

## AI-Driven Mobile App for Real-Time Disease and Insect Detection in Rice Plants

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- Background
  - Agriculture is essential to Cambodia's economy, employing
     36.64% of the workforce (World Bank's 2022 indicators)
  - Cambodia exported approximately **630K** tons of processed rice
  - Cambodian Rice Federation Plan: 1M tons by 2025



- Challenge:
  - A lack of expertise and knowledge in disease detection and timely treatment
  - Limited access to real-time information and practical tools
  - Apply correct chemical treatment based on export country regulations (Guarantee premium quality of rice)



### • Challenge:

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### **RiceDoctor App**

https://www.doctorrice.org.in/

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- Proposed Solution:
  - Develop a mobile application for real-time disease and insect identification using AI.
    - Real-time disease classification using image-based data
  - Multi-Language and Voice Interactions
    - Simplifying the user experience with Text-To-Speech technology (TTS)
  - Training and Support Program
    - Technological advancements and sustainable practices.

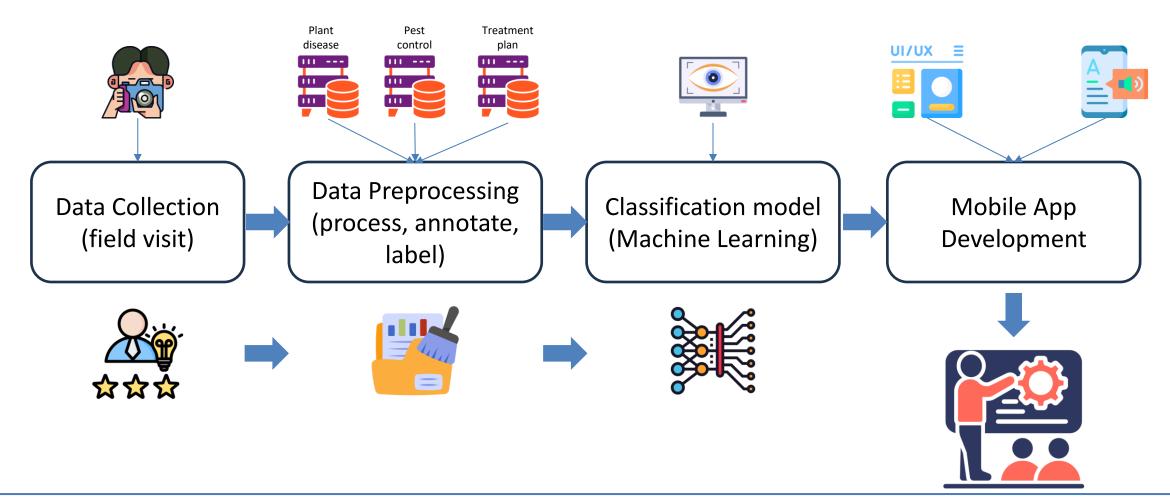


• To successfully completed the proposed method, several stages are identified.

Development of disease and treatment plan database	Data Collection	Data cleaning and pre- processing	Development of machine learning model	Development of mobile application	Deployment
<ul> <li>Identify and categorize diverse rice plant diseases</li> <li>Provide treatment plans for diseases affecting leaves, stems, roots, and seeds</li> <li>Include measures for pest control</li> </ul>	<ul> <li>Collaborate with local agronomy experts to collect and categorize image data of diverse rice plant diseases, creating a comprehensive dataset for model training</li> </ul>	<ul> <li>process, annotate, and label data for training machine learning models</li> </ul>	<ul> <li>Choose a machine learning algorithm and train the model to identify plant diseases.</li> <li>Apply transfer learning to improve a deep learning model's performance using pre-trained weights from a larger dataset</li> </ul>	<ul> <li>Develop a user- friendly mobile app with offline access, text-to-speech, real- time plant diagnostics, and multi-language support</li> <li>Machine learning model integration</li> </ul>	<ul> <li>Conduct comprehensive testing</li> <li>Deploy the application</li> </ul>



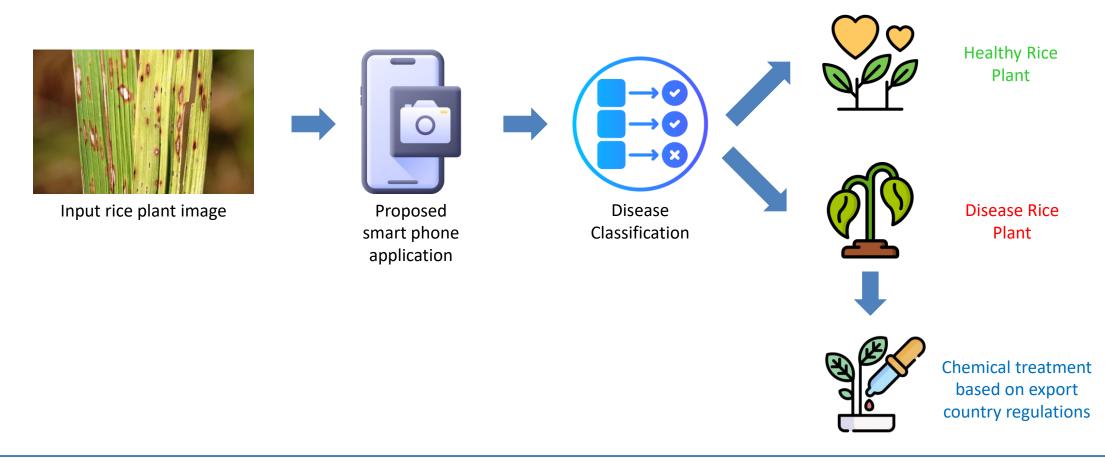
• Proposed Project Implementation





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### Real-time disease classification process:





- Outcome:
  - A robust mobile application capable of real-time detection of rice plant diseases and insect infestations, supporting multiple languages for accessibility.
  - An accurate machine learning model trained on a diverse, highquality dataset, optimized through pre-processing for reliable disease and pest identification.



- Impact:
  - Enable farmers to quickly identify rice plant diseases and pests for timely treatment, reducing crop loss and crop loss and boost productivity.
  - Foster regional collaboration by sharing data on diseases and pests, facilitating the exchange of best practices and improving agricultural knowledge.
  - Enhance food safety and protection.

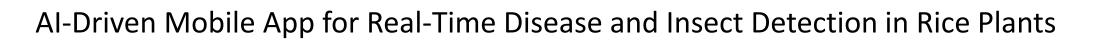


- Conclusion
  - Our main goal is to help farmers to access a tool leveraging ICT technology to identify and address crop diseases.
  - This project empowers them to improve their digital skills and literacy in crop management.
  - By introducing innovative ICT solutions, it aims to create a more secure and resilient agricultural ecosystem.



## • Reference

- International Rice Research Institute. "Knowledge Bank." [Online]. Available: <u>https://www.irri.org/rice-knowledge-bank/</u>.
- U.S. Environmental Protection Agency. "EPA." [Online]. Available: <u>https://www.epa.gov/</u>.
- Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail. "Ephy." [Online]. Available: <u>https://ephy.anses.fr/</u>.
- Cambodian Rice Federation. "CRF." [Online]. Available: <u>http://www.crf.org.kh/</u>.
- M. Rifqi, "Rice disease prediction application," arXiv preprint arXiv:2301.05528, 2023.
   [Online]. Available: <u>https://arxiv.org/abs/2301.05528</u>.
- R. V. N. Rifqi, "Rice Disease Prediction Application." [Online]. Available: <u>https://github.com/rifqinvnd/Rice-disease-Prediction-Application</u>.



# Thank you for your attention!

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