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DEVELOPMENT – TRAINING – RESEARCH

Project Name: Smart Agriculture Assistant and Water Management System

ABSTRACT: Worldwide, 70% of freshwater is used for agriculture alone. Many countries have been facing severe droughts due to extreme climate change and less precipitation. The rainfall pattern has changed, and some parts of Asia have been mainly dependent on underground water exploitation for a long time. This long-term dependence on groundwater carries the risk of soil subsidence. With declining rainfall, water shortages have occurred in different regions, especially international joint river systems in Bangladesh, Bhutan, Cambodia, PR China, India, Lao PDR, Nepal, Thailand, and Vietnam. Minimizing water use is also important when using surface irrigation systems in such joint river systems. Numerous irrigation projects have been established in emerging economies with the aim of achieving food security, particularly in rice production. Most of the HYV rice produced in Asian countries depends on irrigation systems. In those conventional irrigation projects, multiple pumps are used to carry water from primary to secondary and tertiary channels. However, convenience losses occur in natural canals and energy losses occur during long-term pump operations. On the other hand, the soil moisture and water requirements change significantly based on the soil type, existing moisture content, types of organic matter present in the soil, and slope of the land for water retention. In addition, field capacity and plant wilting points make water requirements variable.

Applications of deep learning and Internet of Things (IoT)-based technologies offer solutions to farmers and large-scale irrigation project managers who must with differing soil moisture levels, types of organic matter, and slope in irrigated areas. Deep learning-based IoT-controlled pump operations have the potential to enable optimal, site-specific operations. Single pumps in a system can be activated only when needed in areas where water demand is the highest. High-throughput phenotyping using drones and wireless (WiFi) distributed soil moisture sensors can provide information on which locations require pump operation. Thermal imagery is a promising method for determining moisture content using drones to collect images from the field (Figure 1). Thermal image processing with an orthomosaic

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datasets can be utilized to develop water-stress maps, which help in recognizing areas where crops lack sufficient water.

INTRODUCTION: In a deep learning system, convolution neural network (CNN) ensures accuracy based on the training datasets. The historical datasets and in-situ soil moisture information of large irrigation command areas can be classified based on soil type, organic matter content, and slope. The first classification includes the water retention capacities of major soil types: sandy, silty; and clay loams. The second is related to the high, medium, or low organic matter presence in the soil. The third classification is the slope of the land, which can be determined from raster-generated maps using GIS spatial analysis. In addition, the water requirements of crops can be calculated using remote sensing systems that detect water stress indices based on shortwave and near-infrared data from the Landsat 8 Operational Land Imagery.

Water stress classifiers can also be included in the training datasets, categorized as high, medium, and low stress considering phenology indices, plant water requirements, evapotranspiration rates, and deep percolation of water. All three major classifiers using deep learning procedures require a large dataset for training to develop an NB-IoT and deep learning-based water management system to minimize water losses during irrigation.

RELATED WORK & EXISTING PROBLEM: There are multiple advantages of such advanced irrigation management systems in both developed and developing countries. Pump operational times can be reduced, which also saves energy consumption. According to site-specific variations and water requirements, selected pumps can be operated only in required locations. Systems using a distributed NB-IoT are promising methods for the development of smart irrigation systems. Distributed WiFi modules and in-situ ground reference soil moisture sensors allow remote, real-time confirmation of soil moisture levels in the field. Therefore, Asian countries adopting smart irrigation systems can expect to save water while increasing rice and other crop production.

TECHNOLOGY WE COVER:

1. Python Programming
2. Machine Learning/Deep Learning/Segmentations
3. Django – Front End
4. PostgreSQL – Database
5. MLOps using MLFLow – Model Orchestration

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6. Github Action - CI/CD Pipeline
7. DVC for Data Tracking
8. DagsHub
9. Docker and Kubernetes

OUR OFFERING:

1. Complete Implementation of Project
2. Training and Project Deployment on local system
3. Project Completion Certificate
4. Paper Publication in IJera International
5. Project Report
6. Xerxez T-Shirts

DISCLOSURE:

1. Students must prepare the PPT for demonstration.
2. 50% Advance and 50% during project submission.
3. Once Payment is done, cannot be refundable.

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