AI-Driven Web Application for Automated Disease Detection in Rice and Pulse Crops

An Infosys Springboard Virtual Internship 6.0 project, empowering farmers with AI for healthier harvests.

Mentor & Coordinator

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Project Overview: AI-Driven Disease Detection

Leveraging deep learning and a user-friendly web interface to detect and diagnose crop diseases from leaf images.

1

Primary Objective

Build a production-ready Streamlit web app with CNN for accurate leaf disease classification in rice and pulse crops.

2

Key Highlights

Custom CNN, Streamlit UI, 3 disease classes, PDF reports, AI Chatbot, Secure Auth.

3

Target Users

Farmers, Agricultural Extension Officers, Agronomists, Research Institutions.

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Problem Statement: Agricultural Losses

Problem Statement

Crop diseases pose a significant threat to global food security and farmer livelihoods. Our project directly addresses these pressing issues.

- Time-Consuming & Error-Prone

- Costly Laboratory Testing

- Limited Expert Access

- Reduced Yield and Income

Project Purpose: Smart & User-Friendly AI

1
Project Objective
Identify rice and pulse crop diseases using AI-powered image analysis for timely farmer intervention.

2
Specific Objectives
Robust CNN design, secure authentication, real-time predictions, SOLID principles, comprehensive testing.

3
Expected Outcomes
Intuitive tool, accessible interface, early detection, targeted treatments, comprehensive documentation.

Real-World Impact

Early detection, web-based accessibility, cloud scalability, and data-driven decisions reduce crop loss and pesticide misuse.

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Dataset & Preprocessing for AI Accuracy

Dataset Overview

- **Total Images:** 300+ collected
- **Image Size:** Standardized to 224×224 pixels
- **Format:** JPEG, JPG, PNG
- **Organization:** Structured folders per class
- **Validation:** Manual to remove corrupt samples

Disease Classes (3 Total)

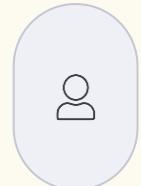Includes Bacterial Leaf Blight, Brown Spot, Leaf Scald.

Preprocessing & Augmentation

Input Image → Resize(224*224) → RGB Conversion → Convert to Tensor → Normalization(ImageNet mean & Std).
Data Augmentation Techniques like random horizontal flip, rotation, color jitter, are used.

Seamless Workflow for Rapid Diagnosis

User Login
Secure access to the platform via personalized accounts.

Upload Leaf Image
Simple, intuitive interface for submitting crop leaf photos.

AI Model Prediction
Deep learning algorithms swiftly analyze the uploaded image.

Disease Identified
Instant diagnosis of specific crop diseases with high accuracy.

Cure Suggestions
Receive recommended treatments and essential care instructions.

PDF Report Generated
Download a comprehensive, detailed report for future reference.

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How Disease Detection Works: The 6-Phase Pipeline

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1
Image Acquisition

User uploads clear leaf image (JPEG/JPG/PNG, max 5MB) with format/size validation.

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2
Preprocessing

Resize to 224×224, normalize with ImageNet stats, convert to PyTorch tensor.

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3
Feature Extraction

CNN backbone extracts visual features, detecting patterns like spots and lesions.

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4
Classification

Fully connected layers map features to 3 classes; Softmax produces probability distribution.

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5
Confidence Scoring

Highest probability class selected; 60% threshold ensures reliable predictions.
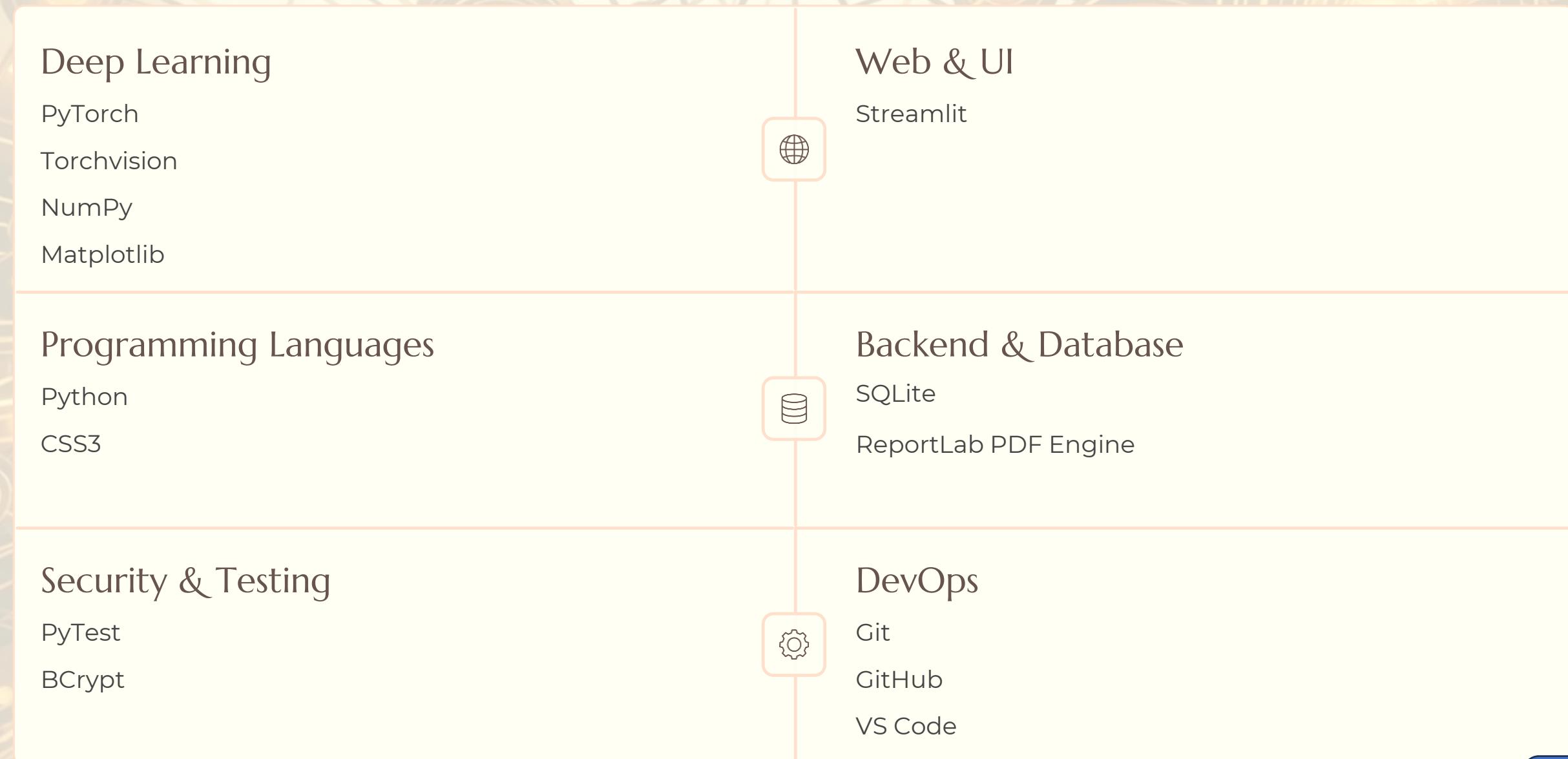
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6
Result Presentation

Disease name, confidence, description, symptoms, recommendations, and downloadable PDF report.

Tools and Technologies Used

Our project leverages a robust stack of cutting-edge tools and frameworks to ensure efficiency, scalability, and performance.

Deep Learning

PyTorch

Torchvision

NumPy

Matplotlib

Web & UI

Streamlit

Programming Languages

Python

CSS3

Backend & Database

SQLite

ReportLab PDF Engine

Security & Testing

PyTest

BCrypt

DevOps

Git

GitHub

VS Code

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Outcomes

AI-Powered Detection

CNN classifies 3 disease classes with confidence scores.

Web Application

Streamlit-based platform accessible via any browser.

PDF Reports

Downloadable diagnosis reports with recommendations.

Secure Authentication

bcrypt (12 rounds) + SQLite user management.

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Future Scope: Expanding Horizons

Our vision extends beyond current capabilities to create a truly comprehensive and globally impactful solution for agricultural disease detection.

Expansion

- More diseases (20+ for diverse crops)
- Mobile application for on-the-go diagnosis
- Offline mode for remote farming areas

Integration

- GPS for precise location-based insights
- Real-time weather data for predictive analysis
- Detailed, localized treatment guidance

Support & Accessibility

- Multi-language support for global adoption
- Expert connect features for personalized advice
- Community forums for peer-to-peer knowledge sharing

Thank You

We appreciate your time and interest in our AI-driven solution for crop disease detection. Together, we can build a more resilient and sustainable future for agriculture.

Questions?

✉ Get in Touch

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