ABSTRACT

IoT (Internet of Things) is poised to transform the real world objects into intelligent virtual objects in the near future. As sensing, communication, and control become ever more complex today, this technology is applied in transforming the Internet into a fully integrated ecosystem. IoT is the next revolutionary technology in transforming the Internet into a fully integrated future ready Internet. IoT allows people and things to be connected at any time, any place, with anything and anyone, by using any path/network and any service. The advances in computer hardware, embedded system devices, networking devices, display devices, control devices, software enhancements, etc. have hugely supported IoT to grow rapidly. The main objective of this project discusses actual implementation of IoT based monitoring system and its associated peripheral devices/equipment's for parameters like temperature and power supply etc. using appropriate sensors. The main utility of the work presented, is in 24x7 monitoring of remotely located devices where it is impractical to monitor manually with direct physical presence. The implementation has been done using an integrated IoT device BOLT IoT.

With advancement of Automation technology, life is getting simpler and easier in all aspects. In today's world Automatic systems are being preferred over manual system. With the rapid increase in the number of users of internet over the past decade has made Internet a part and parcel of life, and IoT is the latest and emerging internet technology. Internet of things is a growing network of everyday object-from industrial machine to consumer goods that can share information and complete tasks while you are busy with other activities. Wireless Automated Light Monitoring System (WALMS) using IoT is a system that uses computers or mobile devices to control basic home functions and features automatically through internet from anywhere around the world, an automated home is sometimes called a smart home. It is meant to save the electric power and human energy. The Automated Light Monitoring System differs from other system by allowing the user to operate the system from anywhere around the world through internet connection.

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Chapter 1

INTRODUCTION

Internet of Things (IoT) is a small electronic device which senses and collects data from around the world and shares this data with backend applications. It communicates with any object, environment, and infrastructure. Nowadays every person is connected with many social media communication networks like Facebook, Whatsapp, Twitter, YouTube, Google+, LinkedIn, Google class, classmates, messenger, Wechat, Qchat, Viber, Snapchat, etc. Communication is a very important part of IoT. The idea of IoT is quite useful for real-world applications and services. A few examples of the application of IoT technology are: Putting on the lights automatically on sensing the human activity, Similarly AC and all other devices need to run in an environment and be switched off based on certain event or trigger. Thus an IoT is basically a framework where the devices are connected to the internet for the purpose of monitoring and control. [2] The First time IoT became popular and made its mark was in the year 1999 when Kevin Ashton applied it for auto-ID. This was a big year for IoT. In 2005 the IoT, combined with ICT technologies, was applied to virtually connect any object at any time and place. IoT applications picked up during 2008 – 2009 with the growth of smart tablet, mobile, PC and other devices connected through the internet. The development of IPv6 helped to reduce the scarcity of public IP address space which was essentially required for the growth of IoT.

1. 1 Background

Homes of the 21st century will become more and more self-controlled and automated due to the comfort it provides, especially when employed in a private home. Automated Light Monitoring System is a means that allow users to control electric appliances of varying kind. Many existing, well-established Automated Light Monitoring System are based on wired communication. This does not pose a problem until the system is planned well in advance and installed during the physical construction of the building. But for already existing buildings the implementation cost goes very high.

Features:

- Intensity Control
- Voice Control
- Control via Smartphone
- Light Scheduler
- Mood Lighting
- Smart Lighting

1.2 Objective

The aim for this project is to design a Automated Light Monitoring System which targets the energy saving and autonomous operation on economical affordable for residential and commercial.

Objectives of this project are to:

- Build an energy saving Automated Light Monitoring System with integrated sensors and controllers
- Design a Automated Light Monitoring System with modular approach design, which makes the system scalability and expandability.
- Design a Automated Light Monitoring System which compatibility and scalability with other commercial product and automation system, which might include more than lighting systems.

1.3 Scope, Purpose and Applicability

1.3.1 Scope:

It's the technology of today which is touching and transforming every aspect of our real life. IoT has given a concept of Machine to-Machine (M2M) communication. Some of the companies are implementing strategy to capitalize on the Internet of Things so that you can just stop your business and start making it thrives. IoT is going to have huge impact on Automated Light Monitoring System and building automation system where every convenience will be taken care of by the interconnected devices on IoT. It is also deployed on large scale for example in Song do, South Africa, the first of it sown kind fully equipped and wired smart city is near to completion (known as Ubiquitous City).

With the personal electronics good connected to Internet will enable us to “author” our lives. In medical science field, IoT has given a privilege to devices and system to sense for coming disease and to prevent it, forge. It can make a person healthier with wearable’s that can predict heart attack and cardio vascular strokes. As per a report consumer will start initiating the usage of IoT in a better way during 2015 and onwards compared to past usage. It is expected that IoT products with interoperable capability will dominate the market. Awareness of IoT products is also vital for market penetration along with security features. Even very few Americans are aware of the usage of these products. As per a study of Consumer Electronics Association and Parks Associates found only 10% of the household in USA fully understood the usage of these products.

1.3.2 Purpose:

A Automated Light Monitoring System is an intelligent network-based lighting control solution that incorporates communication between various system inputs and outputs related to lighting control with the use of one or more central computing devices. Lighting control systems are widely used on both indoor and outdoor lighting of commercial, industrial, and residential spaces. Lighting control systems serve to provide the right amount of light where and when it is needed. Lighting control systems are employed to maximize the energy savings from the lighting system, satisfy building codes, or comply with green building and energy conservation programs. Lighting control systems are often referred to under the term Smart Lighting.

1.3.3 Applicability:

Automated Light Monitoring System is a lighting technology designed for energy efficiency, convenience and security. This may include high efficiency fixtures and automated controls that make adjustments based on conditions such as occupancy or daylight availability. Lighting is the deliberate application of light to achieve some aesthetic or practical effect (e.g. illumination of a security breach). It includes task lighting, accent lighting, and general lighting. Lights can be used to dissuade those from areas they should not be. A security breach, for example, is an event that could trigger floodlights at the breach point.

1.4 Organization of Project Report

The report is composed of the following sections:

Chapter 1: Introduction

This chapter gives a short summary and outlines the objectives of the project.

Chapter 2: Survey of Technologies

This chapter explains the comparison between the technologies used in this project.

Chapter 3: Requirements and Analysis

This chapter contains the details about what are the basic requirements for the project implementation.

Chapter 4: System Design

This chapter presents different UML diagrams of an implemented system like Data flow Diagram, Use case Diagram, Sequence Diagram, Class diagram, Activity Diagram and Entity Relationship Diagram.

Chapter 5: Implementation and testing

This chapter presents the actual implementation of the project.

Chapter 6: Result and Discussion

This chapter shows result of implementation of project.

Chapter 7: Conclusion

This chapter shows the overall overview of project.

Chapter 8: References and Bibliography

This chapters shows the references and useful website of project.

1.5 Conclusion

In this chapter we have studied about what this project is, in short. Introduction to this project that is what is the purpose, scope, applicability and introduction to the project is given.

The Automated Light Monitoring System using Internet of Things has been experimentally proven to work satisfactorily by connecting simple appliances to it and the appliances were successfully controlled remotely through internet. The designed system not only monitors the sensor data, like temperature, gas, light, motion sensors, but also actuates a process according to the requirement, for example switching on the light when it gets dark. It also stores the sensor parameters in the cloud (Gmail) in a timely manner. This will help the user to analyse the condition of various parameters in the home anytime anywhere.

Chapter 2

SURVEY OF TECHNOLOGIES

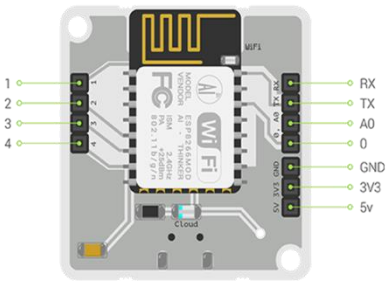
2.1 Description of comparative study of different technologies

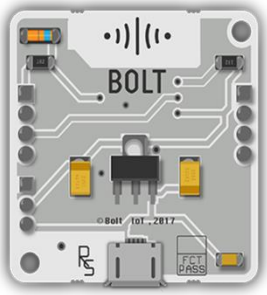
Bolt IoT Bolt WiFi Module

Application of Internet of Things is an emerging domain, which makes common objects to connected objects. In recent few years Internet of Things is making its way into industry applications. In this project Bolt IoT kit based system is planned to real time control the basic appliances in Industry. This system provides real time access of basic industry appliances such as Fans, Tube Lights etc .

Bolt IoT kit has in built microcontroller having input and output ports. The output port is connected to the relay which further gets connected to targeted appliances . Bolt IoT kit connected to internet via Inbuilt WiFi module. With the help of Bolt Cloud Service the webpage is created in Python language and accordingly the current status of appliances is shown there. With the help of Graphical User Interface one can change the ON/OFF condition ,which will trigger the relay and device connected to that relay.

- Our IoT Platform Bolt, enables enterprise and makers to easily and quickly build IoT products. Bolt comes with a WiFi /GSM Chip and a cloud platform which helps the enterprise connect their products to the Internet.
- The chip connects to the cloud out of the box. The Bolt cloud helps users control and monitor the products over the internet, create personalized dashboards to visualise the data, monitor the device health etc.
- With Bolt the companies can build scalable IoT prototypes in just a days time. Bolt Platform takes care of analytics, visualisation, network connectivity, storage, security and scalability, so that the developers can focus on the end application.





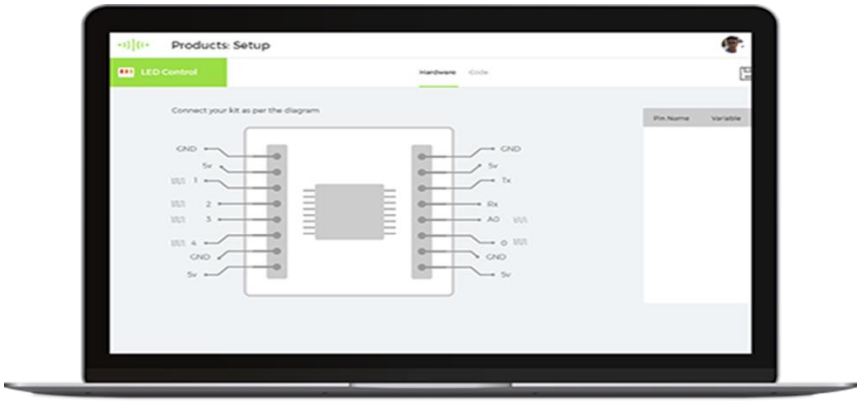
USB-A to Mini-USB Cable

The term USB stands for "Universal Serial Bus". USB cable assemblies are some of the most popular cable types available, used mostly to connect computers to peripheral devices such as cameras, camcorders, printers, scanners, and more.

- USB cables are "Hot Pluggable", in other words you can connect and disconnect the cables while the computer is running without fear of freezing the computer.
- USB cables are fast, transferring up to 480Mbps. Compare that to serial communication which transfers data at about 20Kbps.
- USB cables carry power as well as signals. This allows for "USB powered" gadgets as well as recharging batteries in cameras and other USB peripherals.
- USB cables are designed with several distinct connector types, making it easy to identify which plug goes into the computer and which plug goes into the peripheral device.
- USB cables are a universal standard and are fairly easy to find and to afford

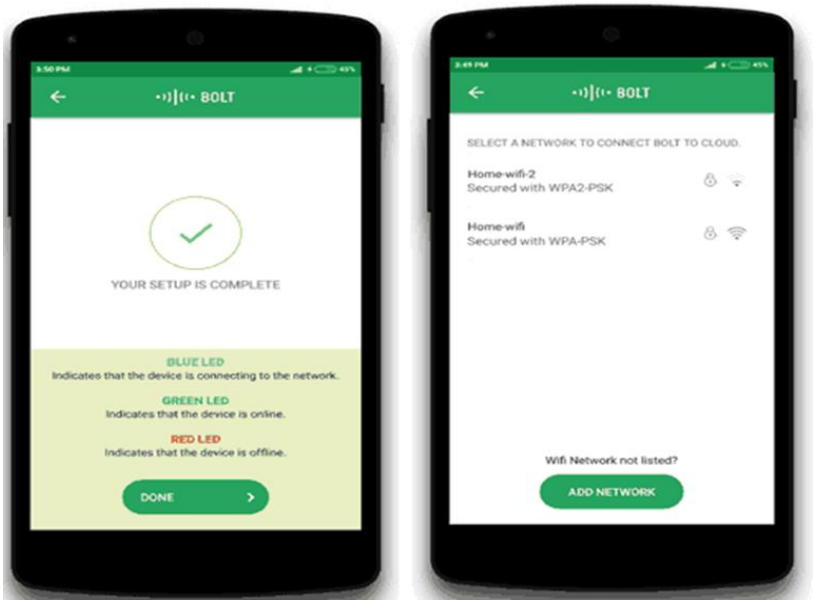
IoT cloud

An IoT system requires a hardware as well as a cloud. Bolt cloud is a server which lets you communicate with your Bolt WiFi module over the internet. It offers features like receiving and storing the data collected by Bolt Modules, Storing the data, Analysing it via Data visualisation and Machine Learning as well as it lets your program your Bolt modules.



Bolt IoT Mobile App

For connecting the Bolt to your cloud account, the Bolt IoT Mobile App is available for download on the Android Play store and iOS App Store. It is not available for other mobile OS such as Windows since the number of users of these Mobile OS is very low. Search for "Bolt IoT" on the App Store. Once you have downloaded the app, use the same username and password that you used for creating your Bolt Cloud account to log in to the app. There aren't any physical On or Off button on the Bolt WiFi Module. To power it on, just plug in the Micro USB Power Adaptor and Blue LED will start blinking showing that it is on. Once you power on the Bolt WiFi Module, it will start its local WiFi Hotspot. You need NOT know the password of this Hotspot. Just open the Bolt IoT mobile app and follow the instructions in the App to set it up.



1 x LDR (2 legged devicewith a red wave pattern disk on top)

LDRs (light-dependent resistors) are used to detect light levels, for example, in automatic security lights. Their resistance decreases as the light intensity increases:

- in the dark and at low light levels, the resistance of an LDR is high and little current can flow through it.
- in bright light, the resistance of an LDR is low and more current can flow through it.

1 x 10k Ohm Resistor (brown black orange color code)

The ohm is defined as an electrical resistance between two points of a conductor when a constant potential difference of one volt, applied to these points, produces in the conductor a current of one ampere, the conductor not being the seat of any electromotive force.

JavaScript

JavaScript is a text-based programming language used both on the client-side and server-side that allows you to make web pages interactive. Where HTML and CSS are languages that give structure and style to web pages, JavaScript gives web pages interactive elements that engage a user.

JavaScript is a programming language commonly used in web development. It was originally developed by Netscape as a means to add dynamic and interactive elements to websites. Like server-side scripting languages, such as PHP and ASP, JavaScript code can be inserted anywhere within the HTML of a webpage.

2.2 Conclusion

In this chapter comparison between the technology used in this project and other technologies are shown.

A network is the most critical component of any ICT infrastructure which is live 24x7 and to monitor it through physical human intervention is not feasible when the scale is large. Therefore, the IoT applications for monitoring temperature, motion, fire, uplink status, security can be of great utility for detecting any issue and raising alerts through SMS and email thereby coming to know quickly about the problem occurring on a remote site without delay and then act according to the need. This can also lead to saving in Power by switching off the device remotely when not in use, by Power ON/OFF application.

Chapter 3

REQUIREMENT ANALYSIS

3.1 Problem Statement

Automated Light Monitoring System face four main challenges, these are high cost of ownership, inflexibility, poor manageability, and difficulty in achieving security. The main objectives of this project is to design and implement a Automated Light Monitoring System using IoT that is capable of controlling and automating most of the house appliances through an easy manageable web interface. The proposed system has a great flexibility by using Wi-Fi technology to interconnect its distributed sensors to home automation server. This will decrease the deployment cost and will increase the ability of upgrading, and system reconfiguration.

3.2 Requirement Specification

Today, we are increasingly talking about creating 'Smart Homes'. Smart homes can mean different things to different people. A builder might say that he is offering a 'Smart Home' to a prospective buyer if the IP video door phone that he is installing can also be viewed over a smart phone. For an architect, a 'Smart Home' could be one, where lighting controls that can be activated manually, on a time clock, remotely or from a house- for one room or for the entire house. A system integrator, selling AV systems could say that he has designed a smart home, where the home owner can view any media content stored in the cloud or locally in the home from anywhere in the home.

So who is right? Or rather, what is the correct meaning of a smart home? For me, there is no right or wrong. A Smart home can be one or all of these things. All of the above could comprise what we call Smart Home technology. One thing however should be common. Whatever technology is used to make a smart home should enhance the user and the home owner experience, making life more convenient and enjoyable!

3.3 Hardware Requirement

Bolt WiFi Module	3.3V
1 x LDR	(2 legged devicewith a red wave pattern disk on top)
USB Cable	5V
1 x 10k Ohm Resistor	(brown black orange color code)

3.4 Software Requirement

OPERATING SYSTEM	WINDOWS 7 OR ABOVE
TECHNOLOGY	JavaScript
BROWSERS	GOOGLE CHROME
EDITOR	Cloud.boltiot.com

3.5 Conclusion

In conclusion, this chapter states the various hardware and software requirements along with the requirement specifications.

Chapter 4

SYSTEM DESIGN

4.1 Data Flow Diagram:

A **Data Flow Diagram** (**DFD**) is a graphical representation of the "flow" of data through an information system. DFDs can also be used for the visualization of data processing (structured design).Often they are a preliminary step used to create an overview of the system which can later be elaborated. A DFD shows what kinds of information will be input to and output from the system, where the data will come from and go to, and where the data will be stored.

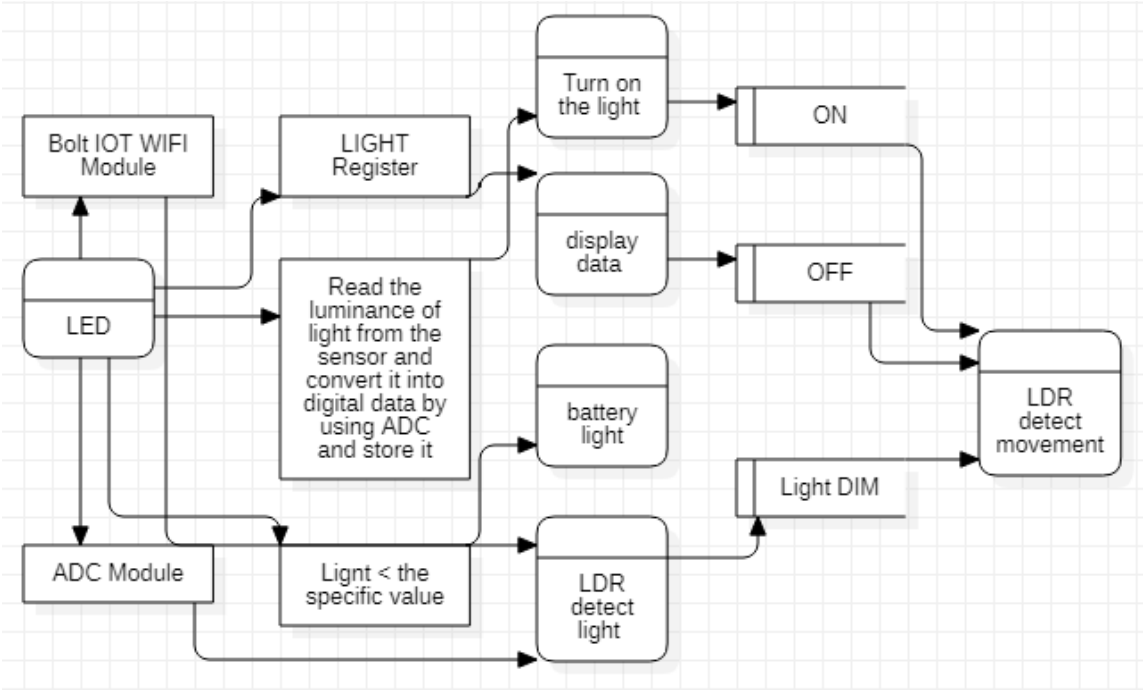


Figure 4.1 Data Flow Diagram

4.2 Use Case Diagram:

A **Use Case Diagram** in the Unified Modelling Language (UML) is a type of behavioural diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors.

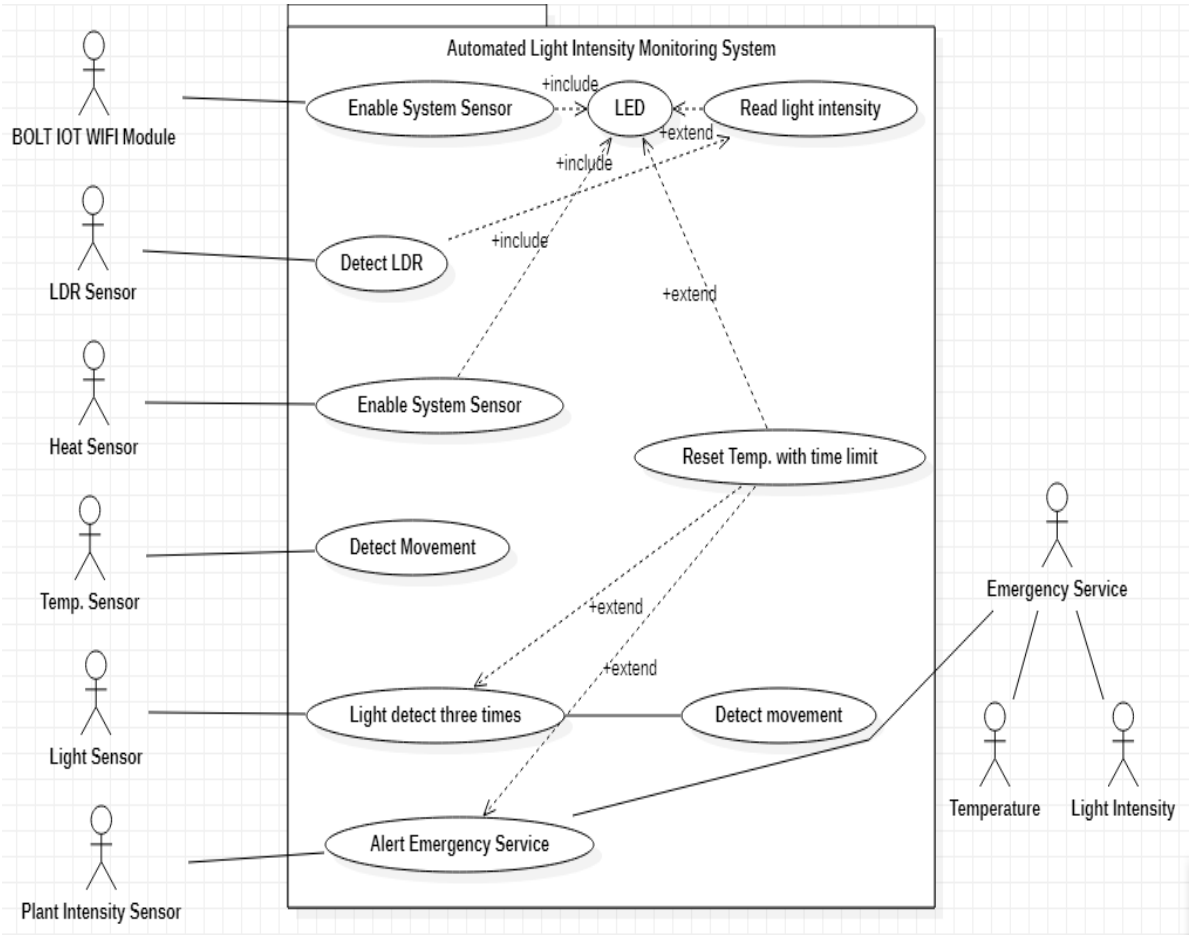


Figure 4.2 Use Case Diagram

4.3 Sequence Diagram:

A **Sequence Diagram** shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario. Sequence diagrams are typically associated with use case realizations in the Logical View of the system under development. Sequence diagrams are sometimes called event diagrams or event scenarios.

A sequence diagram shows, as parallel vertical lines (lifelines), different processes or objects that live simultaneously, and, as horizontal arrows, the messages exchanged between them, in the order in which they occur. This allows the specification of simple runtime scenarios in a graphical manner.

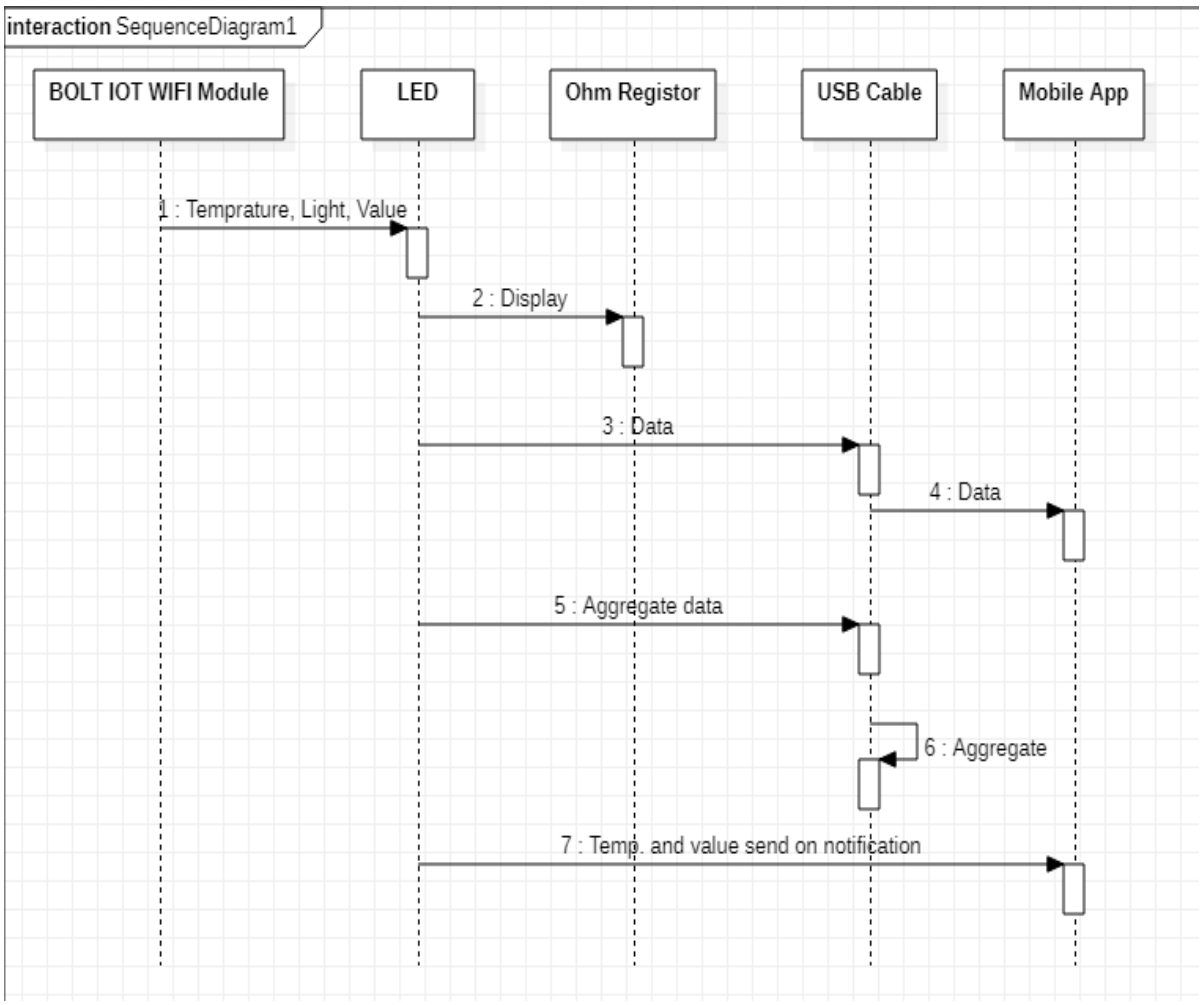


Figure 4.3 Sequence Diagram

4.4 Class Diagram:

A **Class Diagram** in the Unified Modelling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, and the relationships between the classes. The class diagram is the main building block of object oriented modelling. It is used both for general conceptual modelling of the systematic of the application, and for detailed modelling translating the models into programming code.

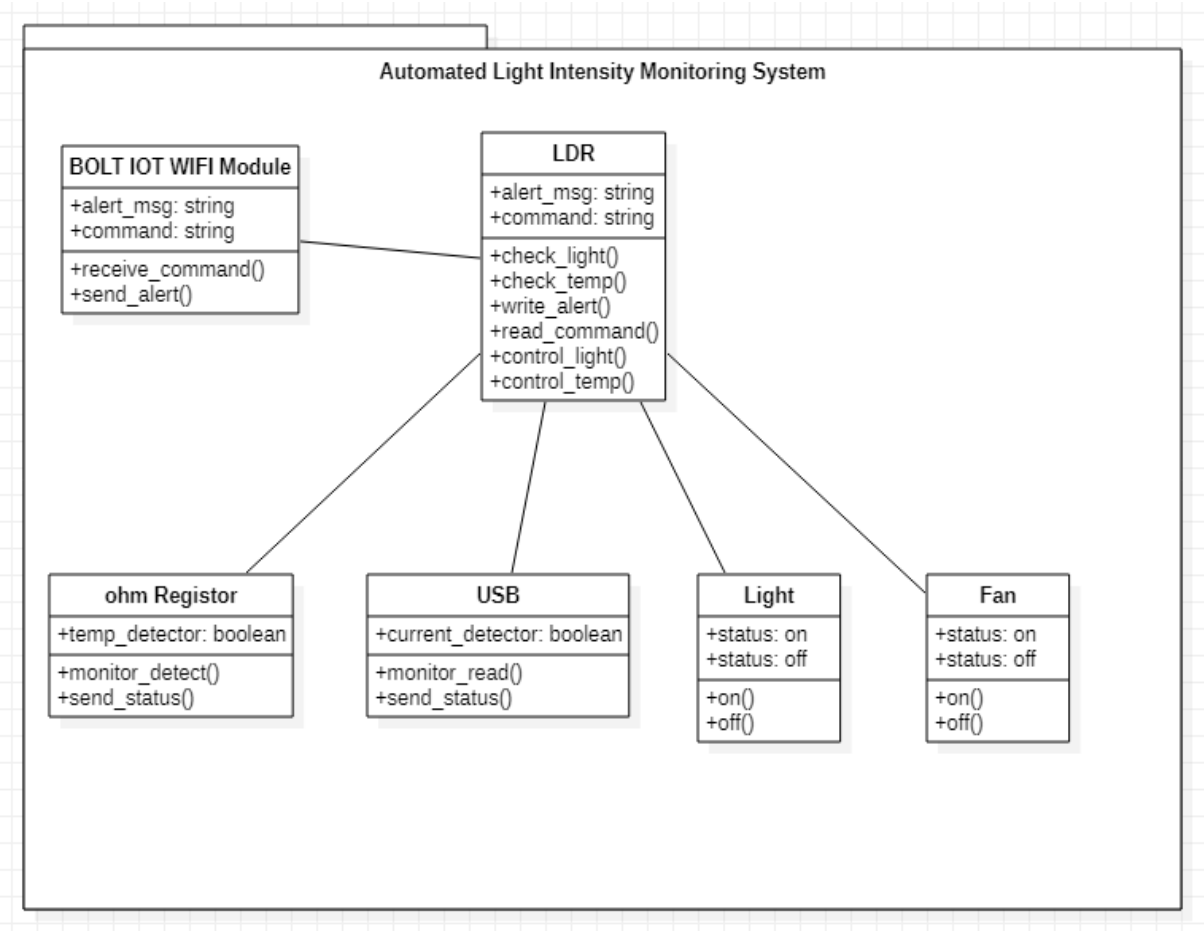


Figure 4.4 Class Diagram

4.5 Activity Diagram:

Activity Diagram is another important diagram in UML to describe the dynamic aspects of the system. Activity diagram is basically a flowchart to represent the flow from one activity to another activity. The activity can be described as an operation of the system. The control flow is drawn from one operation to another. This flow can be sequential, branched, or concurrent. Activity diagrams deal with all type of flow control by using different elements such as fork, join, etc.

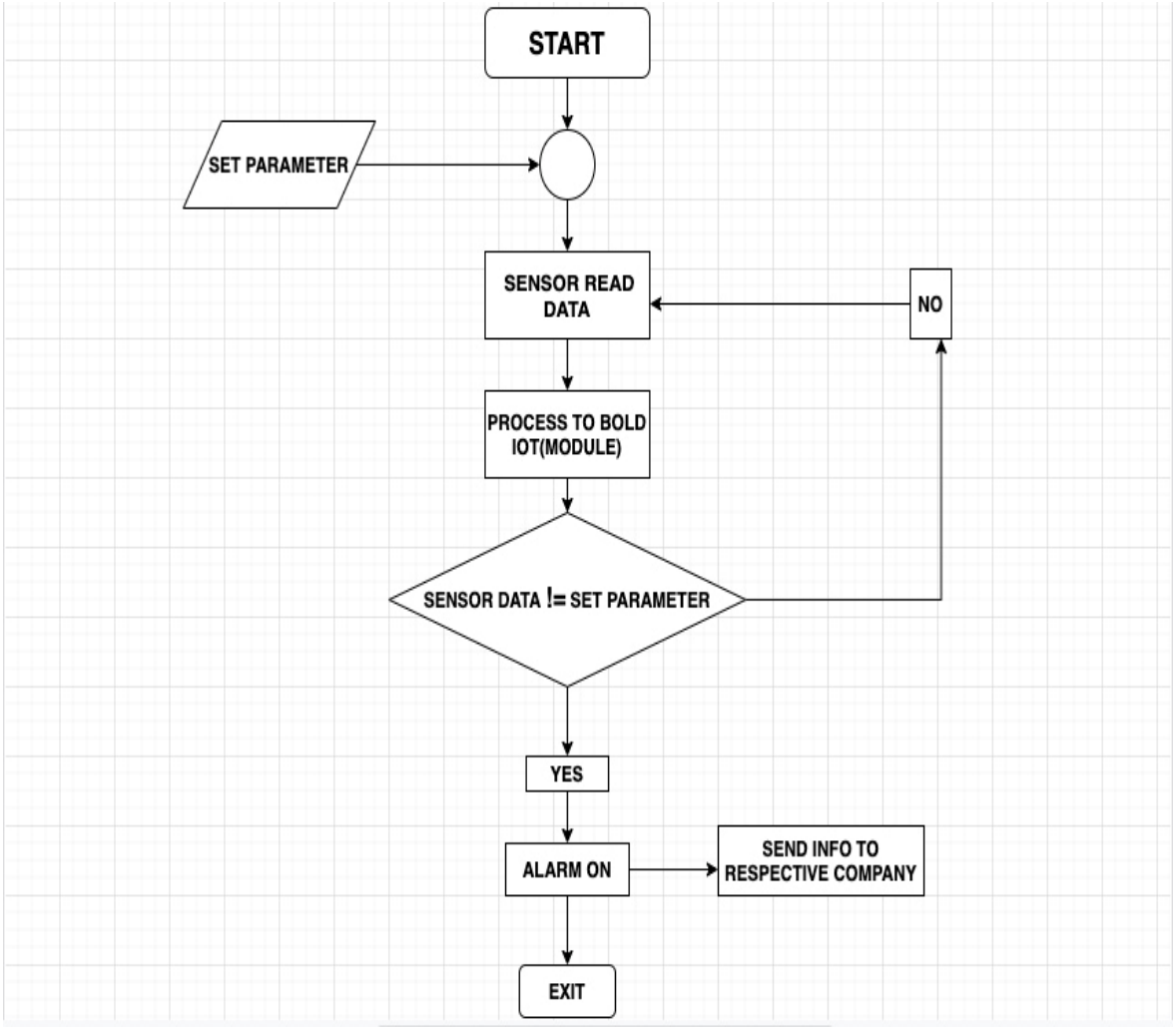


Figure 4.5 Activity Diagram

4.6 Entity Relationship Diagram:

An **Entity-Relationship Diagram (ERD)** is a data modelling technique that graphically illustrates an information system's entities and the relationships between those entities. An ERD is a conceptual and representational model of data used to represent the entity framework infrastructure. The elements of an ERD are Entities, Relationships and Attributes.

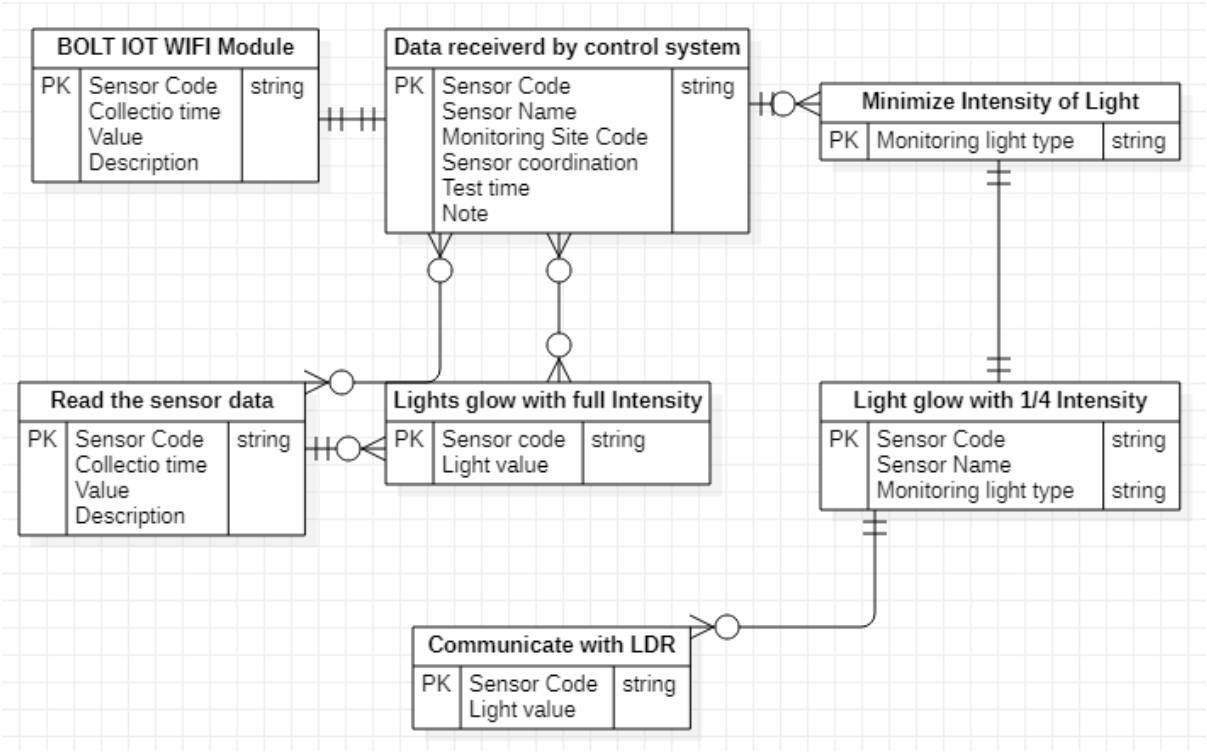


Figure 4.6 Entity-Relationship (ER) Diagram

4.7 Conclusion

This chapter concludes all the diagrams that defines the process of this project and shows diagrammatical representation of the overall project.

Chapter 5

IMPLEMENTATION AND TESTING

5.1 Coding

Program Name: light.js

```
setChartLibrary("google-chart");
setChartTitle('Gauge Chart');
setChartType('gauge');
setAxisName('light');
setDimensions(400, 400);
setMaxValue(1023);
plotChart('light');
setChartLibrary("google-chart");
setChartTitle('Gauge Chart');
setChartType('gauge');
setAxisName('light');
setDimensions(400, 400);
setMaxValue(1023);
plotChart('light');
setGreen(250, 500);
setYellow(501, 725);
setRed(726, 1023);
```

OR

```
setChartLibrary('google-chart');
setChartTitle('Polynomial Regression');
setChartType('predictionGraph');
setAxisName('time_stamp','light');
mul(0.0977);
plotChart('time_stamp','light');
```

5.2 Conclusion

Here all the coding which is needed for our project and modification part is done.

Chapter 6

RESULT AND DISCUSSION

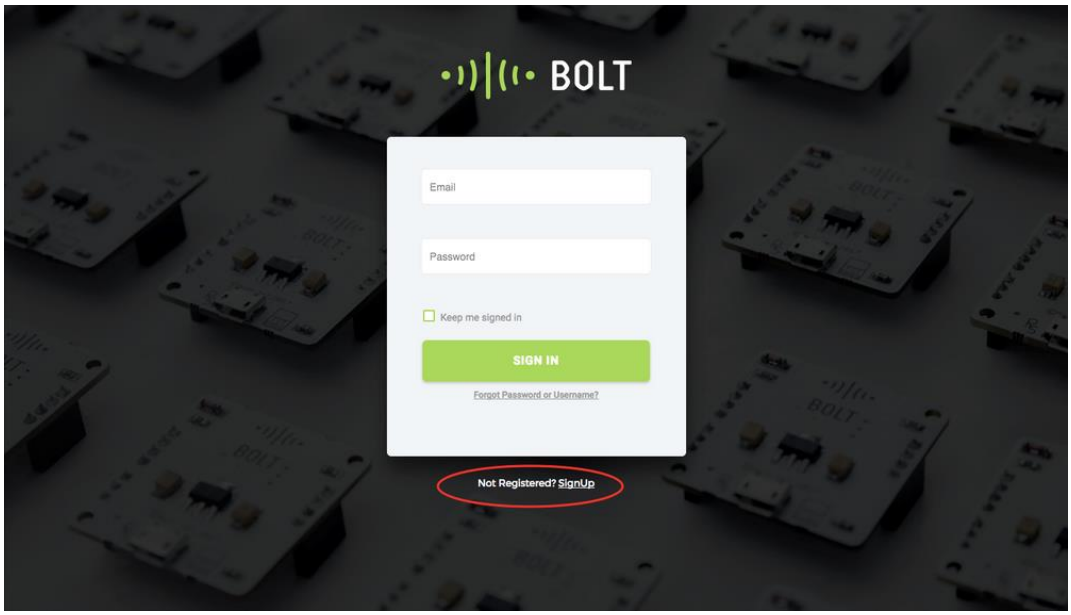
6.1 Test reports

Creating an account on the IoT cloud service

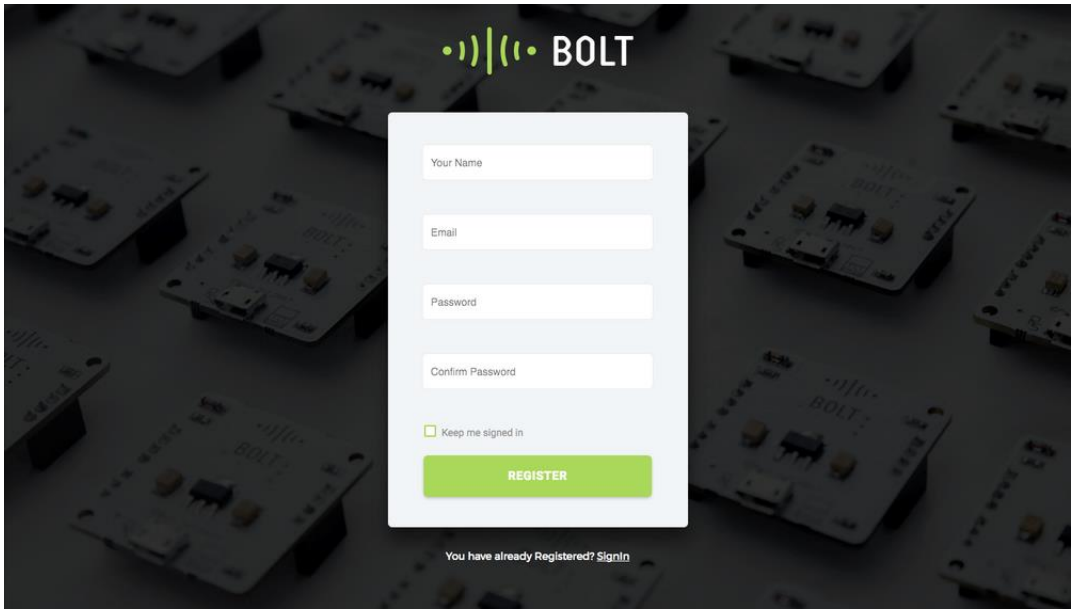
Registration Process

Step 1: Open www.cloud.boltiot.com on your web browser (Google Chrome recommended)

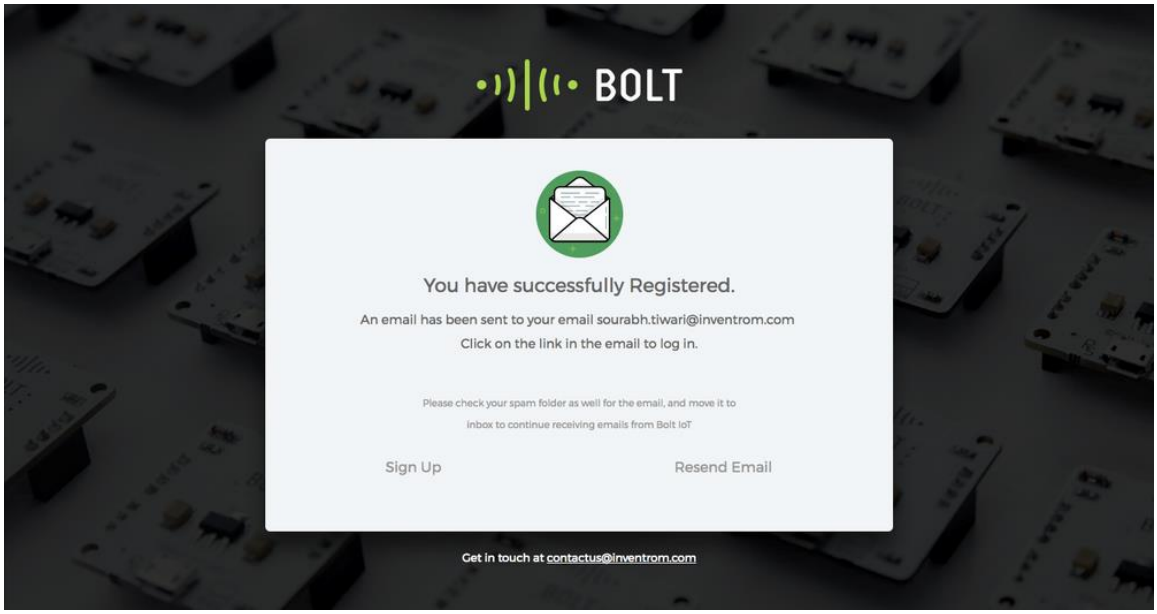
Step 2: Click on "SignUp" as shown below



Step 3: Enter your details in the SignUp page shown below. Enter your name, email id (login ID for Bolt cloud),and password in the fields. Do confirm your password by typing it again in the Confirm Password field and then click on the Register button.

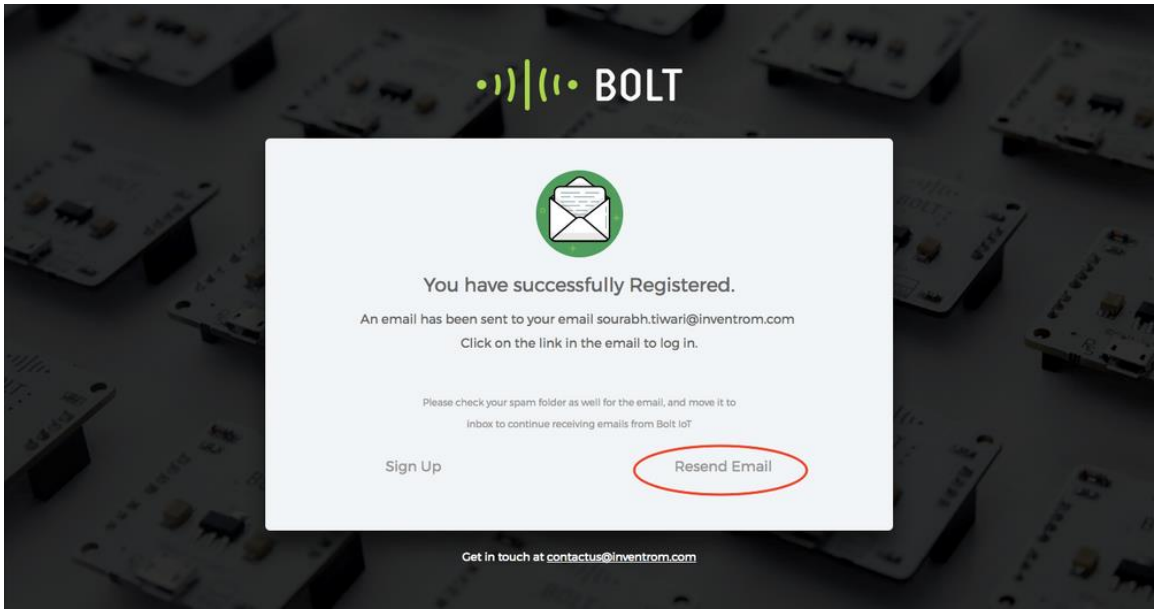


Step 4: Verification of your account: If you have entered all the details correctly, you will be successfully registered on Bolt Cloud and you shall see the screen below.

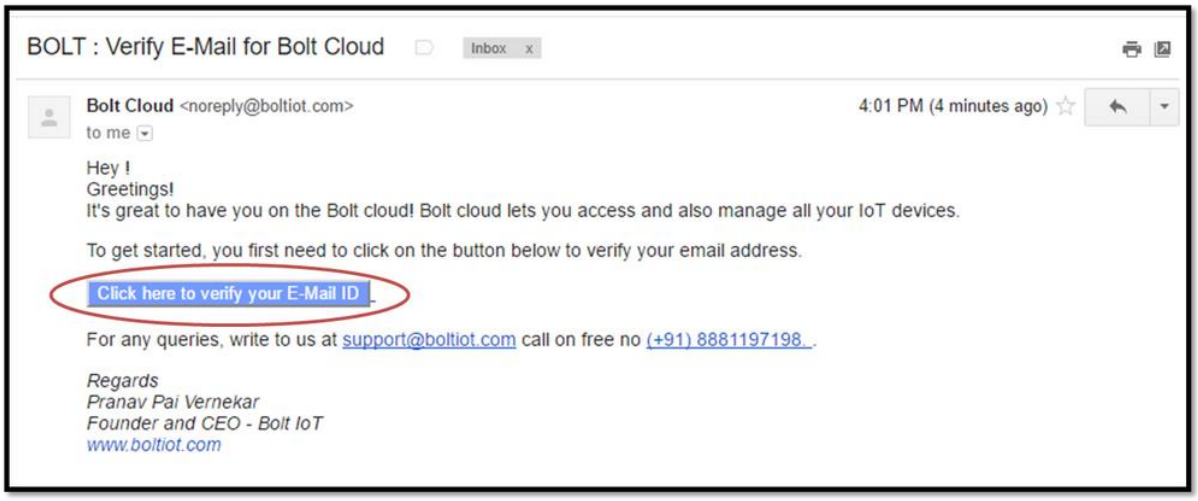


You will be sent a Verification Mail to your mail Id as seen below (Please check your Spam folder if the mail is not found in your Inbox.

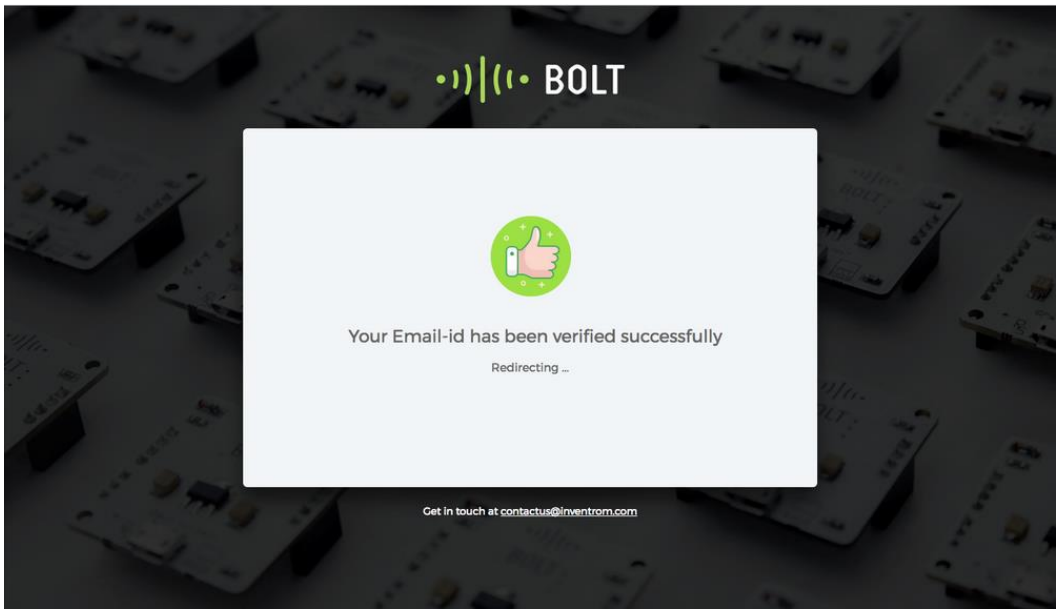
Note: If you did not get the Verification mail you can go to cloud.boltiot.com and SignIn and Click on the Resend Email option marked below.



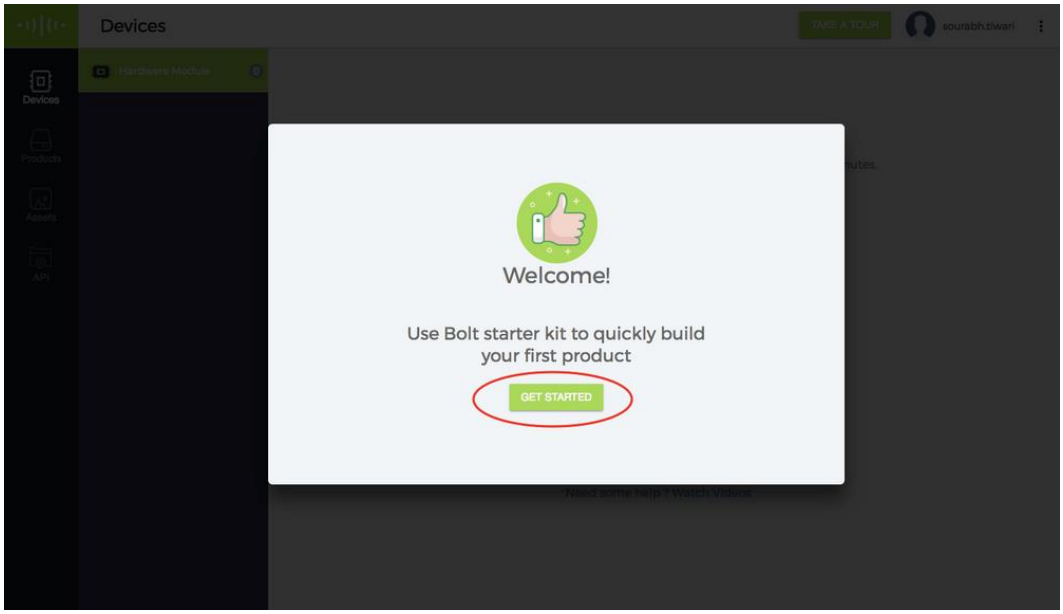
Open the mail and click on the "Click here to verify your E-mail ID" button as shown below.



Once you click on the button, your email id will be verified and you will be directed to the following page thus completing the registration process on Bolt Cloud.

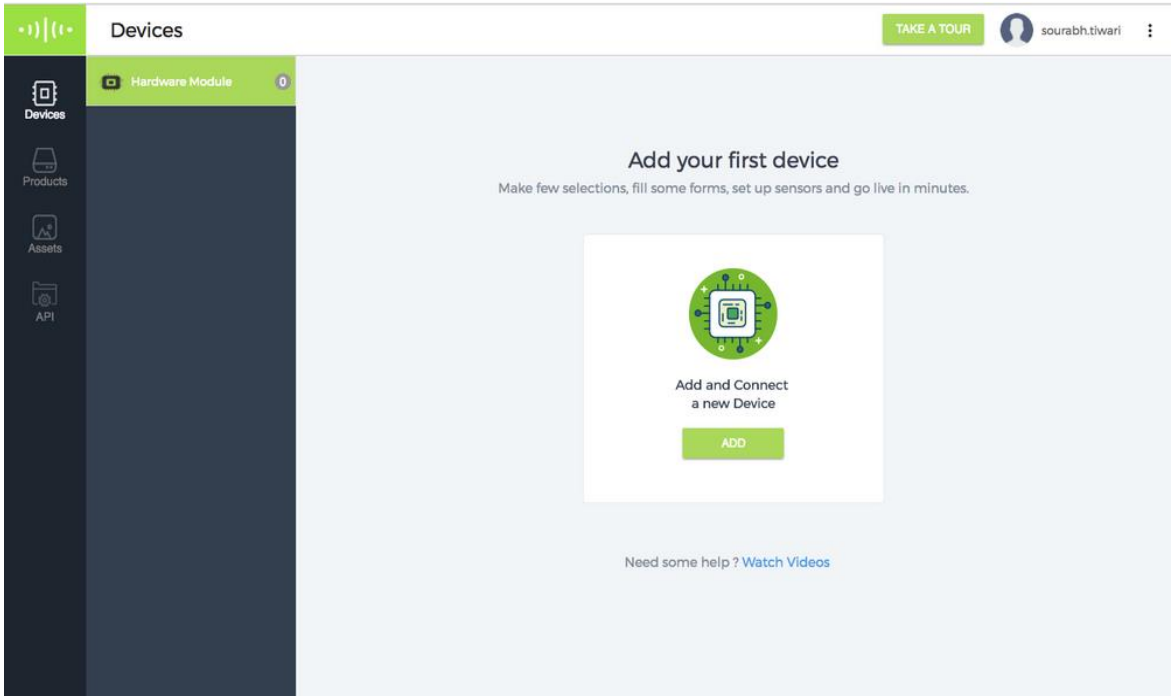


Step 5: You will be redirected to your Bolt Cloud Dashboard, with the Welcome message greeting, where you can click on the Getting Started button to view the guide.



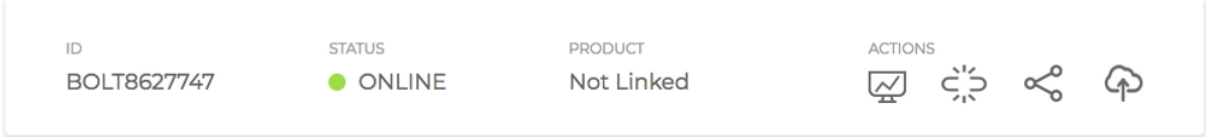
Step 6: You will be given a basic tour of the Bolt Cloud features on the Dashboard. You can click on the Next & Back button to view the features. You can click the Skip button to skip the tour if you wish to. The tour can be taken anytime by clicking the "Take a Tour" button at the top right corner on your dashboard.

Step 7: Once the tour is done you shall have the option to add a Bolt device to you dashboard. The process of linking your Bolt device to your Cloud Dashboard will be covered in the next lesson

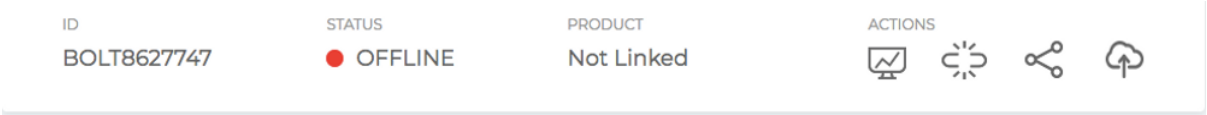


Troubleshooting the setup process

If your Bolt Device shows online on the Bolt Cloud then your setup is complete. Your dashboard should display a new Bolt device as shown in the figure below. You may skip this section if the setup is complete.



However, if it shows offline then it means that there have been some issues in the setup process and you will have to debug it. Before you get into debugging the problem, I suggest you try the setup process one more time. Generally, that solves the problem.



Hardware Required

1 x Bolt IoT Module

1 x Micro USB Cable

1 x LDR (2 legged devicewith a red wave pattern disk on top)

1 x 10k Ohm Resistor (brown black orange color code)

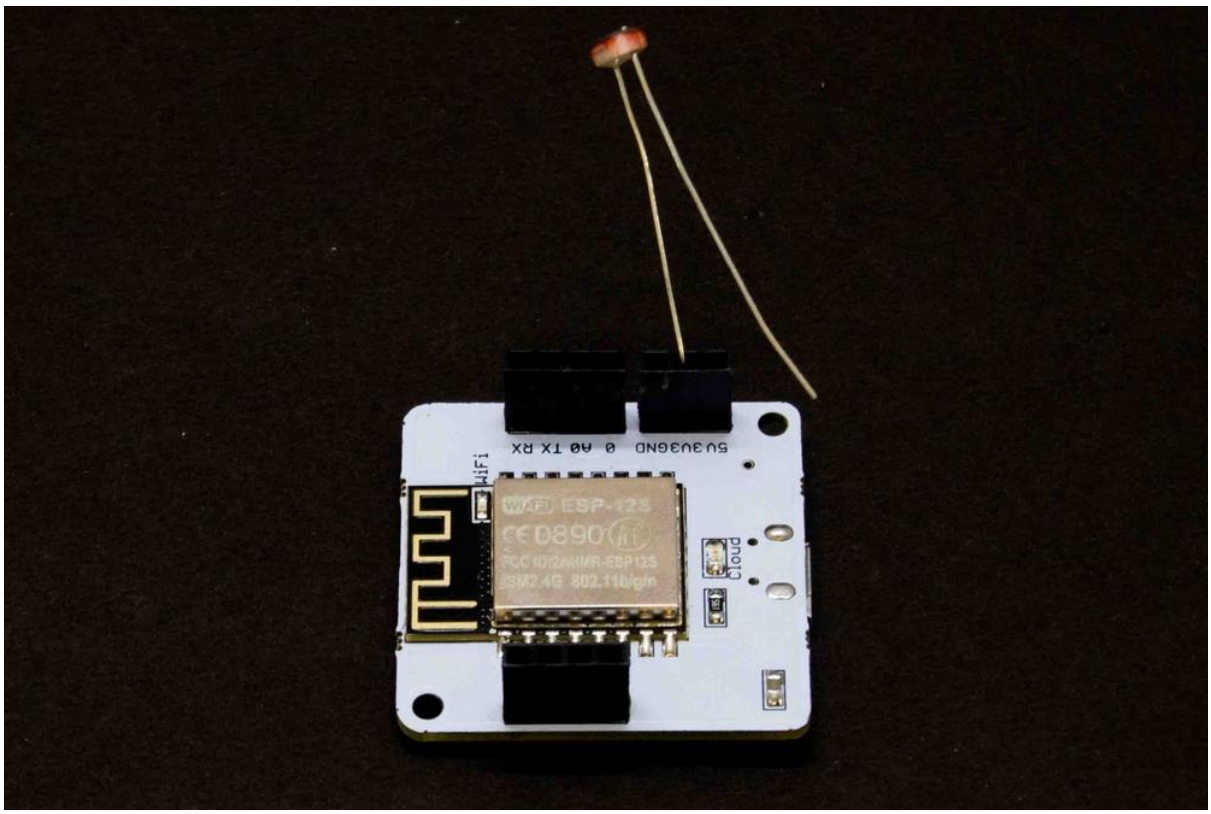
The resistance of an LDR varies inversely with light, i.e., the resistance decreases as the intensity of light falling on the LDR increases.

Connecting the LDR Circuit to the Bolt

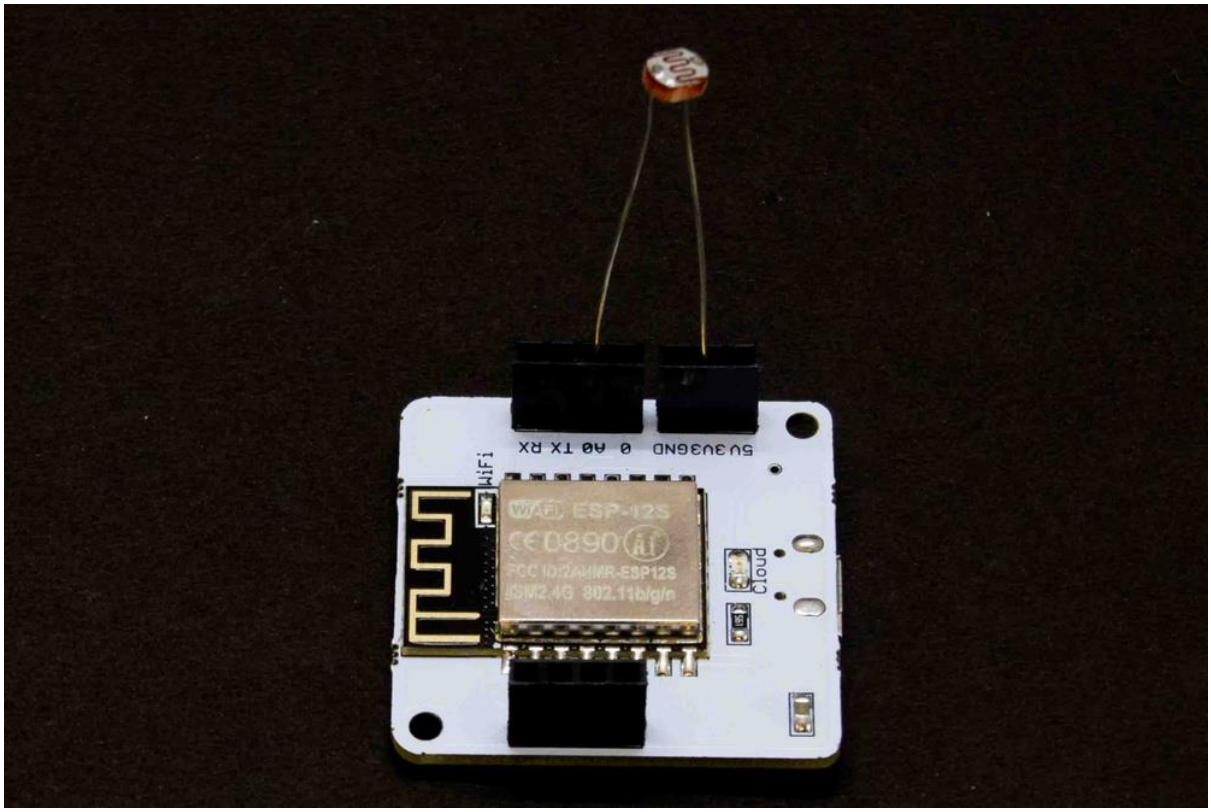
Connect the LDR to Bolt as shown in image below. Note: There is no positive or negative for this and the 10k Ohm resistor. Also, make sure the Bolt module is not powered on while making connections. Always make it a habit to power off the circuit while making connections for your own and the circuit's safety. Double-check all connections before turning it on.

Here are the steps for making the hardware connections:

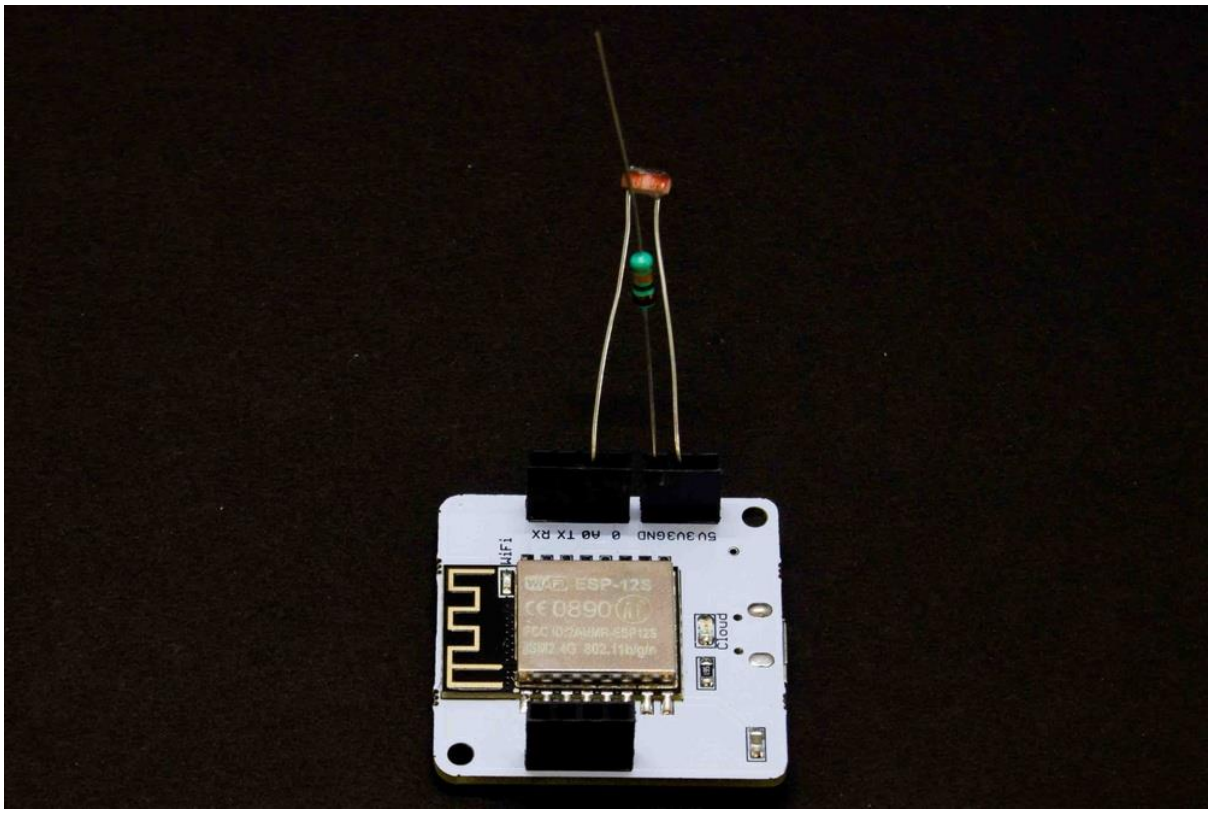
Step 1: Insert one lead of the LDR into the Bolt Module's 3v3 Pin.



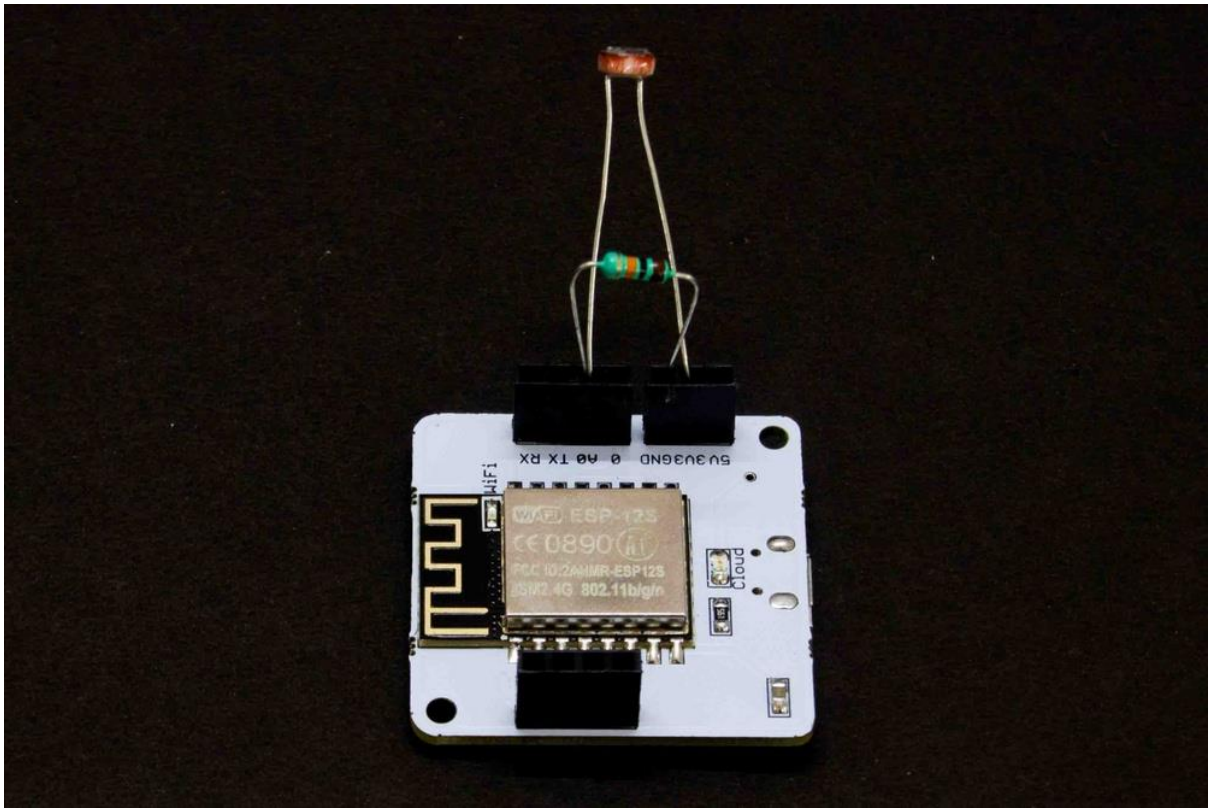
Step 2: Insert other lead of the LDR into the A0 pin



Step 3: Insert one leg of the 10k Ohm resistor into the GND pin

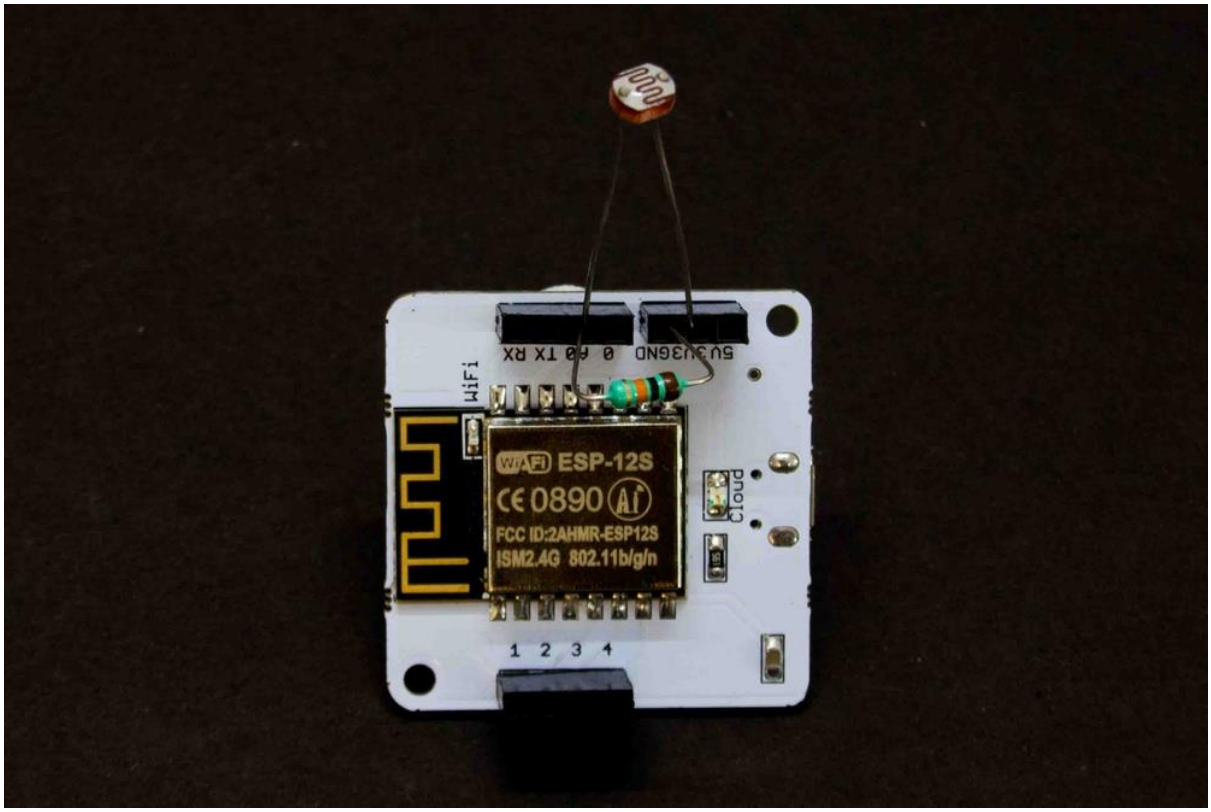


Step 4: Insert the other leg of the resistor also into the A0 pin



Warning!! Make sure that at no point do the 3.3V (or even 5V) and GND pins or wires coming out of them touch each other. If you short power to Ground without a resistor even accidentally, the current drawn might be high enough to destroy the Bolt module

Thus, we are effectively measuring the voltage across the 10k Ohm Resistor and the final circuit should look like the image below:



6.2 Conclusion

In this we have places our project's screenshots from which the guide must easily understand that how my actual project looks like.