

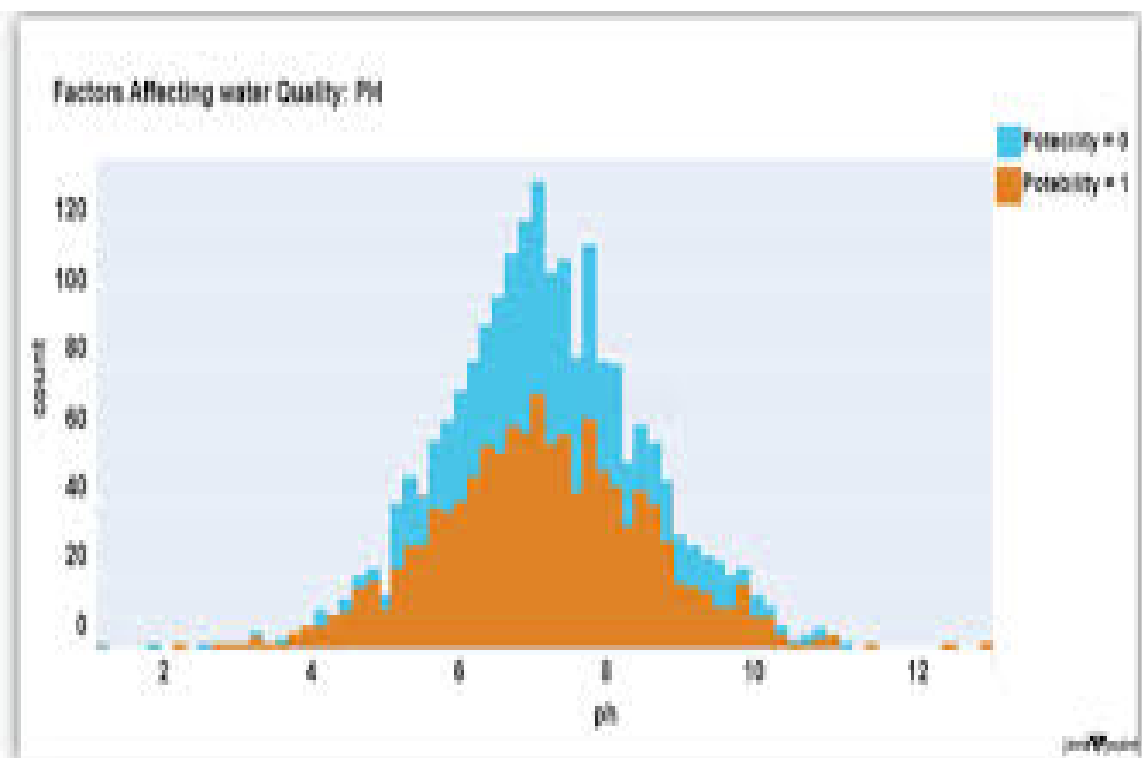
# Water quality analysis with python programming

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Project title:Water quality analysis

Phase3:Development part 1

Topic:Start building the water quality analysis model by loading and pre processing data set.



# Introduction: Water Quality Analysis

- Analysing water quality is one of the key topics of machine learning research.
- In order to train a machine learning model that can determine if a certain water sample is safe or unsafe for eating, we must first understand all the parameters that impact water potability.
- This process is also known as water potability analysis.
- We'll be utilising a Kaggle dataset that includes information on all of the key elements that have an impact on the potability of water for the water quality analysis challenge.
- Before building a model using machine learning to predict whether the water specimen is acceptable or unsafe for eating.
- we must first quickly examine each characteristic of this dataset because all of the elements that determine water quality are crucial

## **About dataset**

### **1. pH value:**

PH is an important parameter in evaluating the acid–base balance of water. It is also the indicator of acidic or alkaline condition of water status. WHO has recommended maximum permissible limit of pH from 6.5 to 8.5. The current investigation ranges were 6.52–6.83 which are in the range of WHO standards.

### **2. Hardness:**

Hardness is mainly caused by calcium and magnesium salts. These salts are dissolved from geologic deposits through which water travels. The length of time water is in contact with hardness producing material helps determine how much hardness there is in raw water. Hardness was originally defined as the capacity of water to precipitate soap caused by Calcium and Magnesium.

### **3. Solids (Total dissolved solids - TDS):**

Water has the ability to dissolve a wide range of inorganic and some organic minerals or salts such as potassium, calcium, sodium, bicarbonates, chlorides, magnesium, sulfates etc. These minerals produced un-wanted taste and diluted color in appearance of water. This is the important parameter for the use of water. The water with high TDS value indicates that water is highly mineralized. Desirable limit for TDS is 500 mg/l and maximum limit is 1000 mg/l which prescribed for drinking purpose.

### **4. Chloramines:**

Chlorine and chloramine are the major disinfectants used in public water systems. Chloramines are most commonly formed

when ammonia is added to chlorine to treat drinking water. Chlorine levels up to 4 milligrams per liter (mg/L or 4 parts per million (ppm)) are considered safe in drinking water.

### **5. Sulfate:**

Sulfates are naturally occurring substances that are found in minerals, soil, and rocks. They are present in ambient air, groundwater, plants, and food. The principal commercial use of sulfate is in the chemical industry. Sulfate concentration in seawater is about 2,700 milligrams per liter (mg/L). It ranges from 3 to 30 mg/L in most freshwater supplies, although much higher concentrations (1000 mg/L) are found in some geographic locations.

### **6. Conductivity:**

Pure water is not a good conductor of electric current rather's a good insulator. Increase in ions concentration enhances the electrical conductivity of water. Generally, the amount of dissolved solids in water determines the electrical conductivity. Electrical conductivity (EC) actually measures the ionic process of a solution that enables it to transmit current. According to WHO standards, EC value should not exceeded 400  $\mu\text{S}/\text{cm}$ .

### **7. Organic\_carbon:**

Total Organic Carbon (TOC) in source waters comes from decaying natural organic matter (NOM) as well as synthetic sources. TOC is a measure of the total amount of carbon in organic compounds in pure water. According to US EPA < 2 mg/L as TOC in treated / drinking water, and < 4 mg/Lit in source water which is use for treatment.

### **8. Trihalomethanes:**

THMs are chemicals which may be found in water treated with chlorine. The concentration of THMs in drinking water varies according to the level of organic material in the water, the amount of chlorine required to treat the water, and the temperature of the water that is being treated. THM levels up to 80 ppm is considered safe in drinking water.

### **9. Turbidity:**

The turbidity of water depends on the quantity of solid matter present in the suspended state. It is a measure of light emitting properties of water and the test is used to indicate the quality of waste discharge with respect to colloidal matter. The mean turbidity value obtained for Wondo Genet Campus (0.98 NTU) is lower than the WHO recommended value of 5.00 NTU.

### **10. Potability:**

Indicates if water is safe for human consumption where 1 means Potable and 0 means Not potable.

# Dataset

# ph	# Hardness	# Solids	# Chloramines	# Sulfate	# Conductivi...	# Organic_c...
8.757257397440991	200.19140044205727	21536.224687445414	4.915101054543186	317.88290049783706	404.7177991564453	13.76832330642337
	168.38843077429533	27492.30730658781	7.046224797696413	299.8204779108216	383.79501999032584	16.1820664936737
7.80963189801941	100.4576150915831	12013.550628764531	5.212314602065352	247.2008260476431	605.2201243500056	9.61134874001138
6.652488090855707	145.0101719190834	19871.788448305862	4.961066380191502	288.0521917368515	545.974993762403	10.94202425601132
9.147197055336921	211.71414177764134	11920.610835646206	7.2307947693374	339.7519188007938	527.7089100130407	18.2753121092765
10.560744636218196	181.89336556155354	21783.651033363374	6.991259996238134	340.39037835517297	456.5564021223438	16.4828353669691
7.484254837727466	260.09217257337195	30616.615148853696	9.379133540507624		404.67077732816267	15.93448387120078
8.520806572970303	238.33511245550966	28779.6500110336	8.282808464509609	381.6493228718946	481.3188026886131	6.01633660927107
4.999413810796919	190.28705014936028	24323.865903045946	7.230164126862036	324.8930378422557	405.3304820275903	8.23655750310503

## Program:

```
import plotly.graph_objs as go
```

```
index_vals
```

```
=
```

```
data['Potability'].astype('category').cat.codes
```

```
fig = go.Figure(data=go.Splom(
    dimensions=[dict(label='ph',
    values=data['ph']),
    dict(label='Hardness',
    values=data['Hardness']),
    dict(label='Solids',
    values=data['Solids']),
    dict(label='Chloramines',
    values=data['Chloramines'])])
```

```
dict(label='Sulfate',
      values=data['Sulfate']),
dict(label='Conductivity',
      values=data['Conductivity']),
dict(label='Organic_carbon',
      values=data['Organic_carbon']),
dict(label='Trihalomethanes',
      values=data['Trihalomethanes']),

dict(label='Turbidity', values=data['Turbidity'])),
showupperhalf=False,
text=data['Potability'],
marker=dict(color=index_vals,
showscales=False,
line_color='white', line_width=0.5)
))
fig.update_layout(
title='Water Quality',
width=1000,
height=1000,
)

fig.show().
```

Output:

