



## Design a New Classification Algorithm for Solid Waste Management

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**Abstract:** India is a developing country. Due to industrialization, urbanization and financial development, huge amount of municipal solid waste (MSW) has been recorded last many decades. Sustainable solid waste management is a very serious problem for governments. Improper waste management directly affected not only environment but also human beings. Our government is making the new policies and introduces many new advanced tools and techniques for improve the quality of solid waste management process. All of these efforts are improve the quality of municipal solid waste management process very effectively. Now , the collaboration with other field like computer science, artificial intelligence, machine learning will also very helpful for solving the municipal solid waste management problems. With the help of data mining or machine learning techniques, they have a large number of advanced algorithms and techniques which can be very useful for manage or handle the waste management problem very easily and they are also help of making the new policies for handling the wastes. This paper describe a new generic approach for classification of the different types of solid waste.

**Keywords:** Municipal Solid Waste Management, Forecasting, Regression analysis, Machine learning, Python Municipal Solid Waste etc.

### 1. Introduction

Madhya Pradesh is a state in central India. Madhya Pradesh is the second largest Indian state by area and the fifth largest state by population with over 72 million residents. Madhya Pradesh, was able to achieve the title due to various initiatives undertaken by the state government focusing on waste management like door-to-door garbage collection, waste segregation, recycling, and composting. [1]The state became the first in the country to achieve 100 per cent door-to-door garbage collection in all of its 378 urban local bodies (ULBs) in February 2018. In October 2017, with the construction of 4.80 lakh household toilets, Madhya Pradesh declared all its ULBs as open defecation free (ODF). [2]

The cluster-based integrated Solid Waste Management model adopted by the state is working in 7

clusters and in various stages of implementation. This covers a total of 110 urban local bodies (ULB).[3] Out of these 7 clusters, 4 clusters are waste to compost (Sagar, Katni, Chhatarpur and Singrauli) and 3 clusters are waste to energy (Jabalpur, Rewa and Gwalior).The Urban Administration Department has reviewed and discussed the various feasible options with the sector experts and is rethinking to adopt the mixed approach of cluster based 'Integrated Solid Waste Management' (ISWM) model with 'Decentralized Solid Waste Management' (SWM) projects in remaining 268 ULBs. [4]

The mixed approach would help Madhya Pradesh to ensure effective implementation of SWM Rules, 2016 across all the ULBs. Decentralized solid waste management model with processing facilities at ULB level is already working in Ujjain city which has a waste to compost facility for processing 190 tonnes per day (TPD) of waste, Our honorable Prime Minister Shri Narendra Modi launch a Swachh Bharat Abhiyan or Swachh Bharat

Mission is a national movement in 2014. The main aim of this mission to clean India's urban and rural areas such as roads, streets etc.[3] The objective of SBA include decreasing open defecation through the creation of household and community owned toilets and launching a responsible monitoring system to view all of these process. Waste management is one of a major challenge for India. Due to huge population the waste generation rate increase very rapidly[5].

A well solid waste treatment system include not only the proper collection of waste but also well dispose of this waste through available advanced technologies. In urban and rural areas of our state, absence of a proper sustainable solid waste management causes many ecological problems. The difficulty of issues involved in MSWM require design, enlargement and application of new analytical tools, which is capable to analyze data inputs of varying formats, mathematical models and expert opinions in multi-criteria objective decision making situation[6].

With the collaboration of advanced data mining techniques we can easily increase the productivity of solid waste management process. Through this research, with the help of advanced regression model we can forecast various solid wastes with quantity very easily. With the help of this research government or organizations make their policies for a sustainable solid waste management of our Madhya Pradesh state. India is a developing country. Due to industrialization, urbanization and financial development, huge amount of municipal solid waste (MSW) has been recorded last many decades. MSW generation, as far as kg/capita/day, has indicated a positive co-relations with economic and social level at world scale. Because of quick industrial development and movement of individuals from towns to urban areas, the urban populace is increase very quickly[7]. Solid waste generation has been seen to increment yearly with respect to the ascent in populace and urbanization. The per capita generation of MSW has additionally expanded colossally with improved way of life and societal position of the populaces in urban focuses [8]. As more land is required for removal of these municipal solid waste, issues identified with removal have become exceptionally challenging . India, with a populace of over 1.31 billion is equal to more than 17.5% of the total population of the world (Census of India2011). India has 475 Urban Agglomerations (UA), three of which has populace more than 10 million. The high pace of urbanization combined with ill-advised arranging and poor monetary condition has made MSW the executives in Indian urban areas an enormous errand[9].

Generally in India, MSW is disposed in low-lying zones without using proper provisions. Along these lines, MSWM is one of the main environmental issues of every urban area of our country. SWM process activities includes collection and transport, treatment and proper disposal of solid wastes. In India, the MSWM framework only focus of above four activities. Old waste collection techniques and insufficient transportation causes the growth of MSW at each niche and corner. The proper treatment of MSW is not an easy task because of the inaccessibility of reasonable facilities to treat and discard the vast amount of MSW produced day by day in metropolitan urban areas. Unfriendly effect on all segments of the earth and human health happens because of informal disposal of MSW[8]. A well MSWM enclosed the planning, arranging, designing, association, organization, financial and legitimate parts of exercises related with generation, storage, collection, transport, processing and disposal in a naturally good way receiving standards of economy, feel, energy-conservation and opportunities[10].

The management of MSW requires appropriate framework, support and overall monitoring of all activities. This turns out to be progressively costly and complex because of the continual and unplanned development of urban areas. The troubles in providing the desired level of public service help in the urban focuses are frequently credited to the poor monetary status of the overseeing metropolitan enterprises[11]. In the current research, an endeavor has been made to give a far reaching survey of the pattern of the MSW segments during most recent four decades and furthermore the estimated MSW segments pattern, in India, to assess the current and anticipated future status for distinguishing the issues of MSWM in significant Indian urban areas. This research presents a new approach using regression modeling for the prediction of most usable municipal solid waste treatment methods based on a set of specific data samples. The possible outcomes of this research clearly direct a new prediction approach which is cover all relevant components using statistical and polynomial regression analysis[1].

#### **Importance of Machine learning in Data analysis**

Data Science is a perception in which researchers or scientists utilize all possible resources to get pivotal data from the collected data sets or information[13]. The analyst done this work with the help of statistics and domain expertise to get useful results. The collected data is then combined and perform sentiment analysis and predictive analysis through machine learning to extract important data or knowledge. The result will be shared with managers on the based on their requirements.

We can analyze large amount of data with the help of data mining and machine learning technology. ML has contain the various advanced algorithms for analysis of big data sets[15]. AI has changed the way information extraction and understanding works by including programmed sets of conventional strategies that have supplanted customary factual procedures. With the association with machine learning technique and other existing technologies like R, SAS, Python, the effectiveness and accuracy of the prediction and other type results is very improved[16]

## 2. Literature Survey

Davor Antanasijević et. all doing their research work on the area of the forecasting of municipal waste generation using artificial neural networks. In this research they have perform the feasibility of generation of MSW at different levels of development using ANN (artificial neural network). In this process, select the useful parameters that can investigate the generic indicators of sustainability. In this research they have to design a ANN based models for predicting the generation of municipal solid waste[17].

Rajendra Kumar Kaushal et. All have done the research work in the area of MSWM challenges in current scenario. They have focused to predict the estimation work on the characteristics and capacity of MSW and its forecasting for help in the is the key to a successful management plan. This investigation analysis the changing pattern in the MSW amounts and qualities in major urban areas in India over most recent four decades[18]. The examination fundamentally audits the current acts of assessing and determining of MSW and features their constraints. The changing requirement for the suitable waste management improvements with respect to the changing patterns of waste generation methods, which is very helpful for municipal corporations, to making the new strategies for a well municipal solid waste management plane.

Kaspars Klavenieks et. All doing their research work on Optimal strategies for municipal solid waste treatment. In their research they can analysis development process of waste management system using different –different approaches. This Paper examinations the effect of treatment of municipal solid waste as energy source on solid waste management system for improvement of performance. In a circumstance where solid waste

recovery depends on a different assortment and material recuperation from unsorted civil waste, and waste removal in landfills is main treatment methods, it is important to take basic choices on the utilization of waste as a vitality asset[19].

## 3. Proposed Classification Algorithm

In present time, the scientists have been designed a lot of advanced analytical and mathematical tool that can be very helpful for enhancing the accuracy of resultant data. In this research we have Work on municipal solid waste data. In this research we have design an new classification approach which classify the different types of solid waste data very easily. We need awareness on data collection time because the quality and authentication of data is very important and they have decide the accuracy of data sets. We would prepared the data which is used of training. In this stage we remove the different types of errors, data type conversions, normalization etc. some important features of this algorithm are:-

- It is specially designed to analyze large data sets consisting of millions of records and hundreds of numeric fields like time, date, numeric, etc.
- Speedily analytical work as compared to previous algorithms.
- Easily understandable than neural networks using decision tree classifiers or other rules.
- Compatible for Windows and Linux operating systems.
- Easy to use, does not require any special statistics skills.

There is a bit of issue in existing Decision tree Approach, The problem is like whenever it designs a tree sometime choosing of the Root Node and basis of classification falls wrongly and hence creates a problem in getting an efficient Score.

Basic Steps of the Algorithm

1. Randomly select any features from the total features.
2. Select the root node using best split
3. Form various decision trees.
4. Predict the Labels using these decision trees.
5. Calculate the vote/Score for each of the target predicted by each tree.
6. The target with the highest Score is considered as the final prediction of the random forest algorithm.



## 7. Pseudo Code

### Function 1: The Simple Decision Tree

1. Parameter
  - a. Features: Independent Values
  - b. Labels: Dependent Values
2. Return
  - a. Trained Decision Tree: Final Trained Model
3. Process
  - a. Import Decision tree from Sklearn
  - b. Initialize Decision Tree
  - c. Train Decision Tree

### Main Function: Hybrid Decision Tree

1. Parameters
  - a. No\_of\_Trees: No. of decision tree to be formed
  - b. Max\_Features: No. of features we need to take in.
2. Return
  - a. The Final most efficient decision tree
3. Procedure
  - a. Take the No\_of\_Trees input from the user.
  - b. Take the Max\_Features input from the user.
  - c. Initialize Temp Model
  - d. For No\_of\_Trees
    - i. Pass Random(Max\_Features) to The Simple Decision Tree
    - ii. If iteration is First
      1. Pass Model to temp Model
    - iii. Else:
      1. Compare with temp model If accuracy is high pass on the model to temp
    - e. Last most efficient Model is in Temp Model
    - f. Return temp Model

## 4. Conclusion & Future Work

Machine Learning is a technique that can be perform a task without simply making a computer perform a task without expressly programming it. In current scenario the researchers have used machine learning In a broad way. Many real time applications have used the machine learning technic for prediction such as Google earth search engine, link din, face book etc. all these systems have used MI algorithms implanted in their systems in one form or the other. They are productively using information gathered from different channels which causes them get a greater image of what they are doing and what they ought to do.

Python is a broadly utilized and high level programming language for used in general programming. It is an open

source programming language. It is based on object oriented concepts and very intelligent programming language. In this research we have done all analytical work through python. For analysis propose, we have taken the data sets form central government web sites. In python, firstly we have classify the data sets year wise. After that we have trained the data sets.

As the Random Forest Algorithm works the same that it creates forests (Collection of trees) and then tests them and count the votes. But the difference between them is like The speed and the time efficiency of the both. As the Random Forest Deals with the creating a forest and it deals with building a fix number of tress only so his algorithm is cheap in terms of time, Space and Cost too.

When we talk about putting the solid waste in the open area or burning the waste filling the waste in the land then the waste must be Non-Toxic. Usually, the composition of the Gases decides the toxicity of the waste, or we can also say that the chemical composition decides the level of toxicity the waste has. If the waste is toxic we can't put the waste in an open area or in dump yards, also we can't landfill the waste cause filling the toxic waste in and can harm the land or can cause land pollution.

So on the basis of there chemical composition we need to identify that the waste is toxic or not. If waste is toxic we need to neutralize it first then after we can place it in any open area or under the land. So here we'll create a sample dataset by ourselves (because the data in the desired form is not available anywhere on the web cause this is a kind of private database). Then we'll use our Proposed classification approach for classifying the waste as toxic or Non-Toxic with respect to the Chemical Position.

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