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# Estimation of Water Quality Parameters Using Regression Model with KNN and BPNN

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**Abstract**: In this paper, we are monitoring and estimating the pollutant typically on the spectral response or scattering of water reflections. In this present study we proposed a new method that to detect pollutants and we determine water quality parameters based on the theory of texture analysis. Here the GLCM(Gray Level of Co-occurrence Matrix)is used to estimate several texture Parameter-Contract, Correlation, Energy, Homogeneity there parameters are used for estimate a regression model with WQPs(Water Quality Parameters standard) the KNN & BPNN are used to generalize the water quality estimates of all segmented image. By using situ measurements & IKOMOS data, the results can be shows that texture parameters & remote sensing can monitor & predict the distribution of WQP in large rivers.

**Keywords:** Water parameters, KNN, BPNN, Texture

## I. INTRODUCTION

Data mining is the process of finding and analysing data and sifting through very large amount of data for particular information it user artificial intelligence technology, Neural networks advance statistical tools. it is named as KDD / Knowledge discovery in database and also it has several names data archaeology, business intelligence. Data mining is decision trees, nearest neighbor classification, neural networks, Rule induction, K-means clustering and it is an interdisciplinary subfield of computer science which involves computational process of large data sets. The main goal of this advanced analysis process it will extract the information from dataset and it will transform it into an proper structure for the future user. The data mining has major element. Extract transform & load transaction data into the data warehouse system it will store & manager the data in a multidimensional database system and it provider data access to business analysis & information technologist. The main use of remote sensing technique to monitor, manage and predict water quality parameters. The natural resource planning and distribution is a challenging task to decision makers of the establishment of been used and performed through the regression model. Here we focused on water quality and its distribution of variation analysis applying a neural network model with several parameters used.

PH - PH is an indicator of existence of biological life as most of them is measured and critical PH range. PH (puissance d hydrogen) strength of hydrogen. To determine the level of acidity & alkanity or basic (salt) PH level varies from in a range of 0 to14. The neural condition of PH is 7 which is pure water. While PH level decreases water becomes more acidic. If PH is decreases become 6 may increases the amount of mercury soluble in water and if PH is increase above 8.5 it enhance the conversion of non toxics ammonic. In present performance if PH level is more than 7 which determine the acidity level. If PH is lesser then 7 which determine the alkanity

TEMPRETURE- Temperature is a measure of the average energy of water modules it will be measured by a linear scale of degrees Celsius. Here overall water body temperature of a system is altered through the degree Celsius.

SALINITY: It is used to measure the salt in the water because the dissolved ions increase the salinity as well as conductivity. Here the time measurement is related. The salt in the sea water is primary sodium chloride (NACL). Such as the monolake has high salinity to a combination of dissolved ions including sodium, chloride, carbonate & sulphate. In water quality parameter we took mainly three parameter to measure the water quality. It will be charge ions. They are P04, N03, C03 these things are negatively charged ions.

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$PO_4$ (PHOSPHATE): It determine the phosphate it is an inorganic chemical and salt created form phosphorus acid. phosphoric is one of the main key element necessary for growth of plant. It is very toxic and is subject to bioaccumulation and phosphate PO4 exist is 3 form they are Ortho phosphate, met-pho sulfate Organically bound phosphate when the concentration of phosphorus becomes too high, problem such as algae blooms and loss of species diversity occurs.

$NO_3$: INORAGONIC NITRATE (NITRATE , NITROGEN) - Nitrate and nitrogen are naturally occurring ions they are part of nitrogen cycle nitrate is an compound that contains N03 ions and it carries a net charge of 1. The nitrate ions is a polyatomic ions its molecular mass in 62 grains it contains the compound act as nutrient in stream & river and sea water. It is essential for the plant growth in an aquatic eco system. when large amount of nitrogen are increased to stream the problem will occur that results will be exclusive algae growth. The nitrate reaction in fresh water can cause oxygen depletion even the aquatic organism depending on the oxygen in the stream

$CO_3$(CARBON TRIOXIDE) - This CO3 is an unstable oxide of carbon. There are three possible isometric of carbon dioxide with molecular symmetric point growth C3,D3n and C2v. Here this conductivity will vary water source.

## II. RELATED WORKS

| Name Of The Author | Year | Methods used |
|---|---|---|
| Heidtke , Asce | 1986 | Water Quality Management for the Great Lakes |
| George & Edward | 1987 | Water Quality Characterization, modelling, modification |
| Sarala , Ravi Babu | 1987 | Assessment of Groundwater Quality Parameters in and around Jawaharnaga |
| Jamie Bartram and Richard Balance | 1996 | Water Quality Monitoring |
| Smeti | 2009 | Treated water Quality assurance and description of distribution networks by multivariate chemo metrics |
| Sirilak , Siripun | 2009 | Water Quality Classification using Neural Networks |
| Changjun , Qinghua | 2009 | Evaluation of water quality using Grey Clustering |
| Xicheng | 2011 | Water Quality Evaluation of Surface Water Based on Back Propagation Neural Network |
| Connor | 2012 | A neural network approach to sensor for water quality monitoring |
| S.P.Gordge,M.V.Jadhav | 2013 | Assessment of Water Quality Parameters |
| Bruce Mitchell | | Water Quality analysis and parameters |
| Hussaina , maneb | 2013 | Comparison between Treated and Untreated water so as to study water treatment plant. |
| Devendra , Shriram | 2014 | Analysis of ground Water Quality Parameters |
| Pradhan , Mohsin | 2014 | Assessment of physico chemical Parameters |
| Sadaf Anis | 2015 | Present status of water quality and some specific parameters |
| Parwari , Sagar | 2015 | Assessment of Underground water Quality around Hadapsar region |
| Dr.Seema Tiwari | 2015 | Water Quality Parameters |
| S.P.Gordge,M.V.Jadhav | 2015 | Assessment of Water Quality Parameters |
| M.J.Parwari1, S.M.Gavande2 | 2015 | Assessment of Water Quality Parameters |
| Mohammad Haji , Assefa | 2015 | Comprehensive Review on Water Quality Parameters Estimation Using remote Sensing Techniques |

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## III. WATER QUALITY ANALYSIS

Here the extraction of water bodies is used in remote sensing image. Through the sensing image several techniques for the extraction of linear features of secured data. It is used to extract the image. We commonly used certain parameters to sense the water quality. Mainly we used PH, P04, N03, C03 parameters to valuating the water quality. The author parwari provided the comprehensive over view of water extraction from quality resolution satellite image. The water quality is censored through the image. Here we used 4 senor to monitor the water region then it will be sensed through the sensor by senor 1 to 4. Here we gives the input image to pre-processing the image with the sense. The water quality is sensed through the image view. GIS (Geographical information system) and ENVI(Environmental visualizing image) there are powerful tools for developing solution for remote sensing tools provide spatial and temporal view of surface water quality parameter that are not readily available from in situ measure these making it possible to monitor the landscape efficiently ,identity & qualifying water quality parameters & problems. Remote sensing of monitoring water quality has been developed an early empirical approach to estimate the suspect sediment general equations.

Y=A+B
Y denotes remote sensing measurement
X denotes water quality parameter
A & B empirical derived factor

Geographical information system is the most popular tool tp provide better information to know about the water resource problem for accessing water quality and determining water availability. Even there are number of spatial modelling technique available through (IDW) inverse distance weighted through this interpolation of the water sample value has been done.

## IV. METHODOLOGY

The proposed methodology contains the following process such as Insitu data, Ikonos data, Extraction of water image, Extraction of texture parameter and Regression model. The system architecture represented as figure 1.

**A. IN SITU Data** - In situ data measurement the data's user IMS(in situ monitoring stations) it will measures the water quality parameters such as PH,temperature,P04,C03,N03. These measurements are taken at fixed location. Each measure it tuple which commit of the time variance, measured parameter, measurement values. Here all parameters were done according to standard specifications'.

**B. IKONOS DATA -** IKONOS data was collect through the IKONOS images there are many types of satellites have the ability & potential for estimating WQPs. This is high resolution satellite and IKONOS imagery was used in this study to avoid spectral mixture, the part containing water has cut out of the images and then the maximum and its image and its classified with the supervised classification methods. In this high spectral, high spatial& high temporal resolution has been functioned with the spectral bandwidth. The sensor image has been generated with this IKONOS satellite view.

**C. EXTRACTION OF WATER IMAGE -** This extraction of water image has been generalized through GIS and ENVI GIS(Geographical information system) this used formulate with sensor medium each sensor has been learned and generalized with the water quality several techniques for the extraction of water quality which is remotely sensed data which is highly spatial resolution imaginary the main aim of this is used to find the extract the water area in the satellite image then it can supervised with the image functionality. GIS integration model contains 2 types such as Spatial and Attribute data. Spatial data it include Arc, view & shape and Attribute data it describes the sample points

**D. EXTRACTION OF TEXTURE PARAMETER -** In this texture parameter there are different approach used for texture analysis. Now we are using GLCM(Gray level co-occurrence matrix) it is statistical approach for examine the textures and spatial relationship of the pixel. This GLCM is used to calculate the pairs of pixel with particular specific values and spatial relationship GLIM provider second order method for generating texture feature to calculate the relationship between conditional join. Here in the approach we use several common statistical applied to co-occurrence such as Contract, Correlation, Energy and Homogeneity. Contract it is used to measure the local variation on the GLCM. Correlation it is used to measure the joint probability occurrence of the specified pixel pairs. Energy provides the sum of squared elements in the GLCM. also known uniformity or the angular second moment. Homogeneity measures the closeness of the distribution of the elements in the GLCM on the GLCM diagonal.

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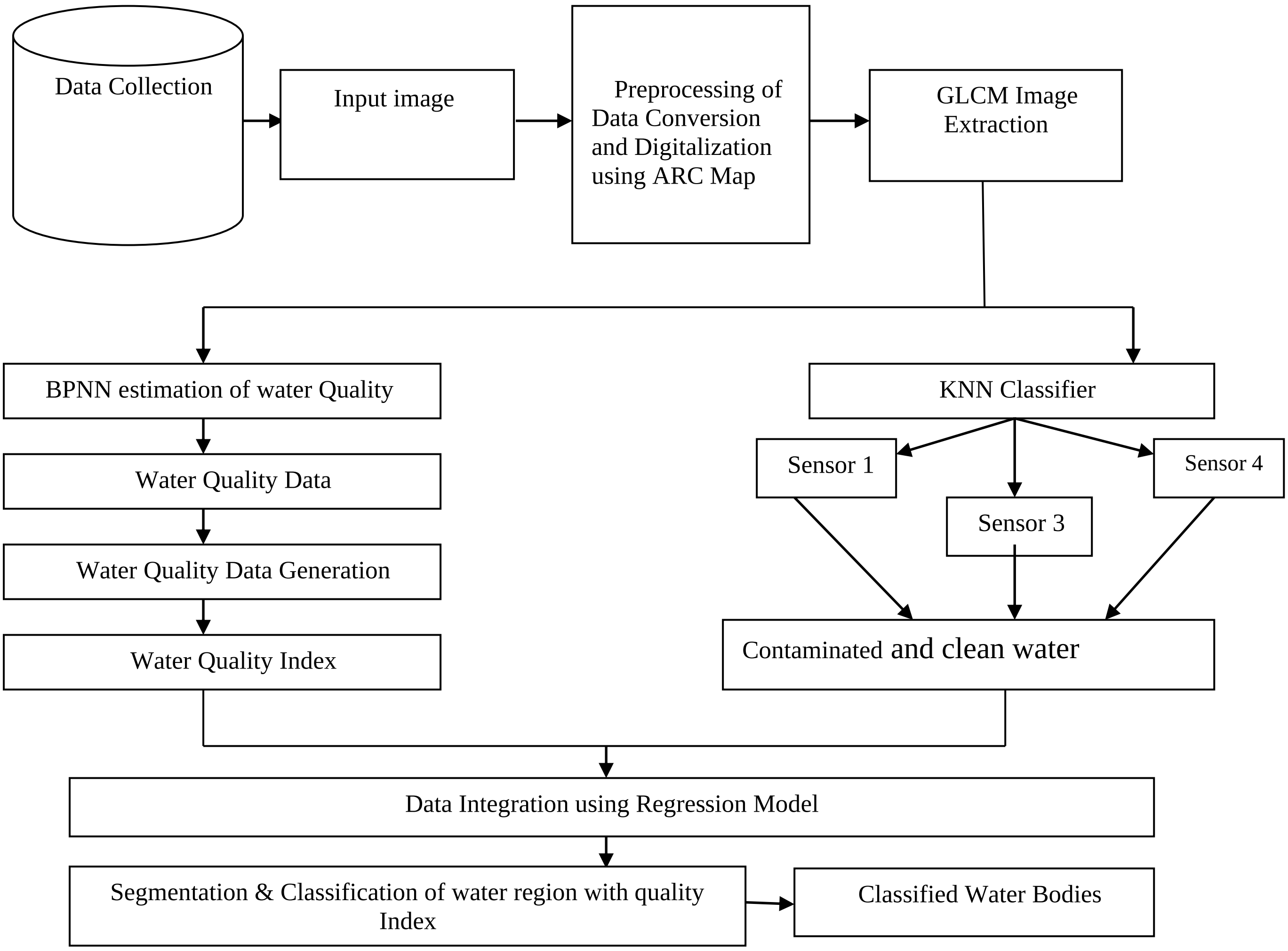


Figure-1 System Architecture

E. REGRESSION MODEL - In generally, empirical relationship between spectral properties of WQP is estimated through the empirical equation

$$Y=A+BX$$

Here this generates the image and water quality parameter and texture parameter values and conditions has been applied in this formula. This regression model is a numerical dataset. It is well known statistical technique that the data mining community utility. It develop a mathematical formula that fits the data. Whenever we product future behavior we must simply take a new data to regenerate. This regression in data mining technique is set the equation to a dataset with this ruled dataset we generate the values with formulated functions.

**BPNN** - Backpropagation is a widely used algorithm for training feedforward neural networks. It computes the gradient of the loss function with respect to the network weights. It is very efficient, rather than naively directly computing the gradient concerning each weight. This efficiency makes it possible to use gradient methods to train multi-layer networks and update weights to minimize loss; variants such as gradient descent or stochastic gradient descent are often used. The Backpropagation algorithm works by computing the gradient of the loss function with respect to each weight via the chain rule, computing the gradient layer by layer, and iterating backward from the last layer to avoid redundant computation of intermediate terms in the chain rule.

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**Backpropagation Algorithm:**

**Step 1:** Inputs X, arrive through the preconnected path.
**Step 2:** The input is modeled using true weights W. Weights are usually chosen randomly.
**Step 3:** Calculate the output of each neuron from the input layer to the hidden layer to the output layer.
**Step 4:** Calculate the error in the outputs
Backpropagation Error= Actual Output – Desired Output

**Step 5:** From the output layer, go back to the hidden layer to adjust the weights to reduce the error.
**Step 6:** Repeat the process until the desired output is achieved.

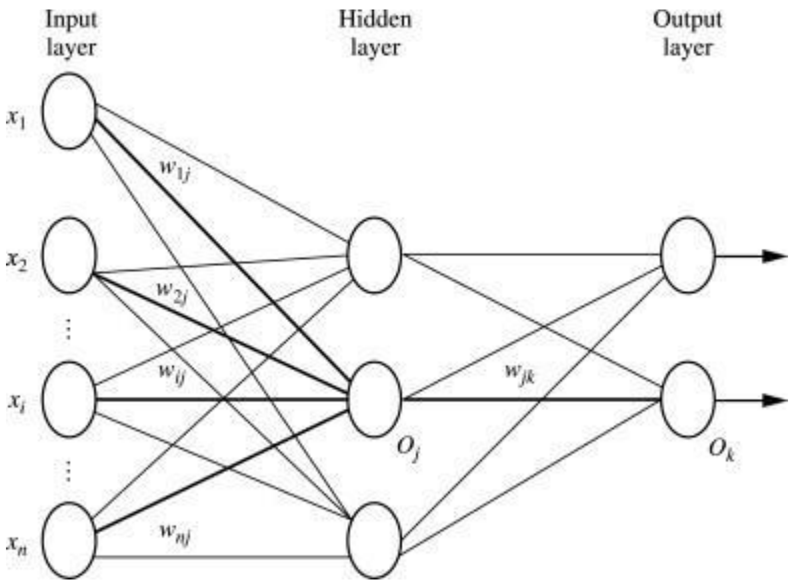


Figure 2 – Back Propagation

**Parameters :**

- x = inputs training vector $x=(x_1,x_2,\ldots\ldots\ldots\ldots x_n)$.
- t = target vector $t=(t_1,t_2\ldots\ldots\ldots\ldots t_n)$.
- $\delta_k$ = error at output unit.
- $\delta_j$ = error at hidden layer.
- $\alpha$ = learning rate.
- $V_{0j}$ = bias of hidden unit j.

**Training Algorithm :**

**Step 1:** Initialize weight to small random values.
**Step 2:** While the stepsstopping condition is to be false do step 3 to 10.
**Step 3:** For each training pair do step 4 to 9 (Feed-Forward).
**Step 4:** Each input unit receives the signal unit and transmitsthe signal $x_i$ signal to all the units.
**Step 5 :** Each hidden unit Zj (z=1 to a) sums its weighted input signal to calculate its net input

$$z_{inj} = v_{0j} + \Sigma x_i v_{ij} \quad (i=1 \text{ to } n)$$

Applying activation function $z_j = f(z_{inj})$ and sends this signals to all units in the layer about i.e output units
For each output l=unit $y_k$ = (k=1 to m) sums its weighted input signals.

$$y_{ink} = w_{0k} + \Sigma\, z_i w_{jk} \quad (j=1 \text{ to } a)$$

and applies its activation function to calculate the output signals.

$$y_k = f(y_{ink})$$

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**Backpropagation Error :**

**Step 6:** Each output unit $y_k$ (k=1 to n) receives a target pattern corresponding to an input pattern then error is calculated as:

$$\delta_k = ( t_k - y_k ) + y_{ink}$$

**Step 7:** Each hidden unit $Z_j$ (j=1 to a) sums its input from all units in the layer above

$$\delta_{inj} = \Sigma\ \delta_j\ w_{jk}$$

The error information term is calculated as :

$$\delta_j = \delta_{inj} + z_{inj}$$

**Updation of weight and bias :**

**Step 8:** Each output unit $y_k$ (k=1 to m) updates its bias and weight (j=1 to a). The weight correction term is given by :

$$\Delta\ w_{jk} = \alpha\ \delta_k\ z_j$$

and the bias correction term is given by $\Delta w_k = \alpha\ \delta_k.$

therefore $w_{jk(new)} = w_{jk(old)} + \Delta\ w_{jk}$

$$w_{0k(new)} = w_{ok(old)} + \Delta\ w_{ok}$$

for each hidden unit $z_j$ (j=1 to a) update its bias and weights (i=0 to n) the weight connection term

$$\Delta\ v_{ij} = \alpha\ \delta_j\ x_i$$

and the bias connection on term

$$\Delta\ v_{0j} = \alpha\ \delta_j$$

Therefore $v_{ij(new)} = v_{ij(old)} + \Delta v_{ij}$

$$v_{0j(new)} = v_{0j(old)} + \Delta v_{0j}$$

**Step 9:** Test the stopping condition. The stopping condition can be the minimization of error, number of epochs.

**KNN** - The K-Nearest Neighbor (KNN) algorithm is a popular machine learning technique used for classification and regression tasks. It relies on the idea that similar data points tend to have similar labels or values. During the training phase, the KNN algorithm stores the entire training dataset as a reference. When making predictions, it calculates the distance between the input data point and all the training examples, using a chosen distance metric such as Euclidean distance. Next, the algorithm identifies the K nearest neighbors to the input data point based on their distances. In the case of classification, the algorithm assigns the most common class label among the K neighbors as the predicted label for the input data point. For regression, it calculates the average or weighted average of the target values of the K neighbors to predict the value for the input data point. The KNN algorithm is straightforward and easy to understand, making it a popular choice in various domains. However, its performance can be affected by the choice of K and the distance metric, so careful parameter tuning is necessary for optimal results.

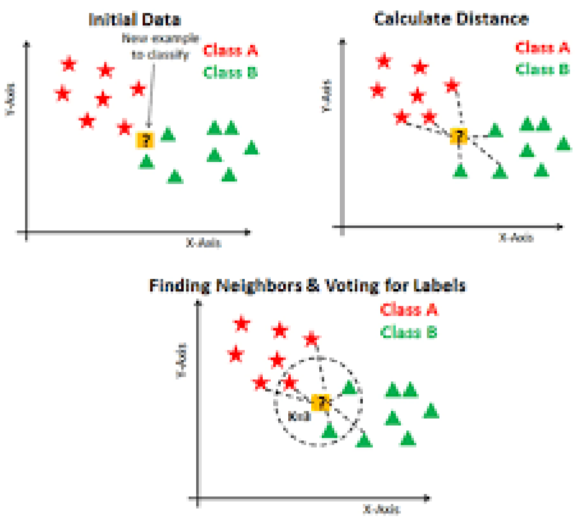


Figure 3 – KNN Algorithm

We can implement a KNN model by following the below steps:

1. Load the data

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2. Initialize the value of k

3. For getting the predicted class, iterate from 1 to total number of training data points

1. Calculate the distance between test data and each row of training dataset. Here we will use Euclidean distance as our distance metric since it's the most popular method. The other distance function or metrics that can be used are Manhattan distance, Minkowski distance, Chebyshev, cosine, etc. If there are categorical variables, hamming distance can be used.

2. Sort the calculated distances in ascending order based on distance values

3. Get top k rows from the sorted array

4. Get the most frequent class of these rows

5. Return the predicted class

## V. RESULTS

The following figure describes the execution results of our proposed system. The implementation work was carried out MATLAB software.

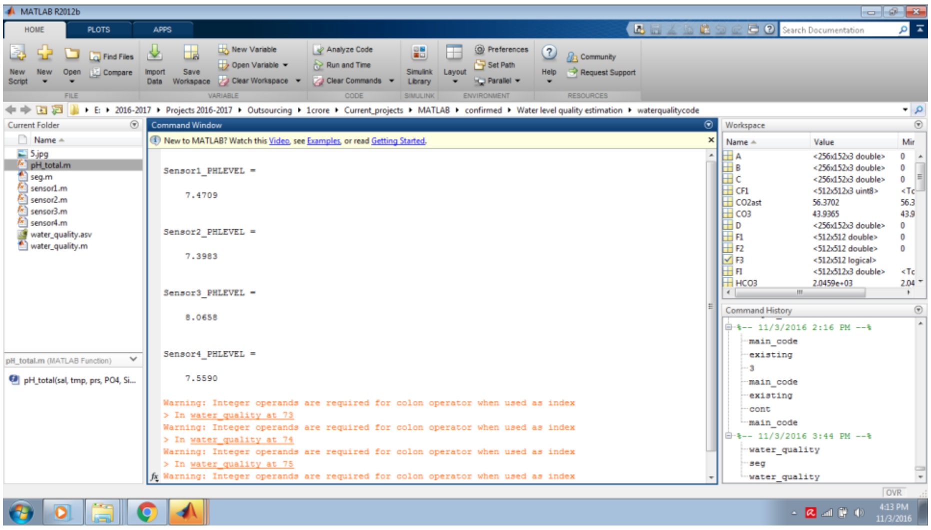


Figure-4 Extracted PH Values

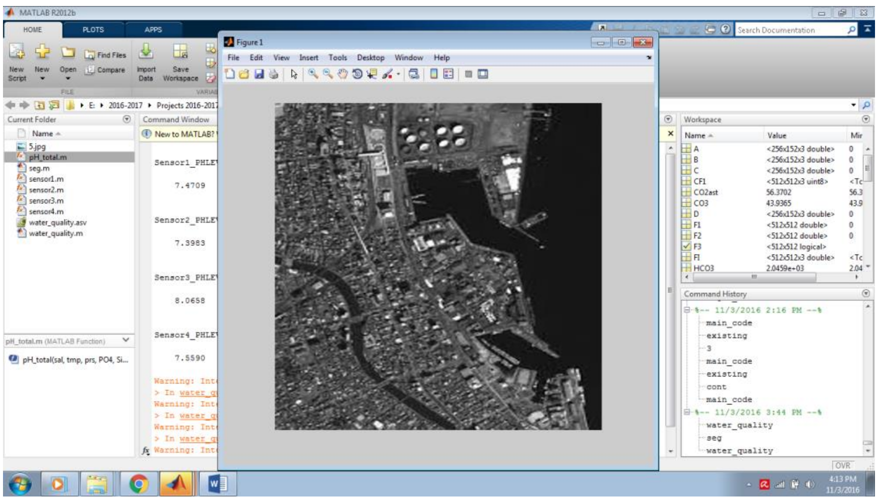


Figure-4 Input Image

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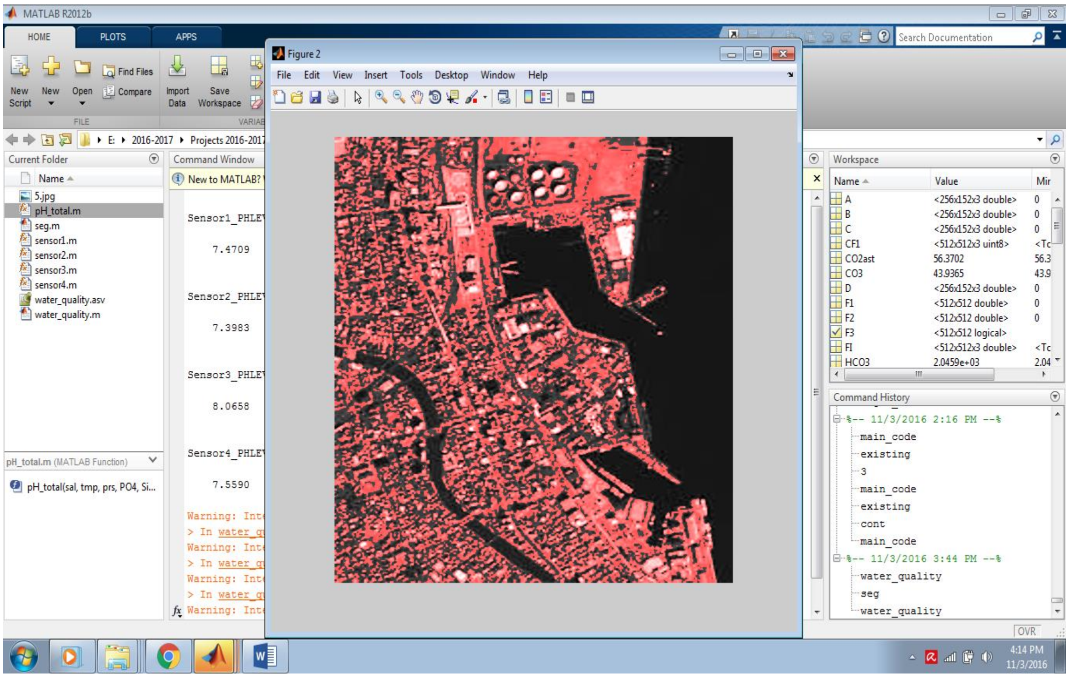


Figure-5 Preprocessing Image

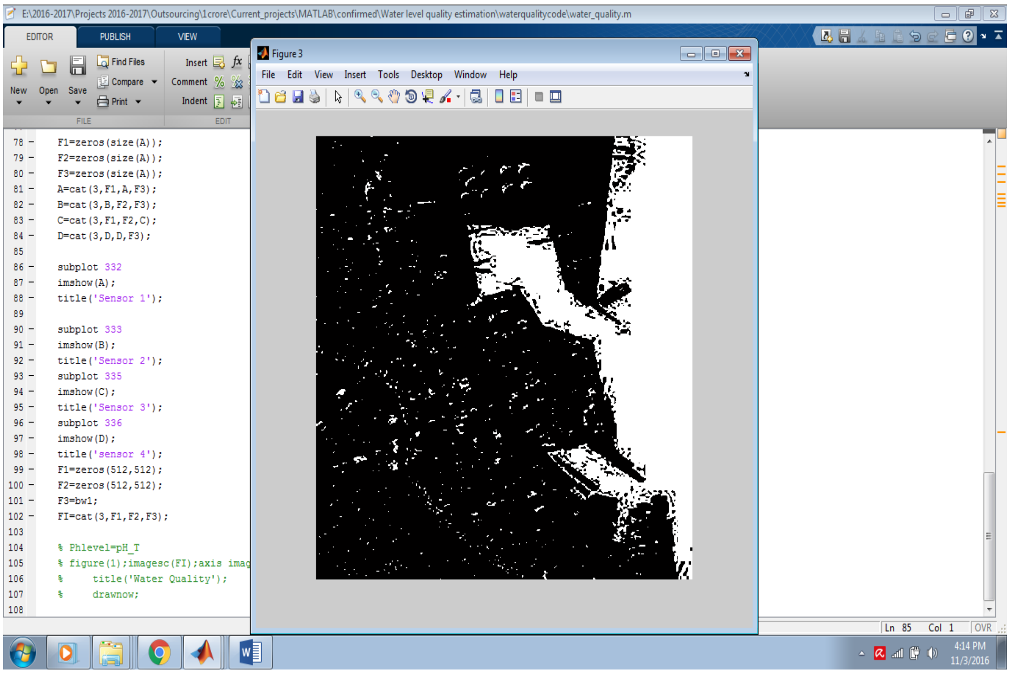


Figure-6 Segmented Image

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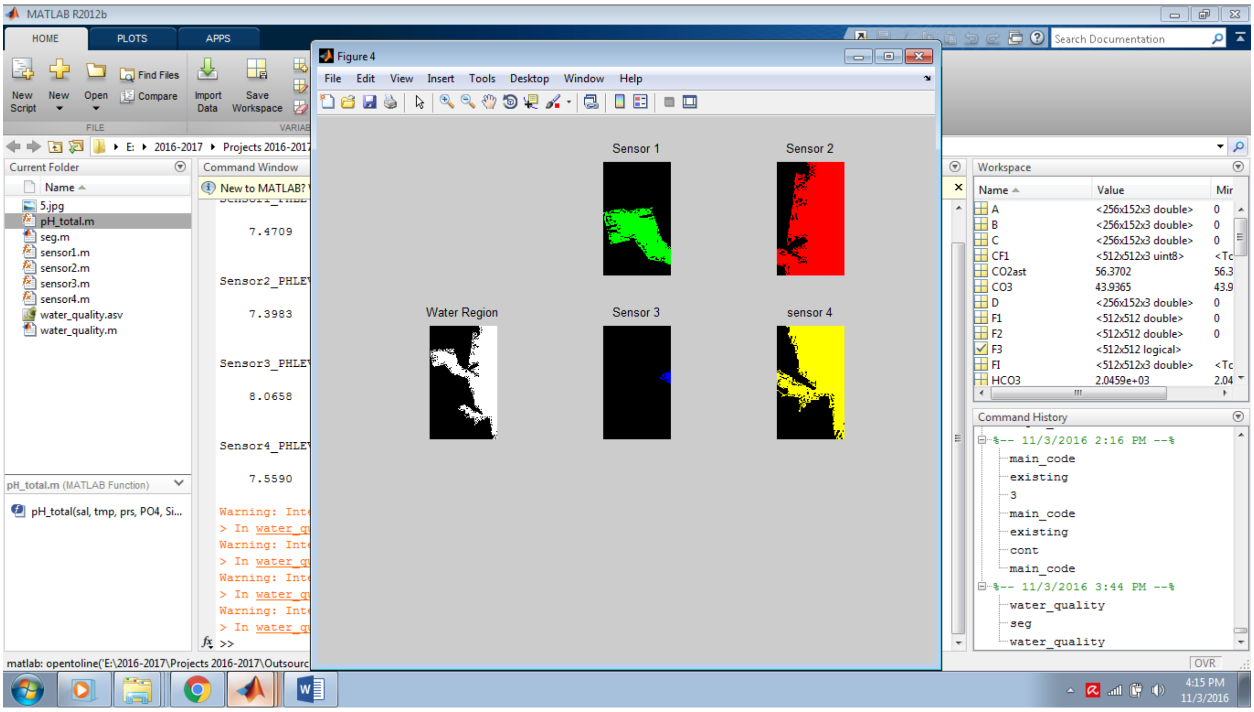


Figure-7 Sensor Image based on feature extraction

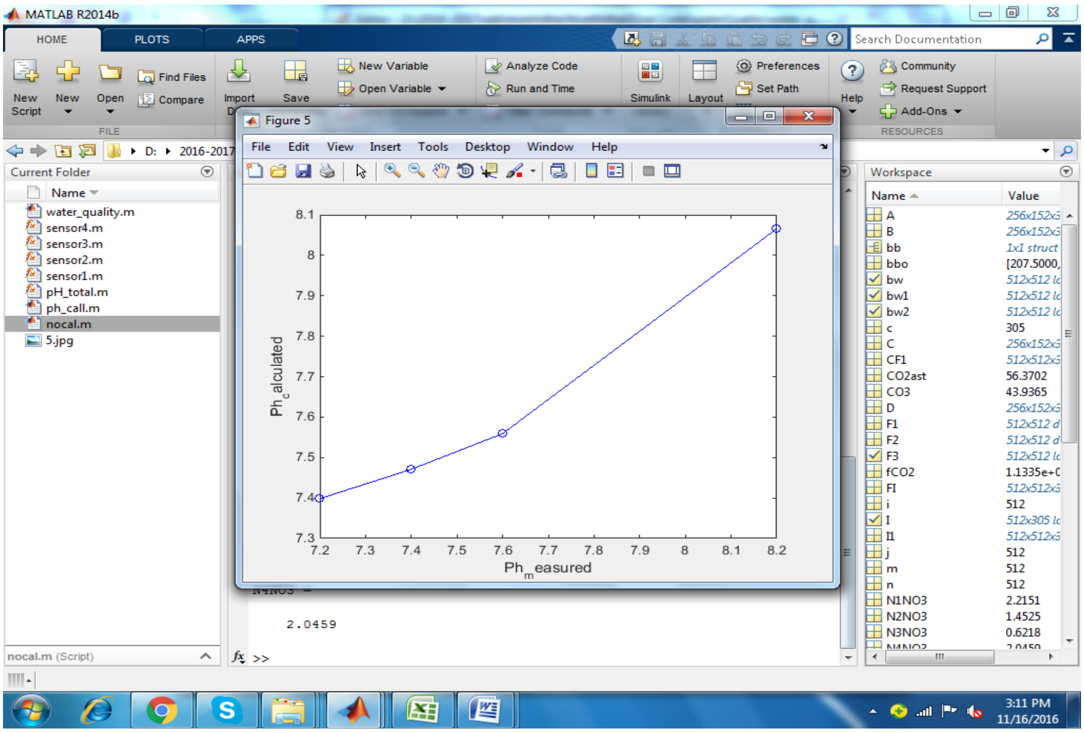


Figure-8 Obtained PH Values

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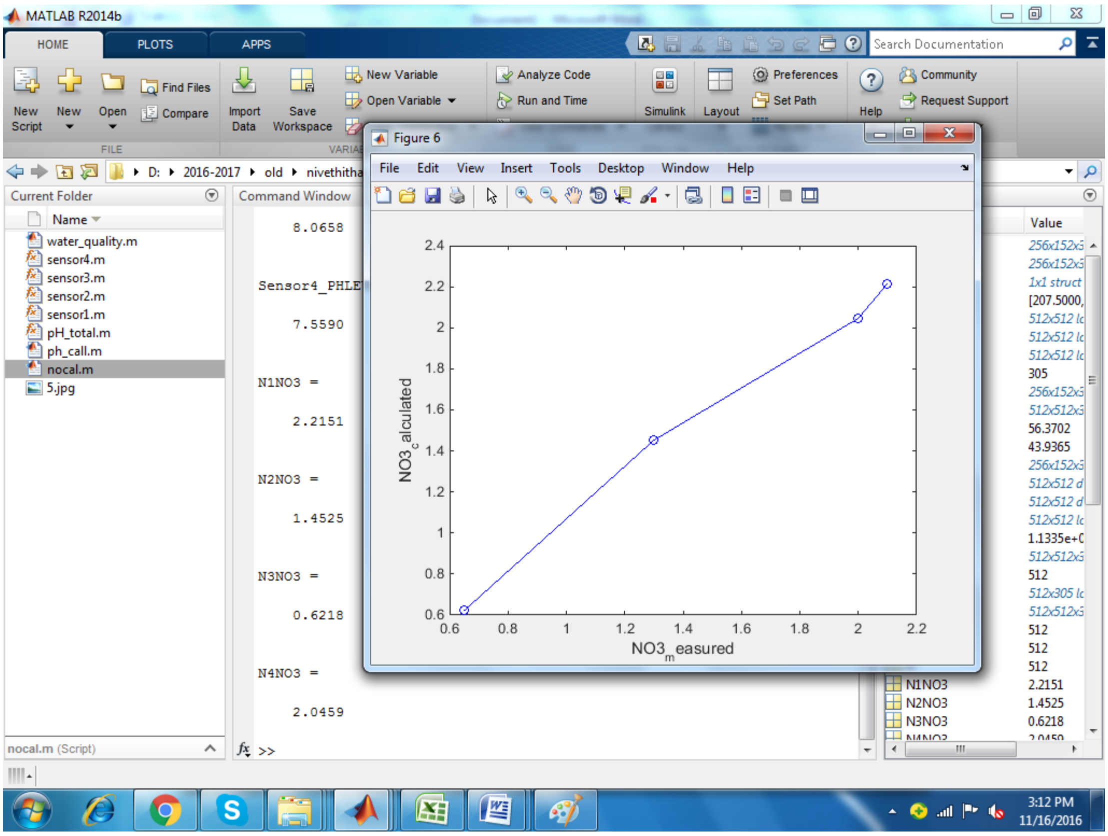


Figure-9 Obtained $NO_3$ Values

Table 2 – PH Values

| SAMPLES | pH Calculated | pH measured |
|---|---|---|
| **1** | 7.40 | 7.20 |
| **2** | 7.47 | 7.40 |
| **3** | 7.54 | 7.60 |
| **4** | 8.06 | 8.20 |

Table 2 – **$NO_3$**Values

| SAMPLES | $NO_3$ Calculated | $NO_3$ Measuerd |
|---|---|---|
| **1** | 0.60 | 0.63 |
| **2** | 1.4 | 1.30 |
| **3** | 2.00 | 2.00 |
| **4** | 2.20 | 2.10 |

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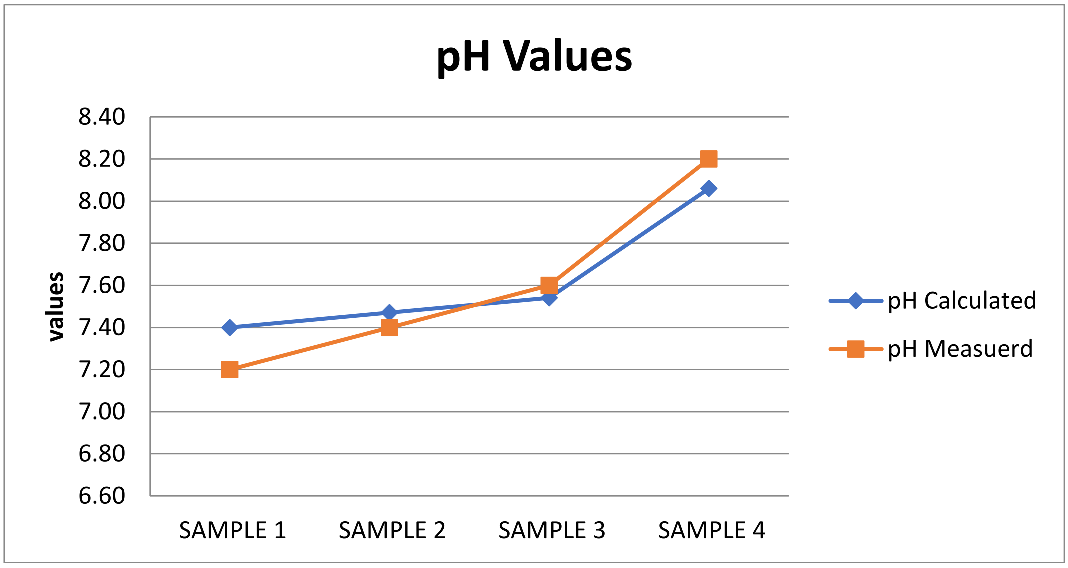


Figure 10 – Experimental results of pH

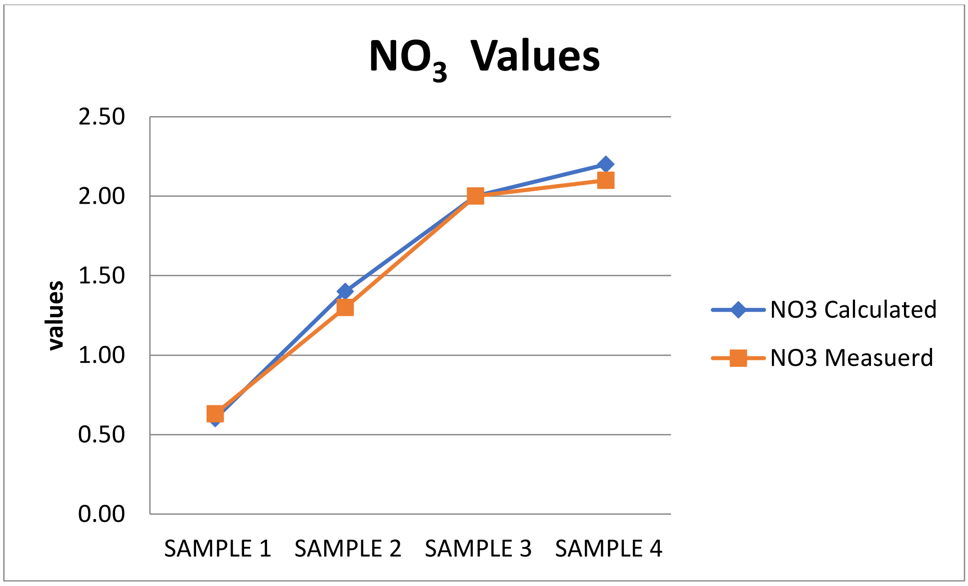


Figure 11 – Experimental results of $NO_3$

## CONCLUSION

In this paper, a modified BPNN with KNN is proposed to classify the water quality in the Haihe River in China. The new algorithm avoids the margin of the iteration not being calculated in some cases and improves the efficiency of data processing. Simulation results show that the algorithm can efficiently and reliably analyse the discrimination of water quality in the Haihe River and determine the most significant indexes that affect water quality. It improves the efficiency of data processing in Haihe River water quality testing, and provides a reliable scientific basis for water pollution control in the Haihe River. The algorithm can be applied not only to large data analysis and processing, but also provides some guidance for others area in the large data processing field.

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## REFERENCES

[1] Dr.Seema Tiwari, **"***Water Quality Parameters***"**, Sagar Iinstitute of Research and Technology, Bhopal, India, International Journal of Engineering Science Invention Research & Development

[2] S.P.Gordge,M.V.Jadhav, "*Assessment of Water Quality Parameters***",** S.P.C.O.E.M.R.,College of Engineering, Pune, University of Pune, Int. Journal of Engineering Research and Applications,ISSN : 2248-9622, Vol. 3, Issue 6, Nov-Dec 2013, pp.2029-2035.

[3] M.J.Pawari1, S.M.Gavande2*, "Assessment of Water Quality Parameters",* P.G.Scholar, Department of Civil Engineering, Anantrao pawar College of Engineering and Research, Parvati, Pune, Maharashtra, India , International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064 Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438 Volume 4 Issue 7, July 2015.

[4] Jamie Bartram and Richard Balance. (1996),"*Water Quality Monitoring*",United Nation Environmental Program & World Health Organization, 376p © 1996 UNEP/WHO ISBN 0 419 22320 7 (Hbk) 0 419 21730 4 (Pbk).

[5] George Tchobanoglous & Edward D Schroeder. (1987). "*Water quality: characterization,modeling, modification"*,706p,University of California.

[6] Sarala C, Ravi Babu P, " *Assessment of Groundwater Quality Parameters in and around Jawaharnaga",* Hyderabad, International Journal of Scientific and Research Publications, Volume 2, Issue 10, 2012, pp.1-6

[7] T. M. Heidtke, A. M. Asce and W. C T. M. Heidtke, A. M. Asce and W. C. Sonzogni ,"*Water Quality Management for the Great Lakes*", J. Water Resour. Plann. Manage. 112:48-63, 1986.

[8] M.J.Pawari& Prof. Sagar Gawande, "*Assessment of Underground water Quality around Hadapsar region in Pune*", Maharashtra., International Research Journal of Engineering and Technology (IRJET), Volume: 02Issue: 04| July-2015.

[9] Bruce Mitchell, "*Water quality analysis and parameters",* Department of Geography, University of Waterloo, Waterloo, Ontario N2L 3G1, Canada.

[10] S.Hussaina, V.Maneb, STakdea, A. Pathanc, M. Farooquic,"*Comparison between Treated and Untreated water so as to study water treatment plant of Ahmadpur Dist. Latur,"* International Journal of Modern Engineering Research (IJMER) www.ijmer.com, Vol.1, pp-564-569, ISSN: 2249-6645

[11] V. Pradhan, M. Mohsin, B. H. Gaikwad -"*Assessment of physico chemical parameters of Chilika Lake water*", International Journal of Research in Environmental Science and Technology, 2(4): 101-103, 2012.

[12] Devendra Dohare, Shriram Deshpande and Atul Kotiya,"*Analysis of Ground Water Quality Parameters",* CE-AMD, S.G.S.I.T.S. College, Indore, INDIA, S.G.S.I.T.S.College, Indore, INDIA , Regional Lab, M.P.P.C.B., Indore, INDIA,Research Journal of Engineering Sciences ,ISSN 2278 – 9472Vol. 3(5), 26-31, May(2014)

[13] Mohammad Haji Gholizadeh 1, Assefa M. Melesse 2,* and Lakshmi Reddi 1**"***A Comprehensive Review on Water Quality Parameters Estimation Using Remote Sensing Techniques"*,1 Department of Civil Engineering, Florida International University, Miami, FL 33174, USA;mhaji002@fiu.edu (M.H.G.); lreddi@fiu.edu (L.R.),2 Department of Earth and Environment, Florida International University, Miami, FL 33199, USA,Correspondence:

[14] E.M. Smeti, et al., "*Treated water quality assurance and description of distribution networks by multivariate chemometrics*," Water Research, vol. 43, no. 18, pp. 4676-4684, 2009.

[15] E. O'Connor, et al., "*A neural network approach to smarter sensor networks for water quality* monitoring," Sensors (Basel), vol. 12, no. 4, pp. 4605-4632, 2012.

[16] Sirilak Areerachakul and Siripun Sanguansintukul, "*Water* Quality *Classification using Neural Networks*": Case Study of Canals in Bangkok, Thailand, Institute of Electrical and Electronics Engineers, 2009.

[17] Changjun Zhu, Qinghua Liu, "*Evalution of water Quality using Grey Clustering*", Second International workshop on Knowledge Discovery and Data Mining, 2009.

[18] XUE Xicheng, CHEN Yan , "*Water Quality Evaluation of Surface Water Based on Back Propogation Neural Network*", 2011.

[19] Simin Li, Nannan Zhao, Zhennan Shi, Fengbing Tang, "Application of Artificial Neural Network on Water Quality Evaluation of Fuyang River in Handan City", 2010.

[20] Sadaf Anis Don and Nisar Shaikh,"*Present status of water quality and some specific parameter of gip railway dam and chikloli dam of ambernath ,district thane, Maharashtra*",department of zoology,G.M. momin womens college,bhiwandi,421302 District thane,Maharashtra ,india,Recived on;17.06.2015

[21] Wilcock R.J., Stevenson C.D. and Roberts C.A.(1981): "Water Research Analysis" vol 15,Part 3, , p 321.

[22] Manjare S. A., Vhanalakar S. A. and Muley D. V. (2010): "*Analysis of Water Quality Using Physico-Chemical Parameters*"Tamdalge Tank in Kolhapur District, Maharashtra, Vol 1, Issue 2: 115-119

[23] Farmaki, E.G., Thomaidis, N.S., Simeonov, "*A comparative chemometric study for water quality expertise of the Athenian water reservoirs"* Environmental Monitoring and AssessmentDecember 2012, Volume 184, Issue 12, pp 7635–7652

[24] Boyacıoğlu H, Gündogdu V, Boyacıoğlu H (2013) ,"*Investigation of priorities in water quality management based on correlations and variations*". Mar Pollut Bull 69(1–2):48–54. doi:10.1016/j.marpolbul.2013.01.010

DOI: 10.17148/IJARCCE.2023.12749

[25] Cox BA (2003), "*A review of currently available in-stream water-quality models and their applicability for simulating dissolved oxygen in lowland rivers*". Sci Total Environ 314–316:335–377

[26] Asheesh Shrivastava*, Shalini A Tandon,Rakesh Kumar" *Water Quality Management Plan for Patalganga River for Drinking Purpose and Human Health Safety*" National Environmental Engineering Research Institute, 89,B, Dr. A.B. Road, Worli, Mumbai –400 018, India,International Journal of Scientific Research in Environmental Sciences, 3(2), pp. 0071-0087, 2015.

[27] Liu Fu-Cheng and He Xue-Zhao, "*Application of Fuzzy c-means Clustering for assessing rural surface Water Quality in Lianyungang City*", Fifth conference of Measuring Technology and Mechatronics Automation, 2013.

[28] Jorge Camejo, Osvaldo Pacheco , Miguel Guevara, "*Classifier for Drinking Water Quality in Real Time*", Foundation for Science and Technology, IEEE, 2013.

[29] ElahehAghaarabi, FarzadAminravan, RehanSadiq, Mina Hoorfar, HomayounNajjarana and Manuel J. Rodriguez, "*A Fuzzy Rule-Based Approach for Water Quality Assessment in the Distribution Network*:, IEEE, 2013.