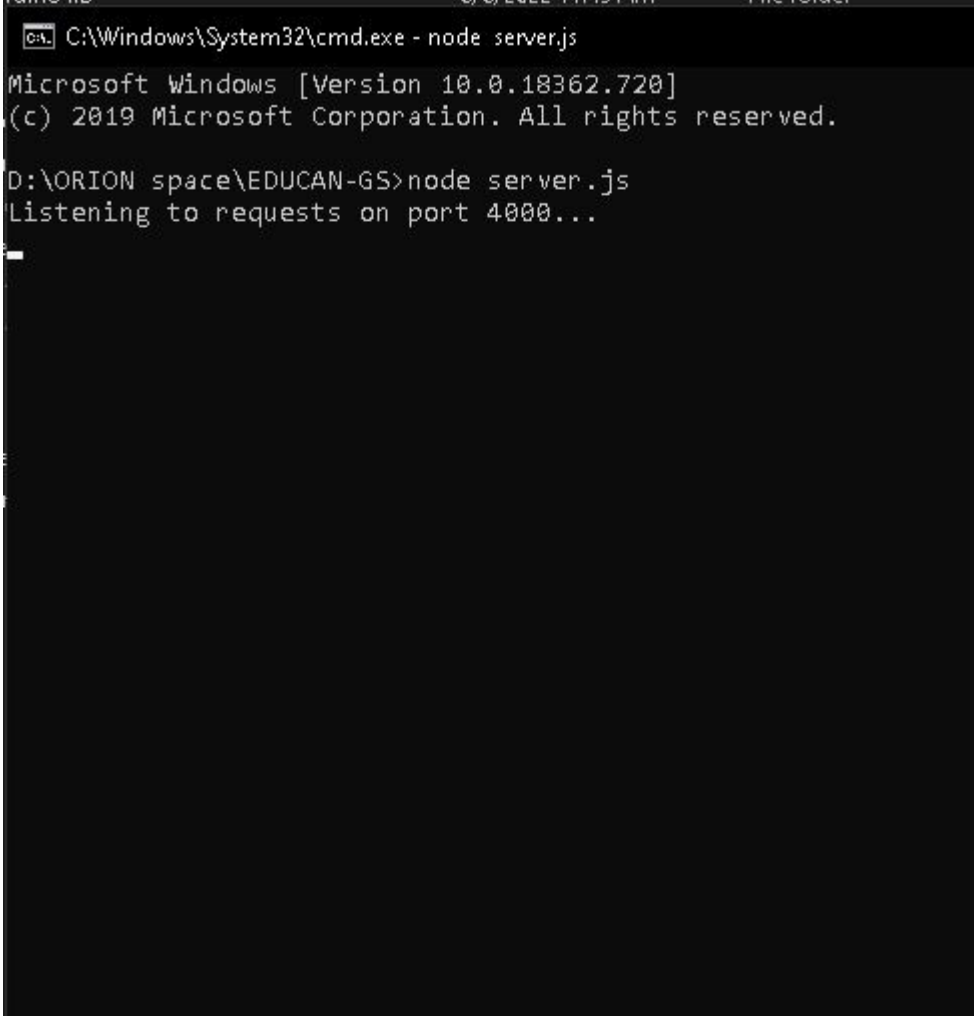
D:\ORION space\EDUCAN-GS>npm install
npm WARN EDUCAN-GS No repository field.
npm WARN EDUCAN-GS No license field.

audited 118 packages in 2.447s
22 packages are looking for funding
  run `npm fund` for details
found 0 vulnerabilities

D:\ORION space\EDUCAN-GS>
```

## Step-9:

- Enter command: “node server.js” in your command prompt
- This start the server.

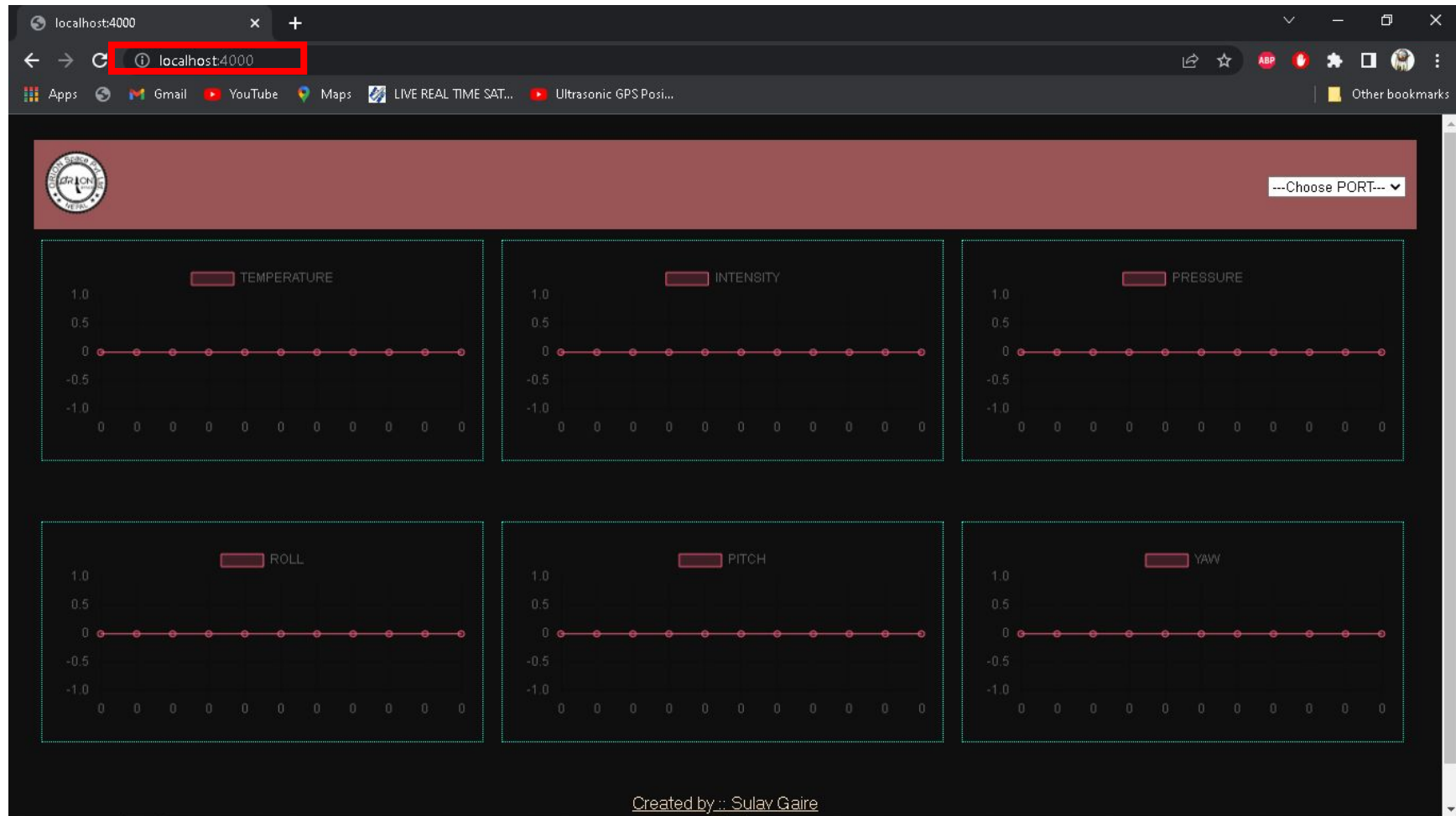


```
C:\Windows\System32\cmd.exe - node server.js
Microsoft Windows [Version 10.0.18362.720]
(c) 2019 Microsoft Corporation. All rights reserved.

D:\ORION space\EDUCAN-GS>node server.js
Listening to requests on port 4000...
```

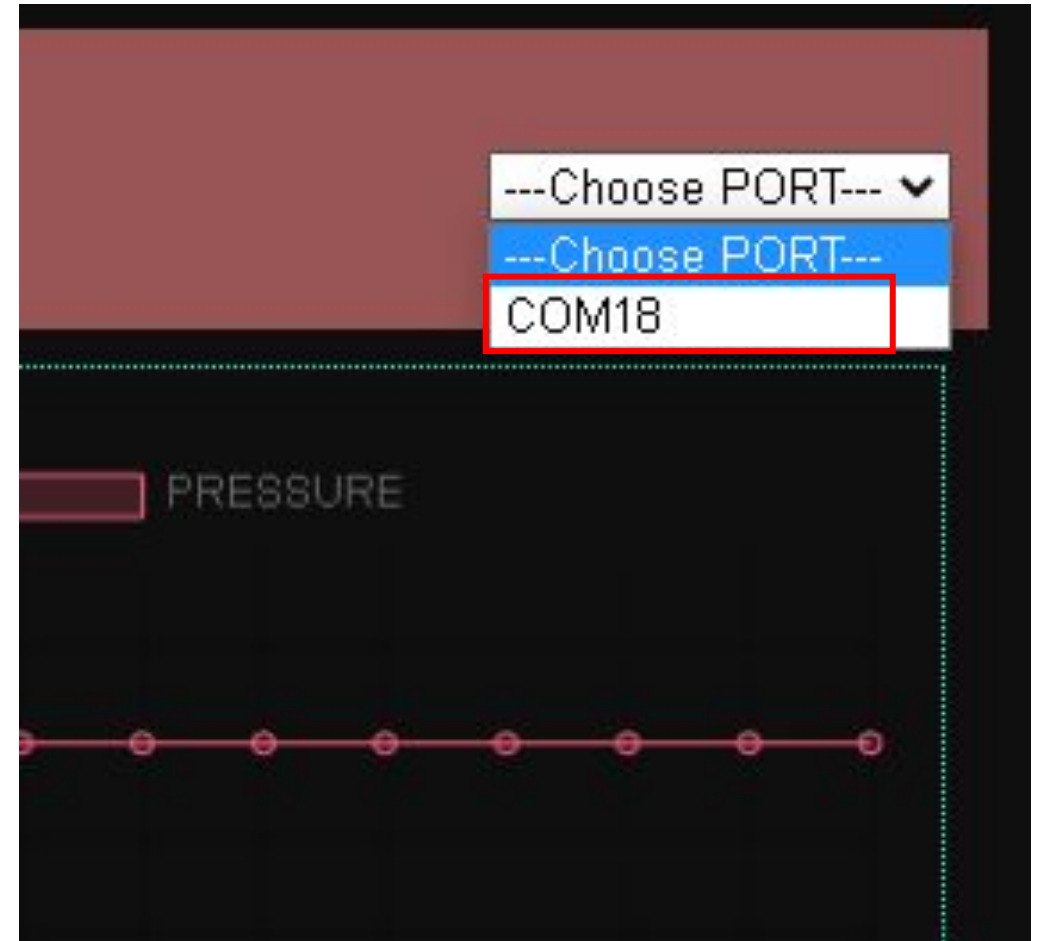
# Step-10:

- Open your browser and visit <http://localhost:4000/>



## Step-11:

- Select the port connected to the receiver from the choose port section
- Close all the serial monitor opened before
- If more port are available select the port while uploading receiver code .



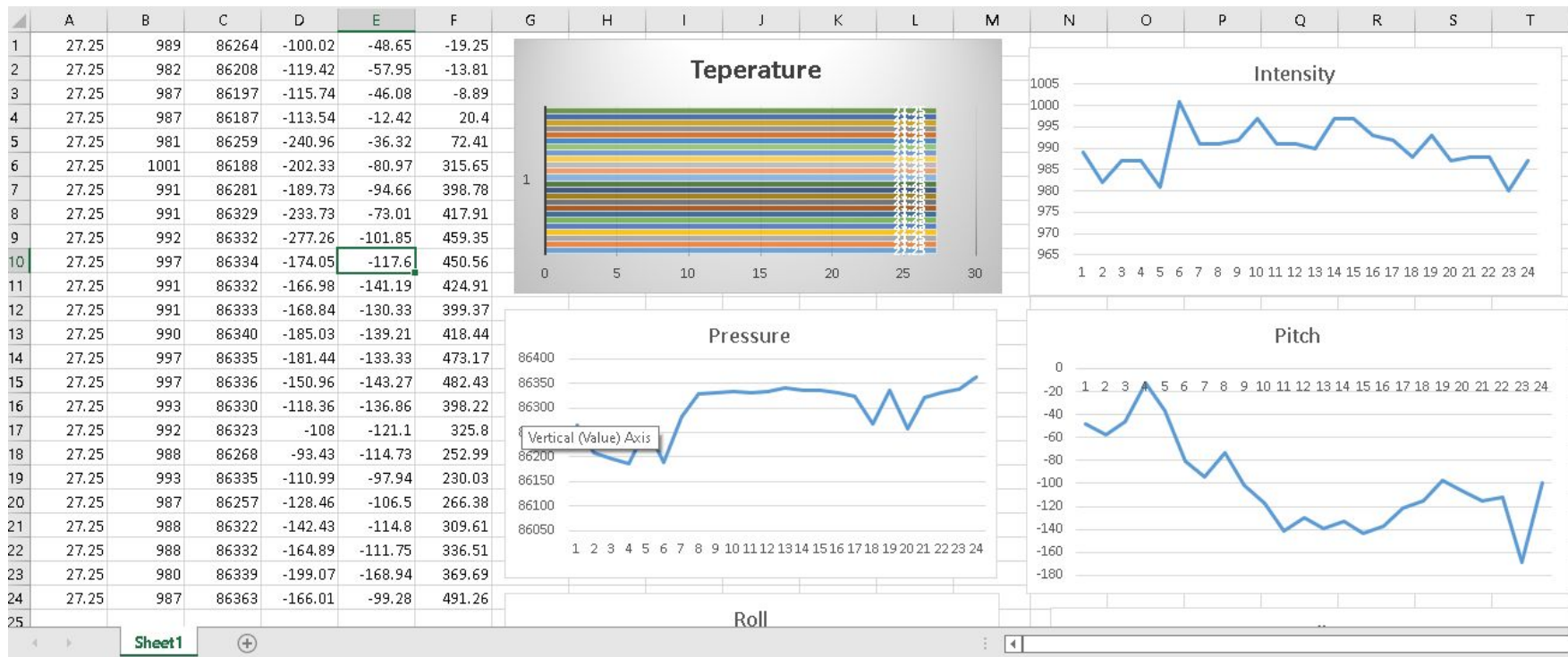
# Step-12:

- Now the data starts to plot in the graph .



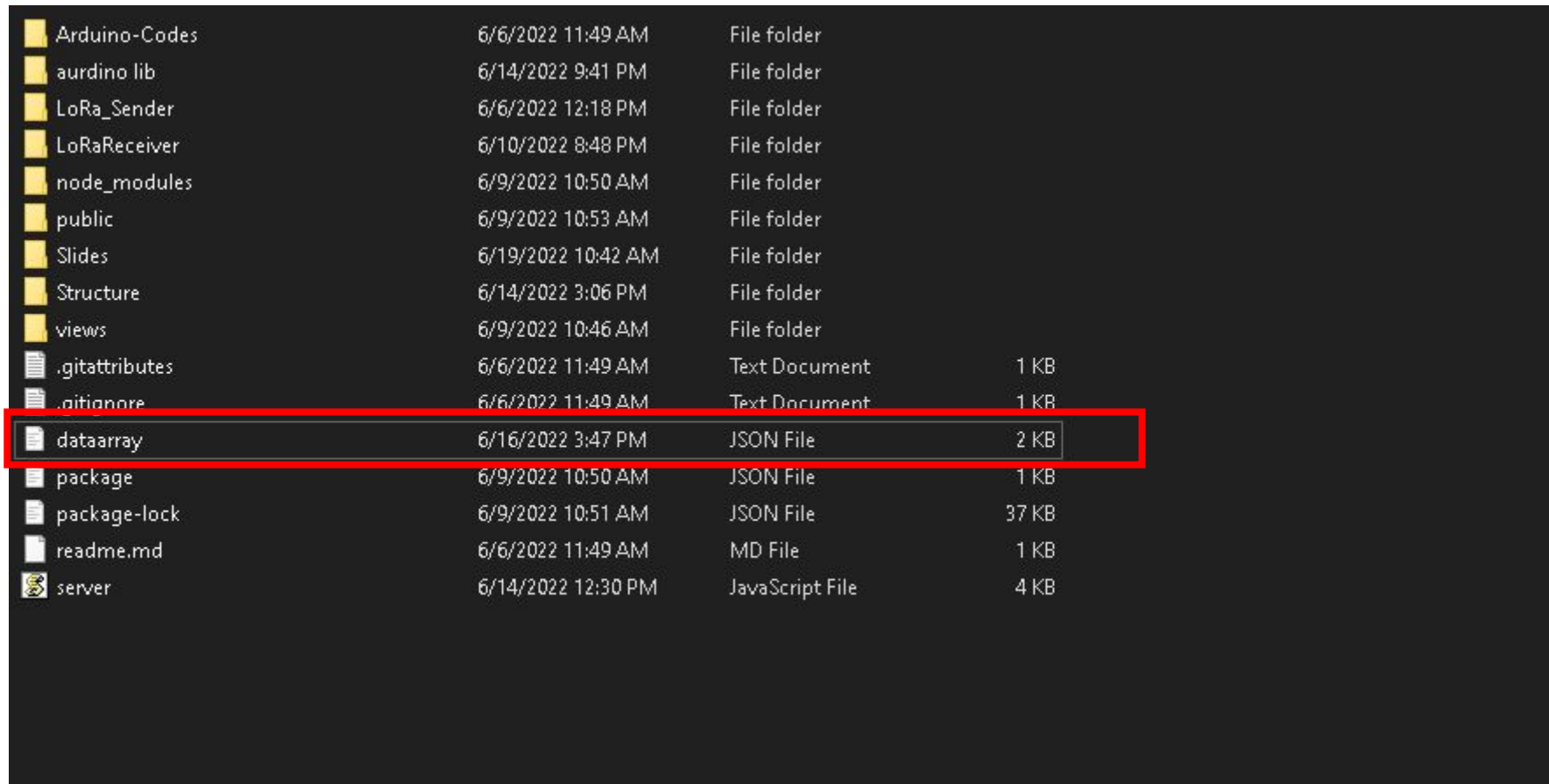
# Record

- The received data is stored in dataarray file
- Import this file in excel if further analysis is required
- 





- Rename or move dataarray file to another location before receiving new data



Arduino-Codes	6/6/2022 11:49 AM	File folder	
arduino lib	6/14/2022 9:41 PM	File folder	
LoRa_Sender	6/6/2022 12:18 PM	File folder	
LoRaReceiver	6/10/2022 8:48 PM	File folder	
node_modules	6/9/2022 10:50 AM	File folder	
public	6/9/2022 10:53 AM	File folder	
Slides	6/19/2022 10:42 AM	File folder	
Structure	6/14/2022 3:06 PM	File folder	
views	6/9/2022 10:46 AM	File folder	
.gitattributes	6/6/2022 11:49 AM	Text Document	1 KB
.gitignore	6/6/2022 11:49 AM	Text Document	1 KB
dataarray	6/16/2022 3:47 PM	JSON File	2 KB
package	6/9/2022 10:50 AM	JSON File	1 KB
package-lock	6/9/2022 10:51 AM	JSON File	37 KB
readme.md	6/6/2022 11:49 AM	MD File	1 KB
server	6/14/2022 12:30 PM	JavaScript File	4 KB