

Case Study: Detection of Micro Plastics using Machine Learning

Mr. Gautam M Lodha
SNJB'S SHHJB Polytechnic Chandwad, Nashik
Email: lodha.gmpoly@snjb.org

Abstract— Micro plastics pose a great threat to human health. These tiny plastics debris can enter our bodies through the water we drink, increase the risk of illness. They are also an environmental hazards found even in remote areas like polar ice Caps and deep ocean. To combat this problem we work on to detecting of micro plastics using machine learning & device which provide information about dust present in water in the form of micro plastic. To monitoring the presence of micro plastics in water and human bodies is important research to preserve healthy environment and can represent serious threat for biological organism including human body .To perceive and understand the level of micro plastics pollution Threats in the environment there is need to design and develop reliable methodologies and tool that can detect and classify the different types of microplastics. This paper represents result of our work related to exploration of method and technics useful for detecting suspicious object in their respective ecosystem captured images with the help of neural Network.

Index Terms—Micro plastics, machine learning, biological organism.

I. INTRODUCTION

Monitoring the presence of Micro plastics in Water & in human and animal habitats is important research theme due to need to preserve healthy ecosystem. Micro plastics Pollute the environmental and can represent a serious threat for biological organism including the human body. There is an increasing scholarly work about the presence and negative effect of microplastics on marine environment.so for a relatively small report can be found about the need for studying contamination sources, pollution characteristics and ecological impact of microplastics.

The novel liquid consist of three layers chistone, polyvinyl alcohol and polyaniline- intertwined together. most plastics are product of incomplete breakdown of household plastics & fibers. The main problem with microplastics detection because there are very small particles, we cannot see them as easy. first we check the PH level of water.

A. Scope, Aims & Objectives

At this stage this research is only concern about to exploring method of detecting the number of object along with there respective location in hyper spectral Image, whilst the classification of object applies the Neural Networks. Thus the main objective and outcome of this project is to find reliable method for

- Locating Object in image
- Classifying Object.

The proposed Neural Network based solution is to employ the supervised learning approach which needs data to be used as training samples. Even though there are other methods of training Neural Network models without data, such as the unsupervised learning approach, they still require some information about the application or scenario; in the unsupervised learning approach a way of observing a model or a system is required to adjust and learn, to reach the optimal solution. In this project's scenario it is unrealistic to have a model that simulate the way plastics react to light synthetically and accurately to the real world. Thus, the supervised learning approach was chosen

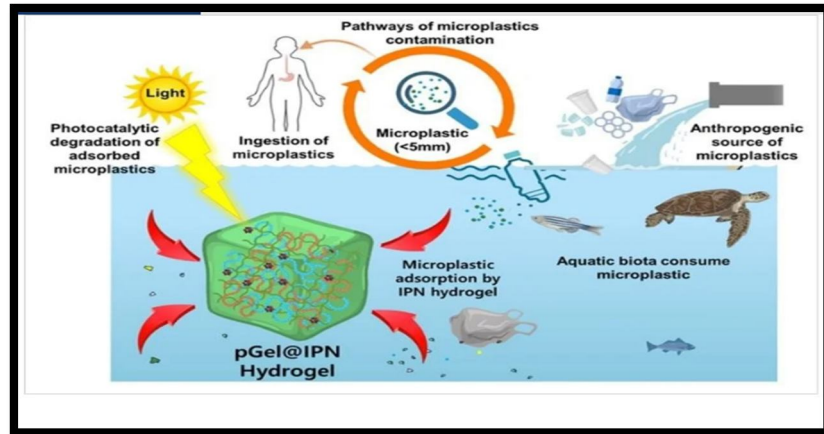


Figure 1

B. Problem Domain

This detecting micro plastics object from water is work of research from science & engineering technology we can define above domain in digital signal processing and information technology approach as we need some information about the object which is find inside water and we also design techniques to remove plastics from water.

C. Problem Statement

Design & Developing an software based application which detect micro plastics from water and remove from water. which will help to provide purified water to society to use.

II. METHODOLOGY

As early stated a data set required for training Neural network model . some creative thinking needed to implement this kind of project. In this dataset we have to use hyper spectral images of various object, and discarding requirement of having them be images of micro plastics The motivation was, that at this stage this research project is concerned about seeing if hyper spectral images can be used effectively in Neural Networks, to apply that in the field of micro plastics pollution research. In this research case, those samples can be considered as (suspicious contaminant) objects. The images have a size of 640 x 640 x 39, as in image high times image width times number of channels. The number of channels refer to different snapshot of the object in different wavelengths, ranging from 400-nm to 780-nm with a 10-nm increment. To prepare the data for training, a limited number of files (10), that contain the samples, were selected for the experiment

A Tools and Libraries

The following selection of software development environment and analytical tool were explored integrated and used in this solution

Python: domain language.

Tensor flow –GPU enabled library for building neural network

Matplotlib- graphing and plotting

Scikit-learn-used for the confusion matrix and shuffling data.

Scikit-image-used for finding the counters for object detection.

Panda-for data manipulation.

YOLO-(you only look once) python library for object detection

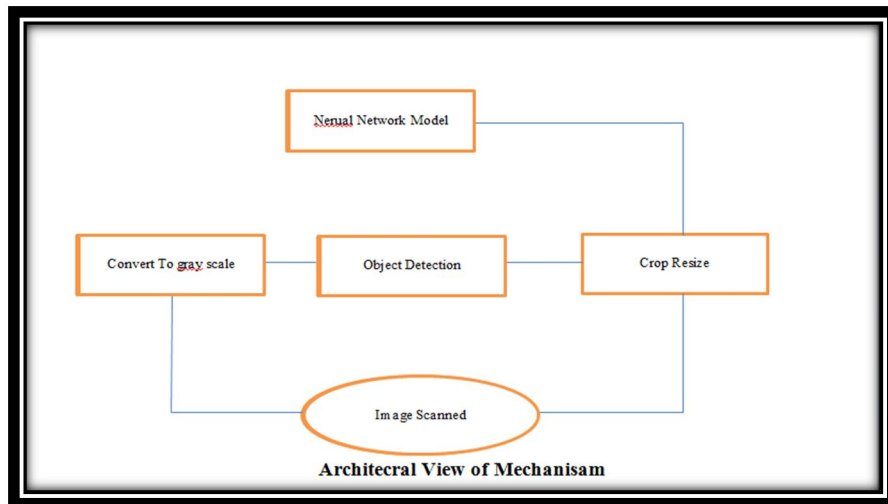


Figure 2

III. THE DESIGN AND IMPLEMENTATION OF MACHINE LEARNING SOLUTION

The Machine Learning system need to execute in the deployment state. It is assumed that when the system is deployed, its computing model is already trained. The deployed system executes the following steps:

- The objects/micro plastics are placed in a canvas
- A hyper spectral image is taken of the whole canvas
- One layer of the hyper spectral image is supplied to the Object Detector
- The locations of the objects are supplied to the “crop&Resize” module
- All the layers are supplied to the “crop&Resize” module
- Cropped and correctly resized hyperspectral images is supplied to the Neural Network model
- The Neural Network provides the prediction

A. Object Detection

Assume that grayscale image of object applying the find counter’s function from scikit-image, will yield what is shown in above architecture. The counter maximum and minimum values in both Y & X axis are calculated to construct in both axis.

Then calculated values are to be constructed with bounding box of the object. Then image is cropped and resize to fit in to specification.

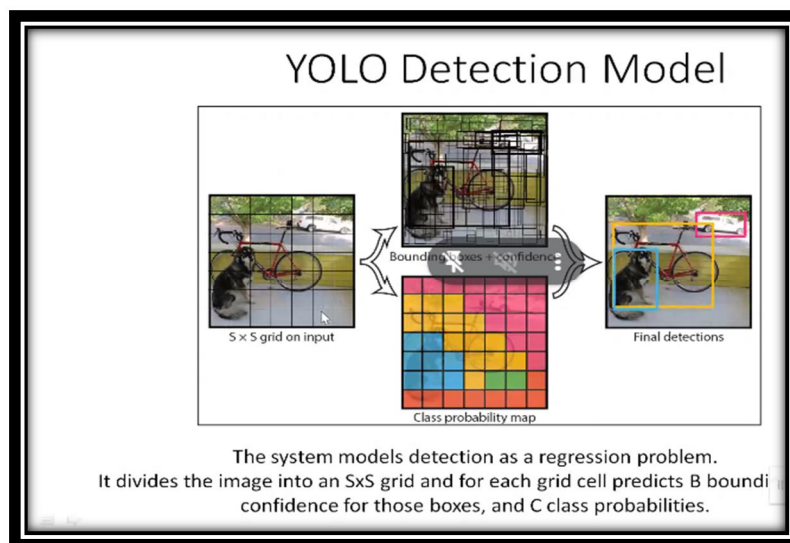


Figure 3

