Machine Learning Project Documentation format

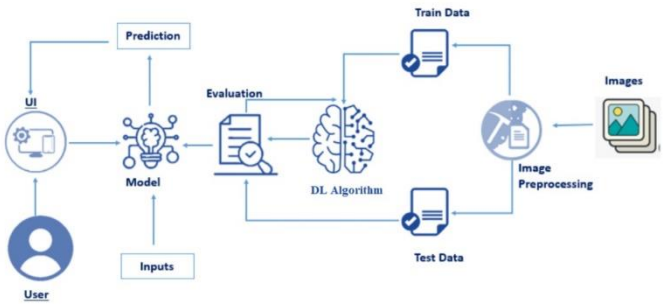
1. Introduction

- **Project Title:** Pollen's Profiling: Automated Classification of Pollen Grains
- **Team Members:**
    1. Eduri Maryjones (Data collection,Train the model,Application building)
    2. Idimukkala Yasasswini (Train the model,save the model,Test the model,Application building)
    3. Mamidela Venkata Naga Suseel Kumar (Read the data,Image pre-processing,Training the model,Save the model,Test the model,Application building)
    4. Inturi Venkata Vikash (Data Collection,Exploratory Data Analysis,Image Pre-processing,Application Building)
    5. J Pushpitha (Data Collection,Exploratory Data Analysis,Image Pre-processing,Application Building)

2. Project Overview

- **Purpose:** Automate pollen grain identification using a deep learning CNN model based on image classification.
- **Features:** Image upload for pollen classification.
  Prediction of pollen type.
  Web-based interface using Flask.

3. Architecture

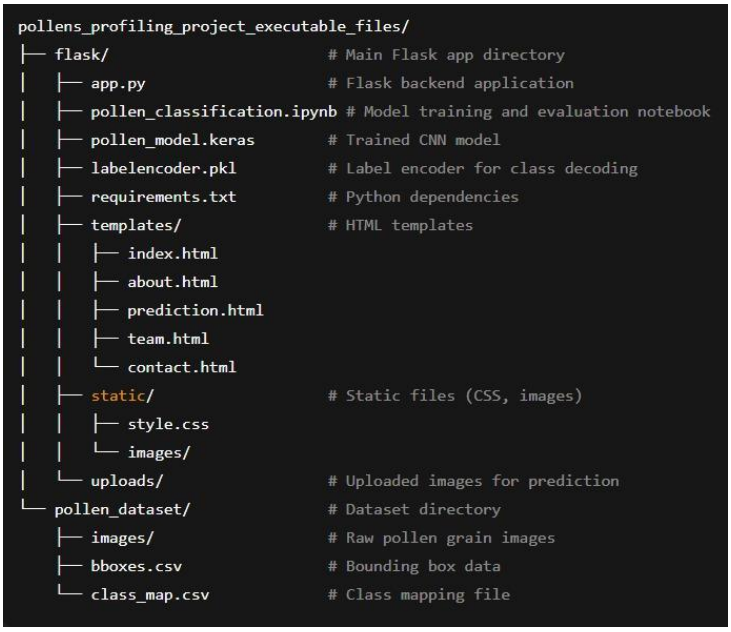


4. Setup Instructions

- **Prerequisites:** Python, TensorFlow, Flask, OpenCV, Scikit-learn, Numpy, Pandas, Matplotlib.
- **Installation:**
  git clone https://github.com/EduriMaryJones/Pollen-s-Profiling-Automated-Classification-of-Pollen-Grains.git
  cd Pollen-s-Profiling-Automated-Classification-of-Pollen-Grains

cd flask
pip install -r requirements.txt

5. Folder Structure



6. Running the Application

- > python app.py
  Type this in the terminal and click the link

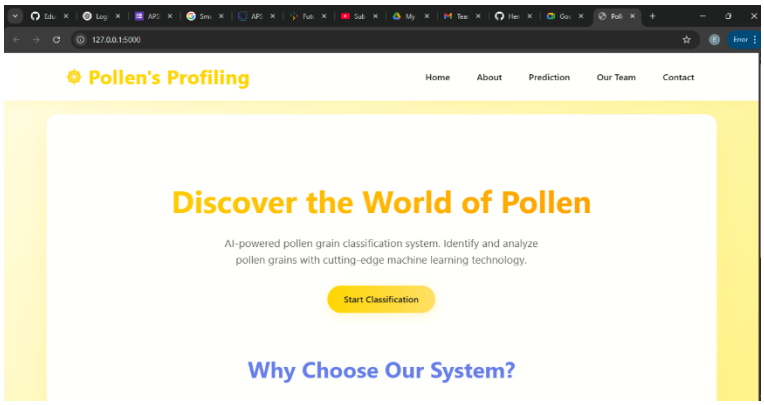
7. API Documentation

- Base URL: http://127.0.0.1:5000/
- Endpoints:
  / → Home (GET)
  /about → About page (GET)
  /prediction→ Prediction page UI (GET)
  /team → Team page (GET)
  /contact → Contact page (GET)
  /predict → Prediction API (POST)
- /predict API:
  Method: POST
  Input: Image file (file)

8. Authentication

- No Authentication required

9. User Interface



10. Testing

🩹 Testing Strategy

☑ Manual Testing

- Each feature of the web application (Homepage, Prediction, Upload, Result display, Contact form) was manually tested across different browsers (Chrome, Edge, Firefox).
- File upload validation was tested with:
- Valid image formats (.jpg, .png)
- Invalid inputs (non-image files, empty uploads)

☑ Model Evaluation

- The CNN model was evaluated using
  Train/Test Split (80/20) stratified by class

Metrics Used:

- Accuracy
- Confusion Matrix
- Classification Report (Precision, Recall, F1-score)
- Visual performance tracking was done using Matplotlib plots for training/validation loss and accuracy.

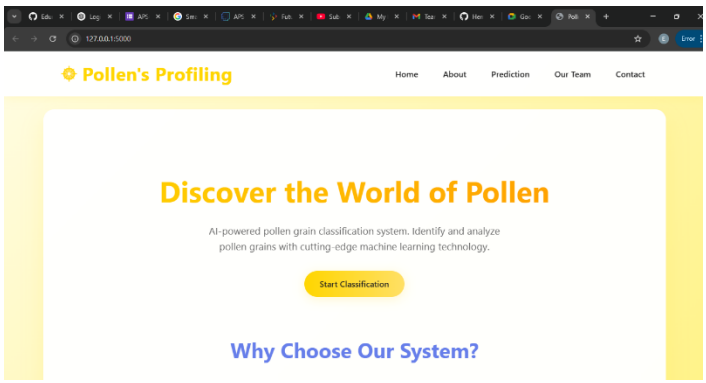
☑ Prediction Testing

- Real-time predictions were tested by:
- Uploading test images via the /predict endpoint
- Verifying output class labels against known inputs
- Cross-checking consistency with model evaluation results in the notebook

🧰 Tools Used for Testing

- Tool / Library Purpose
- Jupyter Notebook Model training, evaluation, and testing
- Matplotlib Visualization of training metrics
- Scikit-learn Confusion matrix, classification report
- Browser Developer Tools UI inspection and validation
- Flask Debug Mode Monitoring and catching runtime errors

11. Screenshots or Demo



12. Known Issues

- Accuracy depends on dataset quality.
- Misclassification in very similar pollen types.

13. Future Enhancements

- Deploy on cloud (Render, Heroku)
- Add user login to save predictions.
- Improve model with a larger dataset.