Project Design Phase Solution Architecture

Date	28 June 2025
Team ID	LTVIP2025TMID40189
Project Name	GrainPalette - A Deep Learning Odyssey In Rice Type Classification Through Transfer Learning
Maximum Marks	4 Marks

Solution Architecture:

To design and implement a scalable, accurate, and user-friendly AI-powered system that classifies rice grain types using image input, with real-time predictions and accessibility for farmers, researchers, and gardeners.

Component	Description
Frontend	HTML/CSS-based UI accessible via browser. Allows users to upload rice grain images and view prediction results.
Backend (Flask Framework)	Acts as a bridge between the frontend and ML model. Manages routing, image handling, and API responses.
Rice Type Classifier (ML Model)	A CNN-based deep learning model (MobileNetV4 via transfer learning) trained on a labeled rice grain dataset.
Preprocessing Module	Converts uploaded image to the format expected by the model (resize, normalize, reshape).
Prediction Service	Executes model inference and returns predicted rice class label with confidence score.
Storage (Optional)	Can include local or cloud-based storage for uploaded images and prediction logs.

Technologies Used

Layer	Technology
Frontend	HTML5, Bootstrap (optional), JavaScript
Backend	Python, Flask
Al Model	TensorFlow/Keras with MobileNetV4
Deployment	Local server / optionally on cloud (Heroku, AWS, or Render)
Image Processing	OpenCV / PIL
Model Storage	.h5 or .pkl format for saved model weights

S Features & Development Phases

Phase	Features
Phase 1	Data collection, image preprocessing, CNN model building with MobileNetV4
Phase 2	Flask backend integration, API creation for inference
Phase 3	Frontend UI development and testing
Phase 4	Model evaluation, deployment, and real-user feedback integration
Phase 5 (optional)	Add multilingual support, mobile app version, cloud deployment, analytics dashboard

Example - Solution Architecture Diagram:

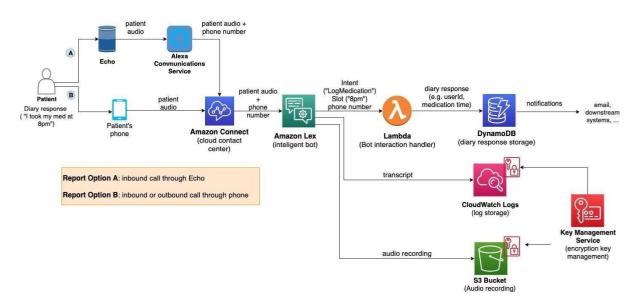


Figure 1: Architecture and data flow of the voice patient diary sample application

 $\label{lem:research-powered-by-ai-on-aws-part-1-architecture-and-design-considerations/} \\ Reference: $\frac{https://aws.amazon.com/blogs/industries/voice-applications-in-clinical-research-powered-by-ai-on-aws-part-1-architecture-and-design-considerations/$