Rice Type Classification using CNN

Milestone 1: Project Initialization and Planning Phase

The "Project Initialization and Planning Phase" marks the project's outset, defining goals, scope, and stakeholders. This crucial phase establishes project parameters, identifies key team members, allocates resources, and outlines a realistic timeline. It also involves risk assessment and mitigation planning.

Activity 1: Define Problem Statement

Problem Statement: The current method of classifying rice types based on physical appearance alone is troublesome because it often leads to errors and inconsistencies. This can result in mislabeled products, customer dissatisfaction, and challenges in meeting market demands effectively. Our solution involves developing a model that accurately classify different rice types such as Basmati, Jasmine, Arborio, Karacadag, and Ipsala. This approach ensures precise labelling, better quality control, and enhanced customer satisfaction. Ultimately, our solution aims to streamline the classification process, reduce errors, and provide farmers, distributors, and consumers with reliable information about the rice they are dealing with, thereby improving overall efficiency and market competitiveness in the rice industry.

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Activity 2: Project Proposal (Proposed Solution)

This project aims to develop a Convolutional Neural Network (CNN) model for accurately classifying various rice types based on their physical and chemical properties. By leveraging deep learning techniques, the proposed solution seeks to improve labeling precision, enhance quality control measures, and streamline operational workflows within the rice industry. The project will focus on data collection, model development, rigorous evaluation, and deployment of the CNN model to provide a robust tool for efficient rice type classification.

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Activity 3: Initial Project Planning

The project will begin with a kickoff meeting to define goals, scope, and assign team roles. Following this, we will collect and preprocess a diverse dataset of rice grain images. Next, we will experiment with different CNN architectures and select the best-performing model. After training and fine-tuning the model, we will rigorously evaluate its performance. Finally, we will deploy the model and integrate it into existing workflows for efficient rice type classification.

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Milestone 2: Data Collection and Preprocessing Phase

The Data Collection and Preprocessing Phase involves executing a plan to gather relevant data from Kaggle, ensuring data quality through verification and addressing missing values. Preprocessing tasks include resizing, normalizing, augmenting, denoising, adjusting contrast, detecting edges, converting color space, cropping, batch normalizing, and whitening data.

Activity 1: Data Collection Plan, Raw Data Sources Identified, Data Quality Report

Elevate your data strategy with the Data Collection plan and the Raw Data Sources report, ensuring meticulous data curation and integrity for informed decision-making in every analysis and decision-making endeavour.

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Activity 2: Data Quality Report

The dataset for "Rice Type Classification using CNN" is sourced from Kaggle. Data quality is ensured through thorough verification, addressing missing values, and maintaining adherence to ethical guidelines establishing a reliable foundation for predictive modeling. The Data Quality Report will summarize data quality issues from the selected source, including severity levels and resolution plans. It will aid in systematically identifying and rectifying data discrepancies.

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Activity 3: Data Exploration and Preprocessing

The images will be preprocessed by resizing, normalizing, augmenting, denoising, adjusting contrast, detecting edges, converting colour space, cropping, batch normalizing, and whitening data. These steps will enhance data quality, promote model generalization, and improve convergence during neural network training, ensuring robust and efficient performance across various computer vision tasks.

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Milestone 3: Model Development Phase

In the Model Development Phase for loan approval, we strategically select relevant features and evaluate models such as Random Forest, Decision Tree, KNN. We initiate model training with code implementation and rigorously validate performance metrics like accuracy and recall. This phase aims to deliver a robust predictive model that enhances decision-making efficiency in the lending process.

Activity 1: Model Selection Report

In the model selection report for future deep learning and computer vision projects, various architectures, such as CNNs or RNNs, will be evaluated. Factors such as performance, complexity, and computational requirements will be considered to determine the most suitable model for the task at hand.

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Activity 2: Initial Model Training Code, Model Validation and Evaluation Report

The Initial Model Training Code employs selected algorithms on the dataset. The initial model training code will be showcased in the future through a screenshot. The model validation and evaluation report will include a summary and training and validation performance metrics for multiple models, presented through respective screenshots.

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Milestone 4: Model Optimization and Tuning Phase

The Model Optimization and Tuning Phase involves refining neural network models for peak performance. It includes optimized model code, fine-tuning hyperparameters, comparing performance metrics, and justifying the final model selection for enhanced predictive accuracy and efficiency.

Activity 1: Hyperparameter Tuning Documentation

We selected Convolutional Neural Networks (CNNs) for our rice varieties classification project due to their proven ability to handle complex image data and capture intricate visual patterns. During hyperparameter tuning, we optimized parameters like convolutional layers, filter sizes, and dropout rates to enhance model accuracy and mitigate overfitting. This process aimed to ensure robust classification of rice varieties based on image data, aligning perfectly with our project goals.

Activity 2: Performance Metrics Comparison Report

Our Performance Metrics Comparison Report highlights the significant improvements achieved through hyperparameter tuning of the CNN model. By comparing baseline and optimized metrics such as accuracy, precision, recall, and F1-score, we demonstrate the CNN's enhanced ability to accurately classify rice varieties from images. This analysis underscores the effectiveness of parameter adjustments in refining our model's predictive capabilities.

Activity 3: Final Model Selection Justification

We chose the CNN as our final model for rice variety classification based on its exceptional performance after hyperparameter tuning. Its robustness in analyzing image features and its alignment with project objectives of accurate classification make it the optimal choice. The CNN's capability to learn complex visual patterns ensures reliable predictions crucial for applications in agricultural analysis and crop management.

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Milestone 5: Project Files Submission and Documentation

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Milestone 6: Project Demonstration

Video Presentation-

Video link: