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# A Review:Classification Of Harmful Algae Using Artificial Intelligence Techniques

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***Abstract:*:** Bodies of freshwater go about as home for various sorts of living beings, including green growth. These green growth assume a vital part in noticing the climate they live in, including as a sign of water quality. Notwithstanding, these green growth can likewise hurt when something many refer to as an unsafe algal sprout happens. A destructive algal sprout happens when there is a quick expansion in the green growth populace making the freshwater conditions harmful. This will bring about the passing of fish and other organisms[1] as well as making drinking water extremely perilous for utilization. Accordingly, it is vital that the green growth living in collections of freshwater be perceived and named a guide for foreseeing unsafe algal blossoms. The review included fundamental stages associated with the system.They are image pre-processing, extraction of four type of harmful algae images, feature extraction, classification of Hemidiscus Wallich,,Ceratium furca, Prorocentrum micans , Gymnodinium catenatum., Four type of harmful algae. For classification neural classifiers in HISTOGRAM or Fast Fourier Transformed (FFT) and WHT are used. The main aim of the method is to develop harmful algae Image Classification which was developed to simulate biologist experience in the recognition of four type Harmful algae

***Index Terms* – Matlab, Neurosolutions, Images,microsoft excel.**

## I. INTRODUCTION

Plankton involves many varieties and has a big population which is in extensive distribution. It is an important marine biological resources and one of cores in the process of marine biological production [1]. Their dissemination of materials which is normal for quick refreshing, short life cycle and high energy change productivity assumes a vital part in essential creation control, energy material flow and recovery of biogenic components. As the most important biological group in marine ecological system, plankton community structure and diversity observation is of extremely important significance to marine ecological study, marine ecological disaster monitoring, ecosystem health evaluation and biological research output. With transition of marine science from ``investigation type" to ``observation type", marine in-situ observation platform which is not based on ship investigation has achieved a rapid development. It mainly includes the acoustics-based observation technology, molecular biological technology and optics-based observation technology [4]. Among them, the automatic counting and classification of plankton based on optical devices as well as the image analysis and pattern recognition technology under the assistance of computer and microscope by using experts' knowledge as the judgment criterion can observe algae parameters vividly and intuitively.

They can even identify different species. These advancements are a significant improvement bearing for order and Identification of green growth. This is the most achievable method for acknowledging microscopic fish acknowledgment as of now. Studies on marine plankton image recognition based on morphological difference started from the 1990s [5]. Abundant progresses have been achieved recently due to the technological development in image acquisition, image process and computer vision .

### 1.1Factors that may contribute to a bloom

Red tides contain thick centralizations of organic entities and show up as stained water, frequently ruddy brown in shading. It is a characteristic peculiarity, yet the specific reason or mix of variables that outcome in a red tide episode are not really known. In any case, three key elements are remembered to assume a significant part in a sprout - saltiness, temperature, and wind. Red tides actually hurt, so episodes are painstakingly checked. For instance, the Florida Fish and Wildlife Conservation Commission gives a forward-thinking status report on red tides in Florida. The Texas Parks and Wildlife Department likewise gives a status report. While no specific reason for red tides has been found, a wide range of variables can add to their presence. These variables can incorporate water contamination, which begins from sources like human sewage and horticultural spillover. There are different elements that have been related with the expansion in red tides, for example, climate, environmental change, and flowing examples, albeit the connection isn't exactly clear all the time. Red tide algal blossoms will quite often be more continuous throughout the late spring in light of the warm temperatures.

The event of red tides in certain areas seems, by all accounts, to be totally regular (algal sprouts are an occasional event coming about because of seaside upwelling, a characteristic aftereffect of the development of specific sea flows) while in others they give off an impression of being a consequence of expanded supplement contamination from human exercises. The development of marine phytoplankton is by and large restricted by the accessibility of nitrates and phosphates, which can be plentiful in agrarian run-off as well as waterfront upwelling zones. Waterfront water contamination delivered by people and efficient expansion in seawater temperature have likewise been embroiled as contributing variables in red tides. Different factors, for example, iron-rich residue deluge from huge desert regions, for example, the Sahara Desert are remembered to assume a significant part in causing red tides. A few algal blossoms on the Pacific Coast have likewise been connected to events of huge scope climatic motions like El Niño occasions. While red tides in the Gulf of Mexico have been happening since the hour of early travelers like Cabeza de Vaca, what starts these blossoms and how huge a job anthropogenic and normal elements play in their advancement is hazy. Whether the obvious expansion in recurrence and seriousness of algal sprouts in different areas of the planet is truth be told a genuine increment or is because of expanded perception exertion and advances in species distinguishing proof techniques is likewise discussed.

While the human contribution to the long-term increase in red tides is apparent, some researchers propose that climate change is also a factor, with more research still needed to claim it as a definitive cause. Increasing temperature, enhanced surface stratification, alteration of ocean currents, intensification or weakening of local nutrient upwelling, stimulation of photosynthesis by elevated $CO_2$, reduced calcification through ocean acidification, and heavy precipitation and storm events causing changes in land runoff and micronutrient availability may all produce contradictory species- or even strain-specific responses. In terms of harmful algal blooms (HABs), we can expect: (i) range expansion of warm-water species at the expense of cold-water species, which are driven poleward; (ii) species-specific changes in the abundance and seasonal window of growth of HAB taxa; (iii) earlier timing of peak production of some phytoplankton; and (iv) secondary effects for marine food webs, notably when individual zooplankton and fish grazers are differentially impacted by climate change. However, the potential consequences of these changes for HABs have received relatively little attention and are not well understood. Substantial research is needed to evaluate the direct and indirect associations between HABs, climate change, ocean acidification, and human health.

The algal images used in our proposed work were taken by the real-time algae imaging system from a stream of water siphoned directly from the ocean. All of the samples were labeled by biologic experts beforehand. Fig. 1 shows certain of the images.

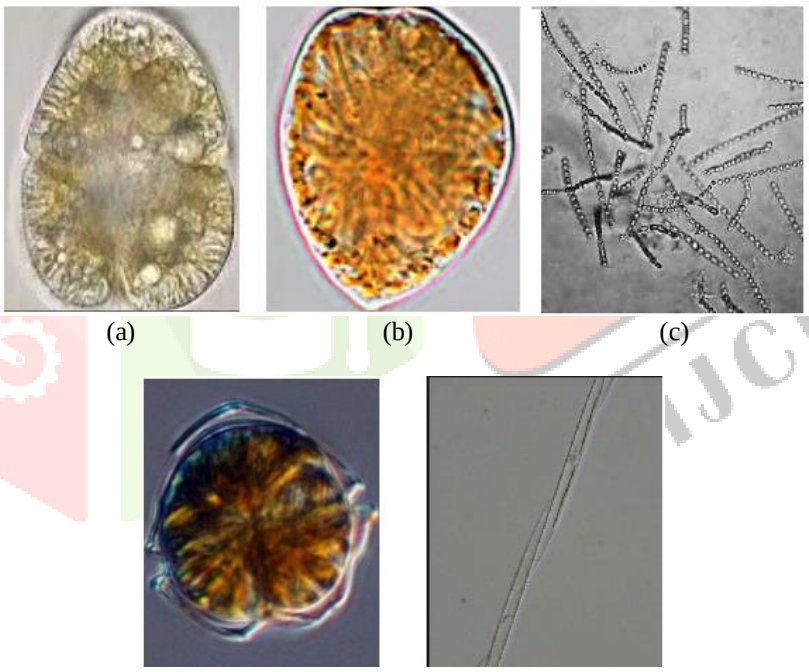


**Figure 1** a)gymnodinium sangnineum ,b)prorocentrum micans, c)skeletonema costatum, d)alexandrium costatum, and e) pseudo-nitzschia pun gens

## II.Literature Review:

Till date what is the status of the related research work has been stated as under.

QIAO XIAOYAN, topic Research on Imbalanced Microscopic Image Classification of Harmful Algae published in the year 2020 using the method Imbalanced classification, microscopic image recognition, multi-level features extraction research outcome with 81.35% accuracy. Paul R. Hill , Anurag Kumar, Marouane Temimi , and David R. Bul, HABNet: Machine Learning, Remote Sensing-Based Detection of Harmful Algal Blooms, published in the year 2020 by using the method Convolutional neural networks (CNNs), deeplearning, harmful algal blooms (HABs), long short-term memory (LSTMs), random forest (RF), support vector machine (SVM) with 91% accuracy.

JASON L. DEGLINT , CHAO JIN, ANGELA CHAO, AND ALEXANDER WONG, The Feasibility of Automated Identification of Six Algae Types Using Feed-Forward Neural Networks and Fluorescence-Based Spectral-Morphological Features published in the year 2018 by using the method Arti cial neural networks, feature extraction, uorescence, image classi cation, machine learning, multispectral imaging, optical microscopy, supervised learning, water conservation the outcome of research with accuracies of 95.7% 3.5% and 96.1% 1.5%.

Xiaogang Ouyang, Zhidong Jia, Shifang Yang, Xiaoguang Shang, Xilin Wang,Hao Chen, Daobang Zhou,Ruitong Liu, Influence of Algae Growth on the External Insulation Performance of HVDC Insulators published in the year 2018 by using the method Algae growth, External Insulation, HVDC insulators, hydrophobicity, partial surface conductivity, withstand capability the algae coverage rate was less than 20%. Ethan T. Daniels Benjamin D. McPheron , Ethan T. Daniels Benjamin D. McPheron, published in the year 2017 by using the method spectrophotometry and optical filtering with Specificity=89.7±6.84%.

Shuangxi Xie, Niandong Jiao*,Shuangxi Xie,Shuangxi Xie,Steve Tung , topic Novel Algae Guiding System to Robotize Algae Cells published in the year 2016 using the method algae cells; phototaxis; microrobot; bioactuation , in which 100 micron size cell were slowly poured into a chamber

Kyle Dannemiller, Kaveh Ahmadi and Ezzatollah Salari A New Method for the Segmentation of Algae Images Using Retinex and Support Vector Machine published in the year 2015 by using the method Retinex enhancement technique,support vector machine The detection rate of the proposed method is over 95%.

Kyle Dannemiller, Kaveh Ahmadi and Ezzatollah Salari on the topic A New Method for the Segmentation of Algae Images Using Retinex and Support Vector Machine published in the year 2015 by using the method the Retinex enhancement technique,SVM with 95% accuracy.

Kaiqiang Wang ,Wenjia Yin,Yu LiYuanze Xu on the topic Research on the system of algae concentration fluorescence measurement published in the year 2012 using the method algae concentrations; fluorescence measurement; logarithm division circuit with precision is 0.1 g/L. Yali Duan, Rongguo Su, Shuwei Xia, Shanshan Zhang, Cui Zhang, Xiulin Wang topic A Fluorescence Discrimination Technique for the Dominant Algae species Developed by Wavelet packet published in the year 2011 by using the method wavelet packet transform; feature spectra;norm spectra database; discrimination with 90% accuracy.

Liti Xu,Jiezhen Xie,Tao Jiang,Shaoping Zheng on the topic Red Tide Algae Classification Using SVM-SNP and Semi-supervised FCM published in the year 2010 by using the method SVM-SNP; fuzzy c-means (FCM) with 0.8214 accuracy. Jiang Tao, Wang Cheng,Wang Boliang ,Xie Jiezhen,Jiao Nianzhi, Luo Tingwei on the topic Real-time Red Tide Algae Recognition using SVM and SVDD published in the year 2010 by using the method support vector machine; feature Extraction having 90% accuracy.

## III. PROPOSED METHODOLOGY

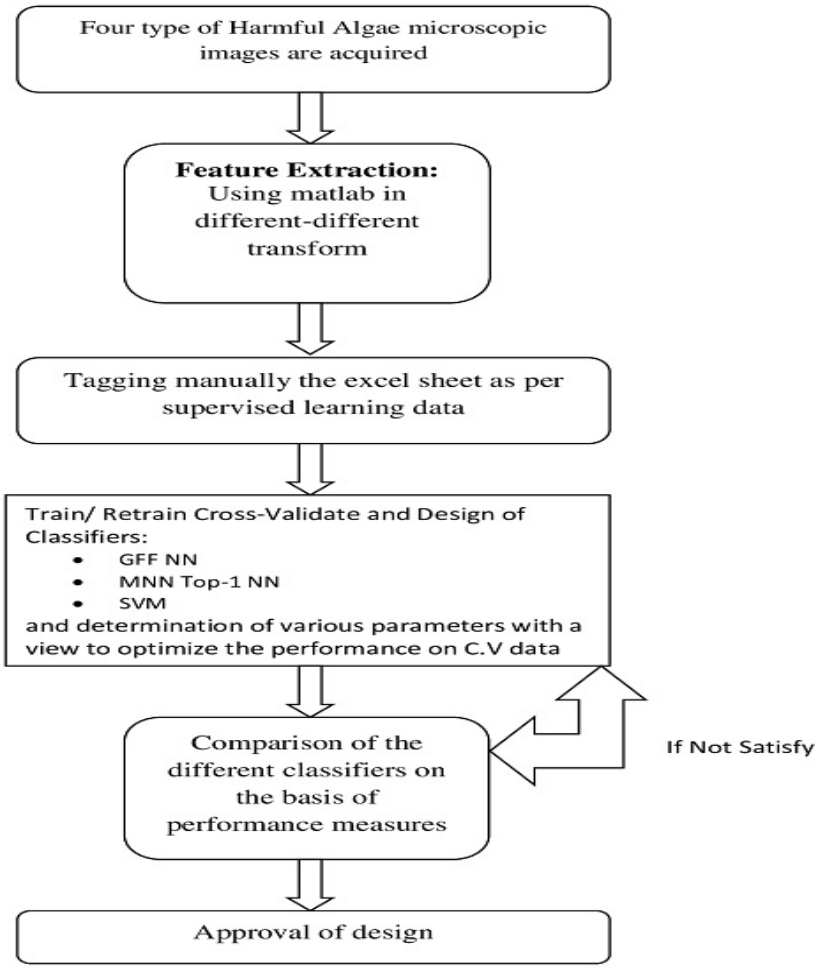


**Figure2:**Flow Chart

Computational Intelligence techniques include the following will established techniques.

i) Statistics

ii) Image processing

iii) Learning Machines such as neural network .

iv) Transformed domain techniques such as FFT, HISTOGRAM, WHT, etc.

For choice of suitable classifier following configuration will be investigated.

i) Support Vector Machine.

ii) Modular Neural network Topology One.

iii) Generalized Feed Forward Neural Network
For each of the architecture, following parameters are verified until the best performance is obtained.
i) Train-CV-Test data
ii) Variable split ratios
iii) Retraining at least five times with different random initialization of the connection
Weights in every training run.

iv) Possibility different learning algorithms Standard Back-Propagation, and learning rules such as Conjugate gradient, Quick propagation, Delta Bar Delta,Momentum

v) Number of hidden layers
vi) Number of processing elements of neurons in each hidden layer.
After regions training & retraining of the classifier, it is cross validated & tested on the basis of the following performance matrix.
i) Mean Square Error
ii) Normalized Mean Square Error
iii) Classification accuracy
iv) Sensitivity
v) Specificity
In order to carry out the proposed research work, Platforms/Software's such as Matlab, Neuro solutions, Microsoft Excel will be used.

**Research Objectives:**
i) To maintain the correctness & accuracy in four type of Harmful algae images Classification even though the input images are contaminated by known or unknown noise.
ii) To increase the classification accuracy for the Images of four type of Harmful algae.

**Implications:**
Use of the proposed optimal classifier based on Computational Intelligence techniques will be result in more accurate and reliable. Using our system will lead to biologist researches, which is useful for biology developments.

## IV. CONCLUSION

This paper demonstrated how to using artificial neural networks(ANN)could be used to build accurate Harmful algae image classifier and i am also try to achieved result more accurate and reliable.

## V. ACKNOWLEDGMENT

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