

# WEEK - 2

## Select Week Number - Week 2 (June 9–16, 2025)

### Tasks Completed This Week

- **June 9:**
  - Conducted a mentor meeting with Johannan Joysingh Sir, who advised integrating a chatbot into the solution.
  - Planned to study AI chatbot development using LLMs; each team member tasked with researching and prototyping within two days.
- **June 10:**
  - Focused on chatbot development:
    - **Sushmetha:** Built a basic RAG-based chatbot using datasets from Hugging Face, with Gradio UI (tested on Kaggle, faced errors). Later switched to Streamlit UI in VS Code.
    - **Abhinav:** Experimented with RAG and fine-tuning on the KisanVaani/agriculture-qa-english-only dataset using DistilBERT uncased and BERT cased models. Answers were partially correct but lacked proper sentence framing.
    - **Kiran:** Modified an Agri-Bot solution (from Analytics Vidhya) to accept multimodal input; also created an LLM chatbot using ChatGPT 4o via Chatling software (no-code solution, worked well).
    - **Harshavardhan:** Used the Phi-2 model with the Keshav022/Agriculture-Dataset, tested T5-small (results shared via images).
- **June 11:**
  - Annotated the Kaggle Pestopia dataset in Roboflow. Wrote a stratification script to sample 9,522 images equally from 55,000 images across pest classes (handled by Sushmetha, Abhinav, and Kiran).
- **June 12:**
  - Found annotation task too time-consuming; switched to the pre-annotated IP102 dataset (available on Kaggle, 19k images, 102 pest classes).
- **June 13:**
  - Trained YOLOv11s and YOLOv11m models on the IP102 dataset for pest detection, experimenting with 5 and 20 epochs.
  - Commenced designing the database schema and the design of the web application in Figma
- **June 14:**
  - Held a team meeting to discuss progress and remodified the solution:
    - Shifted focus to a web app first (React, Flask) with pest identification, pesticide recommendations, and supplier connectivity.

- Decided to integrate a basic chatbot within the web app for farming queries (postponed full WhatsApp chatbot to a stretch goal).
  - Planning to connect farmers with 2g phones through SMS messaging api.
- **June 15:**
  - Continued experimenting with YOLOv11 on IP102 dataset, focusing on object detection performance.
- **June 16:**
  - Finalized weekly report and prepared deliverables overview.

## Link to Codebase / Notebook / Dashboard

- GitHub Repository: [GitHub Link Placeholder] (to be shared with mentors)
- Notebooks: notebooks/chatbot\_rag.ipynb (Sushmetha's RAG implementation), notebooks/rag-agri.ipynb (RAG implementation of AgriModel), notebooks/rag-fine-tune.ipynb (RAG+Fine-tune experiments), notebooks/yolov11\_training.ipynb (YOLOv11 experiments).

## Progress Towards Final Goal

This week's work contributed significantly to the AgriSaarthi project (approximately 30% completion toward the final demo:

- **Chatbot Development:** Initial prototypes using RAG, fine-tuning, and no-code solutions (Chatling) laid the groundwork for an agriculture-specific chatbot. While full integration was deferred, we gained insights into LLM capabilities.
- **Dataset Preparation:** Switched to the IP102 dataset ensuring we have a robust dataset for pest identification.
- **Model Training:** YOLOv11 experiments for pest detection - align with the goal of targeting >90% accuracy (Model performance to be improved in Week 3).
- **Solution Refinement:** The pivot to a web app with an embedded chatbot addresses mentor feedback and our solution's vision.
- **Web Application:** Initial design for the frontend components using Figma.

## Challenges Faced

- **Chatbot Development:**
  - Sushmetha: Errors in Gradio UI on Kaggle; limited success with Streamlit.
  - Abhinav: Poor sentence framing in BERT-based answers despite correct information.
  - General: Team's lack of experience with LLMs led to slow progress and suboptimal results.
- **Annotation Task:** Annotating Pestopia dataset was time-intensive (9,522 images took longer than expected), prompting a switch to IP102.
- **Time Management:** Balancing chatbot research with pest identification tasks stretched the team's capacity, delaying web app development.

## Support Required

- **Guidance on LLM Chatbots:** Recommendations on fine-tuning LLMs for better sentence framing and agriculture-specific responses (e.g., using LLaMA or BERT).
- **Feedback on Solution Pivot:** Validation on focusing on a web app with an embedded chatbot instead of a standalone WhatsApp chatbot.

## Time Spent This Week (in Hours)

- Total: ~ 51 hours
  - Sushmetha: 10 hours (repo setup, chatbot RAG, dataset annotation, report)
  - Abhinav: 10 hours (chatbot fine-tuning, dataset annotation, YOLOv11 training)
  - Kiran: 10 hours (chatbot multimodal, no-code Chatling, dataset annotation)
  - Harshavardhan: 10 hours (chatbot Phi-2/T5-small experiments)
  - Arjun: 8 hours (solution remodification, meeting coordination, web application design)
  - Team Meetings: 3 hours (daily syncs, June 14 meeting)

## Plan for the Coming Week (June 16–22, 2025)

- **Web App Development:**
  - Set up React frontend with Tailwind CSS for image upload, results display, and product/supplier cards (Arjun, Kiranchandran).
  - Build Flask backend for API endpoints (image upload, pest detection, supplier lookup) (Harshavardhan).
  - Set up a PostgreSQL database for testing during development (Arjun)
- **Pest Identification:**
  - Evaluate YOLOv11 model performance (F1-score, confusion matrix) on IP102 dataset (Abhinav, Sushmetha).
  - Implement Grad-CAM for XAI to visualize pest-affected areas (Sushmetha).
- **Chatbot Integration:**
  - Integrate a basic chat UI in the web app for farming queries
- **Supplier Database:**
  - Populate data/suppliers.db with dummy data (PIN, StoreName, Contact, Address, Lat/Long) (Harshavardhan).
- **Documentation:**
  - Update project card and architecture diagram with the revised solution (Sushmetha).