Smart Manufacturing project

Title: Smart Water Quality Monitoring System

Group-9:

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Abstract:

The economical and effective system of water quality observation is the most robust implementation of impure water.

- To make certain the supply of pure water, the quality of the water should be examined in real-time.
- If water pollution is detected at an early stage, suitable measures can be taken and critical situations can be avoided.
- Real-time water quality observation is examined by data acquisition, method, and transmission with an increase in the wireless device network method in the IoT.
- The data updated at intervals within the server may be retrieved or accessed from any place within the world.
- To maintain the quality of water, transfer appropriate measurement will be transferred to the person using MQTT protocol.

How are we going to implement it?

- Using MQTT protocol, data of two water samples from two different water bodies will be collected using pH sensor, turbidity sensor. Sensor Data of each water body will be collected by Wi-Fi module and transferred to the third NodeMCU. Data collected in the water bodies will be stored in the cloud this will be done by third NodeMCU. By using the ML algorithms data will be analyzed to predict quality of water, and the same informed to the person to make water potable.

Hardware Modules:

➢ NodeMCU - 2

➢ LM35 temperature sensor

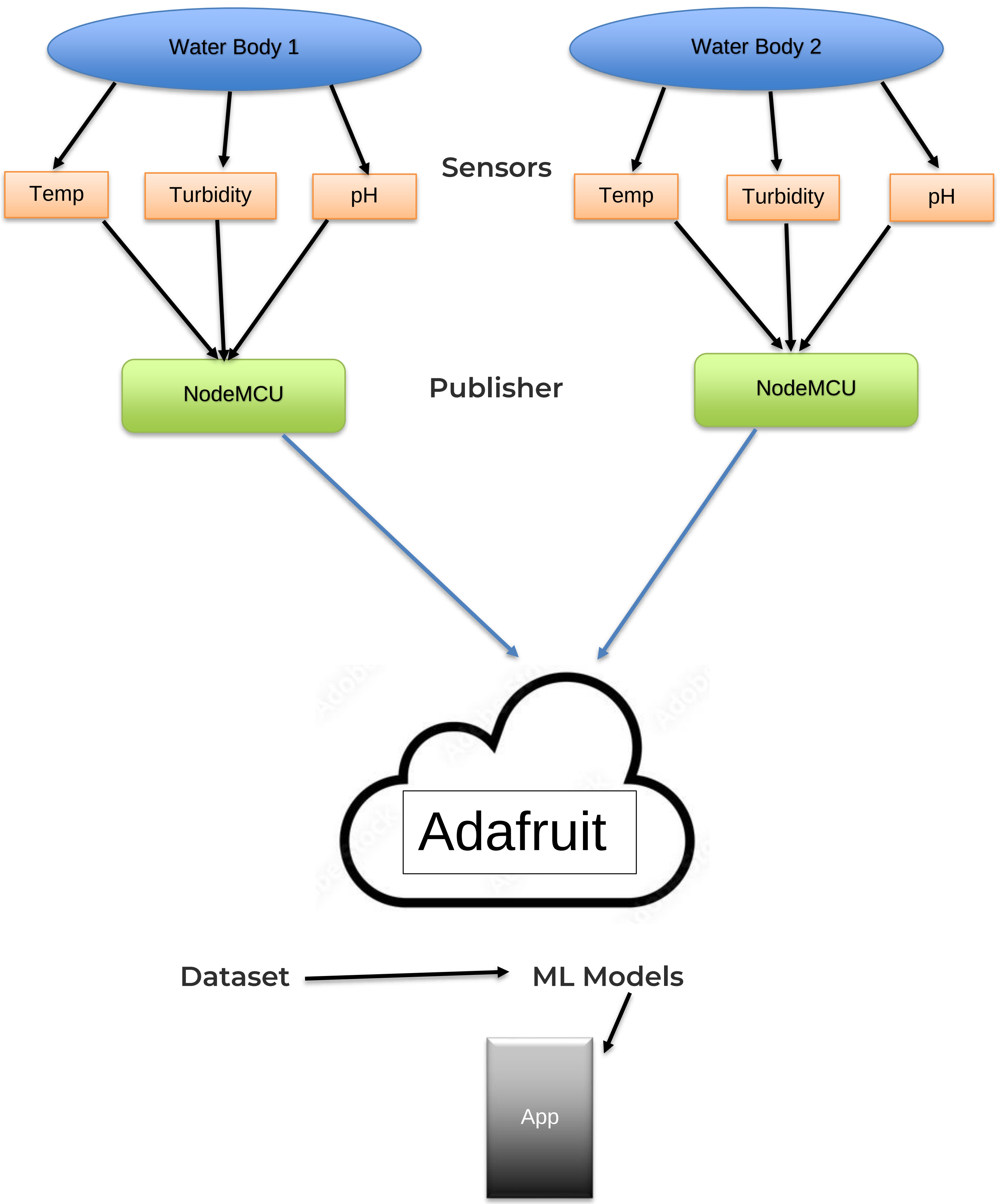
➢ pH sensor

➢ Turbidity sensor

Software Modules:

➢ Material UI
➢ Google Colab / Jupyter Notebook
➢ MQTT for Cloud

Functional Block Diagram:



ML Models:

- We are going to use machine learning algorithms to predict the quality of the water and give appropriate measures to maintain the quality.
- Here we are going to use **Decision Tree** (DT), **K-Nearest Neighbor** (KNN) and **Neural Networks Model** to train and test the model.

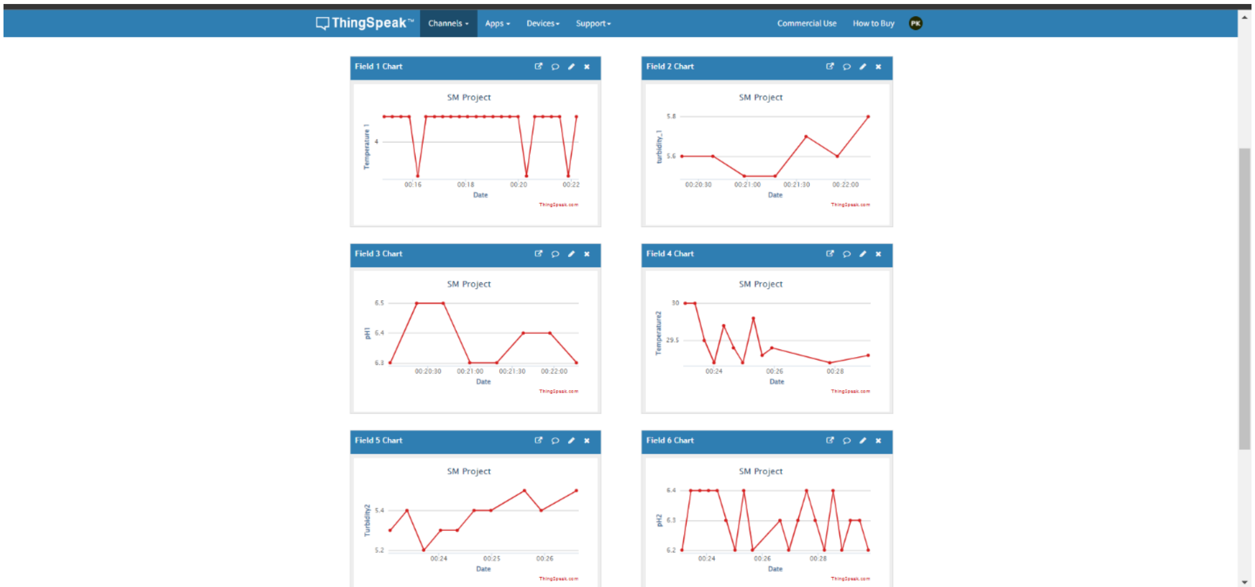
- A neural network is a simplified model of the way the human brain processes information. It works by simulating a large number of interconnected processing units that resemble abstract versions of neurons. The processing units are arranged in layers.

- The decision tree Algorithm belongs to the family of supervised machine learning algorithms. It can be used for both a classification problem as well as for regression problem.

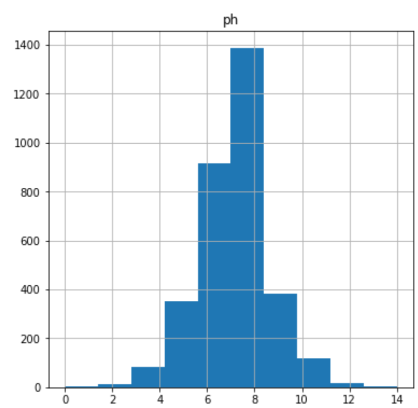
- The k-nearest neighbors (KNN) algorithm is a simple, supervised machine learning algorithm that can be used to solve both classification and regression problems.

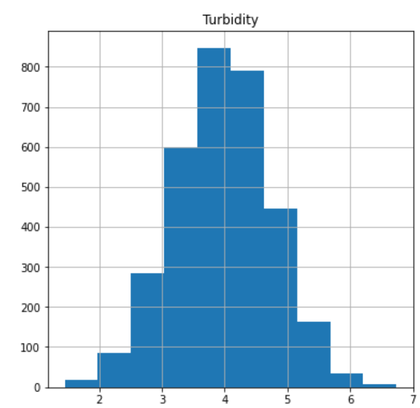
Results:

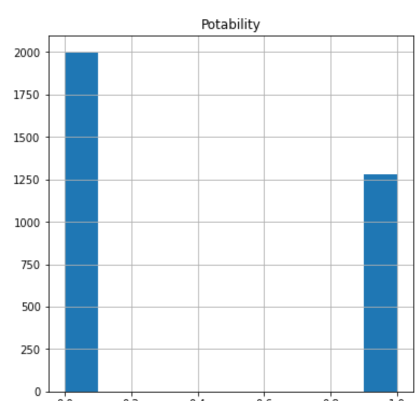
Thingspeak



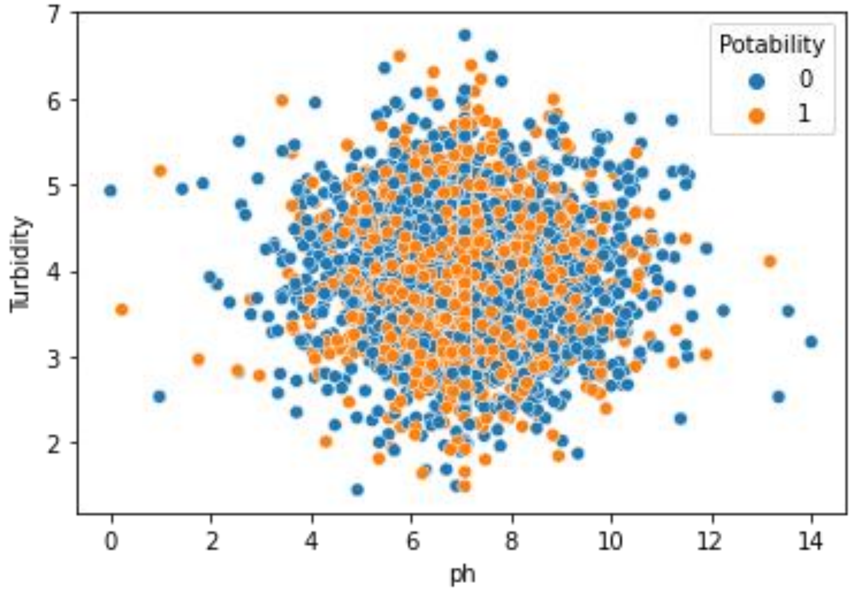
Histograph



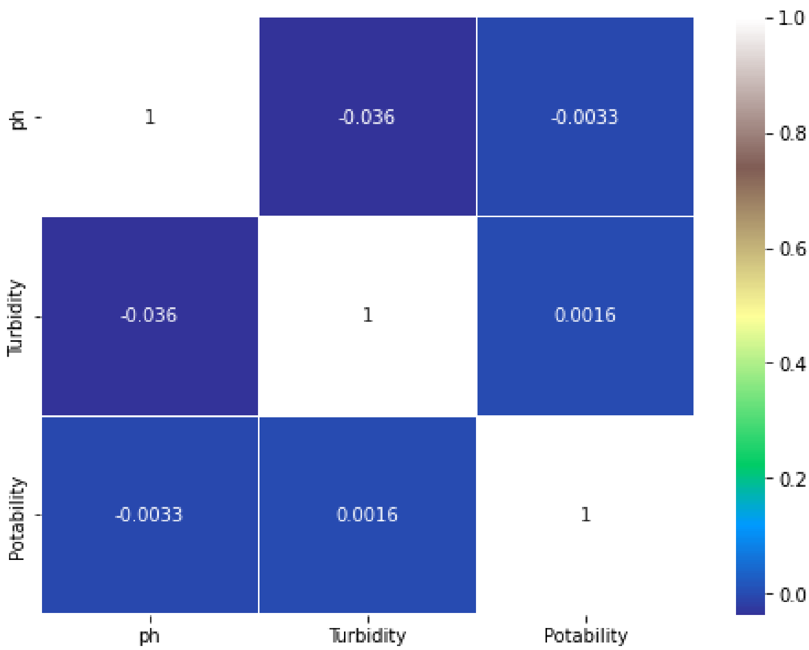




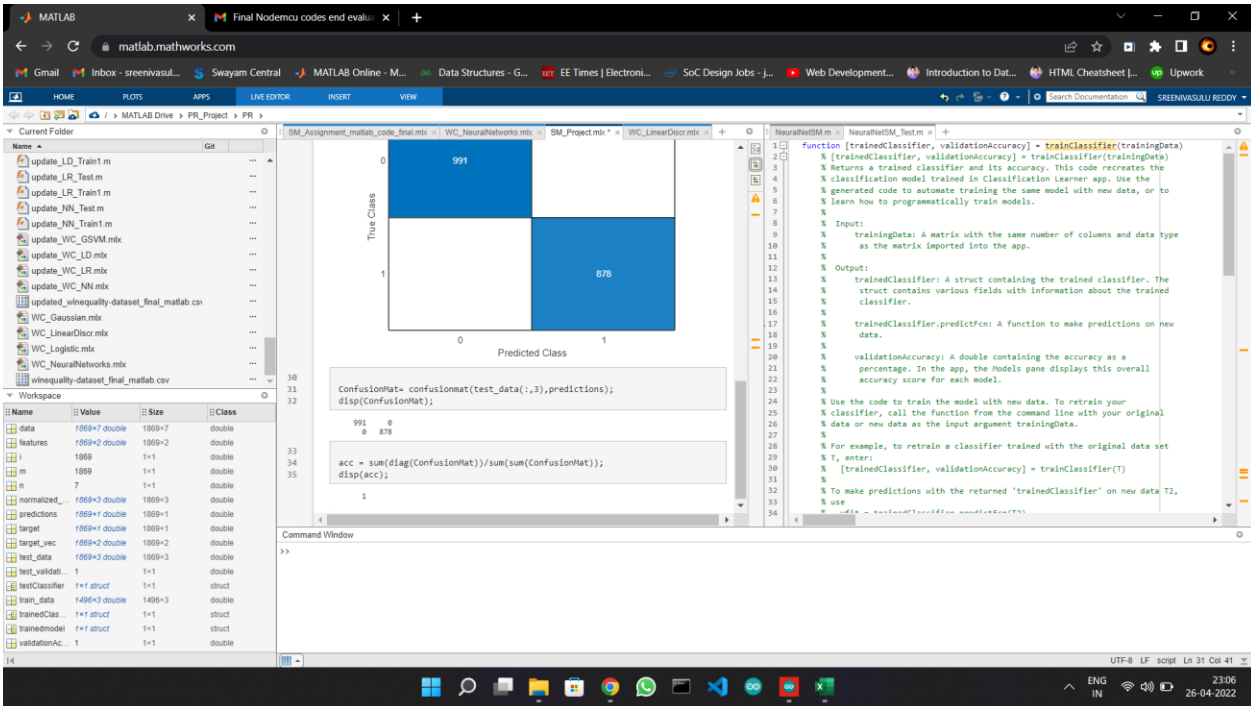
Scatterplot

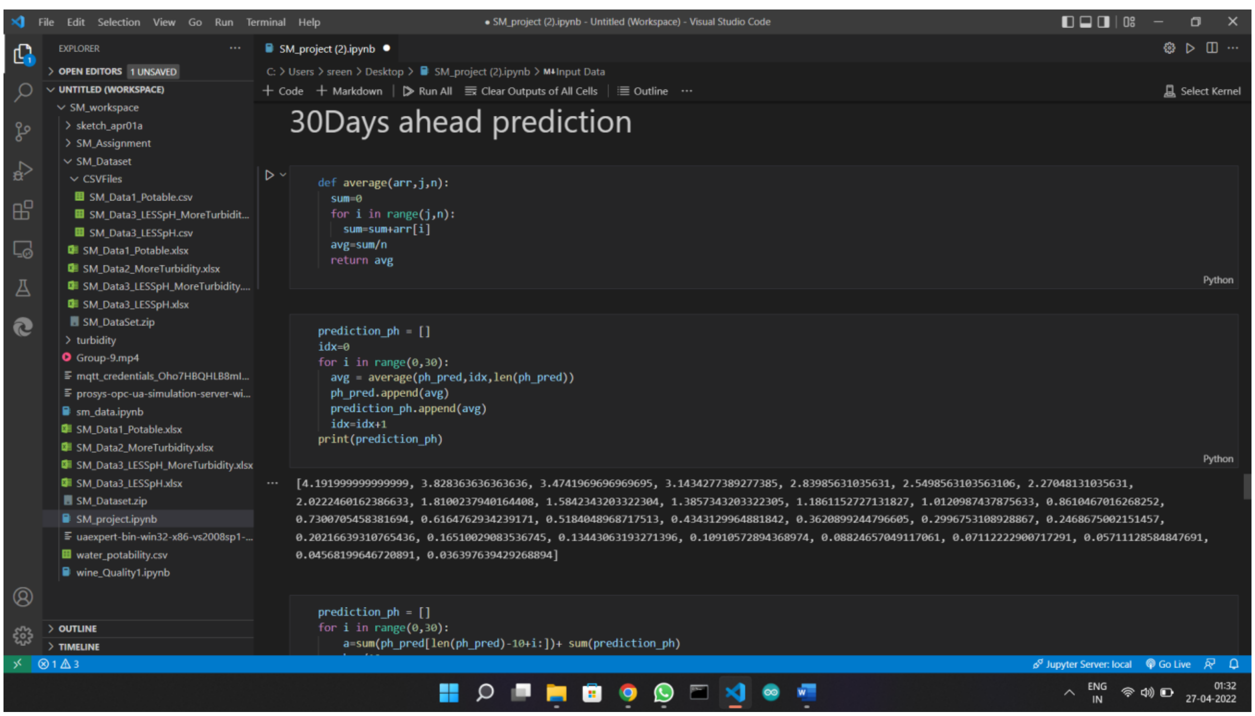


Correlation

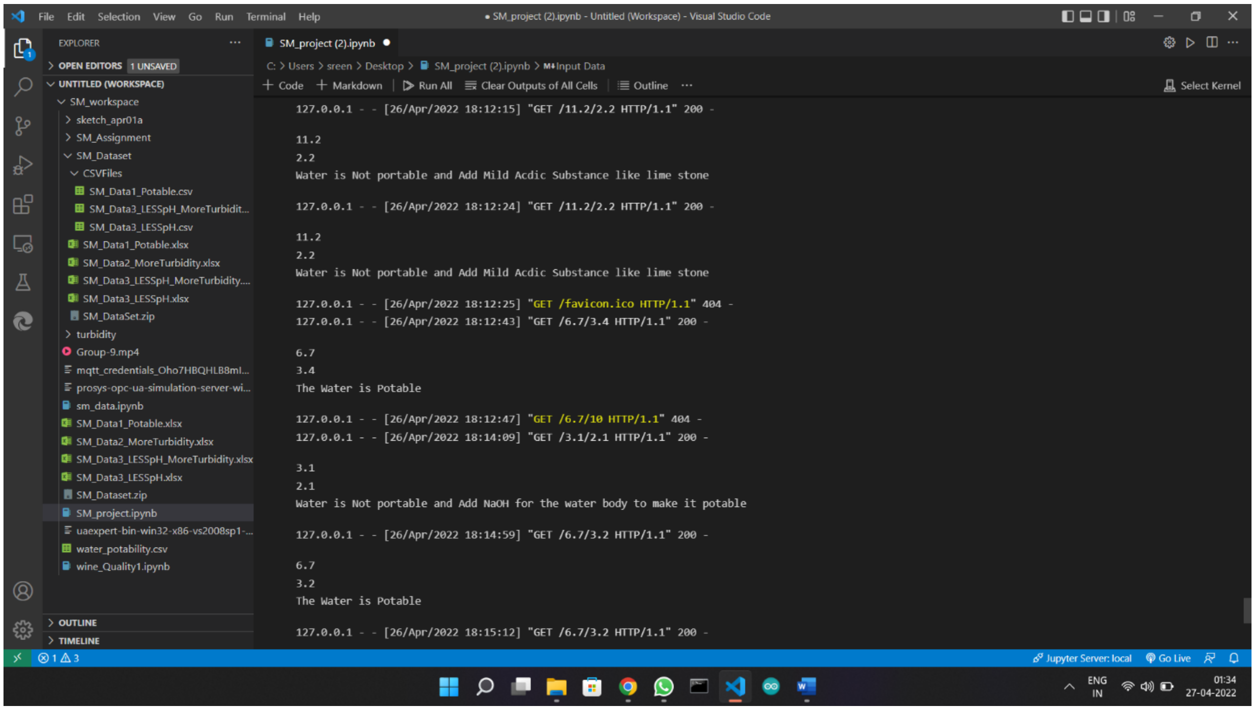


Neural Network

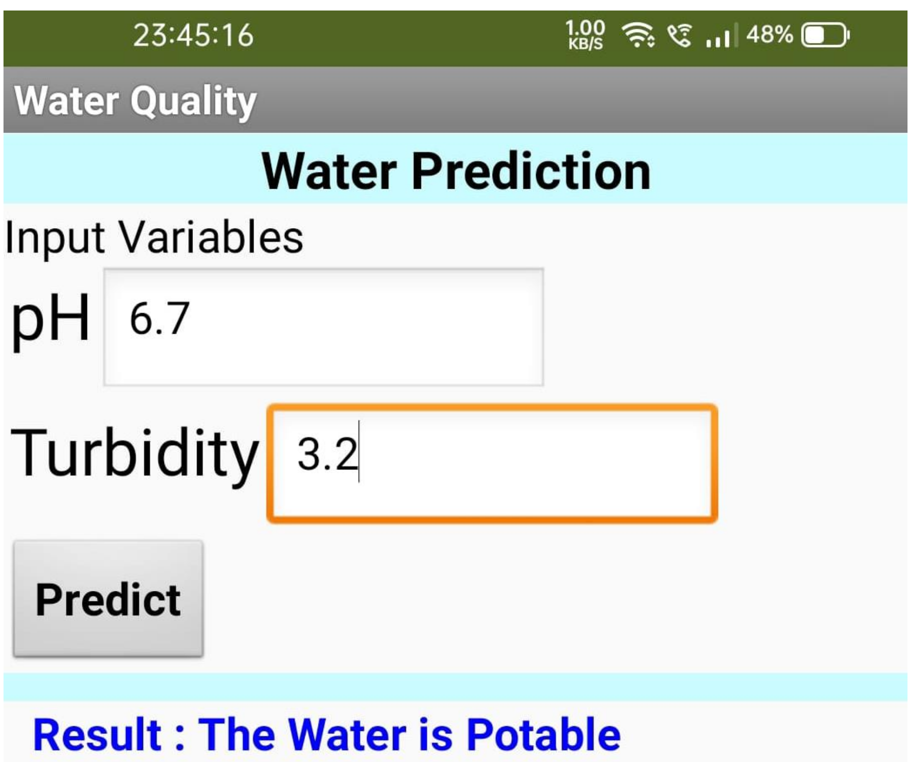




Chemical Suggestion as Notification Message



APP



Codes:

```
prediction_ph = []
idx=0
for i in range(0,30):
  avg = average(ph_pred,idx,len(ph_pred))
  ph_pred.append(avg)
  prediction_ph.append(avg)
  idx=idx+1
print(prediction_ph)
prediction_ph = []
for i in range(0,30):
    a=sum(ph_pred[len(ph_pred)-10+i:])+ sum(prediction_ph)
    b=a/10
    if(b>14):
        b=14
    prediction_ph.append(b)
print(prediction_ph)
prediction_tbt = []
for i in range(0,30):
    a=sum(tbt_pred[len(tbt_pred)-10+i:])+ sum(prediction_tbt)
    b=a/10
    if(b>14):
        b=14
    prediction_tbt.append(b)
print(prediction_tbt)
X_DT=dt.predict([[prediction_ph[-1],prediction_tbt[-1]]])
result=chemical(prediction_ph[-1],prediction_tbt[-1])
print(result)
print(prediction_ph[-1])
print(prediction_tbt[-1])

from flask_ngrok import run_with_ngrok
from flask import Flask,jsonify
app =Flask(__name__)
run_with_ngrok(app) #starts ngrok when the app is running
@app.route("/<float:pH>/<float:Turbidity>")
def home(pH,Turbidity):
  print(pH)
  print(Turbidity)
  res = chemical(pH,Turbidity)
  print(res)
  result = {"Prediction for next 30 days":res}
  return jsonify(result)
app.run()
```

Challenges and Observations:

- As we are considering only temperature, turbidity and pH values accuracy of the ML algorithms is not up to the mark.
- KNN Accuracy – 61.12%.
- Decision Tree Accuracy – 56%.
- Chemical name which turns the water into potable is suggested in the app.

LinkForCodes