AI Based Crop Disease Detection

Challenges and Ethical Consideration

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Introduction

The research evaluates AI-driven crop disease detection in agriculture, highlighting its potential for enhancing productivity and food security, but also addressing ethical concerns and technological limitations.

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Why crop disease detection?

Crop diseases can cause significant losses in crop productivity and quality if they are not diagnosed and controlled immediately.

Farmers can use timely detection to execute appropriate management measures, reducing spread of disease and maintaining crop output.

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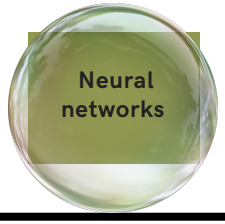
Crop disease detection methods

Historical Methods in Crop Disease Detection

Visual observation

Microscopy

Recent Advances in Ai based crop disease detection

AI Technique	Description	Prediction power	Applications
	Segments diseased regions and extracts relevant features for classification. **Supervised learning**	High	Identification of tomato blight using leaf images
	Learns complex patterns from visual data using CNNs **Deep learning**	High	Detection of potato late blight from drone images
	Extract, analyze, interpret digital images/videos. **Supervised learning**	Moderate	Recognition of apple scab on orchard trees
	Learns decision-making from visual inputs **Reinforcement Learning**	Moderate	Autonomous monitoring of wheat rust in fields
	Used for classification and regression tasks by analyzing data and recognizing patterns. **Deep learning**	High	Identification of banana bunchy top virus using leaf images[6]

Preferred techniques based on the current state of art

Support vector machines (SVM)

- Effective in linear and nonlinear classification tasks.
- High-dimensional feature spaces suitable for processing image-derived features.
- Strong theoretical foundations reduce overfitting.

Convolutional neural networks (CNNS)

- Learn hierarchical representations for image-based tasks.
- Extract discriminative features for accurate crop classification.
- Impressive performance in computer vision tasks.

Image Processing

- Essential for preprocessing and analyzing plant images.
- Enhances image quality, segmentes diseased regions.
- Facilitates analysis and interpretation of raw images.

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Challenges and Ethical Dilemmas

- **Interpretability of models**

  Understanding the logic underlying AI-generated results is challenging, which can affect confidence and approval among stakeholders.

- **Data quality and algorithm bias**

  Ensuring high-quality data and addressing biases in training datasets are crucial for accurate and reliable crop disease detection. Addressing biases in AI algorithms that may result in discriminatory outcomes or inaccurate predictions.

- **Accountability and transparency**

  Establishing ethical frameworks to govern the decision-making processes and ensure accountability for the outcomes of AI systems in crop disease detection.

- **Data privacy**

  Safeguarding sensitive agricultural data and ensuring privacy protection for farmers and stakeholders.

- **Equal access to technology**

  Ensuring that AI-based crop disease detection solutions are accessible to all farmers, regardless of their location or resources.

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Gaps in current research

1. Differences in machine learning approaches
2. Lack of understanding
3. Disease outbreaks in agricultural regions

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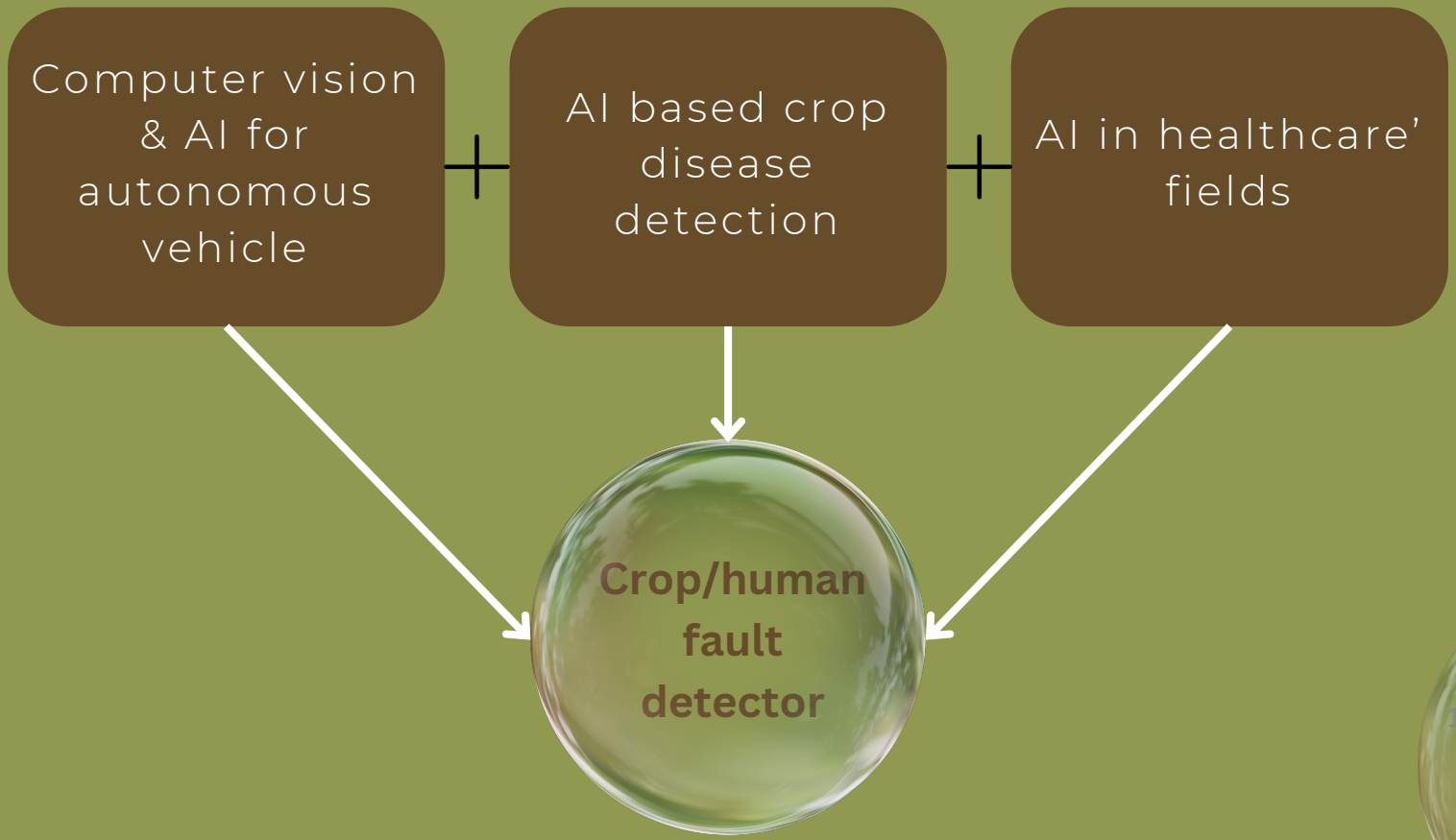
Application

GROUP EXERCISE DISCUSSION

Diverse Applications of AI in Crop Disease Detection: Innovating Towards Autonomous Detection Systems



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Conclusion

AI adoption in crop disease detection offers potential for productivity enhancement and reduced crop losses, but ethical dilemmas and technological limitations must be addressed. Robust ethical frameworks and scalable technology solutions can boost global food security and sustainable practices.

Q & A