Technology Stack

Date	31 January 2025
Team ID	LTVIP2025TMID60812
Project Name	Grain Palette - A Deep Learning Odyssey In Rice Type Classification Through Transfer Learning
Maximum Marks	4 Marks

Technology Stack

The Grain Palette system is built using a modern, modular technology stack that supports machine learning, image processing, deployment, and visualization.

□ 1. Machine Learning & Deep Learning

Technology	Purpose
TensorFlow / Keras	Primary framework for building and training deep learning models
Transfer Learning Models	Pre-trained models like **EfficientNetB0**, **ResNet50**, **VGG16**
Scikit-learn	Evaluation metrics (precision, recall, confusion matrix)
NumPy & Pandas	Data handling and manipulation

□□ 2. Image Processing & Augmentation

Technology	Purpose
OpenCV	Image resizing, enhancement, preprocessing
TensorFlow ImageDataGenerator	Data augmentation during training

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□ 3. Front-End (User Interface)

Technology	Purpose
Streamlit	Lightweight web interface for uploading images and showing results
HTML/CSS	UI styling (if using custom front-end)
Flask (optional)	RESTful API to serve the model backend

□□ 4. Back-End & APIs

Technology	Purpose
Flask / FastAPI	Back-end framework for serving predictions via API
TensorFlow SavedModel / ONNX	Export and serve the trained model

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☁□ 5. Deployment

Platform	Purpose
Google Colab / Kaggle Notebooks	Model development and training environment
Heroku / Render / AWS / Azure	Deployment of the model or web app
TensorFlow Lite (optional)	Convert model for offline/mobile usage

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□ 6. Reporting & Visualization

Technology	Purpose
Power BI	Dashboard for performance analysis, data trends
Matplotlib / Seaborn	Model metrics visualization (confusion matrix, accuracy, etc.)

□□ 7. Data Management

Technology	Purpose
CSV / Excel	Input/output data formats
Firebase / SQLite (optional)	User and classification history storage

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□ 8. Optional Tools

Tool	Purpose
Git / GitHub	Version control and collaboration
Docker	Containerization of the application
Jupyter Notebook	Interactive prototyping and model testing

☑Summary

The chosen tech stack balances **performance**, **ease of use**, and **deployability** — especially for users in agricultural or rural settings. Transfer learning enables fast, accurate classification with minimal computational overhead.