The Electronics Society Report (2022-2023)

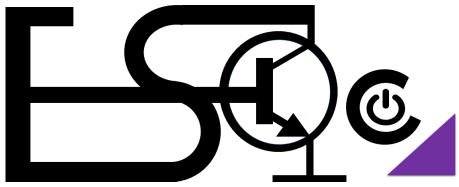


Figure 1: Esoc Logo

The Electronics Society, known as ESoc, is a hub for students with curious and innovative minds to explore and gain hands-on experience with the electronics toolkits and devices outside the classroom amenities.
The activities of the society range from conducting workshops and holding interactive sessions to initiating various rewarding projects on Arduino, NodeMCU and ESP32, etc.
In its niche of an experimenting workplace, the Society not only provides a sound community for learning but it also extends the scope of technological advancement within the campus facilities.

Contents

1 Council members

The Council was declared on 21st July 2022.
The current Council would be dissolved on 31st May 2023.

1.1 Third year council:

Third year Council		
Position	Name	Course
President	Aarya Diwan	B.Sc (H) Physics
Vice President	Danny George	B.Sc (H) Physics
General Secretary	Joyce James	B.Sc (H) Physics
Logistics Head	Josiah Jose Kadithala	B.Sc (H) Physics
Outreach Head	Tarush Tandon	B.Sc (H) Physics

1.2 Second year Council

Second year Council		
Position	Name	Course
Treasurer	Mani Gupta	B.Sc (H) Physics
Project Team Member	Anupam Chauhan	B.Sc (H) Physics
Project Team Member	Vishwanath Mali	B.Sc (H) Physics
Executive Council Member	Ancy A Daniel	B.Sc (H) Physics
Executive Council Member	Nishidha Nidhi	B.Sc (H) Physics
Outreach Team Member	Jayakrishnan K	B.Sc (H) Physics
Outreach Team Member	Pankhuri Chaturvedi	B.Sc (H) Physics

Figure 2: Esoc Council

2 Events held:

2.1 Seminar

The Electronics Society in collaboration with the IQAC held a seminar, following are the details:

Title: Artificial Intelligence and its Impact on Education
Speaker: Mahasweta Bhattacharya
Date: 27th April 2023
Venue: Seminar room and OPLT

Summary of the talk:
The talk was given by Dr. Mahasweta Bhattacharya on the topic, of A.I. and its impacts on education.
In this talk, we looked over why we are using AI models in their current state. Developing from the start of AI model using neural networks and basic image recognition, we discussed various AI tools which have been emerging recently, ChatGPT, bard, etc.
We discussed how are these models changing the teaching and learning process and what changes can be expected in the development of students. How can these be used as tools to aid the teaching-learning process and how can they change the course of teaching and learning in subjects of literature and arts. On the one hand, where it's providing us with easy access to information on the other hand it is affecting the creativity of the upcoming generation.
The talk was concluded by mentioning the advantages and disadvantages of the A.I tools and what key points one should take into account while using them.
By the end, we had an enriching QnA session where Dr. Mahasweta answered questions from faculty and various members attending the talk.

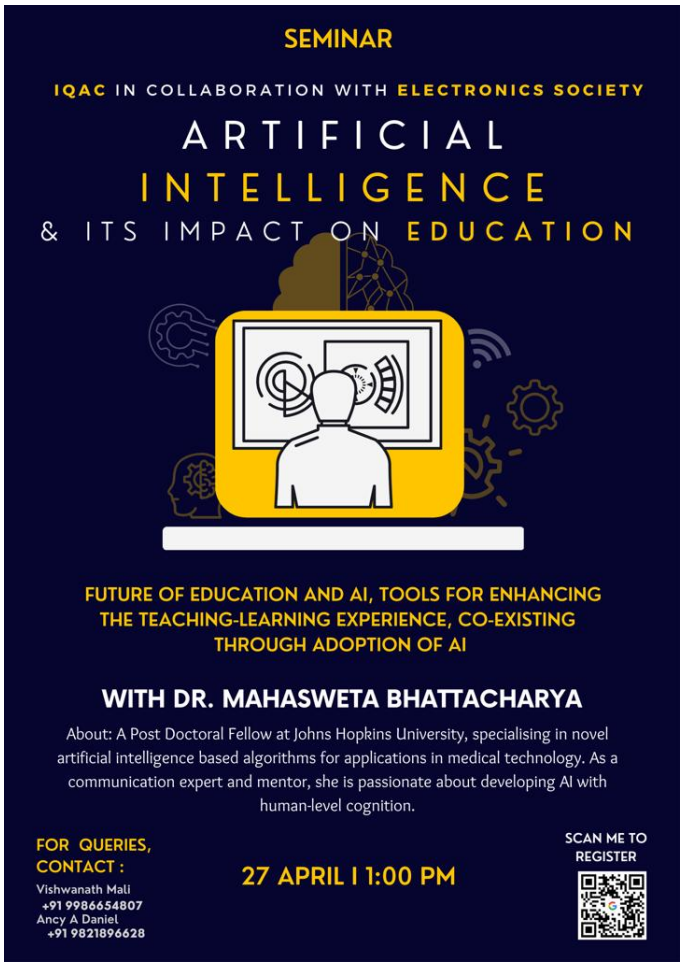


Figure 3: Poster for the seminar

2.2 Sessions

Sessions held in the year 2022 - 2023				
Date	Topic	Description of the session	Conducted by	Time and Venue
19 Nov 2022	Electronics society orientation	To welcome the 2026 batch and brief them about the working of our society.	Ancy Pankhuri	2pm, NPLT
26 Nov 2022	Theft Detection system	We began the session with the basics of electronics and taught them to set up the Arduino IDE and its coding. We also briefed about other microcontrollers. With this we proceeded with our first project - The Theft Detection system. We had also planned fun games like laser limbo and laser tag for them. At the end of the workshop, we introduced them to Tinker cad to try simulating circuits.	Anupam Vishwanath	2pm, NPLT
3 Dec 2022	Ultrasonic Sensor	In this session we covered the ultrasonic sensor. We started with basics like giving a trigger at a pin and getting its echo at another, timeout and explained the beep of buzzers and how it measures the distance of objects. This was followed by a short session on C++ coding.	Anupam Mani	2pm, NPLT
4 Feb 2023	PID Control	A very interactive session on PID (proportional-interactive derivative) control theory was taken. Detailed explanation on how the proportional term measures current error, integral term accounts for past values for error and accumulates it and the derivative term calculates output and anticipates future error was given. A step by step guide to creating an optimal model was suggested, followed by solving a problem statement for a better understanding of the controller. workaround practical constraints. A Python simulation on PID control was shared to learn by adjusting the gain values and to see the system response	Aarya	6pm, Online
11 Feb 2023	PID Control	This was a continuation of the first session on PID wherein we started with a short recap of our previous session. Later we discussed some physical constraints of drones like maximum thrust, response time, etc. Integral anti-windup and its method to prevent this were next. We concluded the session with Integral Clamping and its steps. In addition to the theory, the Python code to vary different parameters and understand its algorithm was shared with them.	Aarya	2pm, Online
19 Feb 2023	Soldering Session	The students were introduced to the components for soldering i.e., Soldering iron, solder wire, flux, etc. A demo session by us was followed by a hands-on experience for them to solder LEDs on a perf board.	Ancy Pankhuri	4pm, CRT
21 Feb 2023	ESP32 (EVM-1)	We introduced a new microcontroller ESP 32 which would be wildly used hereafter in EVMs. Starting with the explanation of its pin structure, they learned its connections. This was followed by teaching to install the libraries for esp and in the end debugging errors.	Anupam Mani Nishidha	4pm, NPLT

The sessions started late for the society as the First year Junior Members joined in November.

2.3 Chandni Chowk Visit

Chandni Chowk is a bustling market in the heart of Old Delhi, known for its vibrant atmosphere, narrow streets, and historic architecture.
For many students, it is also the go-to destination for sourcing electronic components for their projects. To make the task easier, the Electronics Society at our college organizes an annual trip to Chandni Chowk, where members can purchase the necessary components required for our projects namely the weather station and the walking stick, in bulk and at discounted rates.
The trip is eagerly anticipated by students each year, as it not only allows them to procure components but also provides an opportunity to bond with their peers and explore the rich culture of the city.
From 'paranthe vaali gali' to 'natraj ke dahi bhalle', these CC trips are a lot more than just electronics. The society members take the metro to reach Chandni Chowk, where they navigate through the maze of shops and stalls to find the best deals. From magnetometers for the walking stick to Esp32 and sensors, everything is available in the market, making it a one-stop shop for electronic enthusiasts.
Overall, the Chandni Chowk trip organized by the Electronics Society is an excellent initiative that not only aids students in their projects but also helps in fostering a sense of community among them.

2.4 NAAC Visit

The NAAC visit was an anticipated event at our college, as it is a crucial process for evaluating the quality and standards of higher education institutions in India.
During the visit, various aspects of the college were assessed, including academic performance, infrastructure, faculty, and extracurricular activities.
As part of the event, several societies in the college were given the opportunity to showcase their work through stalls and performances.
The Electronics Society was among them, and we were thrilled to have the chance to display some of our innovative projects.
Our projects included a walking stick, which is a smart stick designed to help the disabled navigate their way around obstacles and a weather station that predicts atmospheric conditions of the campus.
Finally, our ESOC board made up of red LEDs soldered in series on a perf board was a simple yet effective project that showcased our skills in soldering and electronics prototyping.
Our society members worked tirelessly to complete the projects in time for the NAAC visit. As the deadline approached, we worked long hours and stayed up late on the campus to ensure that everything was in place for the event. We would often work late into the night, discussing and troubleshooting our designs until we were satisfied with the results.
Working on these projects required a great deal of skill, creativity, and perseverance. Each project had its own unique set of challenges, ranging from sourcing components to programming them. However, we were determined to see them through to the end and make sure that they were ready to be showcased at the NAAC visit.
Our dedication paid off when we saw the assessors take an interest in our work and appreciate our efforts. It was gratifying to see the recognition for our hard work, and we were proud to have represented our college in such a positive light.
In conclusion, our electronics society members put in a lot of hard work and effort to complete the projects and ensure that they were ready for the NAAC visit. It was a testament to our dedication and commitment to our craft.
Overall, the NAAC visit was a great opportunity for us to showcase our talents and contributions to the college community. We hope to continue contributing to the college's growth and development in the years to come.

Figure 4: ESoc Stall for NAAC visit

Figure 5: Close up of ESoc Stall

Figure 6: During Workshop

Figure 7: After Workshop

3 ESoc Expenditures

In Academic Session 2022-2023, The Electronics Society worked to develop a cost-effective model of the Weather Station and Walking Stick. Following is the cost of the prototypes developed by us.
We also conducted workshops on the basics of electronics for our juniors. The society had also put up a stall for the NAAC visit where we displayed all the projects we have worked on. The following tables show where the money provided by the college was spent.

3.1 Cost of Weather Station

Cost of Weather Station		
S.No	Components	Price (Rs.)
1	16*4 LCD	280
2	DHT11 Temperature and Humidity Sensor	165
3	ESP 32S	350
4	Acrylic Sheets	280
5	BMP180 Pressure sensor	120
6	Miscellaneous	50
	Total	1,245

3.2 Cost of Walking Stick

Cost of Walking Stick		
S.No	Components	Price (Rs.)
1	ESP 32S	350
2	HC SR04	75
3	Buzzer	10
4	600 mAh battery	80
5	BMS	30
6	Ptype MOSFET	30
7	Magnetometer	250
8	Miscellaneous	50
	Total	875

3.3 NAAC Expenditures

NAAC Expenditures		
S.No	Components	Price (Rs.)
1	Posters	220
2	Soldering Iron	90
	Total	310

3.4 Inventory Setup and Workshops

Expenditures related to Inventory Setup and Workshops		
S.No	Components	Price (Rs.)
1	Microcontrollers	1,750
2	Sensors	1,220
3	Toolkits	500
4	Jumper wires	80
5	Miscellaneous	150
	Total	3,700

4 Projects

4.1 Electronic Voting Machine (E.V.M)

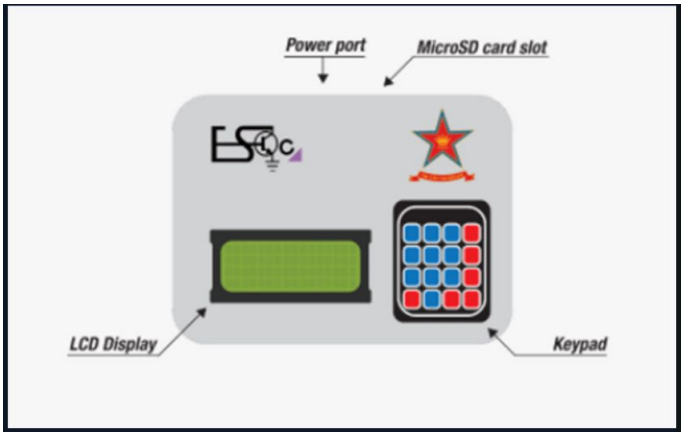


Figure 8: Schematics for the EVM

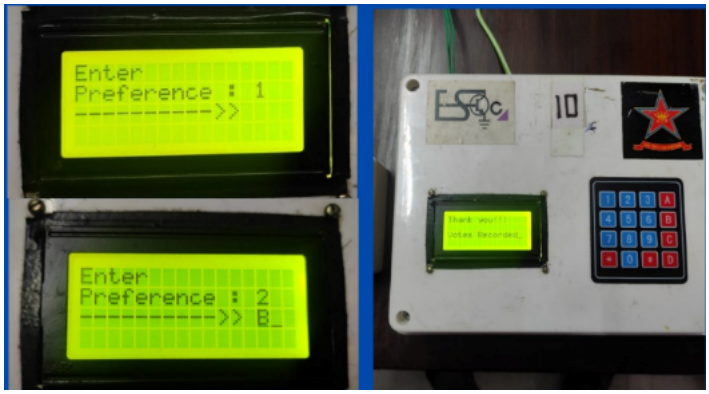


Figure 9: EVM and its display

Introduction:
Electronic Voting Machine is used in modern-day elections heavily. We can compare it to a time when elections used to be on a ballot paper. We know that elections are of utmost importance and hence special care is taken while designing these EVMs. The elections commission goes to strict ends to safeguard the votes and to hold a fair election.
We were given the task of designing the E.V.Ms by the S.U.S. elections held in February.We were asked to make EVMs for the presidential and the council elections. We designed the first model in January which was inspired by the prior model. We took extensive care while designing our models as well.

Designing the E.V.M:
Electronics Society has previously made EVMs for the college elections as well but due to lockdown conditions in 2020, SUS was not in existence. We had reference models from previous batches.
Previously ARDUINO UNO3 was used as the main microcontroller. We shifted to ESP modules because of their accessibility, affordability and features.
We designed the circuit in a similar fashion as the previous design and have physical checks for appropriate power consumption and power distribution over various components of this UNIT.
The first prototype was designed and finished in 2 days which included designing the algorithm, choosing the components and soldering the circuit.

Programming:
The Algorithms and software can't be discussed openly as it is being currently used for the EVMS.
We created the first prototype for the presidential elections.

- **Designing the Algorithm:** The third-year and the second-year council sat for multiple hours to decide what

would be the most efficient and quickest way of collecting votes and we designed the algorithm and methodology accordingly.

- **Implementing the code in python: :** The code for presidential elections was first written in Python and debugged and checked extensively by the council members. As Python is an easy-to-use language we preferred Python. We discussed cases of false voting and possible cheating and designed checks to prevent the same.
- **Converting the code into .ino code:** After the Python code, this code was converted into the code on which ESP32 modules run,i.e. Ino format. Python is an easy-to-use language that had a lot of freedom in writing the code but we had to bind ourselves under constraints possessed by the coding language.
- **Debugging the code:** After writing the code and successfully running in on the machine we started debugging the code and looking for various errors and bugs which may pop-up.

Challenges faced while designing the code:
One of the biggest challenges we faced was to make the space and time complexity as small as possible. We worked on how we can convert the preferential votes into anonymous votes while keeping all the checks and storing the data successfully without data corruption.
We had sessions of debugging the code and found multiple loopholes in the checks.

- Accepting the same candidate as multiple preferences, this was fixed soon.
- Giving a particular string of preferences to bypass the checks, this was fixed.
- Giving invalid input to bypass the checks, this was fixed.
- Voting incomplete and asking the moderator to save the vote, this as fixed

Hardware:
The above components were soldered on a perf board and made into a robust and well designed circuit.
We gave an external 5V power using the 5V power adapter. Each component is given the power individually and checks are implemented in case of power failure leading to data corruption.
The circuit was soldered overnight by the Third Year council members and tested extensively for any hardware bugs and power failures. The moderator switch circuit is cleverly designed to bypass any interruptions by malicious practitioners.
This circuit is easy to fix under failure circumstances and data for votes is stored safely in the provided SD card.

Future Plans:
EVM 2.0 is a robust and affordable machine created by the electronics society.
Presently it has been designed for the presidential elections, we will be creating the first prototype for council elections as well. We will be having the next S.U.S elections soon and the Electronics Society has been conducting sessions and workshops regarding the same.
We have planned to deploy 20 UNITS of EVMS for the next elections for which we will be needing help from the first-year students. We are currently working on improving the current design and teaching first years electronics to make an effective team.

4.2 Walking Stick

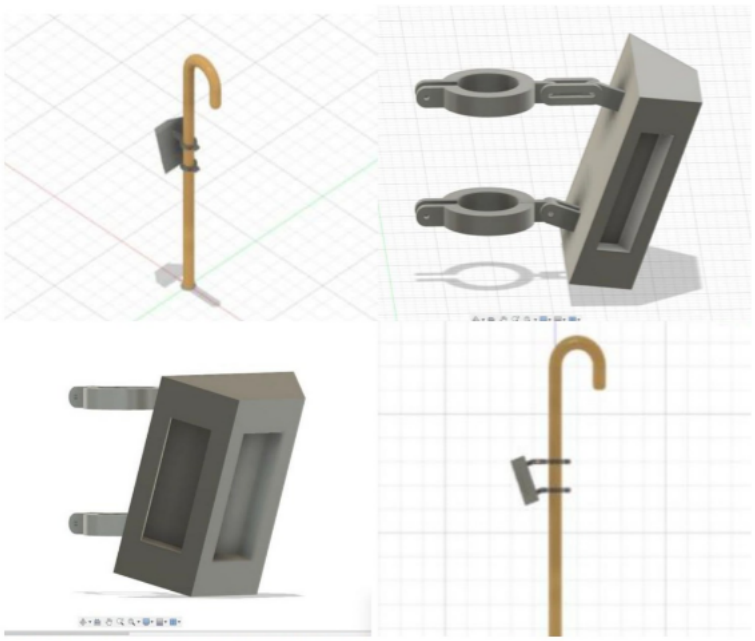


Figure 10: 3D model of the walking stick

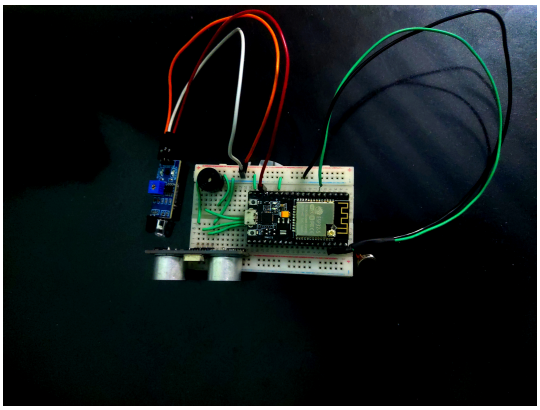


Figure 11: First Circuitry of the walking stick

Our goal is to design a walking stick that is both economically and technically efficient for the visually impaired. While the concept of a smart walking stick is not new, previous models have not been able to achieve a high level of accuracy that is practical for daily use. Therefore, we aim to develop a model that provides less erroneous instructions to the user.

At present, our society has developed a prototype of the walking stick that includes an ultrasonic sensor, buzzer, and a microcontroller (ESP32S). This prototype is capable of detecting obstacles within a certain range and providing an audible warning to the user. Along with this audio feedback, we also tried to incorporate haptic feedback, which due to technical reasons did not make it to the prototype model.

To address the issue of the accurate location of obstacles, we have included a magnetometer in the design of the walking stick. The magnetometer is a sensor that measures the strength and direction of magnetic fields. By incorporating this sensor into the walking stick, we can provide the user with more accurate information about their surroundings. For example, if the user is walking in a city with tall buildings and a lot of metal structures, the ultrasonic sensor may not be able to detect obstacles accurately. However, the magnetometer can help in identifying the direction and distance of the obstacles by detecting any metallic objects nearby. We are working to create an audio feedback system in the form of Morse code that gives the user an indication of the direction of the obstacle.

However, we understand that Morse code may not be the most convenient way for the user to receive instructions. Therefore, in the future, we plan to incorporate speakers and SD card modules into the walking stick. This will allow us to store voice instructions for directions and navigation, which will be more user-friendly and easier to understand.

The use of voice instructions will also allow the user to receive information about their surroundings more quickly and accurately, without having to decipher Morse code. We believe that this will significantly improve the user's experience and make the walking stick more practical for daily use.

Our ultimate goal is to create a walking stick that is not only accurate and functional but also affordable. We are committed to exploring new technologies and working closely with experts in the field to achieve this goal. We believe that by constantly innovating and improving our design, we can create a device that will significantly improve the quality of life for visually impaired people.

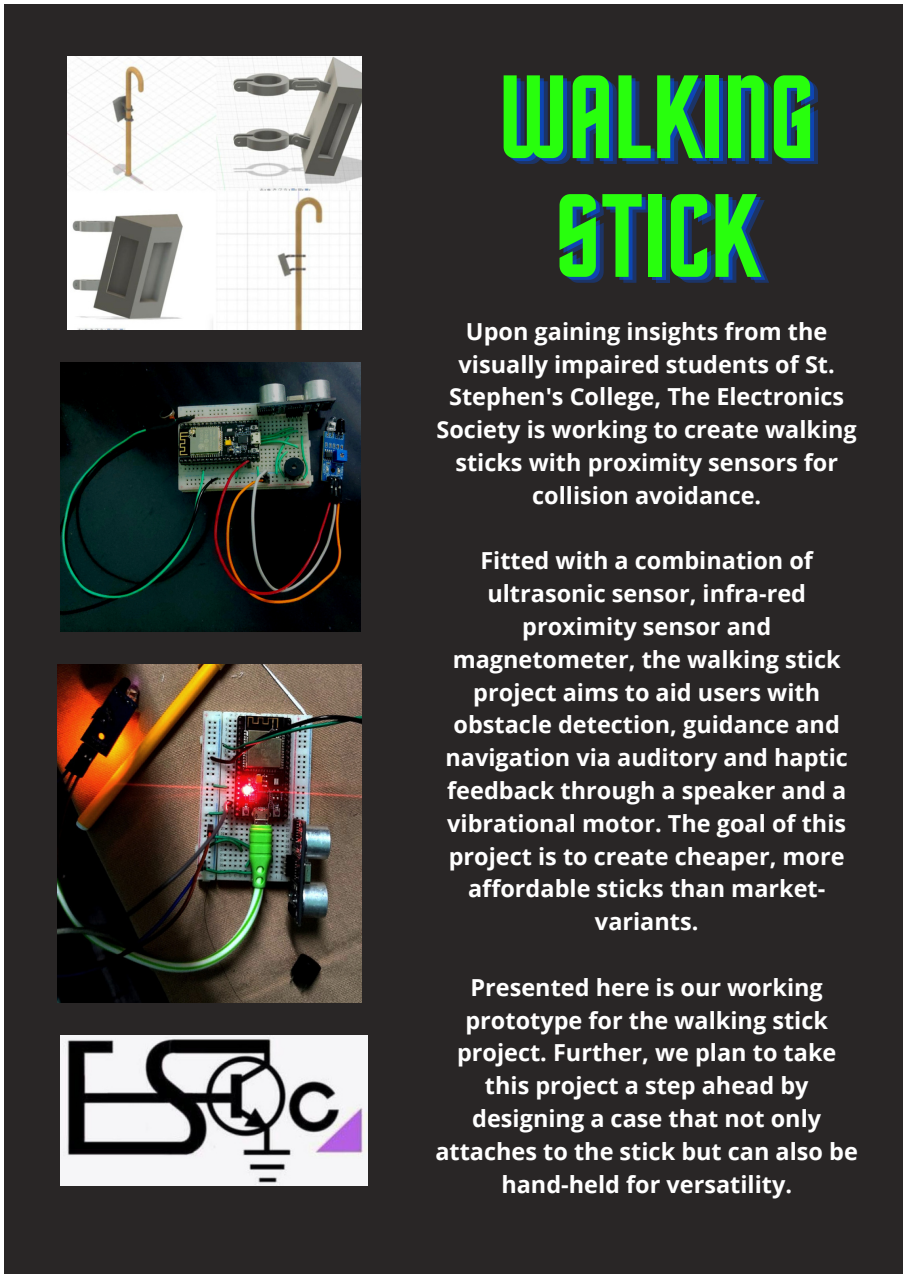


Figure 12: Walking stick poster

4.3 Weather Station

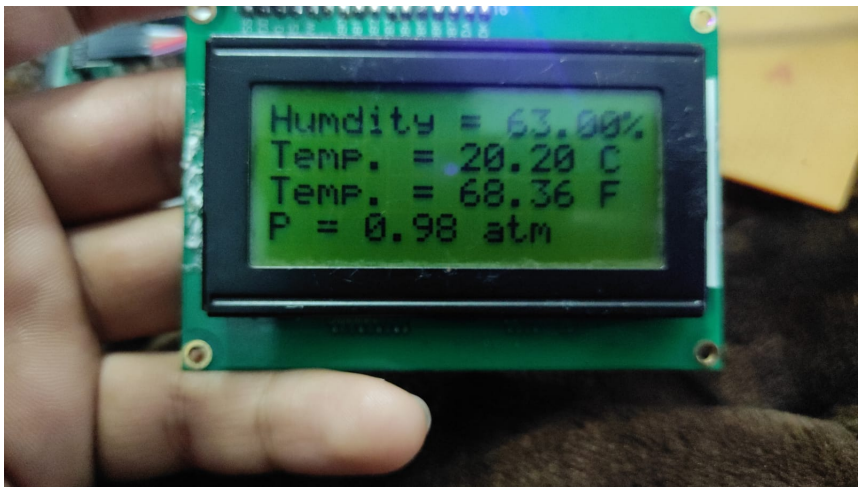


Figure 13: Weather Station Display

A weather station is a device used to measure and record the current weather conditions. It is a valuable tool for various industries, including agriculture, aviation, and weather forecasting. In building our weather station, we focused on ensuring accurate readings of temperature, pressure, and humidity. To achieve this, we utilized different components, such as the DHT 11 sensor for temperature and humidity and the BMP 180 sensor for pressure and temperature.

We also used the ESP32 microcontroller to gather and display the data. The ESP32 is a powerful microcontroller with built-in Wi-Fi and Bluetooth connectivity, making it easy to access and transfer data from the weather station.

One of the challenges we faced in building the weather station was designing and casing it effectively. We needed a sturdy casing that would protect the sensors and microcontroller, while still allowing us to access the data easily. After careful consideration, we decided to use acrylic sheets, which proved to be both durable and aesthetically pleasing.

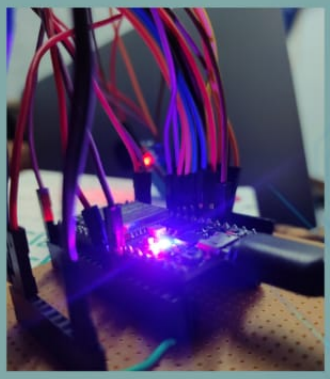
During the building process, we also encountered some problems that required us to collaborate and engage in diligent problem-solving. However, we were able to overcome these issues and ensure that the weather station worked efficiently and effectively.

Looking to the future, we plan to store the weather data collected by the station and use machine learning algorithms to analyse weather patterns and predict future weather conditions. With enough data, we hope to gain insights into weather patterns and use this information to make informed decisions in various industries.

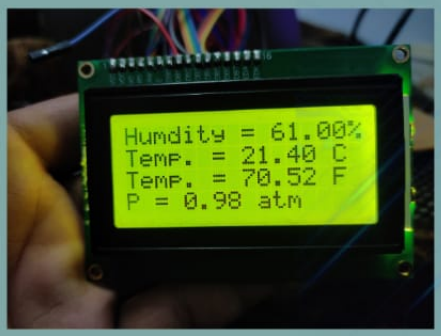
In conclusion, the weather station we built is a valuable tool that provides accurate and reliable weather data. Its components, including the DHT 11 and BMP 180 sensors, and the ESP32 microcontroller, ensure that we collect the data we need to make informed decisions. With future plans to store and analyse the data, we believe that our weather station will continue to be a valuable asset in various industries.

Weather Station

Diving deeper into the realm of predictive modeling, The Electronics Society is seeking to create its own weather station to observe and later predict local weather patterns.



The ESOC weather station is a cost-effective device developed by society members under the supervision of the society staff advisor, Dr. Abhinav Gupta. This machine records data from various sensors connected to the central controller (ESP32) directly or via the internet, which is then recorded on a server and also projected onto the LCD screens in real time.



This is the first version of the weather station project. Our next goal is to use the recorded data to predict local weather patterns in and around the college by applying various machine learning based algorithms

Figure 14: Weather Station Poster

5 Merchandise

The Electronics Society also released its merchandise for the Junior Members of the college. Junior and Seniors Members could buy the following:

1. Varsity Jacket
2. T-Shirt
3. Tote-Bag

Figure 15: Varsity Jacket

Figure 16: T-shirt

Figure 17: Tote Bag

6 Social Handles

- Instagram: Link
- Youtube: Link

We are open to suggestions, inputs, or queries of any kind. For such cases contact us through our email address: esoc.ststephens@gmail.com