🌾 GrainPalette: Rice Classification through Transfer Learning 🤖

GrainPalette is a smart deep learning project that classifies different types of rice grains 🌾 using images 📷. It uses **MobileNetV2**, a powerful pre-trained model (transfer learning), to identify rice types accurately and efficiently.

📌 Project Overview

GrainPalette is a web app that takes an image of rice grains and tells you what type of rice it is. It's helpful for farmers, quality control teams, and food industries 🍚🏭. The app uses computer vision and deep learning to analyze the grains.

🛠️ Technologies Used

- 💻 **Frontend**: HTML, CSS, Bootstrap
- 🧠 **Backend**: Flask (Python)
- 📊 **Model**: MobileNetV2 (Transfer Learning)
- 🔧 **Libraries**: OpenCV, TensorFlow, Keras, NumPy, Pillow
- 📈 **Visualization**: Matplotlib, Plotly
- 🚀 **Deployment**: GitHub

📂 Dataset

We used a rice grain dataset containing images of 5 rice types:

1. 🍚 Basmati
2. 🍚 Arborio

3. 🍚 Ipsala
4. 🍚 Jasmine
5. 🍚 Karacadag

Each category has 200+ high-quality images used for training and testing.

🧠 Architecture (How it Works)

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```
User Uploads Image 📷
        ⬇️
Flask Backend 🔁
        ⬇️
Preprocessing (Resize, Normalize) 🔍
        ⬇️
MobileNetV2 Model 🧠
        ⬇️
Prediction with Confidence 📊
        ⬇️
Results + Pie Chart 📈
```

🏋️ Model Training Details

- ✅ **Base Model**: MobileNetV2
- 🖼️ **Input Size**: 224x224 pixels
- 🔁 **Epochs**: 15–20
- 📉 **Loss Function**: Categorical Crossentropy
- 🚀 **Optimizer**: Adam
- 🎯 **Accuracy**: ~95%

📊 Graphs & Visuals

📈 Training vs Validation Accuracy

- Shows how well the model is learning over time.

📉 Confusion Matrix (Pie Chart Style)

- Visualizes how the model is predicting each class.

🧠 Prediction Confidence Chart

- After uploading a rice image, the app shows how confident it is using a colorful pie chart!

python
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```
# Sample pie chart code
import plotly.express as px
fig = px.pie(names=rice_classes, values=prediction_probs,
title="Prediction Confidence")
```

✨ Features

✅ Upload rice grain images
✅ Predict rice type instantly
✅ Visual confidence results (Pie Chart)
✅ Mobile-friendly UI
✅ Warns users if image is not of rice 🌐⚠️

🚀 How to Use

Clone the project:

bash
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```
git clone
https://github.com/Aditya25-web/grainpalette-a-deep-learning-odyssey
-in-rice-type-classification.git
```

1.

Set up the environment:

bash
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```
cd "Project Files"
python -m venv venv
venv\Scripts\activate
pip install -r requirements.txt
```

2.

Run the app:

bash
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```
python app.py
```

3.

Open in browser:

arduino
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```
http://localhost:5000
```

4.

👥 Contributors

- 👨‍💻 Aditya Kunchala – Lead Developer
- 👨‍💻 bhavesh pavan-team member

🔮 Future Improvements

- Add more rice varieties 🌾
- Remove background noise for better accuracy 🖼️

- Make the app mobile-friendly 📱
- Allow users to export results as PDF 📄

📌 **GitHub Repo**:
🔗 GrainPalette Project Link

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