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Patent Search

Invention Title	AI-Enabled IoT System For Smart Crop Monitoring And Disease Detection
Publication Number	20/2026
Publication Date	15/05/2026
Publication Type	INA
Application Number	202641057343
Application Filing Date	06/05/2026
Priority Number	
Priority Country	
Priority Date	
Field Of Invention	COMPUTER SCIENCE
Classification (IPC)	G06Q 50/02, A01G 25/16, G01N 33/24, G06N 20/00, G06N 3/08

Inventor

Name	Address	Country
O.V.Subrahmanyam	Assistant Professor, Department of CSE(AI&ML), Vishnu Institute of Technology, Sri Vishnu Education Society, Vishnupur, Bhimavaram, Andhra Pradesh 534202	India
M. Sravan Kumar	Student, Department of CSE(AI&ML), Vishnu Institute of Technology, Sri Vishnu Education Society, Vishnupur, Bhimavaram, Andhra Pradesh 534202	India
M.Sai Sowjanya	Student, Department of CSE(AI&ML), Vishnu Institute of Technology, Sri Vishnu Education Society, Vishnupur, Bhimavaram, Andhra Pradesh 534202	India
P.M.Veerendra Kumar	Student, Department of CSE(AI&ML), Vishnu Institute of Technology, Sri Vishnu Education Society, Vishnupur, Bhimavaram, Andhra Pradesh 534202	India
S.Umesh Sai Hanuma Prasad	Student, Department of CSE(AI&ML), Vishnu Institute of Technology, Sri Vishnu Education Society, Vishnupur, Bhimavaram, Andhra Pradesh 534202	India
V.Vamsi Krishna	Student, Department of CSE(AI&ML), Vishnu Institute of Technology, Sri Vishnu Education Society, Vishnupur, Bhimavaram, Andhra Pradesh 534202	India
V.Meghana	Student, Department of CSE(AI&ML), Vishnu Institute of Technology, Sri Vishnu Education Society, Vishnupur, Bhimavaram, Andhra Pradesh 534202	India

Applicant

Name	Address	Country
Vishnu Institute of Technology	Vishnu Institute of Technology, Sri Vishnu Education Society, Vishnupur, Bhimavaram, Andhra Pradesh 534202	India

Abstract:

The present disclosure relates to systems and methods for AI-enabled agricultural monitoring, and provides an IoT-based smart crop monitoring system (100) for real health assessment and automated plant disease detection. The IoT-based smart crop monitoring system (100) includes an ESP32 microcontroller unit (102) having an I2C interface and operatively coupled to a soil moisture sensor (104), a digital temperature sensor (106), and an NPK soil nutrient sensor (108), which continuously acquire soil and environmental parameters and transmit the acquired data via a cloud-based AI processing platform (110) to a mobile application interface (114) integrated with an AI chatbot module (116) and a weather API integration module (118). A deep learning disease detection model (112) processes mobile-captured crop images to detect a plant diseases, thereby delivering data-driven recommendations and enabling scalable, cost-effective crop health assessment and yield optimization.

Complete Specification

Description: TECHNICAL FIELD

[001] The present invention relates to the field of precision agriculture and intelligent farming systems, and more particularly to an AI-Enabled IoT System integrating sensor environmental monitoring with artificial intelligence and deep learning techniques for real-time crop health assessment and automated plant disease detection.

BACKGROUND

[002] The field of precision agriculture and intelligent farming systems has seen significant development in recent years, with various efforts directed toward improving productivity through technological intervention. Agricultural production remains one of the most critical contributors to food security and economic stability, particularly in developing countries where a substantial portion of the population depends on farming as a primary livelihood. Crop productivity is adversely affected by plant diseases under unfavorable environmental conditions, and delayed identification of stress factors. Early-stage symptoms of crop diseases are often difficult to identify through conventional manual observation alone, frequently resulting in reduced yield, increased economic losses, and suboptimal resource utilization across both small-scale and large-scale agricultural operations.

[003] Conventional crop monitoring approaches typically rely upon periodic manual inspection conducted by farmers or agricultural extension workers. Such approaches are generally time-consuming, labor-intensive, and prone to human error arising from variations in observer expertise and the inherent difficulty of visually identifying early-stage disease manifestations before macroscopic damage becomes apparent. In many documented instances, diseases are identified only after significant visible damage has already occurred, leading in some cases to excessive pesticide application, associated environmental degradation, and disproportionate economic burden upon small and medium-scale farming operations that may lack access to specialized agricultural diagnostic resources.

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Page last updated on: 26/06/2019