TURBIDITY MEASUREMENT USING NIR DIGITAL CAMERAS AND GOOGLE EARTH ENGINE: A review

Yogesh Kunkawalekar, Milind Bharambe, Sanjyot Patil, Asiya Shaikh, Prof. A. S. Hambarde

(KJ College of Engineering and Management Research, Pune)

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Abstract - In this study, a turbidity measuring device will be developed using NIR (Near Infrared) light and image-processing software. When the NIR light travels through the turbid solution, the NIR camera captures scattered and transmitted images. The RGB values are obtained from the corresponding image. Then, these RGB values are converted to Lab values. The standard turbidity value is calculated by feeding these Lab values into a neural network.

In the second part of the study, Google Earth Engine is being used to calculate turbidity. Sentinel-2 is a satellite that has a multispectral instrument that measures reflected light in different wavelengths, including visible and near-infrared. The B4, B3, and B2 bands correspond to red, green, and blue, respectively, and can be combined to form an RGB image. The NDWI and NDTI are two indices that are used to estimate turbidity from Sentinel-2 images. NDWI is sensitive to the presence of water, and NDTI is sensitive to changes in the optical properties of the water. Chlorophyll is a pigment that is present in algae and is used as an indicator of the presence of suspended particles.

By comparing the predictive performance of different bands and indices, specific bands can be selected to train the algorithm to accurately predict turbidity. The use of satellite data has the advantage of being able to cover large spatial areas, which is particularly useful for environmental monitoring applications.

Keywords: **Machine Learning, Google Earth Engine, Water Quality Monitoring, IOT, Turbidity sensor, RGB values.**

1.INTRODUCTION

Water is a vital resource that is used for various purposes, including drinking, agriculture, and industrial processes. However, water can contain suspended and colloidal materials, such as soil, dirt, microorganisms, and zooplankton, that can make the water turbid. Turbidity is a measure of the degree to which the water is cloudy or hazy due to the presence of undissolved particles. Turbidity is considered a direct indicator of water quality, and its measurement is important in assessing the suitability of water for various uses. Excessive turbidity can have negative impacts on aquatic ecosystems and human health. For instance, high turbidity can reduce the amount of light that penetrates the water, which can hinder the process of photosynthesis in aquatic plants and impact their growth. Moreover, high turbidity can affect the storage capacity of water reservoirs, which can lead to water shortages during periods of high demand. Therefore, it is essential for water quality control departments to accurately measure water turbidity and keep it within a reasonable range that does not adversely affect the ecological balance and human health.

Turbidity is a measurement that is used to evaluate a liquid's overall clarity. It is a measurement of the amount of light scattered by the elements of water when light shines through a water sample. It is an optical property of water. The turbidity increases with the intensity of scattered light.

When there are more suspended solids in the water, it appears murkier and has a higher turbidity The World Health Organization (WHO) has established guidelines for drinking water quality, which include a recommendation that the turbidity of drinking water should not be more than 5 nephelometric turbidity units (NTU), and preferably less than 1 NTU. This recommendation is since high turbidity levels can indicate the presence of suspended solids, microorganisms, and other impurities in the water that can be harmful to human health.

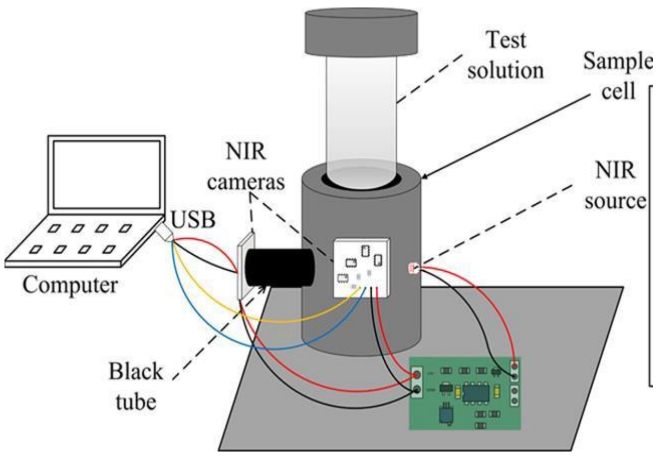
The water seems murkier and has a higher turbidity when there are more overall suspended solids present. Turbidity is taken into consideration as a terrific measure of the fine of water. The WHO (global fitness company) establishes that the turbidity of ingesting water should not be extra than 5 NTU and should preferably be underneath 1 NTU.

There are several methods for measuring turbidity, including visual turbidity, transmission light, scattering light, and ratio methods. These methods are solely dependent on optical techniques, meaning they use light to measure the turbidity of water.

Visual turbidity is a method of measuring turbidity by visually comparing a water sample to standard reference tubes of known turbidity. This method has poor accuracy and is only suitable for making hard judgments of water turbidity. The transmission light, scattering light, and ratio techniques that have been based at the photoelectric detection had been evolved and have been applied to measure the turbidity.

In this have a look at, a low-cost device was developed to measure turbidity using near-infrared (NIR) cameras. The device captured both transmitted and scattered light images of NIR light passing through a turbid solution. These images were then processed using image processing techniques to obtain the RGB values. The RGB values were used to quantify the degree of turbidity in the solution. This simple and cost-effective method has potential applications in water quality monitoring and other fields where turbidity measurement is necessary.

2. Related work



In container One detector for incident light, positioned at 90° angle of light source (LED), is used to measure the intensity of scattered light, and another detector, at 180°, is used to measure the intensity of transmitted light. Because the transmission and scattering light have the same transmission medium, the influence of the change in watercolor and light source on turbidity is the same. Then, the CIE Lab and the grayscale values of the solution image are obtained by RGB values. We Implement multiple linear regression on

(a) Relationship in the ratio of scattering to transmission mode.

(b) Relationship in the ratio of transmission to scattering mode, to create model.

Two NIR cameras with the same type were used in the experiment. Both are 850 nm narrow band filters combined with ordinary CMOS cameras. The 850nm narrow-band filter with a focal length of 3.6 mm can effectively eliminate the influence of other wavelengths and improve the sensitivity.

3. Study of Research Paper

In this paper [1], author proposes a new method for measuring water turbidity using two NIR digital cameras.

The proposed method uses an NIR camera-based measuring device with image processing software. Two NIR cameras capture scattered and transmitted images when the NIR light passes through a turbid solution. The average RGB values of 400 pixels in the central region of the image are obtained and converted into CIE Lab color space values. The relationship between turbidity and the corresponding color components (R, G, B, L, a, b, and grayscale) is then used to determine water turbidity.

The results of comparison with a commercial turbidimeter show that the proposed method has a high accuracy for determining standard solution with a wider linear range. Additionally, the proposed method is consistent with turbidimeter results for measuring real samples, which verifies the feasibility of this method.

The proposed method offers several advantages over traditional methods. It is quick and accurate and does not require any specialized equipment. Additionally, the use of NIR cameras allows for real-time measurements. The proposed method also has a wider linear range compared to traditional turbidity measurement methods, making it suitable for a wider range of applications.

In conclusion, the proposed method of using two NIR digital cameras for water turbidity measurement offers a promising alternative to traditional methods. Further research is needed to fully understand the capabilities and limitations of this method and to evaluate its potential for widespread use in various industries.

This study [2] paper proposes a method using a digital camera combined with a fitting algorithm and T-S fuzzy neural network (T-S fnn) to measure water turbidity accurately and efficiently.

The proposed method involves using a turbidity-measuring device and image-processing software based on a common camera to obtain the image of a standard solution. After passing a constant light source through the sample, the RGB and Lab values corresponding to the image are obtained. These RGB values are used as the input for the fuzzy neural network prediction model, while the corresponding standard turbidity values serve as the output. The camera-based fuzzy neural network turbidity measurement method is then established.

Additionally, a standard curve of turbidity measurement is established by fitting the turbidity using color components and color difference. The proposed method is applied to the measurement of standard turbidity solution, and the results are compared with those obtained using a turbidimeter. The accuracy of the fuzzy neural network and the fitting algorithm is higher than that of the turbidimeter, with the fuzzy neural network method exhibiting the highest accuracy, with a measurement error of only ±0.89%.

The proposed method is compared to the traditional photoelectric detection method using independent sample t-tests on actual water samples. The fuzzy neural network method exhibited the same trend as the turbidimeter, with no significant differences in the results. This suggests that the camera-T-S fuzzy neural network assembly can be applied to measure turbidity in actual water samples.

The proposed method offers several advantages over traditional methods, including reduced measurement errors and costs. It may be useful in various fields, including environmental detection and biomedicine.

In conclusion, the proposed method using a digital camera combined with fitting algorithm and T-S fuzzy neural network is a promising alternative to traditional turbidity measurement methods. Further research is needed to fully understand the capabilities and limitations of this method and to evaluate its potential for widespread use in various industries.

In this research [3], authors discovered that with a view to degree the chromaticity of water and the content material of dissolved count number greater accurately, efficiently, and affordably, a chromaticity size gadget based on the image technique became proposed and applied. The dimension gadget used the designed acquisition tool and image processing software to acquire the Red-Green-Blue (RGB) values of the picture and converted the color photo from RGB coloration area to Hue-Saturation-depth (HSI) area to separate the chromaticity and brightness. In keeping with the definition of chromaticity, the hue (H), saturation (S) values, and chromaticity of preferred chromaticity answer pix have been outfitted through a non-linear floor, and a three-dimensional chromaticity size model was installed primarily based on the H and S values of water snap shots. The proposed method outperforms spectrophotometry in terms of accuracy when measuring a standard chromaticity solution. For real water pattern measurements, there is no full-size distinction between the outcomes of this approach and the spectrophotometer technique, which tested the validity of the approach. By establishing a correlation between the chromaticity value and the peak area of the absorption spectrum or the absorbance value of a standard chromaticity solution at a specific wavelength, a spectrophotometer is used to determine the chromaticity value of water samples. Also, with successful results, the system was used to gauge the presence of ammonia, nitrogen, phosphate, and chloride in water.

Authors [4] of this project aim to improve the process of measuring turbidity in water samples by introducing a new method that uses photo processing. Turbidity is a measure of how clear or cloudy the water is and is an important indicator of water quality. Traditionally, turbidity detection involves manual approaches that are characterized by long calibration times, frequent errors, and lower repeatability.

The proposed method involves capturing water sample images using a high-definition camera and applying image processing techniques to represent the samples with different levels of turbidity. A database is created for water samples with varying levels of turbidity using laboratory methods of turbidity measurement. This new approach can be used anywhere and at any time in the world wherever photo processing techniques are used for turbidity detection.

The image processing results are compared with the information in the database to provide direct and accurate turbidity measurement in a fraction of seconds. This new method of turbidity detection has the potential to improve the accuracy and efficiency of water quality testing, which is essential for ensuring the safety of drinking water and protecting the environment. Additionally, this method can be applied in a variety of settings, including industrial and municipal water treatment facilities, environmental monitoring, and research laboratories.

Authors [5] aim to address the problem of contaminated potable water in many parts of the world by developing a system that can detect and monitor various parameters of water quality, such as pH level, temperature, and turbidity.

The first step in preventing water pollution is to identify the pollutant, and this system would facilitate that process by providing real-time monitoring and analysis of water parameters. The system would utilize low-cost sensors to control and monitor these parameters, making it more accessible to people in areas with limited resources.

To implement this system, the authors plan to use an Arduino UNO microcontroller board and interface it with LabVIEW software, which is a graphical programming language used for data acquisition, analysis, and visualization. This would allow for easy control and monitoring of the water parameters using a computer or other device.

By developing this low-cost and accessible water quality monitoring system, the authors hope to help improve access to clean and safe drinking water in areas where it is currently a problem. This system could be used in a variety of settings, including homes, schools, and community centers, as well as in larger-scale applications such as water treatment facilities and environmental monitoring.

This study [6] describes the development of a mobile application called HydroColor that uses a phone's camera and auxiliary sensors to measure the remote sensing reflectance of natural water bodies. The app utilizes the phone's camera as a three-band radiometer, and users are directed by the app to capture a series of three images to calculate the remote sensing reflectance in the red, green, and blue wavelength bands.

The reflectance data can be inverted to estimate the concentration of absorbing and scattering substances in the water, including suspended sediment, chlorophyll, and dissolved organic matter. This approach is similar to satellite measurements, but HydroColor distinguishes itself from other water quality camera methods by using radiometric measurements rather than photo color.

The study investigates the accuracy of HydroColor's reflectance and turbidity estimates compared to commercial instruments. The results show that HydroColor can measure the remote sensing reflectance within 26% of a precision radiometer and turbidity within 24% of a portable turbidimeter. This demonstrates that HydroColor can provide reliable water quality data, even without expensive or specialized equipment.

One of the advantages of HydroColor is that it uses a phone as an objective sensor rather than relying on subjective user observations or color matching using the human eye. This makes it a powerful tool for crowd sourcing aquatic optical data, as it allows users to easily collect and share water quality data.

In summary, the HydroColor app represents a new and innovative approach to monitoring water quality using mobile technology. By leveraging the capabilities of a phone's camera and auxiliary sensors, HydroColor provides an accessible and low-cost method for collecting reliable water quality data, which can be used for a variety of applications, including environmental monitoring, research, and education.

Nowadays [7] a new concept of a Lab on a cellphone (LOS) where multiple laboratory functions can be conducted on a portable phone. The LOS concept was demonstrated for real-time and on-site water quality detection using the opt electrowetting (OEW) principle. In addition to the on-chip automated sample processing capability, the LOS used a phone camera for microscopic detection of target cells.

The LOS platform can overcome traditional labor-intensive and time-consuming methods for detecting microbiological contaminants and aquatic environments. With comparable fluorescence images and cell counting function, the LOS can provide a faster and more efficient method for water quality monitoring.

The OEW principle used in the LOS device involves manipulating the movement of droplets of liquid by applying a voltage to electrodes. The droplet movement is used to mix the sample and reagents, and the resulting mixture is analyzed using a fluorescence microscope. The LOS platform can detect various contaminants, including Escherichia coli and Legionella pneumophila, with high accuracy and sensitivity.

One of the significant advantages of the LOS platform is its portability and convenience. It can be easily carried in the field, allowing for on-site water quality monitoring and testing. The use of a phone camera for microscopic detection also eliminates the need for expensive and bulky equipment, making it an affordable and accessible option for water quality monitoring in resource-limited settings.

In summary, the LOS platform offers a new and innovative approach to water quality monitoring using a portable phone. By combining multiple laboratory functions and the use of the OEW principle, the LOS platform provides a fast, accurate, and convenient method for on-site water quality testing. This has significant implications for environmental monitoring, public health, and water resource management.

In this study [8], the authors propose a water quality assessment method using image processing techniques. They use two common biological organisms, Daphnia magna and Lemna minor, which are sensitive to water toxicity, to determine the water quality. The proposed approach involves the use of two cameras to continuously scan these two organisms in separate vessels, and the images captured are then processed independently. The authors use techniques for color-area analysis, motion analysis, and transformation in the image processing stage.

In the color-area analysis stage, the color of the organisms is analyzed and compared to a reference image to determine any color changes. The motion analysis stage involves tracking the movement of the organisms, which can indicate changes in their behavior due to water quality. The transformation stage involves morphological operations, such as erosion and dilation, to remove noise and enhance the features of the organisms.

Finally, a relative water quality index is computed based on the extracted features from the obtained images. The index provides a quantitative measure of the water quality based on the color, motion, and morphology of the organisms. The proposed approach offers a fast, automated, and non-invasive method for water quality assessment using image processing techniques, which can complement traditional methods and provide additional insights into water quality.

This article [9] proposes a Water pollution has been a growing problem over the previous couple of years. Personal pride in water may be a standout amongst those primary variables with control wellness and the nation for sicknesses "round kinfolk what's greater animals. Lakes and waterways could be those essential wellsprings for consuming water, which impressively depend on upon water private pride (refers of the bodily, chemical, what's greater dwelling elements about water). The objective of this water high-quality monitoring machine for the usage of internet of factors is to discover the first-class of the water i.e. how the pH content material varies and sending message to the corresponding authorities. We are going to put this undertaking into effect at municipal water tanks and drinking water reservoir. For that we are using an Arduino board for locating pH value and GSM module for message technique. We use a led show to have non-stop observation on water parameters. Eventually the person gets a message of pH fee of water similarly we amplify this undertaking by means of sending the sensor information to cloud for global tracking of water high-quality.

This article [10] proposes a low-cost system for real-time water quality monitoring and control using IoT. The authors argue that water is a prerequisite element required for humans, and therefore, there must be mechanisms in place to vigorously test the quality of drinking water in real time. To address this issue, the authors developed a system that utilizes physiochemical sensors to measure the physical and chemical parameters of water, such as temperature, turbidity, conductivity, pH, and flow.

The system can detect water contaminants using these sensors, and the sensor values are processed by a Raspberry Pi and sent to the cloud. The sensed data is visible on the cloud using cloud computing, and the flow of water in the pipeline is controlled through IoT. This allows for real-time monitoring and control of water quality, which can help to prevent the consumption of contaminated water and the spread of water-borne diseases.

The use of IoT technology makes the system highly scalable and cost-effective. By implementing this system, it is possible to ensure that the quality of drinking water always meets the required standards. This system can be deployed in various settings, such as households, industries, and municipal water systems, to ensure that the water is safe for human consumption.

Authors [11] aim to address the problem of Sentinel-2A/MSI (S2A) and Landsat-8/OLI (L8) data products present a new frontier for the assessment and retrieval of optically active water quality parameters including chlorophyll-a (Chl-a), suspended particulate matter (TSS), and turbidity in reservoirs. However, because of their differences in spatial and spectral samplings, it is critical to evaluate how well the sensors are suited for the seamless generation of the water quality parameters (WQPs). This study presents results from the retrieval of the WQP in a reservoir from L8 and S2A optical sensors, after atmospheric correction and standardization through band adjustment. An empirical multivariate regression model (EMRM) algorithmic approach is proposed for the estimation of the water quality parameters in correlation with in situ laboratory measurements. From the results, both sensors estimated Chl-a concentrations with R2 of greater than 70% from the visible green band for L8 and a combination of green and SWIR-1 bands for S2A. While the NMSE% was nearly the same for both sensors in Chl-a estimation, the RMSE was <10 μg/L and >10 μg/L for L8 and S2A estimations of Chl-a, respectively. For TSS retrieval, L8 outperformed S2A by 31% in accuracy with R2 > 0:9 from L8's red, blue,

and green bands, as compared to 0:47 ⩽ R2 ⩾ 0:61 from S2A's red and NIR bands. The RMSE were the same as for Chl-a, and the NMSE% were both in the same range. Both sensors retrieved turbidity with high and nearly equal accuracy of R2 > 70% from the visible and NIR bands, with equal RMSE at <10% NTU and NMAE% from S2A being higher by more than 30% as compared to L8's NMAE% at 15%. The study concluded that the higher performance accuracy of L8 is attributed to its higher

SNR and spectral bandwidth placement as compared to S2A bands. Comparatively, S2A overestimated Chl-a and turbidity but performed equally well compared to OLI in the estimation of TSS. The results show that while absolute accuracy of retrieval of the WQPs still requires improvements, the developed algorithms are broadly able to discern the bio optical water quality in reservoirs.

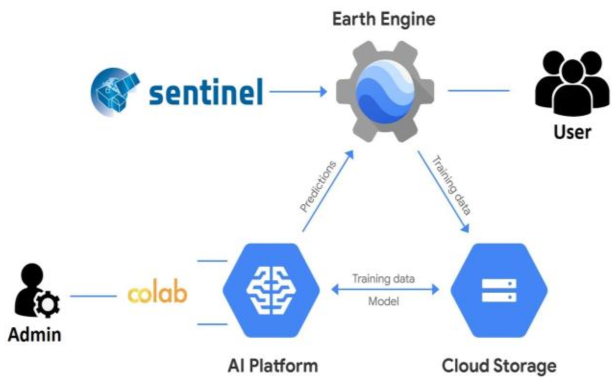
In this paper [12], we studied that River turbidity, serving as an important evaluation index for monitoring water contamination and guiding pollution control, is mainly measured based on the data gathered from contacting turbidity sensors or contactless space satellites. Nevertheless, the prevalence of those abovementioned two measurements is strongly limited due to the disadvantages of low-density spatial distribution of sensor data and extremely high price of satellite data. To solve such difficulty, depending on the Google earth engine (GEE) that freely supplies hyperspectral remote sensing data, in this article, we propose a novel river turbidity measurement model based on random forest ensemble. First, by fully taking advantage of each spectral information and their tuned spectral information, a newly proposed full combination subspace is deployed to generate all the possible base random forests. Second, we introduce a novel error-minimization-based pruning algorithm to circularly delete poor base random forests in accordance with the dynamic threshold. Finally, a weighted average method solved by regularized linear regression is used to aggregate the entire remainder base random forests that are preserved after pruning, thereby yielding the final measurement result of river turbidity. Experiments corroborate the superiority of our proposed model over state-of-the-art competitors and its simplified counterparts.

4. OPEN ISSUES

As we studied that at present, there is lack of a centralized system for water quality monitoring in India. It implies that there is no platform available for people to interact with and monitor the quality of water they are consuming. The research on water quality is limited to dams and conducted in laboratory settings. This approach requires significant human effort, lacks automation, and incurs high costs, making it applicable only on a small scale.

Without a centralized system, it becomes difficult to ensure that people are consuming safe and clean water. The lack of automation and dependence on manual labor can also result in delays in detecting water quality issues, which can further lead to health problems. A centralized system can help to address these challenges by providing real-time monitoring, enabling rapid detection of water quality issues, and allowing for timely interventions. It can also provide a platform for people to interact with and access information about the quality of the water they are consuming, empowering them to make informed decisions about their health.

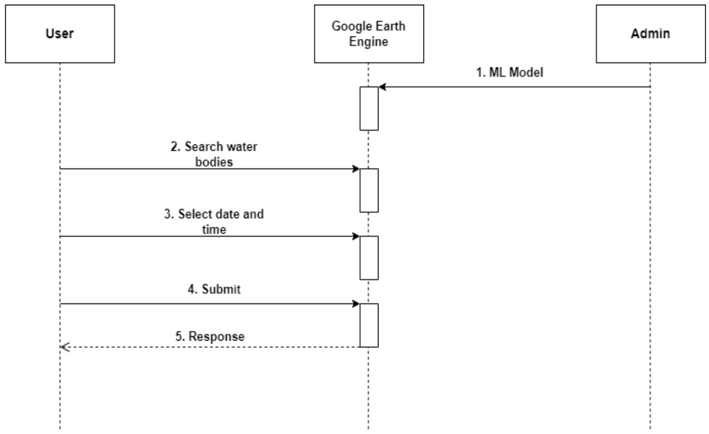
5. SYSTEM ARCHITECTURE



Admin – Admin in the system uses various software tools like Google Collab to access machine learning models such as multiple linear regression and random forest regressor.

Google Earth Engine - Google Earth Engine is a cloud computing platform for processing satellite imagery and other Earth observation data. It provides access to a large warehouse of satellite imagery and the computational power needed to analyze those images. The platform was developed by Google, in partnership with Carnegie Mellon University, NASA, the United States Geological Survey and TIME. Google Earth Engine interface is accessed by admin to train machine learning models and user uses these models in google earth engine to access accurate turbidity data.

User - A user is a person who utilizes a computer or network service. A user often has a user account and is identified to the system by a username. Other terms for username include login name, screenname, account name, nickname and handle, which is derived from the identical citizens band radio term. Some software products provide services to other systems and have no direct end users. User accesses user interface and accesses turbidity data through it.



6. METHODOLOGY

Turbidity measurement using NIR digital cameras and Google Earth Engine involves several steps, including image acquisition, processing, and analysis, as well as calibration and validation. Here is a possible methodology for this approach:

1. **Image acquisition:** The first step in the methodology is to acquire NIR digital images of the water body to be analyzed. This can be done using various types of cameras, such as drones or satellites. The images should cover the entire body of water or a representative portion of it and should be acquired under similar lighting conditions and at the same time of day to minimize the effect of changing light conditions on the measurements.

2. **Image preprocessing:** The acquired images may contain various types of noise and artifacts, which can affect the accuracy of the turbidity measurements. Therefore, the images need to be preprocessed to remove these unwanted elements. The preprocessing can include tasks such as image normalization, filtering, and segmentation.

3. **Feature extraction:** Once the images have been preprocessed, the next step is to extract features related to turbidity from the images. This can be done using various image processing techniques, such as texture analysis, color analysis, and machine learning. The extracted features may

include the average pixel intensity, the standard deviation of pixel intensity, the texture of the image, and the color of the water.

4. **Calibration:** In order to establish a relationship between the extracted features and the actual turbidity values, a calibration process is necessary. This involves taking actual turbidity measurements at different points in the water body and correlating these measurements with the corresponding values of the extracted features. This calibration process can be done using various statistical methods, such as linear regression or machine learning algorithms.

5. **Turbidity measurement:** Once the calibration has been completed, the extracted features can be used to estimate the turbidity values at different points in the body of water. This can be done by applying the calibration model to the features extracted from the NIR images. The output of this process is a map of turbidity levels in the water body.

6. **Validation:** To ensure the accuracy of the measurements, it is necessary to validate the results against actual turbidity measurements taken at different points in the water body. The validation can be done by comparing the predicted turbidity values with the actual measurements and evaluating the accuracy of the model using statistical metrics such as mean absolute error or root mean square error.

7. **Analysis and visualization:**

Random Forrest Regressor –

Random Forest Is A Famous Machine Learning Algorithm That Uses Supervised Learning Methods. You Can Apply It To Both Classification And Regression Problems. It Is Based On Ensemble Learning, Which Integrates Multiple Classifiers To Solve A Complex Issue And Increases The Model's Performance.

Classification algorithms in data science include logistic regression, support vector machines, naive Bayes classifiers, and decision trees. On the other hand, the random forest classifier is near the top of the classifier hierarchy.

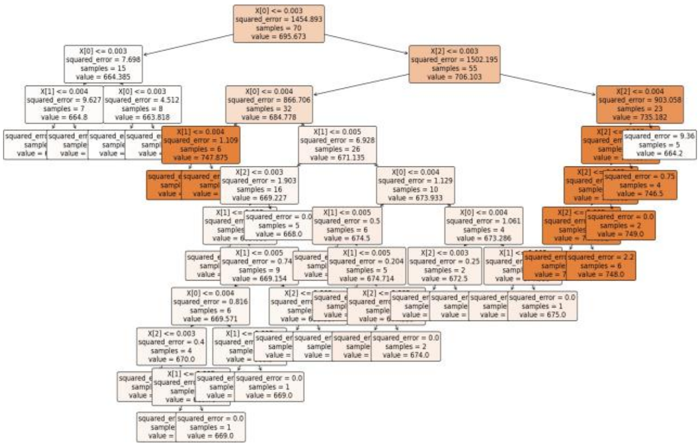
The following steps can be used to demonstrate the working process:

Step 1: Pick M data points at random from the training set.

Step 2: Create decision trees for your chosen data points (Subsets).

Step 3: Each decision tree will produce a result. Analyze it.

Step 4: For classification and regression, accordingly, the final output is based on Majority Voting or Averaging, accordingly.



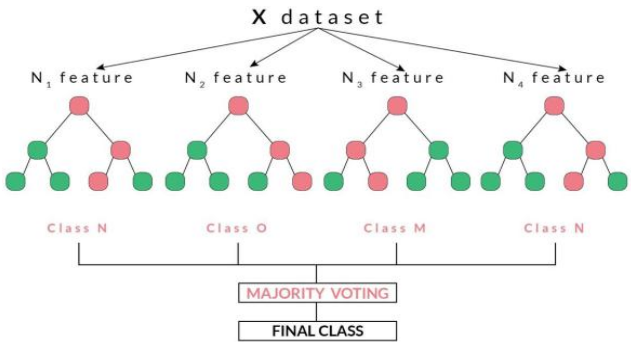
Multiple Linear Regression –

Regression models are used to describe relationships between variables by fitting a line to the observed data. Regression allows you to estimate how a dependent variable changes as the independent variable(s) change.

Multiple linear regression is used to estimate the relationship between two or more independent variables and one dependent variable. You can use multiple linear regression when you want to know:

How strong the relationship is between two or more independent variables and one dependent variable (e.g., how rainfall, temperature, and amount of fertilizer added affect crop growth).

The value of the dependent variable at a certain value of the independent variables (e.g., the

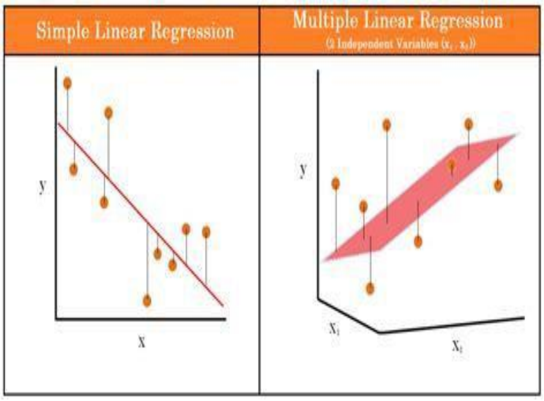


expected yield of a crop at certain levels of rainfall, temperature, and fertilizer addition).

yi=β0+β1xi1+β2xi2+...+βpxip+ϵw

Where:

- yi is the dependent or predicted variable
- β0 is the y-intercept, i.e., the value of y when both xi and x2 are 0.
- β1 and β2 are the regression coefficients representing the change in y relative to a one- unit change in xi1 and xi2, respectively.
- βp is the slope coefficient for each independent variable
- ϵ is the model's random error (residual) term



Once the measurements have been validated, the results can be analyzed and visualized using Google Earth Engine. This can be done by creating maps that show the turbidity levels at different points in the water body and by performing spatial analysis to identify areas of high or low turbidity.

Overall, the methodology for turbidity measurement using NIR digital cameras and Google Earth Engine involves a combination of image processing, statistical analysis, and machine learning techniques and can provide accurate and cost-effective measurements of turbidity in water bodies.

7. CONCLUSION

In this survey, we proposed system which implements the procedure of water turbidity detection utilizing the Random Forrest Regressor in a well-organized and structured manner. Finding turbidity in water requires Turbidity sensor and human intervention. This all can be avoided by using Digital cameras to find turbidity in water. This research concept might be expanded in the future to be executed using Smartphone cameras and without lab condition environment. It can also be used in the future to find Drinkable Water Quality using other IOT based products/sensors.

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