**Rice Type Classification Web Application**

**Project Title:** *GrainPalette –A Deep Learning Odyssey In Rice Type Classification Through Transfer Learning*

**Developed by:** Smart Internz Team ID - LTVIP2025TMID34308  
**Designed by:** Geetha and Team

**1. Purpose of the Project**

The purpose of this project is to develop a smart application that can classify **different types of rice grains** using AI and provide useful agricultural suggestions based on the classification. This aids farmers, researchers, and food quality inspectors in improving rice handling, crop planning, and storage processes.

**2. Use Cases**

* **Farmers**: Determine rice type to receive water and fertilizer suggestions.
* **Traders & Buyers**: Verify grain type quality in marketplaces.
* **Researchers**: Analyze classification performance in regional varieties.
* **AgriTech Startups**: Integrate into larger platforms for crop advisory systems.

**3. Advantages**

* Fast and accurate rice type identification
* User-friendly interface for both web and desktop
* Smart suggestions for agricultural actions
* Can integrate with mobile or field devices
* Reduces manual errors in grain classification

**4. About the Model**

* **Model Type**: Convolutional Neural Network (CNN)
* **Transfer Learning**: Yes, used MobileNetV2 for base architecture
* **Classes Predicted**:
  + Arborio
  + Basmati
  + Ipsala
  + Jasmine
  + Karacadag
* **Final Format**: TensorFlow Lite (.tflite) model for efficiency

**5. Phases of the Project**

**Phase 1: Problem Identification**

* Manual grain sorting is inefficient.
* Needed a scalable, AI-based classification system.

**Phase 2: Data Collection & Preprocessing**

* Collected and labeled rice grain images.
* Augmented and resized images for uniformity.

**Phase 3: Model Training**

* Used MobileNetV2 with custom top layers.
* Trained using categorical crossentropy.
* Achieved high accuracy (e.g., 95%+ on validation set).

**Phase 4: Model Conversion**

* Converted the model to **TFLite** for efficient deployment.
* Optimized for mobile and web use.

**Phase 5: Application Development**

* Developed a **Flask-based Web Application**
* Users can upload or capture rice images from webcam.
* Model classifies and returns:
  + Rice Type
  + Confidence Level
  + Suggestion (e.g., water, fertilizer tips)

**Phase 6: UI/UX Enhancement**

* Green-black themed UI inspired by screenshots.
* Includes banners, social icons, and responsive design.

**Phase 7: Deployment**

* Local deployment with Flask
* Easily deployable on:
  + Render
  + PythonAnywhere
  + AWS EC2
  + Heroku (with filesystem adjustments)

**6. Tools & Technologies Used**

| **Category** | **Tools Used** |
| --- | --- |
| Language | Python, HTML, CSS, JavaScript |
| Framework | Flask (for backend web server) |
| ML Framework | TensorFlow, TFLite |
| Model | MobileNetV2 (Transfer Learning) |
| Deployment | Localhost / PythonAnywhere-ready |
| UI Design | Custom CSS, HTML5, Responsive Layout |
| Image Capture | HTML5 <video> + JS Blob API |

**7. Project Structure**

bash

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GrainPalette\_WebApp/

│

├── app.py # Flask backend

├── templates/

│ └── index.html # Main page

│ └── result.html # Result display page

├── static/

│ ├── css/style.css # Theme styling

│ ├── js/script.js # Camera and upload JS

│ └── images/hero.jpg # Banner image

├── uploads/ # Temp image storage

├── rice\_model.tflite # Deep Learning model

**8. Future Enhancements**

Add real-time auto-classification pipeline

Multilingual support for rural users

Mobile app version with camera integration

Cloud storage for result history and analytics

**Python code:**

<https://colab.research.google.com/drive/1TTRWUdJ6eSLLrG27fI8XP2j3pCERGmtX?usp=sharing>

**Flask application:**

<https://drive.google.com/file/d/1kxfBjRjti-_CctZrqdKSQgpp8DSIdSQi/view?usp=sharing>

**Rice data set:**

<https://drive.google.com/file/d/1rxWHDElhxLF4HSZ44FFYojyv57zx9A8D/view?usp=sharing>

**Demo video:**

<https://drive.google.com/file/d/1I30Pxa65AuVoZ7yeks6HSJsaA9dLvWXi/view?usp=sharing>

**Git Hub:**

<https://github.com/Bvk277353/Smart-internz-project-grain-palette--rice-type-classifier-.git>