Real Time Seed Quality Detection

A Major Project Synopsis Submitted to

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1. Abstract

Every grower at some point has observed the effects of poor seed quality: slow germination, damping-off, poor standards, and mixed or genetically contaminated lots. Determining the seed quality, that is, their suitability for planting is very important for good quality crop.

Seeds are quite small in sizes and are difficult to differentiate based on their color and size. Human testing procedures have their limitations, like most of these are time consuming, labor intensive and sometimes the results are not reproducible in actual field conditions. The seeds we intake in daily life is important part of the diet and we must ensure the quality of seeds to ensure the nutrient ratio. This is a major issue while we buy them from online stores, and this may also affect our health also. Using this tool, a good quality of seed can be determined easily.

Image analysis is a state-of-the-art technique for seed quality testing. This tool provides vast usage in evaluation of various physiological and morphological characteristics of the seed with a more comprehensive perception. It is based on the extraction of numerical data from a captured image for characteristics like color, size, shape of seed and seedlings and their subsequent processing with the help of suitable computer software.

2. Introduction of the Project

Application which is used for detection of seed quality and classify them accordingly in real time. To provide a platform for Industries and local/small business for better classification of different seeds. This classified data can be further used for research and analysis which can result in good crop harvest and yield. This application can also be used to verify quality of rice, pulses, wheat, etc. in an e-commerce shopping.

3. Objective

Application/platform which will be able to detect the seed quality and classify them accordingly in real time. This tool can be used by the industries to classify seeds and their quality, this can also be used by the local/small businesses and can also be used by the ecommerce website to show the quality for the pulses they are selling online. This tool will also collect the seed quality data and show the graphical representation for the data according to the seed, quality and various other aspects and will analyze it.

4. Scope

This application aims to provide a modern interface and tooling for seed quality analysis and classification. The seeds we intake in our day-to-day life are of good quality or not and have sufficient nutrients, for determining these parameters this application is made with modern techniques for classifying seed into good, medium, or bad quality.

Provides a user-friendly interface for seed quality detection and will also provide graphical representation of seeds based on their quality.

Open-source API that can be used by other e-commerce platforms for seed quality detection in real-time, so that the consumers are satisfied with the seed quality while purchasing online.

5. Study of Existing System

S. No.	Company Name	Pros	Cons
1	LUCIA 3.52 software package	Large availability	Only analyses Flax, Lentil
2	Delta-T© (winDIAS)	Large availability	Only analyses Mustard, Oat
3	ImageJ software	Medium availability	Old quality detection strategy
4	Seed Vigor Imaging System	Medium availability	Old quality detection strategy
5	Matrox image processing board	Large availability	Only provide analysis for Lettuce, Sorghum

6. Project Description

A proper, precise, and modern solution for seed quality detection. An application that can provide sufficient data for analysis to classify seeds based on quality. This tool uses Image analysis that can be a significant system to monitor phases of seed quality in controlled environment and the changes associated with it can be assessed accurately, thus helps in seed viability using data analysis.

The assessment of RGB index, size, and shape of each individual seed within a large seed sample may allow the development of non-destructive methods for sorting seed sub-samples with different quality. This tool will also collect the seed quality data and show the graphical representation for the data according to the seed, quality and various other aspects and will analyze it.

This tool can be used by the industries to classify seeds and their quality, this can also be used by the local/small businesses and can also be used by the ecommerce website to show the quality for the pulses they are selling online.

7. Methodology/Planning of the Project work

We will use agile development methodology for our project as it minimizes the risks such as bugs, cost overruns, and changing requirements when adding new functionality.

The primary benefit of agile software development is that it allows software to be released in iterations and Iterative releases improve efficiency.

They also allow us to realize software benefits earlier.
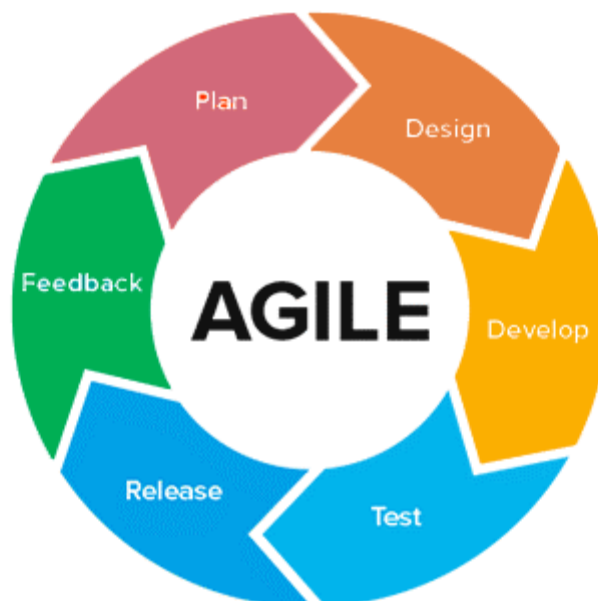
Planning for the project

Phases	Description of work	Expected no. of weeks to complete the phase
Phase One	Data Gathering and ML basic model generation and documentation	**6 Weeks**
Phase Two	UI/UX Designing and Web App Frontend Development and ML real time model generation	**6 Weeks**
Phase Three	Backend development and API integration and ML frontend integration	**5 Weeks**

8. Expected Outcome

The seeds we intake in daily life is important part of the diet and we must ensure the quality of seeds to ensure the nutrient ratio. A customer-friendly interactive application that delivers precise results for seed quality detection using modern methods. Industrial usage of this application/platform will automate the manual task of seeds categorization. The API form the application/platform can be used by various other products like online grocery shopping websites and all.

9. Resources and Limitations

For developing this Application/platform we require the below resources: -

For ML model
- Python: - Python is an interpreted high-level general-purpose programming language. Its design philosophy emphasizes code readability with its use of significant indentation.
- TensorFlow: - TensorFlow is an end-to-end open-source platform for machine learning. It has a comprehensive, flexible ecosystem of tools, libraries and community resources that lets researchers push the state-of-the-art in ML and developers easily build and deploy ML powered applications.

For Backend and Frontend

- TypeScript: - TypeScript is a programming language developed and maintained by Microsoft. It is a strict syntactical superset of JavaScript and adds optional static typing to the language. Will be using this for the frontend and backend.

- Node.js: - Node.js is an open-source, cross-platform, back-end JavaScript runtime environment that runs on the V8 engine and executes JavaScript code outside a web browser.

- MongoDB: - MongoDB is a source-available cross-platform document-oriented database program.

Limitations

- Cost for Real Time processing of image recognition can be very high.
- Real time recognition over web will require higher internet bandwidth.

10. Conclusion

This application can help to determine the seed quality in real time. Also provides API for various online e-commerce websites for real time seed quality detection.

By using certain parameters of each individual seed within a large seed sample this application can classify seeds based on quality. This classification and data can lead us to study about the seeds in more depth and help us to enhance the quality of seeds even more.

Only limitations are Real-time processing can be costly, higher internet bandwidth is required.

11. References

- Date set for training and testing the model https://github.com/dhishku/Machine-Learning-for-Grain-Assaying/blob/master/Dataset_Wheat_Grain.md
- YOLO: Real-Time Object Detection (pjreddie.com)
- https://github.com/ModelDepot/tfjs-yolo-tiny
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- (PDF) Image Analysis: A Modern Approach to Seed Quality Testing (researchgate.net)