

## Garbage Profiling – A Proposed System to rank localities based on waste segregation

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**Abstract**— To increase garbage processing and recycling, the Government implemented a Solid Waste Management Rule but it is not followed by some societies properly. And despite plastic ban plastic is used by some societies. To overcome above issues an app will be developed which take the image of garbage at garbage point and send it to the server for computation. In python, we incorporate the Machine Learning Module. Then by using convolutional a neural network technique, it will identify the garbage whether it is properly segregated or not and also how much amount of plastic is there in the garbage. Based on results we various communities will be rated. and notification will be sent to those communities who do not segregate their waste properly.

**Keywords**—Garbage Processing; Waste segregation; machine learning; convolutional neural network.

### I. INTRODUCTION

Garbage Profiling - a system to rank locality based on their waste segregation is a proposed system to profile the garbage at a collection point and is able to rate the community on basis of waste segregation practices and compliance to ban on plastics.it will help the government to keep track of how well a community is following Solid Waste Management(SWM).

The System will give a rating to the community, based on their waste segregation and plastic usage, currently waste segregation is done manually or by some mechanical machines like Trommel separator or trommel separator. By rating the community our system will force the community/individuals to segregate their waste in compliance with SWM act and reduce plastic usage so that waste disposal will be easier than before. The System will let the authorities know which community is not properly following SWM act so that a warning can be given to them. Objectives of the research are as follows:

The garbage profiling problem looks at capturing images of the garbage at local garbage collection points Analysing the same to create a rating for the community on the parameters of waste segregation and plastic usage.

It should is able to rate the community on basis of waste segregation practices and compliance to ban on plastics.

Based on the categorization, the algorithm has to be able to identify if the nearby communities are segregating the

waste based on the requirements of the solid waste management directive.

We have provided a literature survey on some significant papers in Section II. In Section III we depicted various level chart clarifying the framework usefulness with framework design. We demonstrated a Use Case graph entering the client's collaboration with the framework. Lastly, in Section IV we have provided results and discussion on our paper and Section V contains Future Scope for the advancement of our framework and conclusion of the study.

### II. RELATED WORK

Having smarter trash bins helps automatically sort waste on a large and small scale. Recycling of non- biodegradable waste is currently a manual job. The present-day process of recycling wastes requires various recycling facilities to handle garbage and use a combination of large filters and tools to separate out shape specific objects. Improving this process of recycling will help in improving the efficiency of the plant by reducing the wastage, and also in reducing the time consumed in sorting the waste. This will moreover increase the accuracy of the classification compared to that done by hand, and hence will be beneficial in both environmental and economic aspects. At present different machines like Trommel Separator etc are used to separate the waste into different categories. In our system

first, we need to classify the various object present in an image.

*Sergie et al.* put forward an innovative approach[1] to measure the similarities between various shapes and use the obtained result for recognising the object. The authors measure the similarity in their framework by solving for concurrence between points chosen on the two shapes considered and by using the conformity to put forth an aligning transform. To solve the symmetry problem, a descriptor is assigned as the shape context to each chosen point. The remaining points are captured relatively to the shape context at the reference point, which offers a unique differentiation characteristic. Corresponding points on two similar shapes will have identical dimensional contexts, hence solving for correspondences. According to the point concurrencies, the transfiguration that best coordinates the two shapes is figured out. Transformation maps are provided by regularised thin-plate splines.

Another approach which has been analysed was classification based on materials. *Ce Liu et al.* use the Bayesian Framework[2] for classification of the objects based on material recognition. The objects are identified into various material classes like glass, metal, fabric, etc. by processing the surface of a single image respectively. As it is a difficult task to find good, proper, reliable features that can differentiate materials into different categories compared to the traditional methods that are used for object recognition, the researchers used a set of low and mid-level features that are used to learn and obtain various aspects of material appearance. This paper puts forth an augmented Latent Dirichlet Allocation (ALDA) model to combine multiple features under a Bayesian framework to create an ideal combination of features.

At present different machines are used to separate the waste into different categories[3]. Few of them are

- Trommel separators/drum screens –Trommel separator contains a rotating drum perforated with holes in it. This separates wastes based on their sizes. When wastes are passed through the drum the particles with small size pass out through the holes and large particles stay in the drum.
- Eddy current separator - This system is designed for separation of various metallic materials in wastes. It puts into use an electromagnetic method, dividing the wastes into ferrous and non-ferrous metal categories
- Near Infrared Sensors (NIR) – This system uses the reflectance property as its parameter for distinguishing various waste materials, since different materials exhibit different reflective properties.
- Lastly, the manual method is the most widely used method for separating wastes. Here the wastes are segregated manually by hand.

### III. METHODOLOGY

The block diagram of Garbage Profiling - a system to rank locality based on their waste segregation is shown below in figure 7.1.

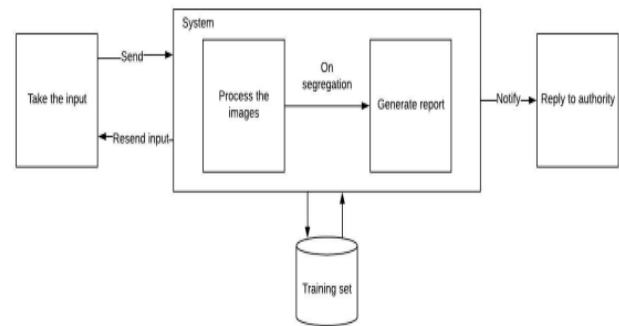


Figure 1. Block Diagram

As shown in the block diagram, different tasks of each entity of our proposed system are defined. For each entity, our proposed system has a different set of input and respective output for that input. The garbage collector provides input to the system. This input is given to the system if the input is acceptable the system accepts it else asks for another input.

The system processes the input using the training set based on the wet waste segregation. It detects the plastic amount in the input and generates the report.

The notification regarding the segregation of the waste is given to the head of the authorities. If the performance of the locality is bad then the locality is warned else the locality is praised. The head replies regarding the notification given to him to the authority.

#### *Proposed Algorithm:*

- Step 1: Start
- Step 2: Capture the image through the app and send it to the system.
- Step 3: If the image is blur then the system will tell to go to step 2 else go to step 3.
- Step 4: filter the captured image by using the median filter algorithm to remove noise or distortion. This is required to maintain the efficiency of output.
- Step 5: Detect the garbage in a picture using Viola- Jones Object Detection Framework.
- Step 6: Then garbage categories into wet waste, solid waste, biodegradable waste, and plastic waste.
- Step 7: store the thousands of data sets in the python server for comparing it with the objects detected during classification.
- Step 8: calculate the dimension of each wet waste object and at the end add all calculated dimension.
- Step 9: this calculation will allowing to rate the community. if the dimension area is more than that particular community fully disobey the rule and will rate them a high attention Society.

Step 10: Notification will be sent to the localities as per the reports generated.

Step 11: Stop.

#### Classification using CNN:

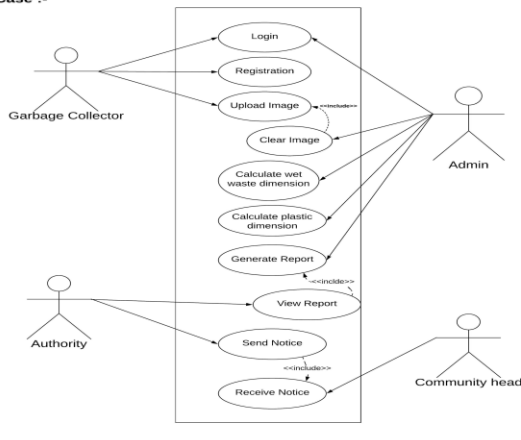
Computational models of neural networks have been around for a long time, the first model proposed was by McCulloch and Pitts as in [4]. Neural networks are made up of a number of layers with each layer connected to the other layers forming the network. A feed-forward neural network or FFNN can be thought of in terms of neural activation and the strength of the connections between each pair of neurons [5] In FFNN, the neurons are connected in a directed way having a clear start and stop place i.e., the input layer and the output layer. The layer between these two layers, is called the hidden layers. Learning occurs through adjustment of weights and the aim is to try and minimize error between the output obtained from the output layer and the input that goes into the input layer. The weights are adjusted by the process of backpropagation (in which the partial derivative of the error with respect to the last layer of weights is calculated). The process of weight adjustment is repeated in a recursive manner until weight layer connected to the input layer is updated.

Convolutional Neural Networks (CNN) is variants of Multi-Layer Perceptron (MLPs) which are inspired from biology. These filters are local in input space and are thus better suited to exploit the strong spatially local correlation present in natural images [6]. Convolutional neural networks are designed to process two-dimensional (2-D) image [7].

#### Use-Case Diagram

A use case diagram at its simplest is a representation of a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved. A use case diagram can identify the different types of users of a system and the different use cases and will often be accompanied by other types of diagrams as well.

Use Case :-



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Figure 2. Use-Case Diagram

#### Admin

The admin maintains the working of the system. All the functionalities are handled by the admin. If any kind of error occurs the admin handles it. It adds a new garbage collector to the system and also sends the report to the authority.

#### Garbage collector

The garbage is the actual user of the application it clicks the pictures of the garbage and uploads it to the server. If the picture is blur the operation is repeated.

#### Authorities

The authorities analyse the result and send it to the required personnel as a sign of warning.

## IV. RESULT AND DISCUSSION

The Garbage Profiling system looks at capturing images of the garbage at local garbage collection points and analysing the same to create a rating for the community on the parameters of waste segregation and plastic usage. This analysis could be used to create feedback for the civic bodies to understand or identify communities where they need to take action to make sure this change is brought into action.

It will also help in the reduction of usage of non-recyclable plastics on which the government has imposed a ban. Yet they are available and being used. It will help to eradicate those issues.

## V. CONCLUSION AND FUTURE SCOPE

Various steps and methods for efficient waste management and disposal have already been researched and carried out by many researchers and research enthusiasts. Many devices have also been designed in order to carry on this process efficiently. Hardware components such as raspberry pi have been used along with various algorithms to achieve the goal. Images of objects are scanned using the device in order to classify them accordingly. But a major shortcoming of such devices is that all these devices work with maximum accuracy only on images containing single objects to be recognised and classified. Convolution Neural Networks is considered to play a very important role in the process of object recognition and classification, and can be said to be the major step towards the development of such methods.

In the future, we can use a large dataset that will result in higher accuracy. We can make use of multiple GPUs to increase computational speed.

## REFERENCES

- [1] S. Belongie, J.Malik, and J.Puzicha. Shape matching and object recognition using shape context. TPAMI, 24(4):509-522, 2002. , IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE, VOL. 24, APRIL 2002
- [2] c.Liu, L. Sharan, E. H. Adelson, and R. Rosenholtz, "Exploring features in a Bayesian framework for material recognition," in

- Computer Vision and Pattern (CVPR), 2010 IEEE Conference on. IEEE, 2010, pp. 239-1105.
- [3] C. Capel, "Waste sorting - a look at the separation and sorting techniques in today's European market," Waste Management World, 2008.
- [4] McCulloch, Warren; Walter Pitts, "A Logical Calculus of immanent Ideas in Nervous Activity", Bulletin of Mathematical Biophysics 5 (4): 115-133(1943)
- [5] An introduction to convolutional neural networks [Online]available at:[http://white.stanford.edu/teach/index.php/An\\_Introduction\\_to\\_Convolutional\\_Neural\\_Networks](http://white.stanford.edu/teach/index.php/An_Introduction_to_Convolutional_Neural_Networks)
- [6] Hubel, D. and Wiesel, T. (1968). Receptive fields and functional architecture of monkey striate cortex. Journal of Physiology (London), 195, 215-243. J. Kaufman, Rocky Mountain Research Laboratories, Boulder, Colo., personal communication, 1992. (Personal communication)
- [7] Yann LeCun, Leon Bottou, Yodhua Bengio, and Patrick Haffner, "Gradient-Based Learning Applied to Document Recognition", Proc. Of IEEE, November 1998.

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