International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 07 | July - 2023 SJIF Rating: 8.176 ISSN: 2582-3930

CRUD IMAGE PARADIGM USING DEEP LEARNING ALGORITHM

ARVAPALLI SIRISHA[1],KOMMINI LAKSHMI PRIYA[2], VALLURU ANJANA PRIYA[3]

[1]Arvapalli Sirisha, Department of Information Technology & Dhanekula Institute of Engineering and Technology
[2]Kommini Lakshmi Priya, Department of Electronics & Communication Engineering & Dhanekula Institute of Engineering and Technology
[3]Valluru Anjana Priya, Department of Electronics & Communication Engineering & Dhanekula Institute of Engineering and Technology

---

Abstract - Pollution is becoming a serious issue all around the world. That contamination can arise as a result of waste items that cannot be decomposed, such as plastic, certain metals, medical waste, and so on, resulting in severe soil pollution. Soil contamination can have serious consequences for the environment by diminishing soil organic matter and the soil's ability to operate as a filter. However, this is the ideal answer for this situation because it classifies waste as bio or non-bio. A neural network based on the textural properties of the images allows for the classification of normal images while distinguishing them from cancerous ones. To address this issue, CNN algorithms for image detection have been proposed. The algorithm has a detection precision of 90%. The results suggest that autonomous waste classification using image processing and artificial intelligence is possible.

***Key Words*:** Soil pollution, CNN algorithms, classification, image processing, artificial intelligence

1. INTRODUCTION

Nowadays, the Internet is critical to technological progress.Typically, solid waste management relies on community residents manually sorting domestic solid trash into two major categories: organic and recyclable. Organic waste (usually sourced from plants and animals) is biodegradable and has significant economic value since it may be handled to produce soil additives and methane. Recyclable garbage, on the other hand, comprises reusable items that can be turned into new materials, such as glass, metal, paper, and electronics. However, residents' trash separation is not rigorous due to a variety of issues such as poor subjective consciousness, inadequate knowledge of garbage classification, and so on... As a result, additional (manual) classification is typically performed by operators working at local trash management depots. This is inefficient and costly.

According to recent estimates, just 13.5% of worldwide garbage is recycled, while 33% is thrown openly without classification. Soil contamination, surface and groundwater pollution, greenhouse gas emissions, and reduced crop output are all common risks connected with openly dumping unsorted garbage.

Because of rapid improvements in computer vision and artificial intelligence, automatic recognition and detection of garbage from photographs has become a popular choice to replace human waste sorting. To improve the accuracy of automatic trash classification, many machine learning techniques have been proposed. As a result, using photos of solid waste as input data, CNNs may automatically classify garbage into the appropriate categories.

2. METHODOLOGY

2.1 Image processing

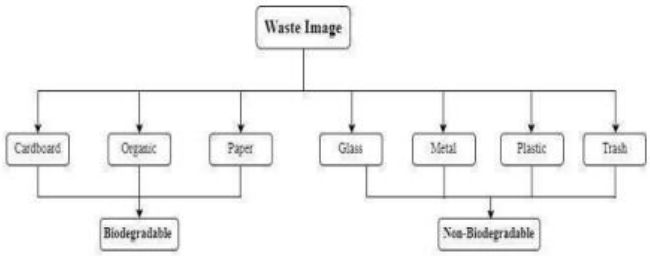
Image processing is the process of converting an image to a digital format and then executing various operations on it to extract valuable information. When specific specified signal processing methods are used, the image processing system typically interprets all images as 2D signals.
Image processing can be divided into five categories:
Visualization - Locate objects in the image that are not visible.
Recognize - Identify or recognize things in an image.
Sharpening and restoration - From the original image, create an upgraded image.
Pattern recognition - It is measuring the numerous patterns that surround the items in an image.
Retrieval - Browse and search photographs similar to the original image in a big library of digital images.

Layer (type)	Output Shape	Param #
input_1 (Input Layer)	[(None, 180, 180, 3)]	0
block1_conv1 (Conv2D)	(None, 180, 180, 64)	1792
block1_conv2 (Conv2D)	(None, 180, 180, 64)	36928
block1_pool (MaxPooling2D)	(None, 90, 90, 64)	0
block2_conv1 (Conv2D)	(None, 90, 90, 128)	73856
block2_conv2 (Conv2D)	(None, 90, 90, 128)	147584
block2_pool (MaxPooling2D)	(None, 45, 45, 128)	0

2.2 Waste Management

Waste management is one of the most difficult issues in developing countries. The categorization of garbage is an important stage in waste management. Waste classification refers to the process of categorizing or separating similar types of waste. In Nepal, the primary source of garbage generation is the home. Household garbage accounts for 50 to 75% of overall waste. Because household trash consists primarily of organic or degradable waste rather than non-degradable garbage, proper

waste segregation in the home reduces waste in landfill sites. Organic garbage is mostly made up of paper, textiles, and agricultural waste, whereas non-biodegradable waste is made up of plastic, glass, metals, trash, and so on. Other categories of garbage include electrical, medical, and construction waste.



2.3 Artificial Intelligence

Artificial intelligence (AI) is the simulation of human intelligence in machines that are programmed to think and act like humans. The phrase can also refer to any machine that demonstrates human-like characteristics such as learning and problem-solving. In contrast to natural intelligence expressed by humans or animals, artificial intelligence (AI) is intelligence demonstrated by machines. Leading AI textbooks define the topic as the study of "intelligent agents," which are any systems that sense their surroundings and adopt behaviors that maximize their chances of success.

2.4 Deep Learning

Deep learning is a subset of machine learning that is entirely based on artificial neural networks. Because neural networks are designed to mimic human disease, deep learning is likewise a type of mimic of human disease. It's all the rage these days because we didn't have as much processing power and data back then. Neurons are a formal definition of deep learning. Deep learning is a subset of machine learning that learns to represent the world as a nested hierarchy of concepts, with each concept defined in relation to simpler concepts and more abstract representations computed in terms of less abstract ones.

2.5 Machine Learning

The integration of modern machine learning and computer vision has now enabled the recognition of many everyday items, human faces, handwritten writing in photographs, and so on. Machine learning is an area of AI and computer science that focuses on the use of data and algorithms to mimic the way humans learn, gradually improving its accuracy. Machine learning is a critical component of the rapidly expanding discipline of data science. Algorithms are taught using statistical approaches to produce classifications or predictions and to find critical insights in data mining operations. These insights then influence decision-making within applications and organizations, ideally influencing key growth indicators.

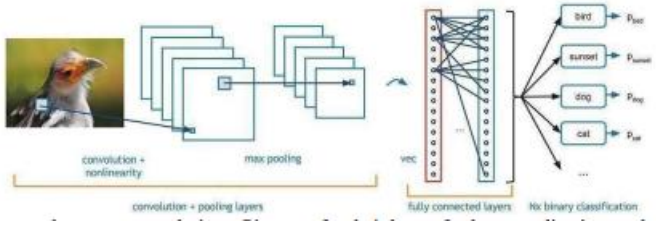
3. ALGORITHM

3.1 CNN

Convolutional neural networks are a type of neural network. It may sound like a strange combination of biology and arithmetic with a dash of cs, but these networks have been some of the most impactful developments in the field of computer vision. Alex Krizhevsky used neural nets to win that year's image net competition (essentially, the yearly Olympics of computer vision) in 2012, decreasing the classification error record from 26% to 15%, an astonishing improvement at the time. Since then, a slew of businesses have made deep learning the foundation of their offerings.

The most common is the Convolutional Neural Network. The major goal of this work is to use CNN to categorize photos of waste materials into seven categories (cardboard, glass, metal, organic, paper, plastic, and garbage). The images in the cardboard organic and paper classifications are then deemed biodegradable garbage, whereas the images in the other classes are regarded as non-biodegradable waste. On the trash dataset, pre-trained CNN models such as InceptionV3, InceptionResNetV2, Xception, VGG19, MobileNet, ResNet50, and DenseNet201 were trained and fine-tuned.

Among these models, the VGG19 model performed poorly, whereas the InceptionV3 model did well in terms of learning accuracy. Overall, the outcome is encouraging.

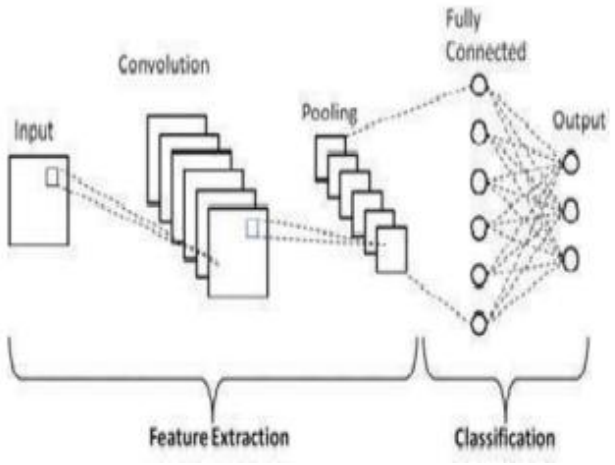


3.2 Architecture of CNN

A CNN architecture consists of two major components. A convolution tool that separates and identifies visual features for analysis, also known as feature extraction. A fully connected layer that uses the convolution process output to forecast the image class based on the features extracted in prior stages.

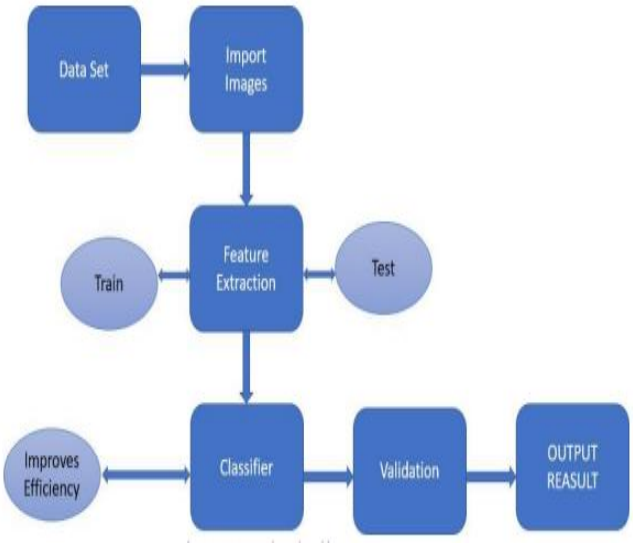
The CNN is made up of three types of layers: convolutional layers, pooling layers, and fully-connected (FC) layers. A CNN architecture will be constructed when these layers are stacked. Aside from these three layers, there are two other significant parameters to consider: the dropout layer and the activation function.

CNN is extremely beneficial since it reduces human effort by automatically detecting features. For example, it would detect the distinguishing traits of each class on its own for apples and mangoes.



4. PROPOSED SYSTEM

The proposed methodology for the project titled "Waste Image Classification using Deep Learning Algorithm" involves data collection and preprocessing, where a diverse waste image dataset will be collected and prepared. The primary model used for classification is the Convolutional Neural Network (CNN), trained with appropriate hyperparameters and optimization techniques. Additionally, a machine learning classifier will be employed for comparison and post-classification refinement to achieve a target accuracy of 90%. The evaluation will focus on accuracy, precision, recall, and F1-score. The comparative analysis will demonstrate the superiority of the proposed approach over previous papers, which achieved an 85% accuracy rate. The conclusions will highlight the significance of the results and potential applications of the improved waste image classification system.



5. RESULT

Sample Data set: This Dataset contains 2467 images from 6 categories: cardboard (393), glass(491), metal (400), paper(584), plastic (472) and trash(127).

Training: In this we are going to use 70% of the images for training purposes. A training data set is a data set of examples used during the learning process and is used to fit the parameters.

O R

Testing: In this we are going to use 30% of the images for testing purposes. It is like a subset of the training dataset that is used to give an objective evaluation of the final model.

O R

Final Output

This system provides the desired output of recycling waste and organic waste that are classified based on the parameters mentioned.

6. CONCLUSIONS

To have a substantial impact on waste management, waste segregation and processing technologies must be carefully considered. The research topics addressed here are developing a systematic way to detect and categorize waste into organic and recyclable waste, which would aid garbage collectors and waste management employees in prospect investigation. The research illustrates the significance of image processing in the field of crud image management and the need of addressing the type of trash for future work.

7. FUTURE SCOPE

The following practices can help to increase the network's accuracy and generalization even further. The first is to use the entire dataset during the optimization process. Batch optimization is better suited for larger datasets. Another method is to assess the waste photos one at a time. This can help determine which garbage photographs are the most difficult to classify. Finally, utilizing a larger dataset for training appears to be advantageous. However, such a dataset may no longer exist. Using many datasets could be a solution, but it requires a careful approach to normalize them. Finally, using the entire dataset for training, pre-training on each waste image, and a larger dataset appear to have the potential to improve network performance. As a result, they should be addressed in future research on this topic

ACKNOWLEDGEMENT

For the allowing the authors to perform this project CRUD IMAGE PARADIGM USING DEEP LEARNING ALGORITHM by Dhanekula Institute of Engineering and Technology, Faculty of Electronics & Communication Engineering Department, and our beloved guide Professor Dr. M. Sunil Babu through the provision of computational resources and a conducive working environment.

REFERENCES

1. M. Feurer, A. Klein, K. Eggensperger, J. Springenberg, M. Blum, and F. Hutter, “Efficient and robust automated machine learning,” Advances Neural Inf. Process. Syst., vol. 28, pp. 2962–2970, 2015.
2. C. Thornton, F. Hutter, H. H. Hoos, and K. Leyton-Brown, “Auto-WEKA: Combined selection and hyperparameter optimization of classification algorithms,” in Proc. 19th ACM SIGKDD Int. Conf. Knowledge Discovery Data Mining, 2013, pp. 847–855.
3. European Commission, Waste. [Online]. Available: http://ec.europa. eu/environment/waste/
4. T. Anagnostopoulos et al., “Challenges and opportunities of waste management in IoT- enabled smart cities: A survey,” IEEE Trans. Sustain. Comput., vol. 2, no. 3, pp. 275–289, Jul./Sep. 2017
5. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach. Upper Saddle River,NJ, USA: Pearson, 2010
6. T. Fawcett, “An introduction to ROC analysis,” Pattern Recognit. Lett., vol. 27, pp. 861–874, 2006.
7. I. Guyon, J. Weston, S. Barnhill, and V. Vapnik, “Gene selection for cancer classificationusing support vector machines,” Mach. Learn., vol. 46, pp. 389–422, 2002.
8. G. Nandini, Kumar, A., K, C. “Dropout technique for image classification based on extreme learning machine.” Global Transitions Proceedings. 2, pp.111- 116, 2021.
9. F. Miar Naeimi, G. Azizyan, M. Rashki, “Horse herd optimization algorithm: A natureinspired algorithm for high dimensional optimization problems.” Knowledge-Based Systems. vol.21, pp.106711, 2021.
10. F. Gruber, W. Grählert, P. Wollmann, S. Kaskel, “Classification of Black Plastics Waste Using Fluorescence Imaging and Machine Learning.” Recycling. vol.4, pp.40, 2019.