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ijircce@gmail.com



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# Coffee Grading System and Price Estimation

Ruthwik B I, Ms. Bhavya Shree H M

Student, Department of MCA, Visvesvaraya Technological University, The National Institute of Engineering,  
Mysuru, India

Assistant Professor, Department of MCA, Visvesvaraya Technological University, The National Institute of  
Engineering, Mysuru, India

**ABSTRACT:** The increasing consumer consciousness regarding food quality and safety has spurred the demand for robust systems capable of evaluating agricultural produce accurately. In response to this demand, this paper introduces an innovative application aimed at predicting the grading and estimated price of coffees through the integration of machine learning and image processing methodologies. By harnessing cutting edge image processing algorithms and machine learning models, the proposed system offers an automated solution for analysing the quality attributes of coffees based on visual cues extracted from images. The envisioned system holds the potential to revolutionize the coffee industry by providing stakeholders with timely and precise assessments of product grades and pricing dynamics. By automating the quality assessment process, the proposed solution not only enhances efficiency but also facilitates the maintenance of high-quality standards, thus meeting the evolving demands of consumers. Moreover, the integration of predictive analytics enables stakeholders to anticipate market trends and make informed decisions regarding production, pricing, and distribution strategies. Overall, the proposed system offers a comprehensive solution to address the challenges associated with coffee grading evaluation and price prediction, thereby contributing to the advancement and sustainability of the agricultural sector.

## I. INTRODUCTION

The agriculture sector has experienced a notable transition in recent times towards technological innovations with the objective of augmenting productivity, quality, and efficiency. As customers become more concerned about the safety and quality of their food, there is an urgent demand for novel approaches that can precisely evaluate the qualitative characteristics of agricultural products. Coffee, is an important cash crop that is widely grown around the world. Acknowledged for its economic and cultural importance, the coffee sector has difficulties accurately assessing product grade and forecasting market pricing. This research aims to create an automated system for the evaluation of coffee grade and the forecasting of market pricing in response to these difficulties. Making use of image processing methods and machine learning skills, the suggested methodology seeks to transform the conventional coffee assessment techniques, which frequently depend on subjective judgment and manual inspection. Aiming to give stakeholders quick and accurate insights into coffee grade indicators and pricing patterns, the system integrates powerful algorithms for feature extraction, classification, and predictive modelling. This introduction provides context for a thorough investigation of automated coffee quality analysis and price prediction by outlining the project's goals, motivation, and scope.

## II. OBJECTIVES

- Create an Automated Quality Assessment System: Build a dependable and effective system that assesses Coffee grade based on size, and density features using machine learning and image processing techniques.
- Use Feature Extraction techniques: To extract useful texture features from Coffee photos, apply sophisticated techniques like the Grey Level Co-occurrence Matrix (GLCM).
- Categorize Coffee Grading: To categorize Coffee photos into predetermined grading categories, create and train a image processing model.
- Forecast Market Prices: To help stakeholders make well-informed decisions, develop predictive models that use data from quality assessments to forecast Coffee market prices.
- To Improve Decision-Making :To improve Coffee cultivation, marketing, and sales decision making processes, provide accurate and timely insights to stakeholders, such as farmers, traders, and policymakers.

### III. LITERATURE SURVEY

- [1] “Comparing performance of classification algorithms to use for grading coffee’s raw quality by using image processing techniques” Authors: Muktar Bedaso Kuyu ,Chala Diriba Jimma ,Meshesha Addis
- [2] “Coffee Bean Grade Determination Based on Image Parameter” Authors: Faridah, Gea O. F. Parikesit, Ferdiansjah
- [3] “Comparing performance of classification algorithms to use for grading coffee’s raw quality by using image processing techniques” Authors: Muktar Bedaso Kuyu ,Chala Diriba Jimma ,Meshesha Addis
- [4] “Grading Ethiopian coffee raw quality using image processing techniques” Authors: Muktar Bedaso Kuyu ,Million Meshesha Addis ,Chala Diriba
- [5] “Grading Ethiopian Coffee Raw Quality Using Image Processing Techniques.” Authors: Muktar Bedaso ,Million Meshesha ,Chala Diriba
- [6] “Grading of Green Coffee Beans for Specialty Coffee using Image Processing Techniques” Authors: Chamika Kuruppuarachchi
- [7] “The performance of size grading machine of robusta green coffee bean using oscillating sieve with swing along width direction” Authors: N Srisang, W Chanpaka and T Chungcharoen
- [8] Coffee disease detection and classification using image processing: A Literature review Authors: Edwin R. Arboleda
- [9] Application of Machine Learning to Assess the Quality of Food Products—Case Study: Coffee Bean Authors: Krzysztof Przybył , Marzena Gawrysiak-Witulska , Paulina Bielska Marek Gancarz , Bohdan Dobrzański, Jr. andAleksanderSiger , Robert Rusinek
- [10] An Implementation of Convolutional Neural Network for Coffee Beans Quality Classification in a Mobile Information System Authors: Robby Janandi, Tjeng Wawan Cenggoro

### IV. METHODOLOGY

The project's methodology encompasses the following key steps:

- **Feature Extraction:** Key features that identify various areas of the image are extracted at this stage. These characteristics could be based on hue, pattern, form, or other characteristics.
- **Segmentation:** The division of the image itself takes place in this central component of the design. Many algorithms, including thresholding, clustering , edge detection , and region-based techniques, can be used for this.
- **Post-processing:** To increase accuracy, additional refinement is frequently required after the first segmentation. For the purpose of eliminating minute artefacts or reuniting divided areas, this can use morphological operations, noise reduction, and smoothing.
- **Validation and Evaluation:** In this phase, measures such as accuracy, precision, recall, and the Dice coefficient are used to evaluate the segmentation findings' quality. For comparison, ground truth data is frequently utilised.
- **Output:** Once the final segmented image or data is generated, it can be used in applications like object detection, image recognition or subjected to additional analysis.
- **Deploy the Model using a web service:** Using react framework

### V. TOOLS AND TECHNOLOGIES REQUIRED

#### Hardware

- PROCESSOR: Intel i4
- HARDDISK: 500gb
- RAM: 4gb or above

#### Software

- OPERATING SYSTEM: Windows 7 and above
- FRONT END: React framework
- LANGUAGE: Python version 3.7
- LIBRARIES: Pandas, NumPy, openCV,matplotlib
- EDITOR: VS Code

## VI. CONCLUSION

This report demonstrates how artificial intelligence may be effective in agriculture while also enhancing decision-making abilities for merchants, farmers, and enterprises. The use of an intuitive web interface guarantees accessibility and user-friendliness by permitting users to quickly upload photographs and obtain informative forecasts. The project has room for improvement going future, including adding new features, raising the accuracy of the predictions, and extending to other agricultural goods, greatly advancing the modernization of farming methods and marketing approaches.

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4. “Image Processing and Machine Learning for Automated Fruit Grading System: A Technical Review” By Rashmi Pandey, Sapan Naik, Roma Marfatia
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9. “Coffee Bean Grade Determination Based on Image Parameter” Faridah, Gea O. F. Parikesit, Ferdiansjah
10. “Comparing performance of classification algorithms to use for grading coffee’s raw quality by using image processing techniques” Muktar Bedaso Kuyu ,Chala Diriba Jimma ,Meshesha Addis





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