IDEAS

AGRICULTURE

SMART IRRIGATION SYSTEM BASED ON SOIL MOISTURE USING IOT
https://www.irjet.net/archives/V5/i6/IRJET-V5I6379.pdf

CONTROLLING SURFACE IRRIGATION USING SOIL MOISTURE ANALYSIS

Development of Optimized Phenomic Predictors for Efficient Plant Breeding Decisions Using Phenomic-Assisted Selection in Soybean
https://spj.sciencemag.org/journals/plantphenomics/2019/5809404/#data-availability

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THEORY

ML Cheat Sheet
https://docs.microsoft.com/en-us/azure/machine-learning/media/algorithm-cheat-sheet/machine-learning-algorithm-cheat-sheet.svg

BASICS OF AGRICULTURE IOT

REMOTE SENSING(GENERAL)

IoT based remote sensing utilizes sensors placed along the farms like weather stations for gathering data which is transmitted to analytical tool for analysis. Sensors are devices sensitive to anomalies. Farmers can monitor the crops from analytical dashboard and take action based on insights.

Some topics under remote sensing:

Crop Monitoring

Sensors placed along the farms monitor the crops for changes in light , humidity, temperature, shape and size. Any anomaly detected by the sensors is analysed and the farmer is notified.

Thus remote sensing can help prevent the spread of diseases and keep an eye on the growth of crops.

Weather conditions

The data collected by sensors in terms of humidity, temperature, moisture precipitation and dew detection helps in determining the weather pattern in farms so that cultivation is done for suitable crops.

Soil quality

The analysis of quality of soil helps in determining the nutrient value and drier areas of farms, soil drainage capacity or acidity, which allows to adjust the amount of water needed for irrigation and the opt most beneficial type of cultivation.

COMPUTER IMAGING

Computer imaging involves the use of sensor cameras installed at different corners of the farm or drones equipped with cameras to produce images which undergo digital image processing. Digital image processing is the basic concept of processing an input image using computer algorithms. Image processing views the images in different spectral intensities such as infrared, compares the images obtained over a period of time and detects anomalies thus analysing limiting factors and helps better management of farms.

Some topics under imaging are:

QUALITY CONTROL

Image processing combined with machine learning uses images from database to compare with images of crops to determine the size, shape, color and growth therefore controlling the quality.

Sorting and grading

Computer imaging can help sort and grade the produce based on their size, color and shape.

Irrigation Monitoring

Irrigation over a period of time helps in mapping of irrigated lands. This helps in deciding during pre harvest season whether to harvest or not.

IOT FOR AUTOMATION OF FARM IRRIGATION

https://reader.elsevier.com/reader/sd/pii/S1877050920309078?token=18E557C8824DA01697F31F05BED57E739011733606BBE59E6E101D967989CC2B6EA58DE9ED2B084131DFF9B2C2DA31FA

Agriculture Ontology(roughly speaking can be defined as a semantic system that contains terms, the definitions of those terms, and the specification of relationships among those terms.)
https://link.springer.com/chapter/10.1007/978-3-642-18333-1_18

Internet-of-Things (IoT)-Based Smart Agriculture: Toward Making the Fields Talk (describes the domains on which we can work
Page 15 of the paper tells about precision algo and cloud computing which seems imp
Page 16 imp smartphone apps related to agriculture
Page 22-23: what tech giants are doing using iot for agriculture(isse related bhi company wise videos and unke projects mein woh kya krne ki soch rhe hain woh dekh lenge))
https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8784034

Precision Agriculture Design Method Using a Distributed Computing Architecture on Internet of Things Context
https://www.mdpi.com/1424-8220/18/6/1731
(How Precision Agriculture works
Layered Architecture model of IOT
Fog and Edge computing
Pg- 6,7,8 User centered Model(For defining rules autonomously without human intervention)
Pg 9,10,11-3.3,3.4 Data Analysis: Edge and Fog Computing Configuration
Pg 12-end Experimental Design for managing things related to irrigation(like optimizing, failure detection etc)
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Machine Learning in Agriculture: Applications and Techniques(Don't read, duplicate of iflexion article)

https://medium.com/sciforce/machine-learning-in-agriculture-applications-and-techniques-6ab501f4d1b5

Machine Learning Applications on Agricultural Datasets for Smart Farm Enhancement
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjg97PGuoTsAhWG73MBHXe7Dp8QFjACegQIBxAB&url=https%3A%2F%2Fwww.mdpi.com%2F2075-1702%2F6%2F3%2F38%2Fpdf&usg=AOvVaw07p1ZcVTq7gVbx4QMvDCIA
(2-3 Types of farming and related works
4- Sources of Data, look mainly for sensor data
5,6-Faltu Bakwas about data collection from other sources
7,8,9-Reconstruction of missing/corrupt data using ML

10-Sensor anomaly detection(Suppose we have 3 sensors for temperature and one is giving wrong results)
Rest pages:- Implementation and Results of various methods
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Application of IoT and Machine Learning in Agriculture
https://www.ijert.org/research/application-of-iot-and-machine-learning-in-agriculture-IJERTV9IS070080.pdf
(What kinds of data we can get
Soil Data:Temperature, pH, NO2 and other chemicals
Water: pH, Turbidity, TDS
Weather: Temp, Humidity, Light)

ML IN AGRICULTURE IDEAS
https://www.iflexion.com/blog/machine-learning-agriculture

LOOK FOR EFFECT OF THESE PARAMETERS ON CROP YIELD SEPARATELY :
1) WEATHER
2) SOIL
3) IMAGING
4) Water Quality
COMBINE THEIR RESULTS USING SOME WEIGHTS(Not predefined but assign using results of experiments) ASSIGNED TO EACH THRU ML METHODS LIKE Neural Networks

Final things to work on
1) Irrigation systems based on IOT devices
(Water Quality Management for Irrigation)
2) Sensor anomaly detection(For multiple sensors measuring same data)
3) Reconstruction of missing data using ML
1. We already have all the data available. We need to create our model in case future datasets are having some missing values. (device, ts)
2. Polynomial regression

3. We will divide data group wise.
4. Model will be the same for all datasets but we will save trained model values for each dataset separately.
4) Soil management(Soil Quality,Classification Fertility etc)
5) Effect of Soil and Climate(Temperature and Humidity) on crops

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We can also use values of parameters to predict the type of environment(device) in telemetry dataset

Order :
Sensor Data-------> 2) and 3) data preprocessing
--->For water: 1)->(also can do things like :-predict what pH,TDS is better for crops)
---For Soil: 4) ->(Also can include which soil type is better for which crop)
---> Combine soil and climate parameters 5)

Machine Learning in Agriculture: A Review(Links to various methods and parameters that can be used in Agriculture ML)

https://www.researchgate.net/publication/327029380_Machine_Learning_in_Agriculture_A_Review

Yield prediction using NN(Used weather+Soil)
https://www.frontiersin.org/articles/10.3389/fpls.2019.00621/full#h7

Improving the prediction accuracy of soil nutrient classification by optimizing extreme learning machine parameters

Artificial Neural Networks for Soil Quality and Crop Yield Prediction using Machine Learning

Intelligent IoT Based Water Quality Monitoring System

Dataset:https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6879973/

Microsoft FarmBeats
https://www.microsoft.com/en-us/research/project/farmbeats-iot-agriculture/#!publications

Automated Control System for Crop Yield Prediction using Machine Learning Approach
https://www.ripublication.com/ijaer19/ijaerv14n2_21.pdf

Datasets

Sources for multiple Datasets
https://archive.ics.uci.edu/ml/index.php

https://hub.packtpub.com/25-datasets-deep-learning-iot/

https://www.sih.gov.in/sih2020PS/QWxs/U29mdHdhcmU=/QWxs/QWxs

https://www.quora.com/Where-can-I-find-a-good-Internet-of-Things-dataset

Weather: generally
https://www.meteoblue.com/en/weather/archive/export/new-delhi_india_1261481

Temperature reading
https://www.kaggle.com/atulanandjha/temperature-readings-iot-devices

Environmental Sensor Telemetry Data

Temperature, humidity, CO, liquid petroleum gas (LPG), smoke, light, and motion

https://www.kaggle.com/garystafford/environmental-sensor-data-132k

A field-scale sensor network data set for monitoring and modeling the spatial and temporal variation of soil moisture in a dryland agricultural field

https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2017WR021307

https://data.nal.usda.gov/dataset/data-field-scale-sensor-network-data-set-monitoring-and-modeling-spatial-and-temporal-variation-soil-moisture-dryland-agricultural-field

Indian Water Quality data
https://www.kaggle.com/anbarivan/indian-water-quality-data

Motion sense dataset: Accelerometer and Gyroscope

https://www.kaggle.com/malekzadeh/motionsense-dataset

Gas sensor Dataset(Not related)

https://www.kaggle.com/javi2270784/gas-sensor-array-temperature-modulation

Hydraulic Sensor(Not related)

https://www.kaggle.com/jjacostupa/condition-monitoring-of-hydraulic-systems

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Colab Links