



# Seed Quality Testing using Deep Learning

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**Abstract:** Seed testing has been developed to aid agriculture to avoid some of the hazards of crop production by furnishing the needed information about different quality attributes viz., purity, moisture, germination, vigour and health. It is very inconvenient to filter out every damaged seed and foreign elements by winnowing in industries and commercial farming. This issue can be minimized if the seeds are filtered in clusters. We have an approach to enhance the efficiency in seed cultivation and seed packaging processes. We created a high-quality dataset which includes fine maize seeds, damaged maize seeds, and foreign elements. By using the Deep Learning technique, the system categorizes an input image as Excellent, Good, Average, Bad and Worst quality seed cluster. The Excellent and Good clusters (sometimes Average) can be cultivated or packaged, and the Bad and Worst clusters can be rejected. We also have recommended the use of object detection to detect and filter out damaged seeds and foreign elements from good quality seed cluster

**Keywords:** deep learning, seeds, seed cultivation, seed classification

## I. INTRODUCTION

In the commercial seed cultivation sector, it is not feasible to filter out the individual damaged seeds and foreign elements in the case of the voluminous number of seeds. Moreover, in the seed packaging industries, the seed filtering is done by the manual labor force which leads to poor quality seeds in the packets and waste of a large amount of fine quality seeds. In this context, efficient and automated seed testing is the most important part of all other seeds technologies. Seed testing facilities need to evaluate tens of thousands of seed lots each year. To make ease in all the sectors of seeds, there should be some efficiency and automation in the seed filtering and packaging sectors. All these problems motivated us to enhance efficiency and bring automation by the use of Deep Learning technique. This would help to cultivate the fine quality seeds and reject the bad quality seeds without much effort. On the other hand, packaging of only fine quality seeds in seed packaging industries can be ensured by the use of our system. In this regard, we came across various solutions but the deep learning technique was an ideal approach to implement the system efficiently. Furthermore, use of Artificial Intelligence and Machine Learning is quite rare in the context of agriculture and industry, especially in Nepal. We also aimed to synchronize the Artificial Intelligence, Agriculture and Seed Packaging Industry, which would be a novel solution in Nepal. Therefore, the purpose of the paper is to use the deep learning technique to generate a system that can enhance ease in the commercial seed cultivation and seed packaging industries

## II. LITERATURE SURVEY & PROPOSED WORK

Ref	Name	Author	Year	Findings	Research Gaps
1	Digital Image Processing Applied to Seed Purity Test	Ms. Mrinal Sawarkar, Dr. S.V. Rode.	May,2017	In this paper, Digital Image Processing and MATLAB were used for the processing of the image and classifying it as Bad Purity or Good Purity or Excellent Purity	1.The cluster made for the image processing would not give accurate results as the seeds underneath would not be visible.
2	Image Analysis: A Modern Approach to Seed Quality Testing	Hemender, Sushma Sharma, V. S. Mor, Jitender1 and Axay Bhuker1	April,2018	In the paper they proposed the idea of seed testing using Image Analysis Software. Image Analysis (IA) which functions similar to the human observations. Fundamental approach in this technique is acquisition of data (shape, size, colour etc.) via a video or still camera followed by analysis of these data using suitable computer software.	1.The dominating features in the images could not be extracted with just image analysis. 2.The enhancement of the image features could not be done. 3. Image data direct from a camera may have a variety of problems



3	Automated In Situ Seed Variety Identification via Deep Learning: A Case Study in Chickpea	Amin TaheriGaravand, Amin Nasiri, Dimitrios Fanourakis, Soodabeh Fatahi, Mahmoud Omid and Nikolaos Nikoloudakis	2021	<ol style="list-style-type: none"> <li>1. Visible image processing techniques (400–700 nm) offer the advantages of being low cost and rapid.</li> <li>2. They have been successfully employed across several studies for seed variety identification generally utilizing the most important visual seed features</li> </ol>	<ol style="list-style-type: none"> <li>1. The imaging techniques such as spectral imaging, thermal imaging, fluorescence imaging Xray imaging, and magnetic resonance imaging offer reliable alternatives to the traditional methods.</li> <li>2. Having several images of a given grain, at different spectral bands, allow tackling the classification problem, in a more robust and easy way.</li> </ol>
4	Rapid Vitality Estimation and Prediction of Corn Seeds Based on	LEI PANG, SEN MEN, LEI YAN, AND JIANG XIAO	2020	<ol style="list-style-type: none"> <li>1. Hyperspectral imaging includes near infrared imaging and magnetic resonance images.</li> <li>2. The X-ray imaging and magnetic resonance imaging are able to provide anatomical details and the spectral imaging, thermal imaging and</li> </ol>	<ol style="list-style-type: none"> <li>1. The multispectral and hyperspectral technologies offer many possibilities that still need to be explored. The main drawback that can be observed is the lack</li> </ol>
	Spectra and Images Using Deep Learning and Hyperspectral Imaging Techniques			fluorescence imaging are usually utilized to deliver the functional and nutritional information about the seeds being examined.	<ol style="list-style-type: none"> <li>of well- documented and available datasets for reference</li> <li>2. However, these techniques are characterized by the drawbacks of necessitating costly equipment (conducted by specialized personnel), while subsequent data analysis is highly sophisticated and complicated</li> </ol>



5	Seed Quality Assessment Using Artificial Neural Networks	M. Mladenov, M. Dejanov	2007	<p>1. This paper discusses the method of seed quality assessment using artificial neural networks</p> <p>2. This present a model of a classifier based on cascade structure.</p> <p>3. In this paper the classifier is used for separation quality assessment based on geometrical parameters of corn seed. It has a cascade structure built of two types of neural networks – LVQ and BPN</p>	<p>The proposed classifier has a bigger classification accuracy in comparison to the classifiers based on a standard BP or RBF networks. The obtained classification errors obtained by the discussed three classifiers are respectively 0%, 47.5% and 25.1% .When the seed sizes are measured by a standard method. If the seed sizes are measured by computer vision system the classification errors are respectively 5.8%, 36% and 12V</p>
6	Analysing Rice Seed Quality Using Machine Learning Algorithms	Dr. T. Avudaiappan#1, S.Sangamithra* 2, A.Silpha roselin * 3, S.Sherin farhana *4, KM.Visalakshi* 5	Mar,2019	<p>In this paper image Pre-processing techniques, Filtering, Segmentation, and edge detection are performed on the acquired image. They also used MLP (Multi-Layer Perceptron) it is Artificial Neural Network (ANN) types and it is used for classification purpose,</p>	<p>MLP takes vector as input so it cannot understand spatial relation but CNN takes tensor as input so CNN can understand spatial relation (relation between nearby pixels of image) between pixels of images better thus for complicated images CNN will perform better than MLP</p>

### III. TOOLS USED

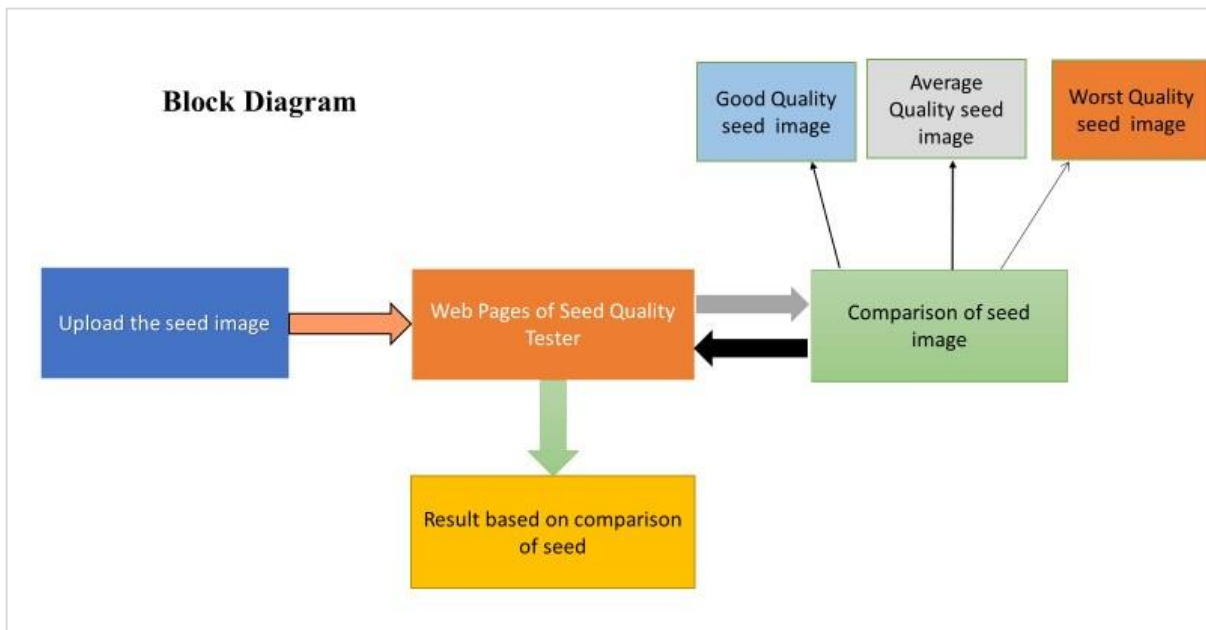
Technology:

- HTML, CSS, JS, Bootstrap
- Python
- Django
- Deep Learning (CNN)



6.3 Scheduling (Time line chart or Gantt chart) according to sprint backlog

TASK NAME	JUNE 21	JULY 21	AUG 21	SEP 21	OCT 21
Meetings	[Bar]				
Reading paper		[Bar]			
Preparing Literature survey			[Bar]		
Gap Identification				[Bar]	



**RESULT AND DISCUSSION:**

- Seed quality is an important factor in agricultural production.
- In the seed industry, quality assurance programs rely on numerous methods to certify seed quality attributes, such as germination and vigor tests .
- These procedures have limitations related to time consumption, subjectivity, and the destructive nature of assessing seed quality.
- In fact, there is a growing demand for efficient methods that can provide a quick, reliable, nondestructive, and objective detection of seed quality.
- This method will help you analyze the seed quality by passing the dataset through various algorithm.

**IV. CONCLUSION**

- This seed quality testing system detects the quality of a seed lot as excellent, good, average, bad and worst on the basis of the percentage of fine quality seeds in the seed lot.
- The decision of categorization is based on the flow of the dataset through the various neurons in the convolutional neural network (CNN).
- With extensive research and experiments, we came to the conclusion that the model where dataset is more uniformly distributed can predict accurately if the images in the dataset are of high quality, all the hyperparameters like number of convolution layers, number of hidden neurons, use of dropout layers, etc. are properly adjusted as per the requirement of the system.



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