

AGROBOT

– Project Documentation

Multilingual Agricultural Assistance System using CNN
& NLP

ABSTRACT

AgroBot is an intelligent agricultural assistance system designed to help farmers with crop-related queries through image classification and text-based chatbot responses. The system combines a Convolutional Neural Network (CNN) for detecting crop issues from images and Natural Language Processing (NLP) for understanding and responding to user queries. A major highlight of AgroBot is its multilingual capability, where users can interact in various Indian regional languages, and the system responds in the same language using the Google Translate API. The aim of this project is to build a smart, accessible, and user-friendly platform that helps farmers obtain accurate information anytime and in their preferred language.

INTRODUCTION

Agriculture plays a critical role in the Indian economy, and millions of farmers rely on timely and accurate information for healthy crop growth. However, farmers often face challenges such as identifying plant diseases, understanding crop care, and accessing information in their native language. AgroBot is developed to address these challenges by integrating image classification and NLP into a unified system that offers intelligent assistance. The platform can recognize visual symptoms of crop diseases and answer agricultural questions in the user's own language.

PROBLEM STATEMENT

Many farmers struggle to detect crop issues early, and consulting experts is not always possible. Additionally, most digital agricultural tools are available only in English, creating a language barrier. There is a need for a system that:

- Identifies crop issues from images
- Understands text queries
- Responds in multiple regional languages
- Provides reliable agricultural guidance

AgroBot aims to solve this real-world problem.

OBJECTIVES

- To build an image classification model using CNN for detecting crop issues.
- To implement a fast, text-based chatbot using NLP.
- To provide multilingual support for better accessibility.
- To integrate the Google Translate API for automatic translation.
- To develop an easy-to-use interface for farmers.

LITERATURE REVIEW

Convolutional Neural Networks (CNNs):

CNNs are deep learning models widely used for image classification. They extract spatial features effectively and outperform traditional machine learning methods for visual data.

Natural Language Processing (NLP):

NLP enables computers to understand human language. It is used to analyze user queries and provide meaningful responses quickly.

Translation APIs:

The Google Translate API is used to detect the user's language and convert responses to the desired language, enabling multilingual interaction.

SYSTEM ARCHITECTURE

The system workflow includes:

- **User Input:**
 - a. Image uploaded by the user
 - b. Text query entered in any language
- **Processing:**
 - a. CNN model processes the image
 - b. NLP model processes text
 - c. Translation module detects language and converts responses
- **Output:**
 - a. Identified crop issue
 - b. Text response in the same language entered by the user

TECHNOLOGIES USED

Frontend:

- Streamlit

Backend:

- Python
- TensorFlow (CNN model)
- NLP-based text response system

APIs & Libraries:

- Google Translate API (deep-translator)
- langdetect
- rapidfuzz for matching queries

MODULES

1. Image Classification Module (CNN)

- Built using TensorFlow and Keras
- CNN chosen because it handles image features efficiently
- Extracts spatial patterns like spots, discoloration, texture, etc.
- Helps detect potential crop issues

2. NLP Chatbot Module

- Preprocesses text to clean and understand queries
- Matches queries to predefined responses
- Fast response generation

3. Multilingual Module

- Uses language detection (langdetect)
- Uses Google Translate API
- Supports multiple Indian regional languages
- Ensures user receives reply in their own language

4. Frontend Interface

- Simple UI for uploading images and entering text
- Implemented using Streamlit
- Deployed using Streamlit Community Cloud

IMPLEMENTATION

- Trained a CNN-based model using a crop disease dataset
- Created preprocessing functions for text cleaning
- Implemented NLP logic to match queries
- Integrated Google Translate API for multilingual support
- Built a Streamlit interface for user interactions
- Deployed the project on Streamlit Cloud

RESULTS

- The CNN model successfully identifies crop issues with good accuracy
- The chatbot responds correctly to agricultural questions
- The multilingual feature works smoothly for various Indian languages
- The interface is simple and easy for farmers to use

CONCLUSION

AgroBot is a powerful agricultural assistance tool that combines image classification, NLP, and multilingual translation to help farmers access information quickly. The system provides accurate results, supports regional languages, and bridges the communication gap in agriculture.

FUTURE ENHANCEMENTS

- Add audio input/output for farmers who prefer voice support
- Add more crop categories and diseases
- Improve NLP model accuracy with deep learning
- Develop a mobile application version
- Add real-time camera-based disease detection