

An AI-based Crop Recommendation System through Disease Detection

Presented by: LY Rottana

Institute of Digital Research and Innovation
Cambodia Academy of Digital Technology

Background:

- Agriculture accounts for 22% of the Cambodian GDP in 2022 (FAO, 2023) [1]
- Challenges: **low productivity and quality of farm products, lack of knowledge and technical skills, insufficient R&D in agriculture sector**
- Modernize agriculture sector towards digital transformation through AI technology to align with Cambodian Government's Policy [2, 3]

Problem:

- Crop diseases cause significant **damage** and direct **loss** to agricultural products.
 - The infectious plant diseases are caused by **bacteria**, **fungi**, or **viruses**, leading to leaf or fruit damage to death [4, 5].
- Farmers: hard to identify the variant of plant diseases + treatment



bacteria



fungi



viruses

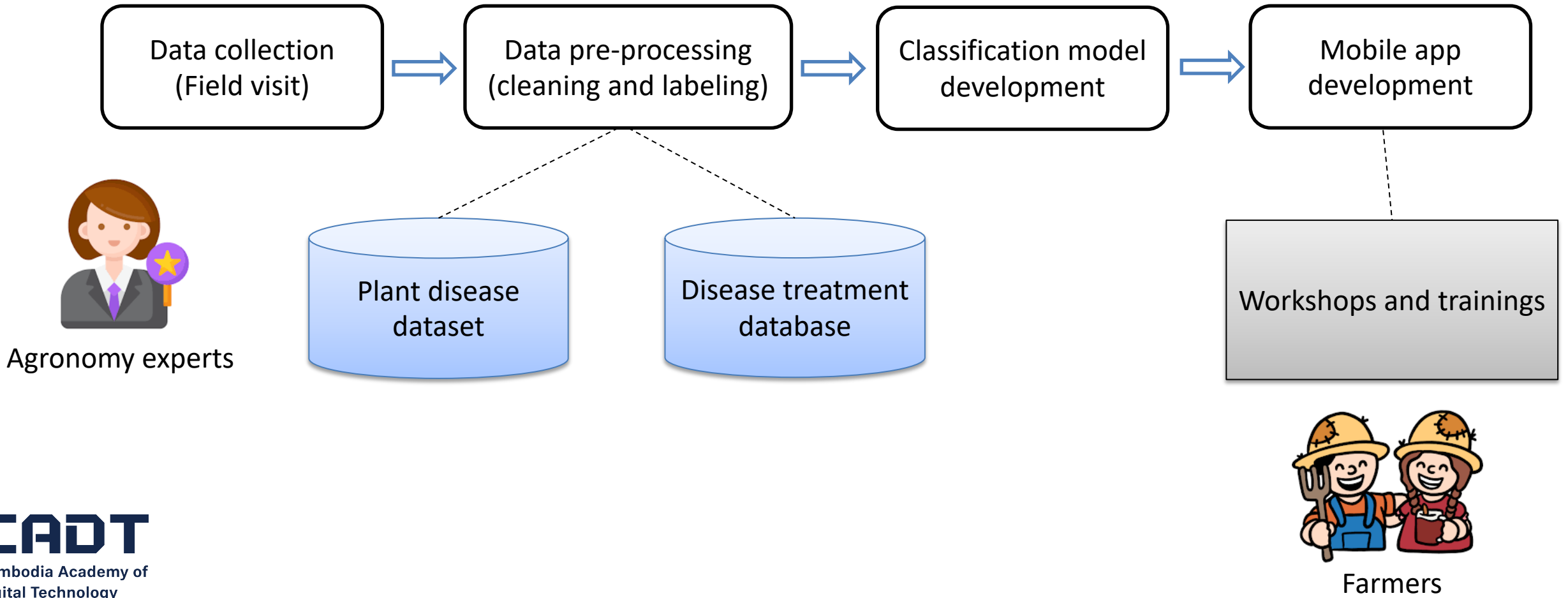
Proposed solution:

- **Solution: A plant disease detection system with treatment recommendations**
 - Develop an AI application using machine learning algorithms to detect disease of common crops in Cambodia
 - Provide a recommendation treatments to farmers to save the plants and to increase the production of crop harvest
- Plants and crops diseases are geographical specific due to the weather and location.
 - Therefore, the developed system must be adapted to local contexts, including language, crops, diseases, and the treatment.

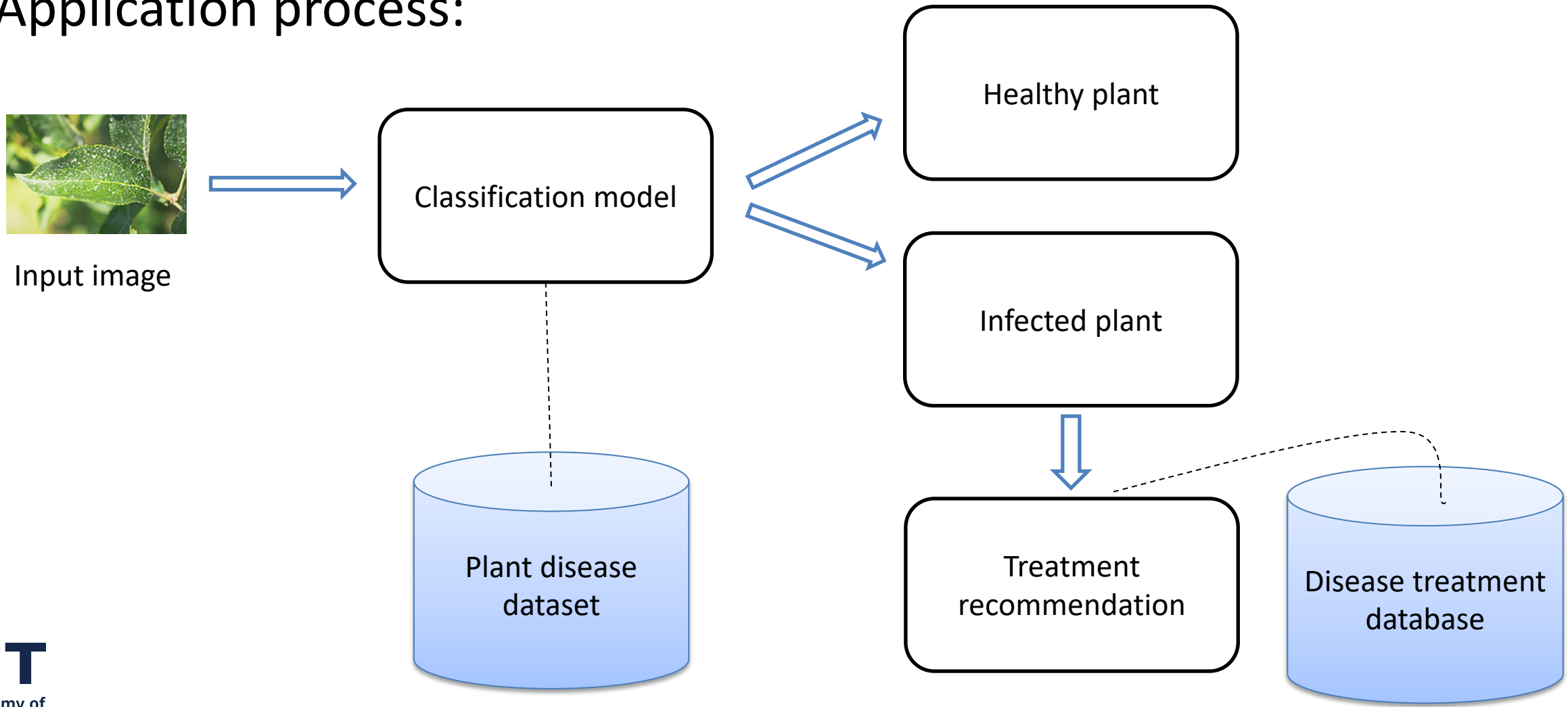
Proposed method:

- To successfully build this system, several stages are identified.
- **Data collection:** collaborate with local agronomy experts to identify and categorize various types of plant diseases.
- **Development of treatment database:** provide recommendation to farmers for effective treatments.
- **Data cleaning and pre-processing:** clean and label data for training ML models.
- **Development of machine learning model:** select ML algorithm and train the model for plant disease detection.
- **Development of mobile application:** for plant disease detection and treatments.

Project Implementation:



Application process:



Outcomes:

- Plant disease dataset: can be used as a baseline dataset for further research
- Treatment database: can be used for further research/study
- Mobile application: farmers are able to use this app to detect plant disease with recommendation given for proper treatments.

Impacts:

- Help farmers to properly identify the plant disease and obtain effective treatment so they can reduce the risk and increase crop production.
- Help farmers, particularly those in underserved regions and vulnerable groups, to increase their income and reduce poverty rate through the advanced agricultural technology.
- Improve food safety and security.
- Possibility to build a platform to connect farmers and sellers (fertilizer and crop markets)
- Possibility to collaborate with countries within the region to learn about their best practices and to share the common data and use cases.

Conclusion:

- Farmers are able to use a tool that utilizes ICT technology to identify and combat crop diseases.
- Farmers are able to enhance their digital skills and literacy related to crop management.
- This project brings innovative solutions in agricultural sector using ICT technology to ensure a more secure and resilient agricultural ecosystem.

References:

- [1] <https://www.fao.org/hand-in-hand/hih-IF-2023/cambodia/en>
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- [4] Chen, H. C., Widodo, A. M., Wisnujati, A., Rahaman, M., Lin, J. C. W., Chen, L., & Weng, C. E. (2022). AlexNet Convolutional Neural Network for Disease Detection and Classification of Tomato Leaf. Electronics (Switzerland),11(6).
- [5] Zaki, S. Z. M., Zulkifley, M. A., Mohd Stofa, M., Kamari, N. A. M., & Mohamed, N. A. (2020). Classification of tomato leaf diseases using mobilenet v2. IAES International Journal of Artificial Intelligence, 9(2), 290–296. <https://doi.org/10.11591/ijai.v9.i2.pp290-296>

Thank you for your kind attention!

Institute of Digital Research and Innovation
Cambodia Academy of Digital Technology

LY Rottana

Email: rottana.ly@cadt.edu.kh

Tel: (+855) 17 938 932