# RESEARCH AND PROPOSED MODEL OF WIRELESS SENSOR NETWORK WITH MACHINE LEARNING TO MONITOR THE DEVELOPMENT OF MEDICINAL PLANTS ARTICHOKE

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# Outline

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# Introduction

- The use of IT in agriculture is becoming a new trend, significantly improving output and product quality and productivity, such as:
  - Wireless sensor network: monitor plant growth, soil and air environment of plants.
  - Cloud computing: storing and processing big data on factors affecting crops obtained through wireless sensor networks.
  - AI algorithm: calculate accurately the necessary elements for plants to increase productivity, reduce human labor; predict quality, yield, disease of crops.
- In Da Lat- VN, some companies and farms apply only basis IT in hi-tech agricultural production, such as:
  - Automatic/drip irrigation system according to time and intensity by smartphone.
  - Application of sensors to monitor soil, air based on the experience of farmers to adjust the best environment for crops.

# Introduction

- In Da Lat- VN, there is a suitable environment for the growth of artichoke medicinal plants.
- Artichoke has very high value : Artichoke's medicinal herbs have great health benefits such as lowering cholesterol, treating liver and kidney diseases, limiting stress-related medical conditions and especially having the ability to prevent cancer.
- Purpose of this research:
  - Design a wireless sensor network model to collect soil and air environment data in the Artichoke growing area.
  - Proposing a machine learning model as the basis for developing a decision system to perform the smart environment control to help increase the yield and quality of medicinal herbs of Artichoke using data analysis.
  - Testing and evaluating the proposed machine learning model for the problem of analyzing environmental data for the cultivation of Artichoke medicinal plants.

# Research Method

- Focus on monitoring the development of the popular artichoke medicinal plants: twisted cotton and round cotton.
- Research period: Jan. 2023 – Dec. 2024.
- Research location: Da Lat city- Viet Nam
- Approach of the research:
  - Discus with farmers/experts who have experience/knowledge in cultivating artichoke medicinal plants.
  - Explore factors affecting the growth of medicinal plants Artichoke
  - Setup a wireless sensor network to collect particular land/air data
  - Propose mathematical models for crop data analysis, data extraction, cluster analysis and machine learning models as a basis for overall system building

# Research Method

- **Research Method:**
  - *Data collection/processing*: Exploiting on a big data system obtained from the cultivation of artichoke medicinal plants. Use some statistical analysis tools such as SPSS, R.
  - *Research*: methods of machine learning such as clustering, data classification, deep learning for the smart decision support system that regulates the environment for each farming area.
  - *Experimental method*: re-testing of the system model and the calculation results compared with the results on yield and quality of medicinal herbs of Artichoke obtained from previous crops. Then, we re-adjust the model based on the reliability to get the best results.
  - *Expert method*: attend some scientific conferences to absorb in-depth opinions to improve and enhance the efficiency of the model.

# Research Content

- **Content 1: Overview**
  - An overview of researches in Vietnam and abroad.
  - Define research objectives, objects, research scope, research content.
  - An overview of the problem of analyzing environmental data for artichoke cultivation.
- **Content 2: Design wireless sensor network; design the environmental conditioning system in the farming area; plant environment data collection**
  - Research on factors affecting the growth of artichoke plants to design sensors to collect corresponding data from the cultivation environment of artichokes.
  - Research on building a wireless sensor network, and a database system for data collected from the plant environment.
  - Research/setup the air conditioner control model for plant environment.
  - Collect data from crop cultivation environment of Artichokes in Da Lat and Lac Duong.
  - Publish scientific articles

# Research Content

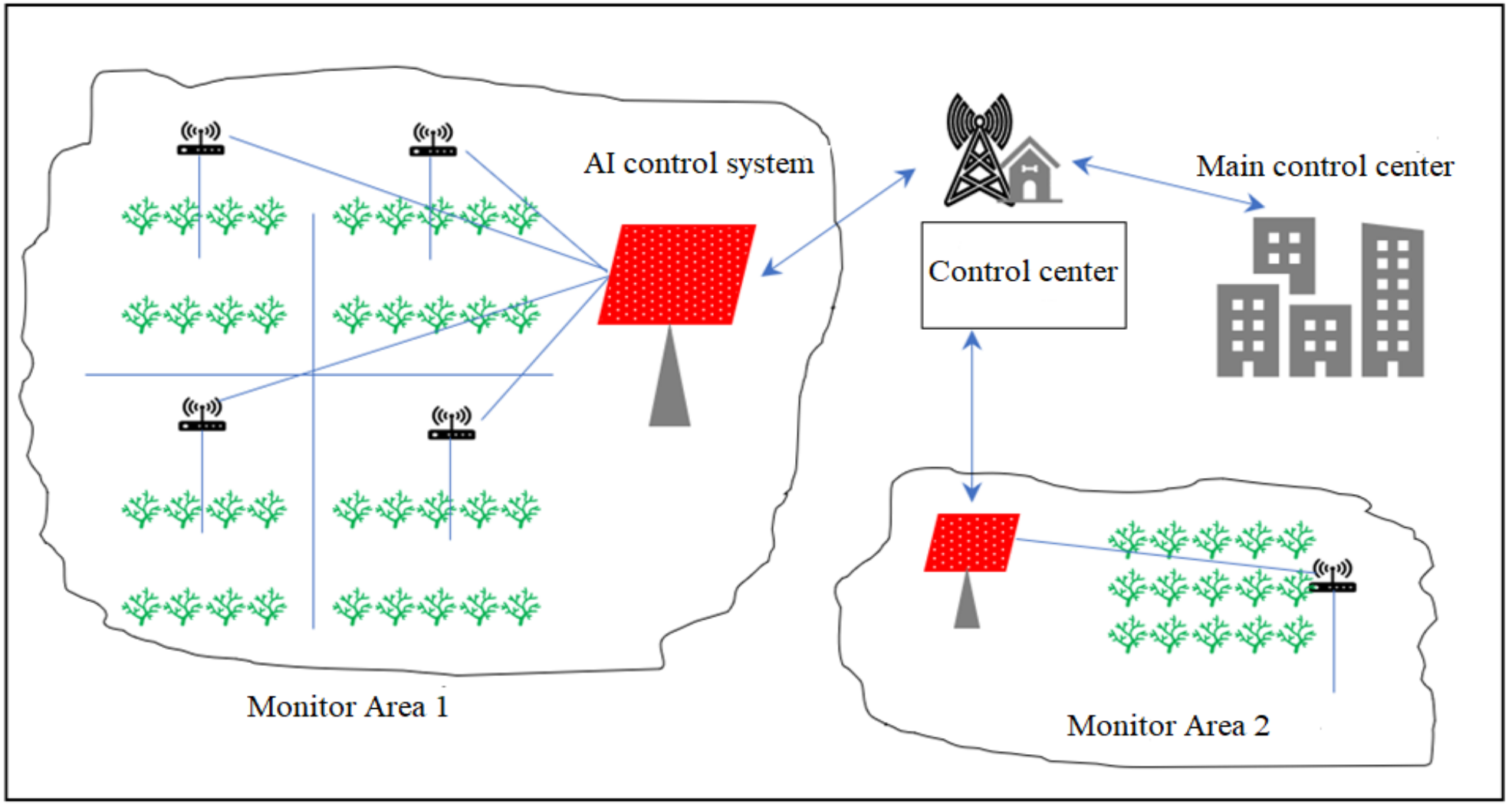
- **Content 3. Research and develop machine learning techniques in statistical analysis, intelligent control decision support to help develop artichoke trees**
  - Overview of machine learning techniques to improve the artichoke development environment
  - Research and develop clustering model in statistical analysis of data collected from the environment
  - Research/develop the deep learning model for improving the artichoke growing environment
  - Setup/evaluate clustering models and integrated machine learning techniques on crop environment data
  - Publish scientific articles

# Research Content

- **Content 4. Building experimental application of machine learning techniques in statistical analysis, decision support to control intelligent system regulating crop environment**
  - Building an application that integrates modules on clustering and integrated machine learning techniques on artichoke tree environment data
  - Test/evaluate the results of the integrated application with test data
  - Publish the experimental results

# Research Content

- **System model**




# Expected Results

- **Publications:**
  - Journal articles: 2 SCI/SCIE paper in rank Q1/Q2
- **Training products:**
  - Master training: 1 student
- **Application products:**
  - Wireless sensor network model for data collection
  - Environment condition controller for farming
  - Environment dataset for cultivation of artichokes
  - Machine learning model
  - Decision support system for cultivation of artichokes

# Conclusion

- Design the wireless sensor network to collect data are factors affecting the growth of artichoke plants
- Our research needs about 10-15 wireless sensors
- Design the environment conditioning system for artichokes
- Analyze the data obtained from the artichoke plant, propose a machine learning model to to control the environmental conditioning system for the artichoke growth