CHIPKIN

# Methods and Challenges in Optimizing Irrigation using Weather and Humidity

## List of Sources

### 1) Irrigation Monitoring and Prediction System Using Machine Learning

This research proposes a wireless controlled rover irrigation system. Farmers can irrigate their crops according to moisture and temperature values and see that every plant is getting sufficient water and sunlight. The rover system uses a microcontroller unit as the master controller. Joysticks are used to control the rover using wireless interface. The sensor unit consists of a moisture and temperature sensor. The project uses Google-assistant bolt IoT, Integromat, telegram bot and mail gun, for data analysis. It also uses a bolt WIFI module for connecting it to the internet, and a bolt cloud platform for data transferring and storing and predictions

https://www.researchgate.net/publication/342200641_Irrigation_Monitoring_and_Prediction_System_Using_Machine_Learning

### 2) A Review of Intelligent Practices for Irrigation Prediction

This paper presents;

i) ***Computational methods*** - Scientific correlations between physical parameters and
ii) ***Statistical methods*** - specific prediction algorithms that can be used to automate the process of irrigation water prediction.

These algorithms interpret semantic relationships between the various parameters of temperature, pressure, evapotranspiration etc., and store them as numerical precomputed entities specific to the conditions and the area used as the data for the training corpus used to train it. The computational methods used to determine Evapotranspiration and its implications are reviewed. The efficiencies of different data mining and machine learning methods such as Logistic Regression, Decision Tress Classifier, SysFor, Support Vector Machine (SVM), Fuzzy Logic Techniques, Artificial Neural Networks (ANNs) and various hybrids of Genetic Algorithms (GA) applied to irrigation prediction are used as well.

https://www.researchgate.net/publication/311573548_A_Review_of_Intelligent_Practices_for_Irrigation_Prediction

## 3) Automated Irrigation System using Weather Prediction for Efficient Usage of Water Resources

"Automated irrigation system using weather prediction for efficient usage of water resources" (AISWP) uses available water resources by sensing the moisture present in the soil and predicting the weather by sensing ***temperature*** and ***humidity*** thereby processing the measured values through an algorithm and releasing the water accordingly

https://iopscience.iop.org/article/10.1088/1757-899X/225/1/012232

https://ui.adsabs.harvard.edu/abs/2017MS%26E..225a2232S/abstract

https://www.scopus.com/record/display.uri?eid=2-s2.0-85030323438&doi=10.1088%2f1757-899X%2f225%2f1%2f012232&origin=inward&txGid=ef8aa1e10ed06e161e97fd4ff60402d4

https://www.amrita.edu/publication/automated-irrigation-system-using-weather-prediction-efficient-usage-water-resources

## 4) Predictive Irrigation Scheduling Modelling in Nurseries

This chapter describes predictive irrigation scheduling in nurseries with multiple crop species and high-frequency water requirements under limited resources.

Historical data and time-series analysis is used to forecast evapotranspiration. To minimize crop's water stress periods and optimizing resource materials, an algorithm is proposed to predict irrigation schedules. Simulation results with different climatic conditions show on the one hand the ability of the time-series model to forecast potential evapotranspiration, and on the other hand that, given a typical nursery, the proposed predictive approach of irrigation scheduling compared to the non-predictive approach makes it possible to prevent crop's water stress.

https://www.intechopen.com/books/current-perspective-on-irrigation-and-drainage/predictive-irrigation-scheduling-modeling-in-nurseries

## 5) An IOT Based Smart Irrigation System Using Soil Moisture and Weather Prediction

This chapter proposes a system based on a smart algorithm, which considers sensed data along with the weather forecast parameters like precipitation, air temperature, humidity, and UV for the near future. The complete system has been developed and deployed on a pilot scale, where the sensor node data is wirelessly collected over the cloud using web services and a web-based information visualization and decision support system provides real-time information insights based on the analysis of sensor data and weather forecast data.

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3597146

## 6) Machine learning based crop water demand forecasting using minimum climatological data

This study presents traditional machine learning methods used to predict the irrigation schedule of rice daily. The data of years 2013-2015 is used to train the models and to further optimize it while data of 2016-2017 is used for testing the models. Correlation thresholds are used for feature selection which helps in reducing the number of input parameters from the initial 26 to the final 11. Results show that Adaboost performed consistently well with an average accuracy of 71% as compared to other models for predicting the irrigation schedule.

https://link.springer.com/article/10.1007/s11042-019-08533-w

## 7) IoT-based monitoring and data-driven modeling of drip irrigation system for mustard leaf cultivation experiment

This research provides an improved monitoring and data-driven modeling of the dynamics of parameters affecting. An IoT-based monitoring framework is implemented using ESPresso Lite V2.0 module interfaced with different soil moisture sensors (VH-400), flowmeter (YF-S201) as well as Davis vantage pro 2 weather station to measure soil moisture content, irrigation volume, and computation of the reference evapotranspiration (ETo). The data collected including plant images were transmitted to the Raspberry Pi 3 controller for onward online storage and the data are displayed on the IoT dashboard. The combination of both soil moisture and ETo values was used for scheduling a drip-irrigated plant grown in a greenhouse for 35 days. A total number of 20,703 experimental data samples are collected from the IoT-based platform was further used for data-driven modeling through system identification in MATLAB. The result shows the development of different predictive models for soil moisture content prediction. The ARX prediction model is found to perform better than the ARMX, BJ and State-space model in terms of the estimated fit of 91.31%, 91.09%, 91.08%, and 90.75% respectively. Therefore, a robust monitoring framework for irrigation systems has been developed, while the performance of the identified ARX model is promising to predict the volumetric soil water content.

https://www.sciencedirect.com/science/article/pii/S2214317320301864

## 8) Soil moisture forecasting for irrigation recommendation

This study integrates measured soil moisture sensor data, a remotely sensed crop vegetation index, and weather data to train models, in order to predict future soil moisture. Lasso, Decision Tree, Random Forest and Support Vector Machine modeling methods were trialed. The system was implemented in Google Cloud Platform and a model was trained continuously through the season. An online irrigation dashboard was created showing previous and forecast soil moisture conditions, along with the weather and normalized difference vegetation index (NDVI). This was used to guide operators in advance of irrigation water needs. The methodology developed in this study could be used as part of a closed-loop sensing and irrigation automation system.

https://www.sciencedirect.com/science/article/pii/S2405896319325078

## 9) IoT Enabled Crop Prediction and Irrigation Automation System Using Machine Learning

In this study, data sensed by a temperature sensor and soil sensor in real-time are sent to the microcontroller board and based on the values received, it will instruct the relay to turn on/off the water pump and thus automate the irrigation process. Secondly, it involves predicting suitable crop types using soil parameters and weather conditions that may be implanted by the farmers, using machine learning techniques, displayed on an android-based application.

https://www.eurekaselect.com/node/185575/article/iot-enabled-crop-prediction-and-irrigation-automation-system-using-machine-learning

## 10) Machine Learning based soil moisture prediction for Internet of Things based Smart Irrigation System

This paper presents the application of ML techniques to optimize irrigation water usage by predicting the future soil moisture of a field in an IoT-driven smart irrigation framework. The field data collected from the deployed sensors (air temperature, air humidity, soil moisture, soil temperature, radiation) and the weather forecast data from the Internet are used for predicting the future soil moisture. Multiple ML techniques are analyzed for predicting future soil moisture and the results obtained using GBRT are quite encouraging. The proposed techniques could be a crucial research front for optimizing water usage in irrigation.

https://ieeexplore.ieee.org/abstract/document/8988313/