TEMPERATURE MONITORING BY ANOMALY DETECTION

INTERNET OF THINGS AND MACHINE LEARNING

SUBMITTED BY

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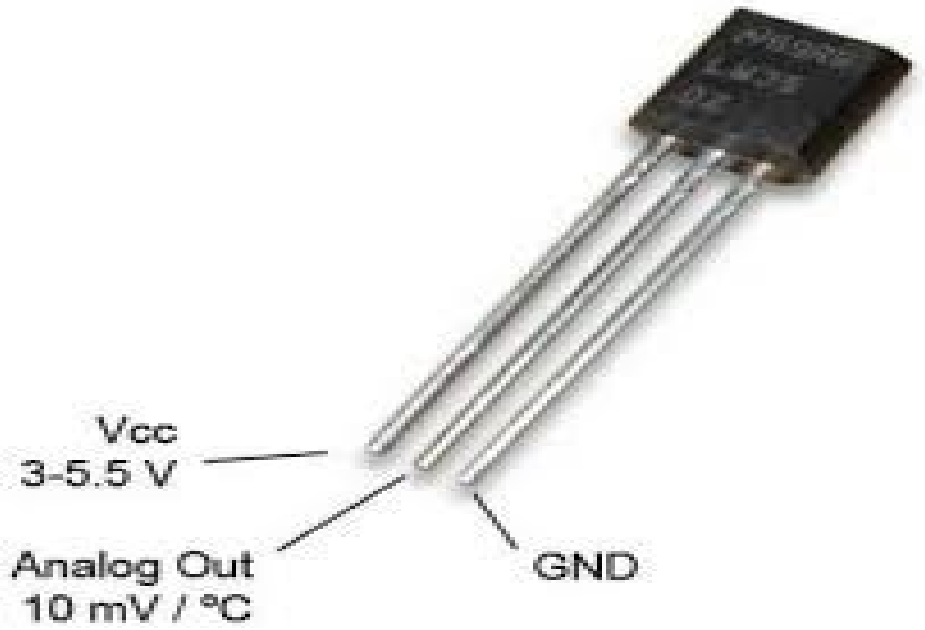
Objectives: The pharmaceutical companies use a cooling chamber which is similar to a refrigerator to keep the tablets and maintain the temperature in the required limits. However, since you most probably don't have a cooling chamber which can maintain a temperature in the range, of -40 to -30 degrees Celsius, you can instead use a regular refrigerator at your home for this project.

STEPS TO DOING PROJECTS:

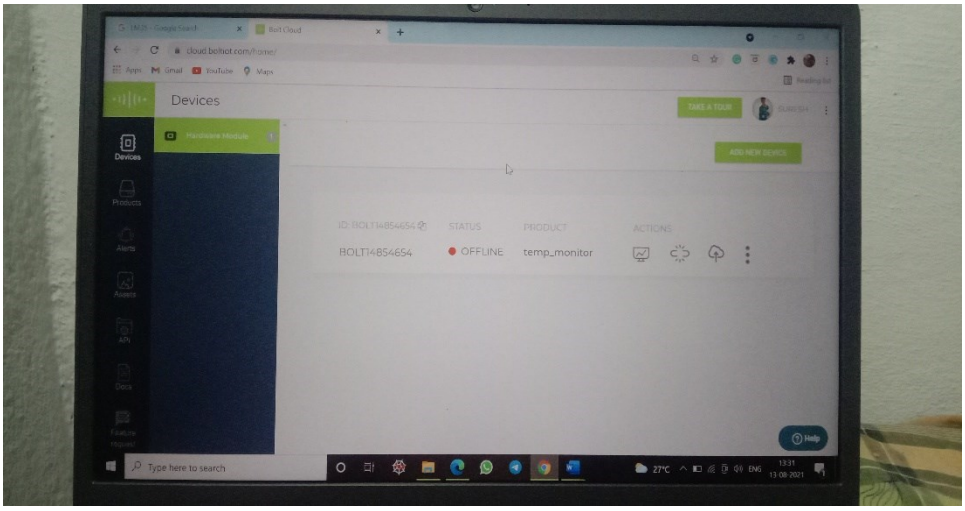
1.Study the LM35 temperature senor and its working:

below figure shows, show LM35 works



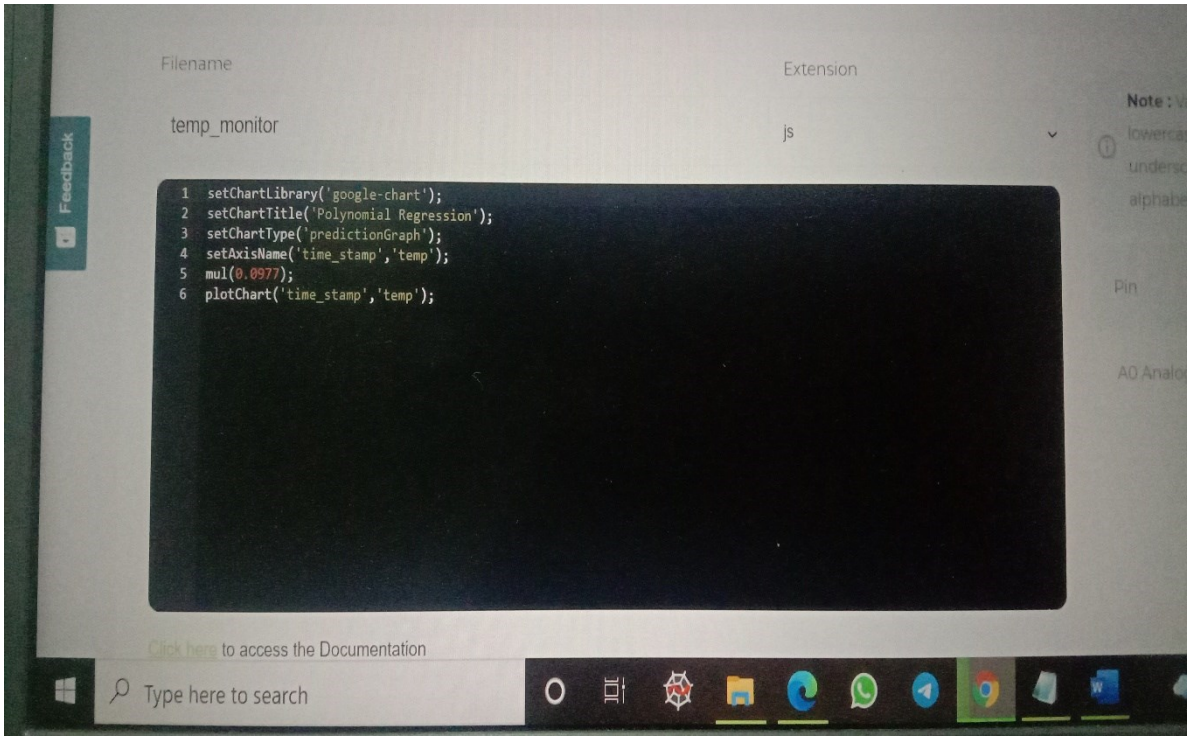
Its works -50 to 150 degree Celsius

2) Creating a product on Bolt cloud to get the upper, lower temperature limits of the Refrigerator,



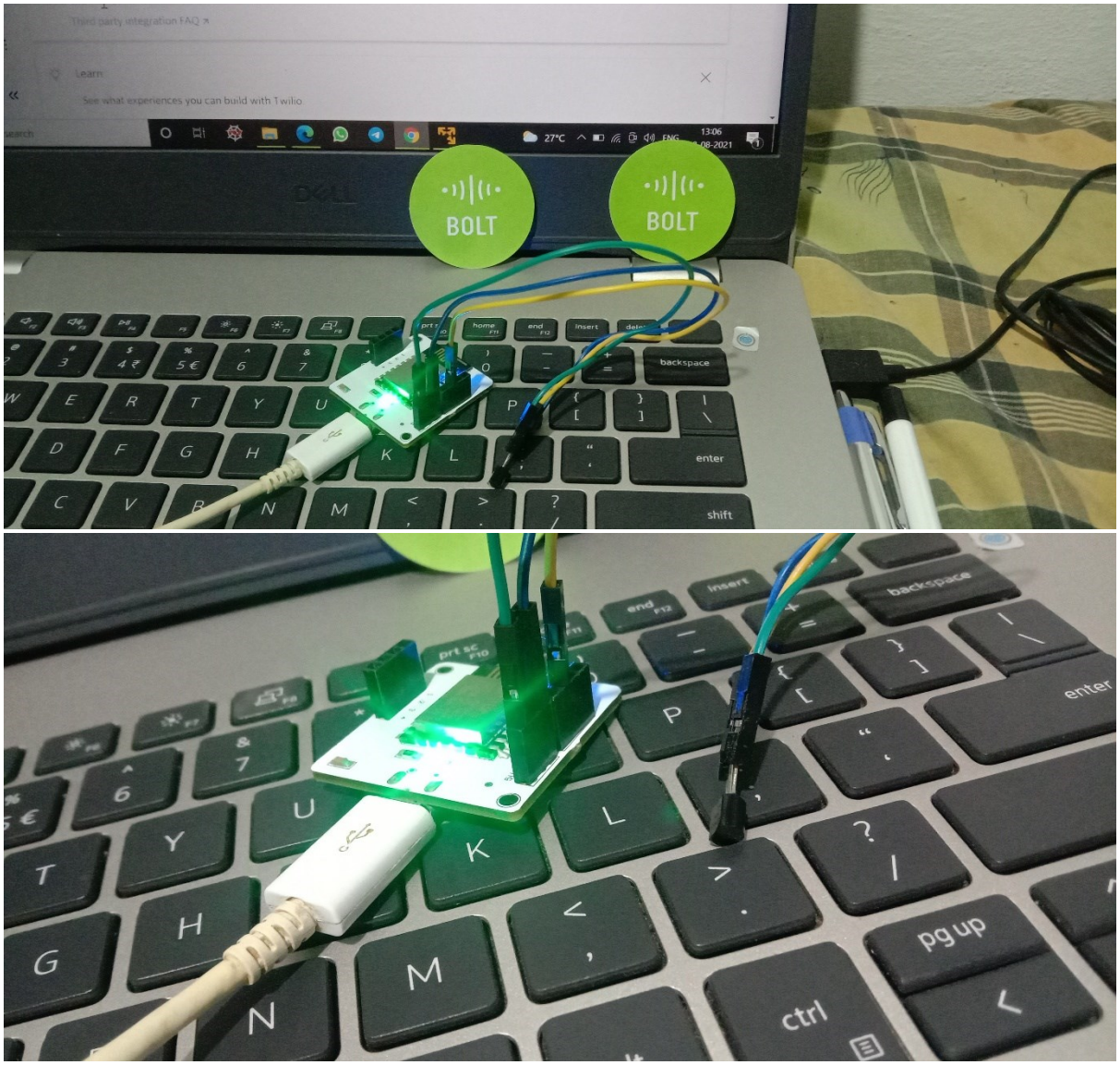
3)

- Create a product as name temp_monitor
- select “configure this product” in the product
- select anolog pin as(“A0”)
- In code section select file extention,
- select language of code(HTML/JS)
- write a code



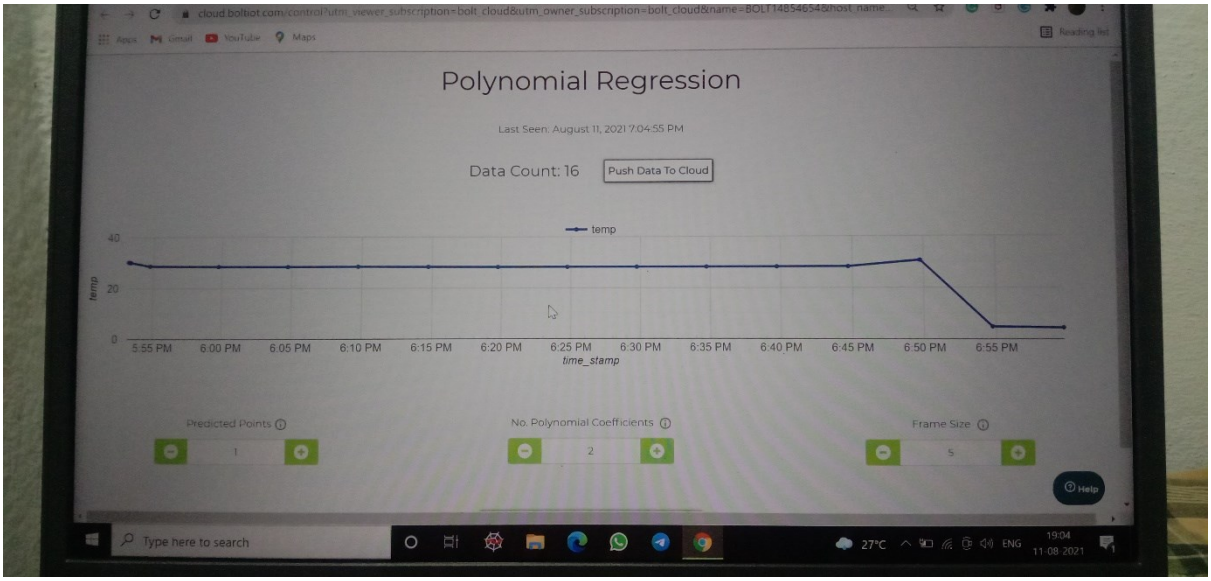
4)Save the code:

5)make hardware connection to boltiot module and LM35



6)give supply to bolt wi-fi module it blinks blue first than green constently.

7)view the the device data in cloud, seems:



8)It takes a data per 5 minutes:

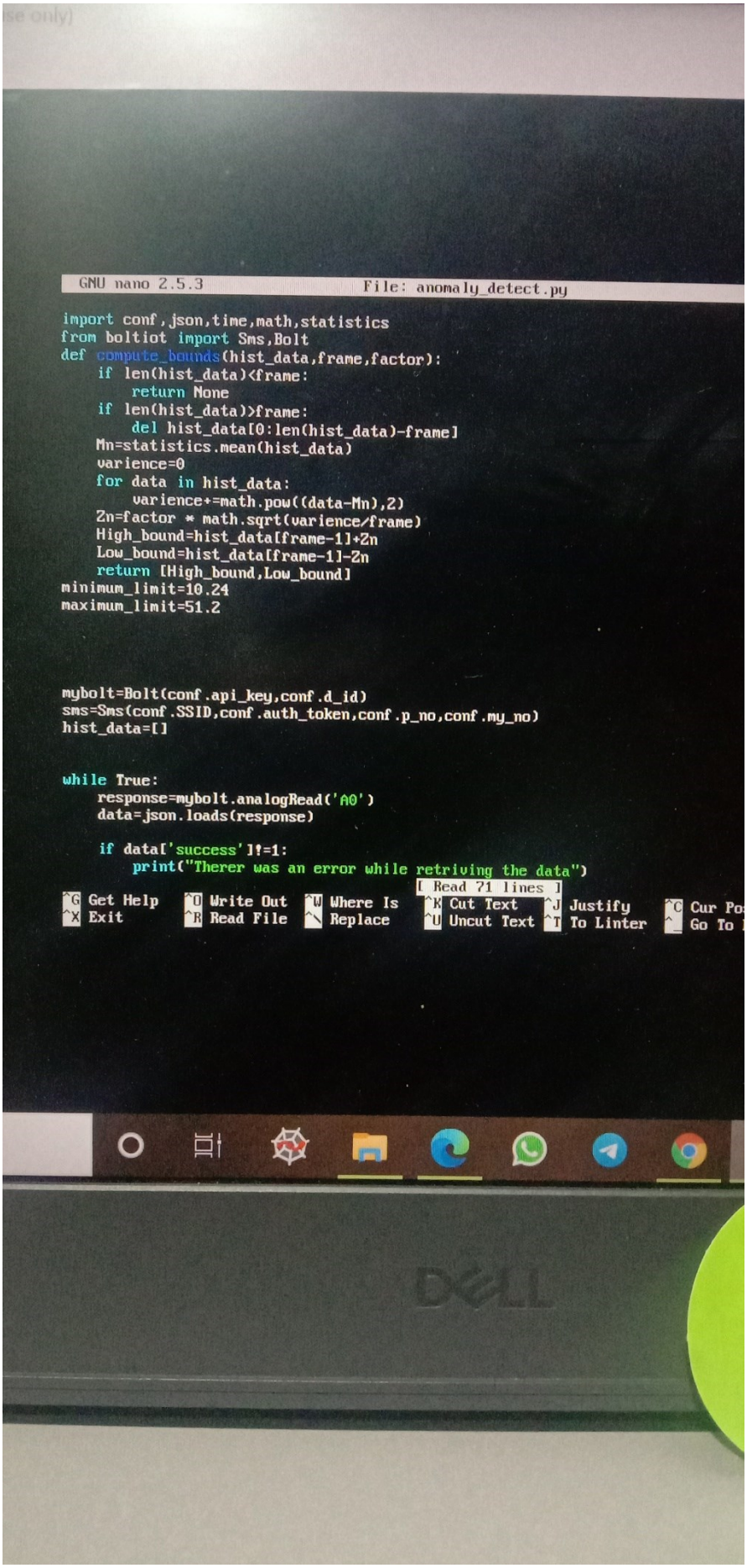
9)simultaneously, run the code by ubuntu VMware local server:

codes are:

create a file name as conf.py write SID, auth_token

from number, to number gather from twilio.

and api_key and divece_id from boltiot cloud.



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  GNU nano 2.5.3                File: anomaly_detect.py

import conf,json,time,math,statistics
from boltiot import Sms,Bolt
def compute_bounds(hist_data,frame,factor):
    if len(hist_data)<frame:
        return None
    if len(hist_data)>frame:
        del hist_data[0:len(hist_data)-frame]
    Mn=statistics.mean(hist_data)
    varience=0
    for data in hist_data:
        varience+=math.pow((data-Mn),2)
    Zn=factor * math.sqrt(varience/frame)
    High_bound=hist_data[frame-1]+Zn
    Low_bound=hist_data[frame-1]-Zn
    return [High_bound,Low_bound]
minimum_limit=10.24
maximum_limit=51.2



mybolt=Bolt(conf.api_key,conf.d_id)
sms=Sms(conf.SSID,conf.auth_token,conf.p_no,conf.my_no)
hist_data=[]


while True:
    response=mybolt.analogRead('A0')
    data=json.loads(response)

    if data['success']!=1:
        print("Therer was an error while retriving the data")
                                [ Read 71 lines ]
^G Get Help  ^O Write Out  ^W Where Is  ^K Cut Text  ^J Justify   ^C Cur Po
^X Exit      ^R Read File  ^\ Replace   ^U Uncut Text ^T To Linter ^_ Go To
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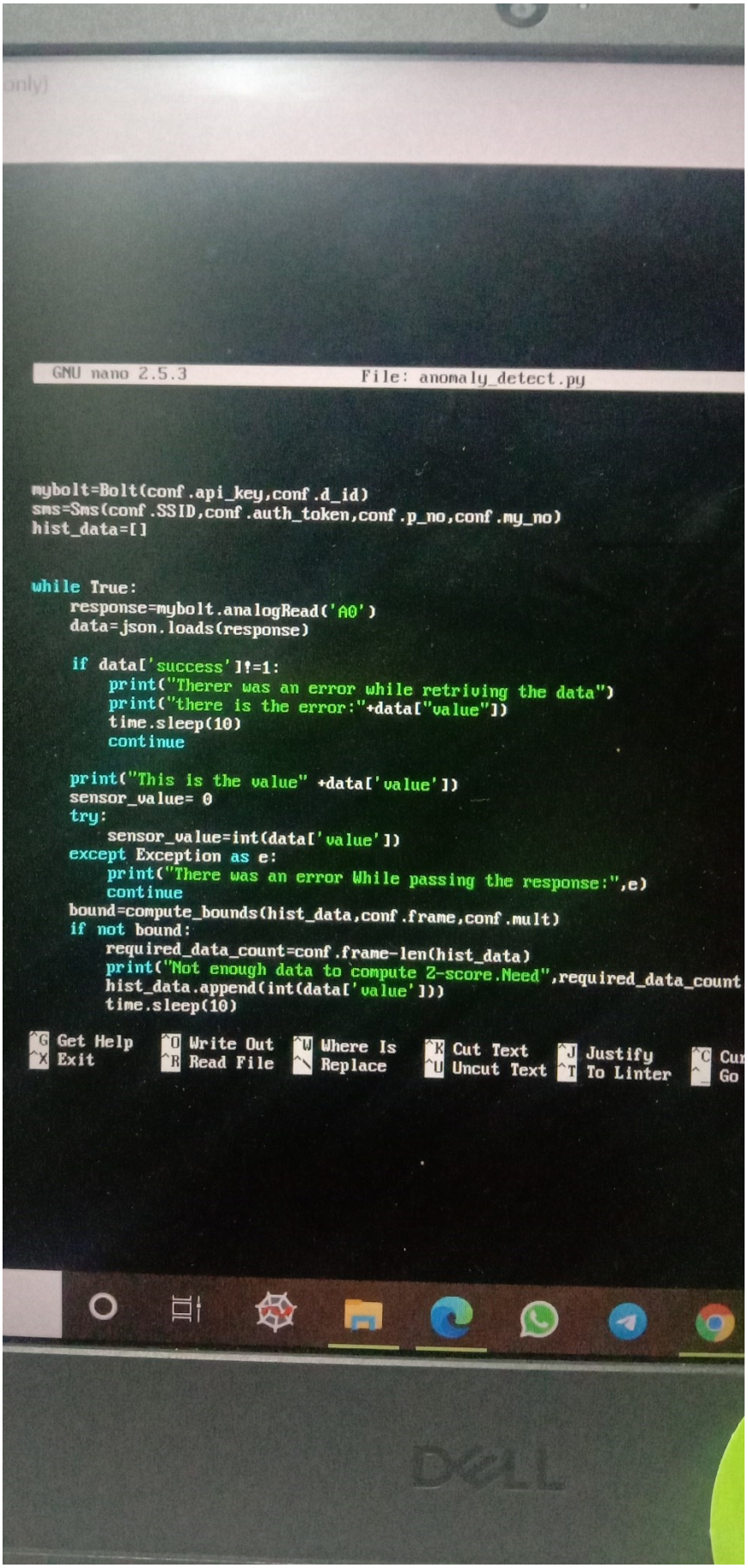
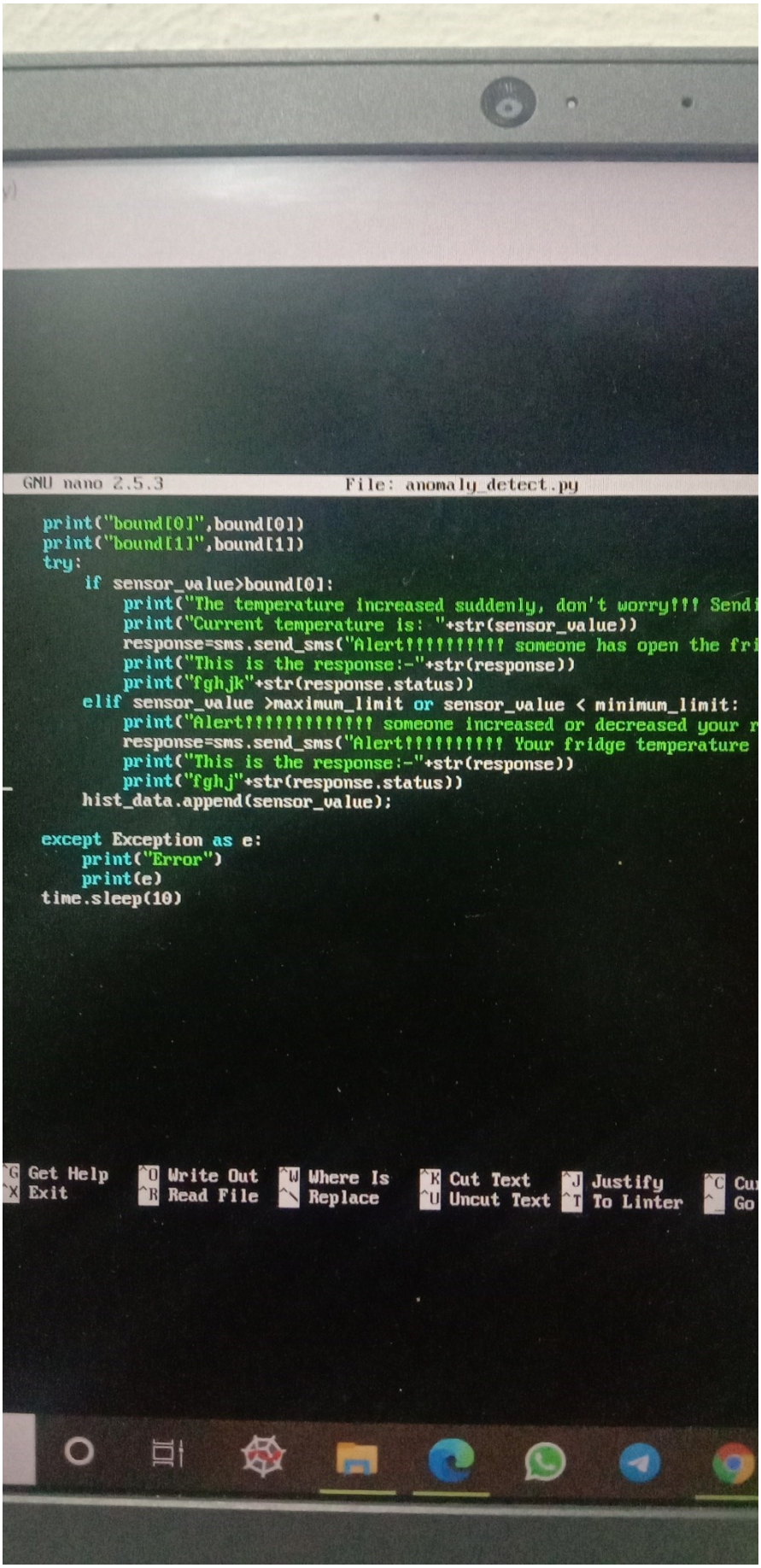
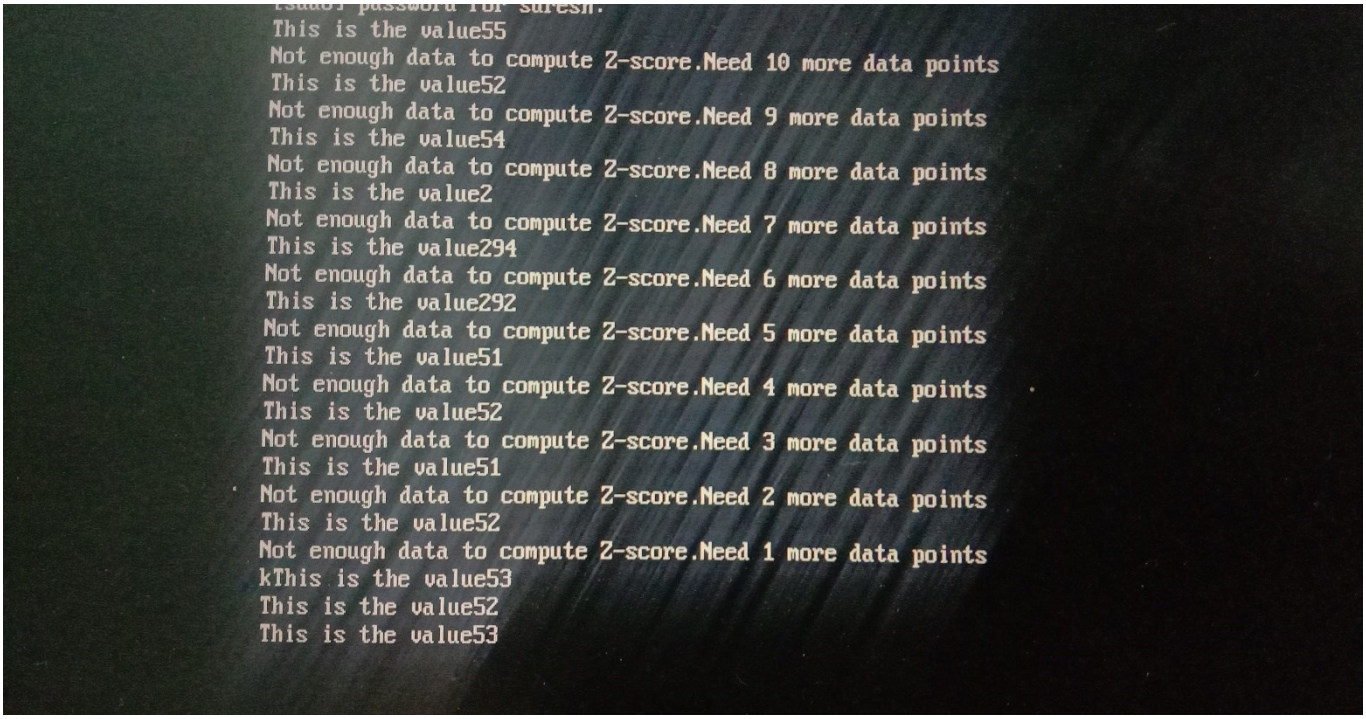

GNU nano 2.5.3 File: anomaly_detect.py
mybolt=Bolt(conf.api_key,conf.d_id)
sms=Sms(conf.SSID,conf.auth_token,conf.p_no,conf.my_no)
hist_data=[]
while True:
response=mybolt.analogRead('A0')
data=json.loads(response)
if data['success']!=1:
print("Therer was an error while retriving the data")
print("there is the error:"+data["value"])
time.sleep(10)
continue
print("This is the value" +data['value'])
sensor_value= 0
try:
sensor_value=int(data['value'])
except Exception as e:
print("There was an error While passing the response:",e)
continue
bound=compute_bounds(hist_data,conf.frame,conf.mult)
if not bound:
required_data_count=conf.frame-len(hist_data)
print("Not enough data to compute Z-score.Need",required_data_count
hist_data.append(int(data['value']))
time.sleep(10)
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Linter
DELL


GNU nano 2.5.3 File: anomaly_detect.py
print("bound[0]",bound[0])
print("bound[1]",bound[1])
try:
if sensor_value>bound[0]:
print("The temperature increased suddenly, don't worry!!! Send
print("Current temperature is: "+str(sensor_value))
response=sms.send_sms("Alert!!!!!!!!!! someone has open the fri
print("This is the response:-"+str(response))
print("fghjk"+str(response.status))
elif sensor_value >maximum_limit or sensor_value < minimum_limit:
print("Alert!!!!!!!!!!!!!! someone increased or decreased your r
response=sms.send_sms("Alert!!!!!!!!!! Your fridge temperature
print("This is the response:-"+str(response))
print("fghj"+str(response.status))
hist_data.append(sensor_value);
except Exception as e:
print("Error")
print(e)
time.sleep(10)
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cu
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Linter ^_ Go

rune the code get the output as:



After getting all Z-score,

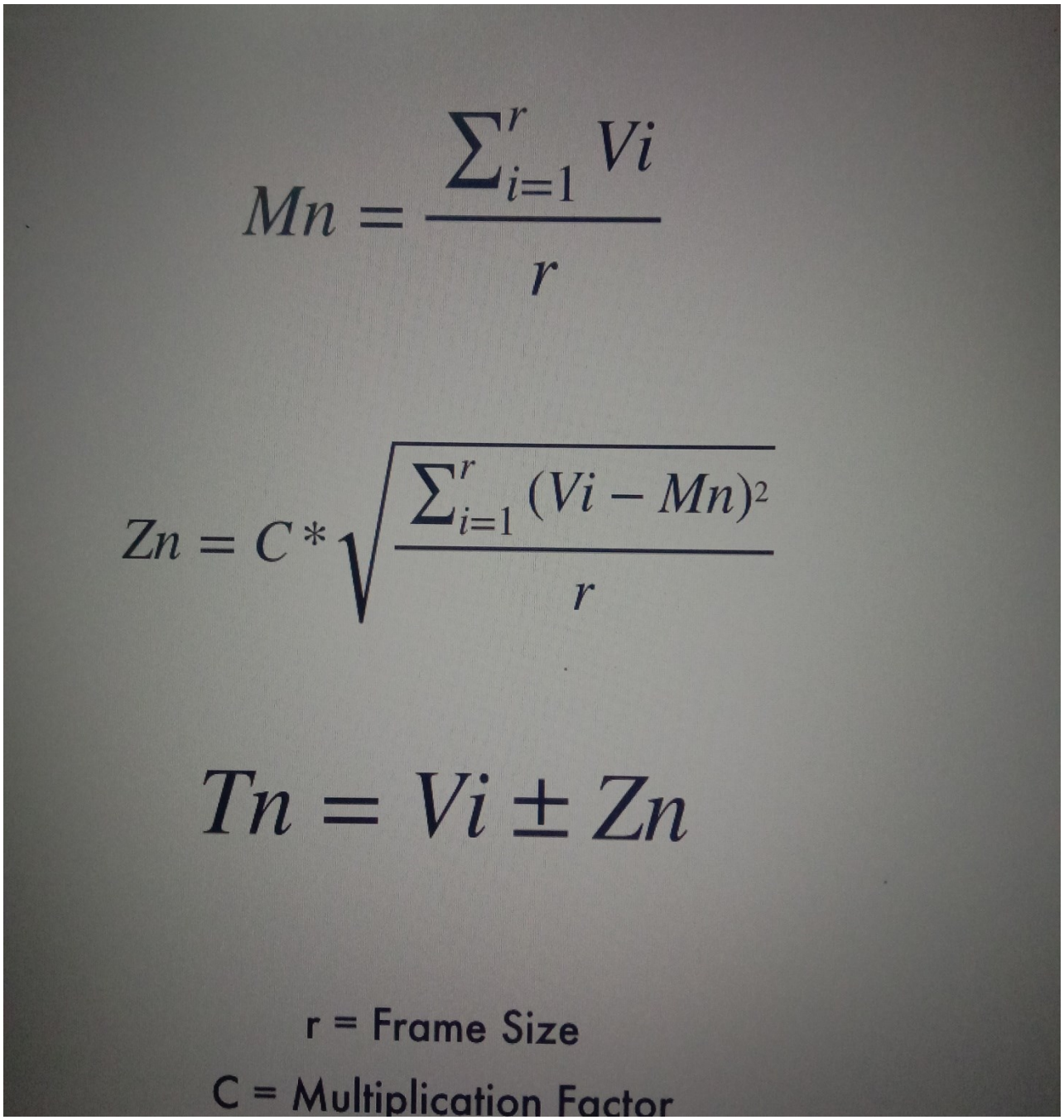
Bounded values are created, if the next value incase greater than or less than the bounded values get a Alert! message through twilio or mailgun whatever we use,

“and also get someone opens the fridge door”

normally in refrigerator temperature is low, Z-Score will calculate accordingly, when opens the door temperature will increases it beyond the bounded value, then will get a message.

than the datas are gathered in boltiot cloud, click the view device and predict the values by using formulas,

data(t)=(Cn*t)+(Cn-1*t^n-1)+(Cn-2*t^n-2)……(C1*t^1)+Co.



Conclusion: To monitor the temperature is using in paramedical industries to monitor the tempearature incase increases automatically detect alanomasly and control the losses,

Thank you Intershala to give a great opportunity to do this project as well as full of training, I gained the lot of information from this training,