🌾 GrainPalette – A Deep Learning Odyssey in Rice Type Classification Through Transfer Learning

GrainPalette is an AI-powered system for rice type classification using **deep learning and transfer learning techniques**. It uses pre-trained models to accurately classify different rice grain types based on image inputs. This system aims to support agricultural quality control, automate grain inspection, and enhance food supply chain analytics.

🔍 Core Features:

- 📸 **Image-based Rice Grain Detection**
- 🤖 **Deep Learning Classifier** using transfer learning
- 🔄 **Transfer Learning with Pre-trained CNNs** (e.g., ResNet, VGG, MobileNet)
- 📊 **Result Dashboard** showing prediction confidence and type
- 🌐 **User Interface** for image upload and result display

🧠 Technology Stack:

- **Frontend**: HTML, CSS, JavaScript (for image input & result view)
- **Backend**: Python Flask / Streamlit (to run inference and serve results)
- **AI Models**: TensorFlow / PyTorch with pre-trained CNNs (ResNet50, MobileNetV2, etc.)
- **Libraries**: OpenCV, NumPy, Pandas, Matplotlib

🧪 How It Works:

1. **Image Preprocessing** – Resize, normalize, and enhance the input image.
2. **Model Inference** – Use transfer learning with a fine-tuned CNN model.
3. **Prediction Output** – Show the rice type and confidence score.

4. **Optional** – Export report or integrate into agricultural monitoring systems.

▶ How to Run:

bash

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pip install -r requirements.txt

python app.py # (Flask version)

Or for Streamlit version:

bash

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streamlit run app.py

Would you like a **poster**, **PowerPoint**, or **project report** version of this? I can also add:

- Flowchart or architecture diagram
- Model training details
- Accuracy and confusion matrix
- Dataset information (e.g., Rice Image Dataset)