## VISVESVARAYA TECHNOLOGICAL UNIVERSITY, JNANASANGAMA, BELAGAVI- 590018



### BLDEA’s V.P. Dr. P.G. HALAKATTI COLLEGE OF ENGINEERING AND TECHNOLOGY, VIJAYAPUR



**DEPARTMENT OF**

**ELECTRONICS AND COMMUNICATION ENGINEERING**

A Project Phase-I report on

**“RICE GRAIN QUALITY ANALYSIS”**

*Submitted in partial fulfillment for the award of degree of Bachelor of Engineering in Electronics and Communication Engineering*

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**2023-24**

**VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM**

## B.L.D.E. Association’s

**V.P Dr. P.G HALAKATTI COLLEGE OF ENGINEERING AND TECHNOLOGY, VIJAYAPUR**



### DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

**CERTIFICATE**

This is Certified that the Project Phase-I work entitled **“Rice Grain Qualtiy Analysis”** carried out by **Amar Honawad, Anil Halagunaki, Rahul Basetti, Rahul Patil,** bonafide students of **VP Dr P.G Halakatti College of Engineering and Technology, Vijayapura** in partial fulfillment for the award of **Bachelor of Engineering** in **Electronics and Communication Engineering** of the **Visvesvaraya Technological University, Belgaum** during the year 2023-2024. It is certified that all corrections/suggestions indicated for internal assessment have been incorporated in the report deposited in the departmental library. The Mini project report has been approved as it satisfies the academic requirement in respect of Mini project work prescribed for the said degree.

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DEPARTMENT OF ELECTRONICS & COMMINUCATION ENGINEERING

**DECLARATION**

We, students of Sixth semester B.E, at the department of Electronics & Communication Engineering, hereby declare that, the Mini Project entitled **“Rice Grain Qualtiy Analysis”** ,embodies the report of our mini project work, carried out by us under the guidance of **Prof. R N Math,**  We also declare that, to the best of our knowledge and belief, the work reported here in does not form part of any other report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this by any student.

Place:-Vijayapur Date:- 23/12/2023

**ACKNOWLEDGEMENT**

The satisfaction and euphoria that accompany the successful completion of any task would be incomplete without the mention of people who made it possible, whose consistent guidance and encouragement crowned our efforts with success. We consider it as our privilege to express the gratitude to all those who guided in the completion of our Mini Project.

First and foremost, we wish to express our profound gratitude to our respected Principal **Dr. V.G. Sangam, B.L.D.E. Association’s VACHANA PITAMAHA Dr.**  **P.G. HALAKATTI COLLEGE OF ENGINEERING & TECHNOLOGY, Vijayapura** , for providing us with a congenial environment to work in.

We would like to express our sincere thanks to **Dr. Umesh Dixit**, the HOD of Electronicsand **Communication Engineering**, B.L.D.E. **Association’s VACHANA PITAMAHA Dr. P.G. HALAKATTI COLLEGE OF ENGINEERING & TECHNOLOGY, Vijayapura**, for his continuous support and encouragement.

We are greatly indebted to our guide **Prof. R N Math**, Department of **Electronics and Communication Engineering**, B.L.D.E. **Association’s VACHANA PITAMAHA Dr. P.G. HALAKATTI COLLEGE OF ENGINEERING & TECHNOLOGY, Vijayapura**, who took great interest in our work. He motivated us and guided us throughout the accomplishment of this goal. We express our profound thanks for his meticulous guidance.

# ABSTRACT

Many researches applied machine vision to estimate rice appearance quality inspection. There are various food varieties like rice, wheat, potato, soya bean and maze. Rice is main food crops that all human consumes in all over the world, especially in Asian countries. It is primarily classified according to its grain shape, colour etc. The main crop for our nation to boost agricultural income is grains.

Several contaminants, including stones, weed seeds, chaff, damaged seeds, etc., are present in these grains. Low automation levels and a large human workforce are required for assessing grain quality. Additionally, it increases the cost and length of the testing process.

In order to identify different types of grains and determine the purity of grains using image processing techniques based on various parameters including grain size and shape, we proposed a grain classification system based on machine learning and image processing algorithms.

The Python programming language and Python software are used for all operations machine vision has been used in a most application of grain classification to differentiate rice varieties based on special features such as shape, length, chalkiness, colour and internal damage of rice.

In this paper also discussing and suggesting methods classify four varieties of rice and it also finds the percentage of purity of rice grains using the image processing technics based on several features such as grain colour and shape.

**CONTENTS**

# CHAPTER 1

# INTRODUCTION

The agricultural industry, spanning across centuries, remains expansive and steeped in tradition. The challenge of assessing grain quality has persisted throughout history. This project introduces a pioneering solution for the evaluation and grading of rice grains by harnessing image processing techniques. Traditionally, the commercial grading of rice hinges on grain size classification, categorizing grains as full, half, or broken. The assessment of food grain quality has conventionally relied on human inspectors employing visual scrutiny. However, the decision-making abilities of human inspectors are susceptible to external influences such as fatigue, subjectivity, and personal biases.

The integration of image processing techniques offers a transformative approach, eliminating the aforementioned challenges while remaining non-destructive and cost-effective. This methodology transcends human limitations, enhancing objectivity and accuracy. The subsequent discussion outlines the procedure deployed to ascertain the percentage quality of rice grains. Rice quality, in essence, is a composite of both physical and chemical attributes. Physical characteristics encompass grain size, shape, chalkiness, whiteness, milling degree, bulk density, and moisture content. On the other hand, chemical attributes involve gelatinization temperature and gel consistency, contributing to the comprehensive assessment of rice quality.

In contrast, conventional methods employed for measuring grain shape and size, such as the grain shape tester, dial micrometer, and graphical method, tend to be protracted and cumbersome. These methods typically allow for the measurement of the dimensions of one grain at a time, yielding results that are not only time-consuming but also susceptible to human errors. Consequently, there is a pressing need for greater precision to fulfill customer expectations and overcome the limitations posed by manual procedures.

On the other hand, the machine vision or the digital image processing is a non-destructive method, it is also very fast and cheap process compared to the chemical method. In the early days of machine vision application to grain quality evaluation, suggested some pattern recognition techniques for identifying and classifying cereal grains.

# CHAPTER 2

# LITERATURE SURVEY

Food quality detection is a crucial aspect of the food industry, ensuring consumer safety and satisfaction. Recent advancements in machine learning and image processing techniques have revolutionized the accuracy and efficiency of food quality assessment. This literature review aims to provide an in-depth analysis of 15 research papers that explore the integration of machine learning and image processing in food quality detection.

The authors in [1] propose a model to y showcases the application of deep learning techniques, particularly convolutional neural networks (CNNs), for food quality assessment. The authors use image analysis to detect defects, such as mold and discoloration, in food products. The paper [2] focuses on fruit ripeness detection using machine learning algorithms. The authors employ support vector machines (SVM) and random forests to classify fruits into different ripeness categories based on color and texture features. The study [3] presents an automated system for inspecting bakery products' quality. Image processing techniques are combined with support vector machines for real-time detection of defects and anomalies in baked goods.

The research in [4] focuses on fish quality assessment using image analysis and machine learning. The authors in [5] use features like color, texture, and shape to classify fish into different quality categories, ensuring freshness and safety. This paper introduces texture analysis and neural networks for meat quality detection. Texture features extracted from meat images are fed into neural networks to classify meat products based on tenderness and freshness.

This study [6] explores the use of CNNs for detecting diseases and assessing quality in vegetables. The authors develop a model that can identify diseases and quantify the extent of damage using leaf images. The paper [7] discusses the application of transfer learning and CNNs for food quality inspection. The authors pre-train a CNN on a large dataset and fine-tune it for specific food quality assessment tasks. The authors in [8] focus on contaminant detection in food products using deep learning techniques. The authors train a CNN to identify foreign objects and contaminants, ensuring food safety. This study [9] presents a non-invasive approach to inspect egg quality using machine learning. The authors use image analysis and machine learning algorithms to assess egg freshness and defects.

The paper [10] introduces an automated system for detecting milk spoilage using image processing and neural networks. The authors [11] employ texture and color features to classify spoiled and fresh milk samples. This research focuses on classifying food items based on image features using decision trees.

The authors extract color, texture, and shape features to develop a decision tree-based classifier. The study [12] presents a multi-class food quality assessment using deep learning and ensemble methods. The authors in [13] combine the predictions of multiple models to enhance the accuracy of quality assessment. This paper introduces a hybrid CNN-SVM model for quality inspection of fruits. The authors utilize CNN for feature extraction and SVM for classification, achieving improved accuracy in fruit quality assessment.

This research [14] employs image processing and random forests for dairy product quality detection. The authors use image features to train a random forest model that identifies defects and anomalies in dairy products. This study focuses on automated detection of freshness in seafood using deep learning techniques. The authors use a deep neural network to assess seafood quality based on color, texture, and shape attributes [15].

In conclusion, the reviewed papers collectively highlight the significant advancements achieved in food quality detection through the integration of machine learning and image processing techniques. From deep learning-based approaches to hybrid models, these studies showcase the potential of technology to enhance food safety, quality, and consumer satisfaction in the food industry.

# CHAPTER 3

# PROPOSED METHODLOGY

# CHAPTER 4

# SOFTWARE REQUIREMENTS

# 1. Visual Studio Code:

# Visual Studio Code is a lightweight, open-source code editor developed by Microsoft.

# It provides a modern and customizable interface for software development across multiple platforms.

# 2. Python:

# Python serves as the programming language for the entire application.

# It provides a clean and readable syntax, making it suitable for rapid development.

# 3. Flask:

# Flask is a micro web framework for Python.

# It simplifies the process of building web applications by providing tools and libraries for common web development tasks. In this code, Flask is the core framework handling HTTP requests and responses.

# 4. OpenCV (cv2):

# OpenCV, or Open-Source Computer Vision Library, is utilized for computer vision tasks.

# In this application, OpenCV is used for image processing, including operations like thresholding, filtering, erosion, dilation, and contour detection.

# 5. NumPy:

# NumPy is a powerful library for numerical operations in Python.

# It provides support for large, multi-dimensional arrays and matrices, along with mathematical functions. In this code, NumPy is likely used for efficient array manipulation in the context of image processing.

# 6. Matplotlib:

# Matplotlib is a comprehensive library for creating static, animated, and interactive visualizations in Python. The code employs Matplotlib to generate a pie chart visualizing dust and rice grain percentages.

# 7. Web Browser:

# The end-users interact with the Flask web application through a web browser. The user interface is generated using HTML templates, and the results are displayed in the browser.