SMART INDIA HACKATHON 2025

TITLE PAGE

- **Problem Statement ID – SIH25030**
- **Problem Statement Title- AI-Based Crop Recommendation for Farmers**
- **Theme- Agriculture, FoodTech & Rural Development**
- **PS Category- Software**
- **Team ID-**
- **Team Name - CodeSentry**

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KrishiSaarthi

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We are developing an AI-based Mobile/web platform that empowers farmers to diagnose crop diseases and receive localized advice in their own language. The system combines computer vision with an agriculture-tuned LLM, making scientific guidance simple and accessible for every farmer.

The Prototype will function as follows :

- Image-Based Detection – Farmers upload a crop image, and our transfer-learning model identifies plant diseases with high accuracy.
- Audio/Voice Queries – Farmers can ask questions via voice in their native language, making the app accessible even for low-literacy users.
- Localized Recommendations – Detected disease info is passed to a fine tuned LLM (via OpenRouter), which generates concise advice in regional language, adapted to local climate and conditions.
- Flexible Response Modes – Advisory delivered in both text and speech for maximum inclusivity.

A farmer in Bihar lost nearly 30% of his tomato yield last season due to late detection of blight.

With early AI-powered detection and timely advice, he could have saved most of his crop, earning 20% more income.

Our platform ensures that farmers get instant, vernacular guidance to prevent such losses and boost yields sustainably.

Unique Features Of KrishiSaarthi:

Vernacular-First Design – Supports 12+ Indian languages with text-to-speech and voice input using Google ML kit.

Dual AI Stack – Combines a plant disease recognition CNN with a domain-specific language model for contextual, farmer-friendly answers.

Location-Aware Advisory – Integrates weather and soil context for more relevant, field-level recommendations.

Low-Tech Accessibility – Designed for small and marginal farmers with minimal digital literacy, ensuring real impact at the grassroots.

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TECHNICAL APPROACH

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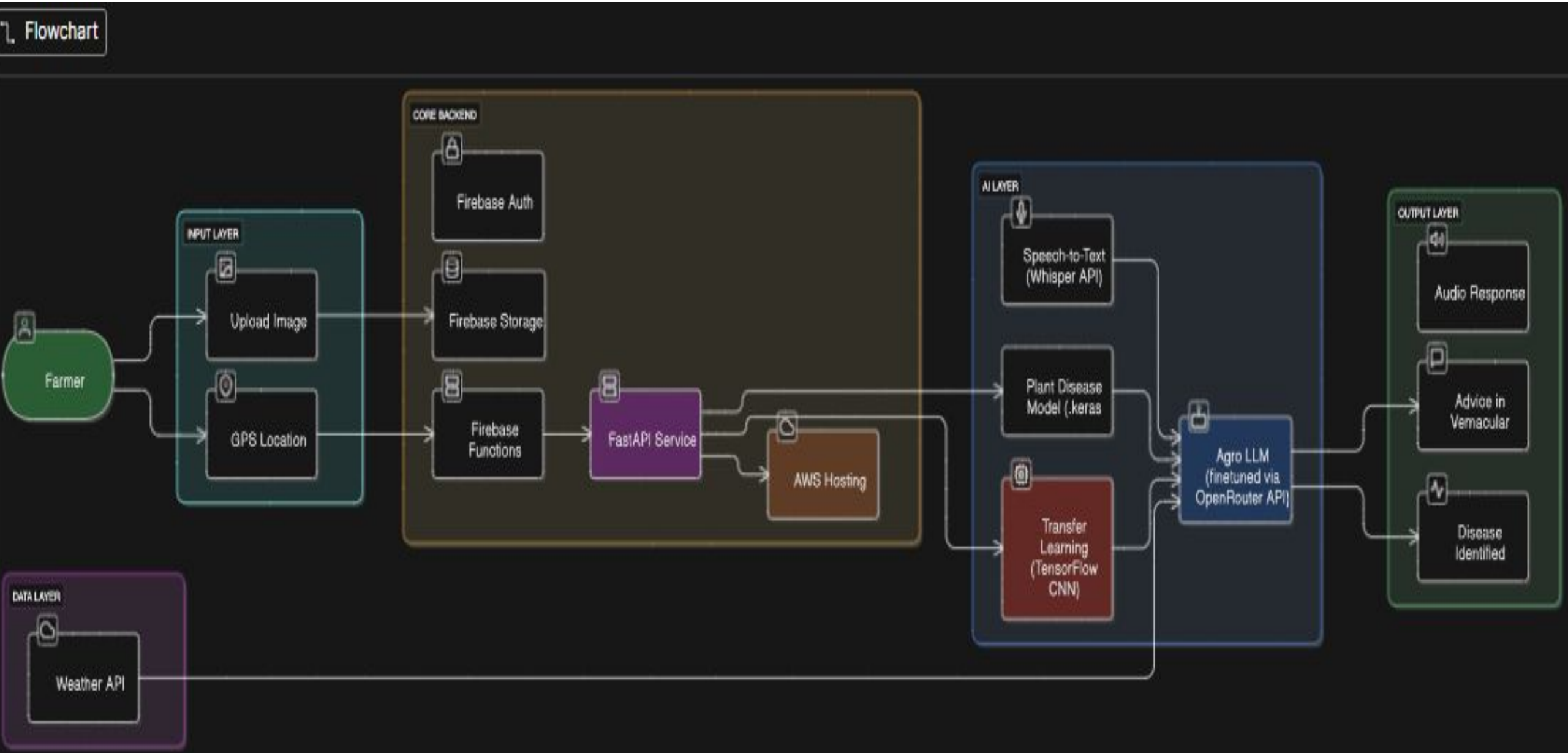

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Technical Approach :

- Input Capture

  Farmers upload crop images or ask queries via voice/text in their local language.

  GPS location is collected for context-aware recommendations.

- Preprocessing & Data Handling

  Images stored in Firebase Storage.

  Voice converted to text using Whisper API, ensuring multilingual support.

  Auth & access control managed by Firebase Auth.

- AI-Powered Detection & Advisory

  Plant Disease Recognition Model (.keras, Transfer Learning) identifies diseases from crop images.(gives 95% accuracy as of now)

  Results are passed to a fine tuned Agro-LLM (via OpenRouter API) for generating treatment advice in vernacular text.

- Contextual Insights Integration

  Weather API and Soil/Agri DB integrated for location-based recommendations.

  Ensures advice is tailored to regional conditions.

- Output Delivery

  Farmers receive advice in vernacular text or speech (gTTS/ElevenLabs).

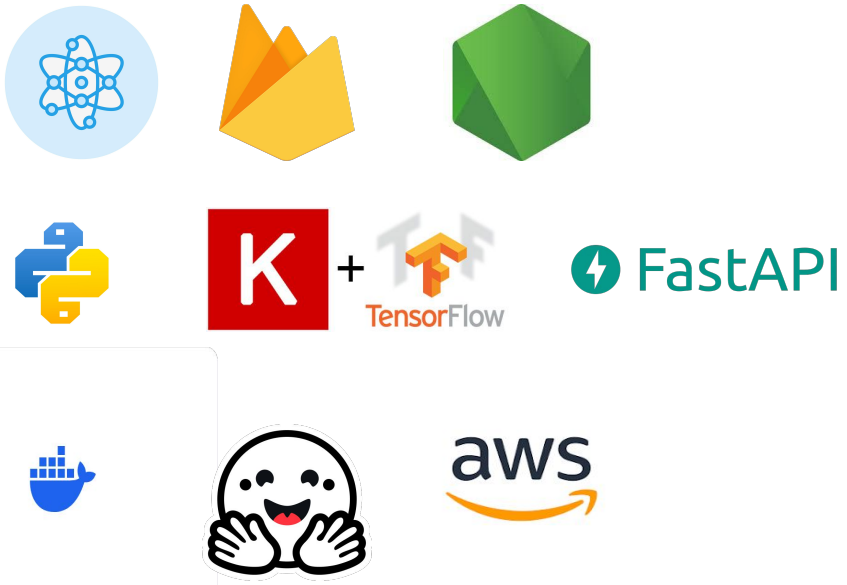
  Outputs include disease name, description, and treatment steps.

- Scalability & Deployment

  Core AI services exposed through FastAPI microservices.

  Deployed on AWS cloud infrastructure for scalability and reliability.

Tech Stack :



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FEASIBILITY AND VIABILITY

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Technological Readiness: Uses pre-trained transfer learning models for plant disease detection (already proven in agriculture research with >90% accuracy on benchmark datasets).

Ease of Deployment: Works on smartphones with minimal compute requirements; backend runs on scalable cloud infrastructure.

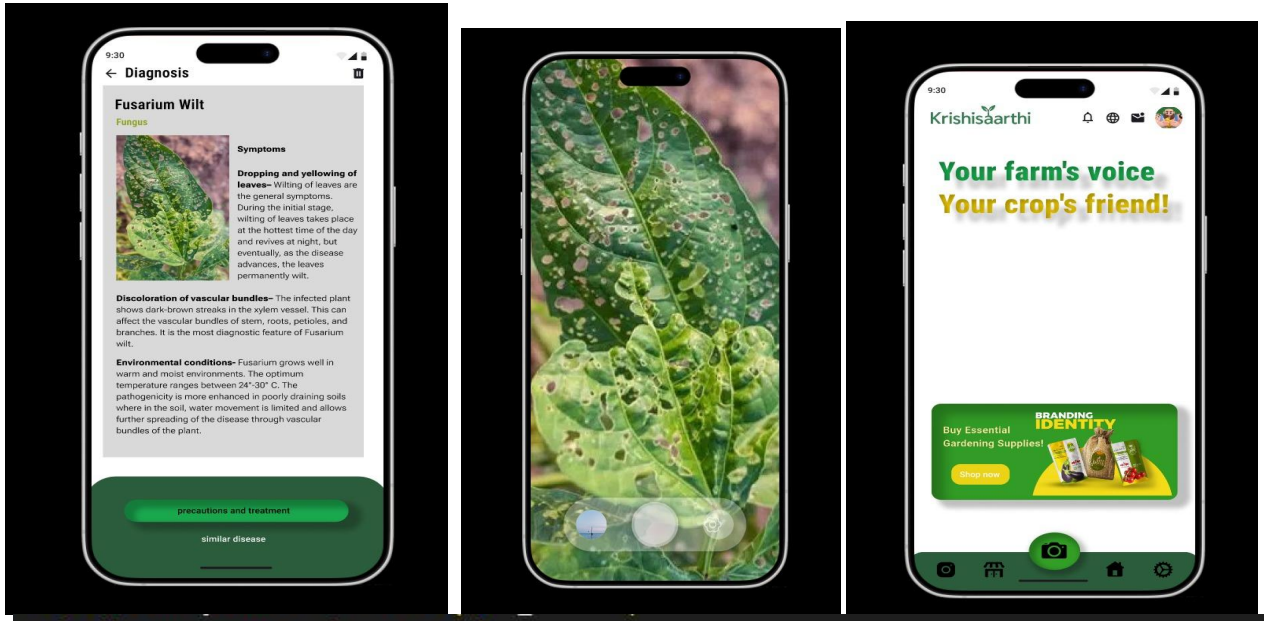
Farmer-Centric Design: Vernacular language audio/text ensures inclusivity, bridging the digital literacy gap.

Cost-Efficient: Open-source ML + API-based LLM (via OpenRouter) keeps operational costs low compared to custom model training.

Potential Challenges & Risks :

Data Quality: Blurry/incorrect images may reduce disease detection accuracy.

Adoption Hurdle: Farmers may hesitate to trust AI recommendations without validation.




```
print('Test accuracy :', accuracy)

193/193 ━━━━━━━━━━━━━━━━━━━━ 24s 127ms/step - accuracy: 0.9529 - loss: 0.0285
Test accuracy : 0.9497405886650085
```

Strategies to Overcome These Challenges:

Farmer Training & Awareness: Simple guides on how to capture good crop images.

Hybrid Advisory: AI + local Krishi Kendra experts to validate suggestions, increasing trust.

Impact Partnerships: Collaboration with state agri-universities & NGOs for wider adoption.

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IMPACT AND BENEFITS

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Potential Impact on Target Audience:

- ❏ Empowered Farmers: Easy access to reliable crop disease diagnosis in their local language, reducing dependency on middlemen.
- ❏ Inclusive Access: Works even for smallholder farmers with low digital literacy, thanks to voice-based interaction.
- ❏ Faster Response Time: Immediate advice on disease & treatment prevents delays that normally cost farmers yield.

Benefits of the Solution:

Social:

- Reduces farmer distress by providing timely, trustworthy guidance.
- Promotes digital literacy and confidence among rural communities.
- Bridges the gap between agricultural research and ground-level adoption.

Economical:

- Prevents up to 20–30% crop loss, translating into higher income stability.
- Saves money spent on wrong pesticides/fertilizers.
- Opens potential for micro-finance & insurance tie-ins once trust builds.

Environmental:

- Promotes judicious use of agrochemicals, avoiding overuse of harmful pesticides.
- Encourages sustainable farming practices through location-based advice.
- Contributes to food security by increasing crop yield & reducing waste.

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RESEARCH AND REFERENCES

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- Indian Council of Agricultural Research (ICAR) – India loses crops worth ₹50,000 crore annually due to pests and diseases.
  https://icar.org.in/

- Digital advisory platforms have improved smallholder productivity by 15–25%
  https://www.worldbank.org/en/topic/agriculture

- Model Training and Testing
  https://colab.research.google.com/drive/1d5sCruBwdZMARRQ_XKODDnIjJBbyh97q?usp=sharing
  https://github.com/vatsal80085/save-growth

- Government of India (NMSA) – Agro-climatic zone–based crop advisory improves adoption and sustainability
  https://nmsa.dac.gov.in/