

# Implementation of Advance Artificial Intelligence for Agriculture system

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**Abstract:** Agriculture is the nerve of any country as it is needed for the survival of living beings. Water is a crucial input to agriculture in nearly all aspects having a determined effect that eventual yield. The major aim of Smart Irrigation systems is to help out in the growing of agricultural crops and vegetables by maintaining with the minimum amount of water required, maintenance of landscapes, and re-vegetation of disturbed soils. Machine Learning is a subset of Artificial Intelligence which focuses mainly on Machine Learning making predictions based on its experience. Machine learning using Raspberry Pi is a promising technique of smart irrigation which provides comfort and also reduces energy, efficiency and time consumption.

**Index Terms:** Irrigation, Machine Learning, Berryconda, Artificial intelligent

## I. INTRODUCTION

In the last decade, there is quick advancement in Smart Irrigation system show that agriculture has great importance worldwide. Indeed, In India, about 70 % of the people relies upon the vital sector of agriculture. In the past, irrigation system used to dependent on mills to irrigate the farm by the conventional method without knowing the appropriate quantities of this crop. These old systems are a major cause of the waste of large quantities of water and thus destroy some crops because of the lack of adequate quantities of water. However, with the recent technological developments, there have been innovative systems for irrigation without the farmer interfering in the irrigation process. Agriculture is developing from mechanized by simple methods in the twentieth century to being automated in the 21st century. There is evolving in field operation in the agriculture section, which requests a high accuracy in processes to optimize output and quality of the crops, in addition, limiting the production cost. But automation system issue is that atmospheric conditions, soil, Season, temp is not same so it is very difficult to configure this for automation. Indeed Machine learning using Raspberry would be good option to regulate the supply of water to crop depends upon prehistoric data consisting of moisture level, time, crop used, season, weather based on which system will learn what is the best moisture level and maintain the level by providing insight of when to start and stop the water-pump. Whenever there is a change in temperature, humidity - it gives an interrupt signal to Raspberry Pi. Raspberry Pi read all sensor value send to trained model on a daily basis. So prediction is done by a trained model to get details whether to start or stop motor with maintaining moisture level up to threshold value. Machine learning in Smart irrigation system consists of Raspberry Pi, Moisture level sensor, Temperature & Humidity Sensor, Weather forecasting.

## II. MACHINE LEARNING

Machine Learning is a concept which allows the machine to learn from examples and experience, and that too without being explicitly programmed. It is subset of Artificial intelligent so instead of you writing the programed explicitly, what you do is you feed data to the generic algorithm, and the algorithm/ machine builds the logic based on the given data. Following is the way to machine learning work:-

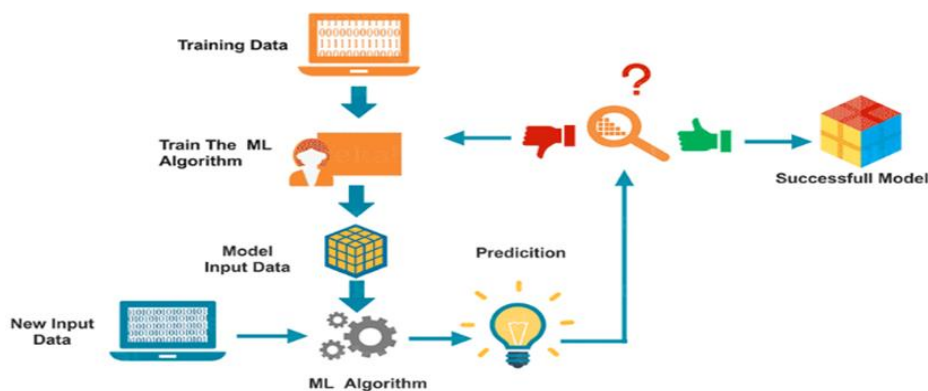
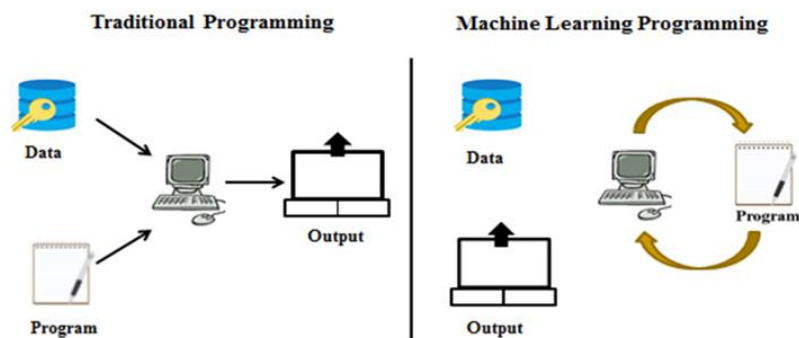


Figure 1. Machine Learning

The machine learning algorithm is trained using a training data set to create a Model. When new input data is introduced to the ML algorithm, it makes a prediction on the basis of the model. The prediction is evaluated for accuracy and if the accuracy is acceptable, the Machine Learning algorithm is deployed. If the accuracy is not acceptable, the Machine Learning algorithm is trained again and again with an augmented training data set. It classified as a three-way:-

- A. **Supervised Machine Learning:-** Supervised Learning is the one, where you can consider the learning is guided by a teacher. We have a dataset which acts as a teacher and its role is to train the model or the machine. Once the model gets trained it can start making a prediction or decision when new data is given to it.
- B. **Unsupervised Machine Learning:-** The model learns through observation and finds structures in the data. Once the model is given a dataset, it automatically finds patterns and relationships in the dataset by creating clusters in it. What it cannot do is add labels to the cluster, like it cannot say this a group of apples or mangoes, but it will separate all the apples from mangoes.
- C. **Reinforcement Learning:-** It is the ability of an agent to interact with the environment and find out what is the best outcome. It follows the concept of hit and trial method

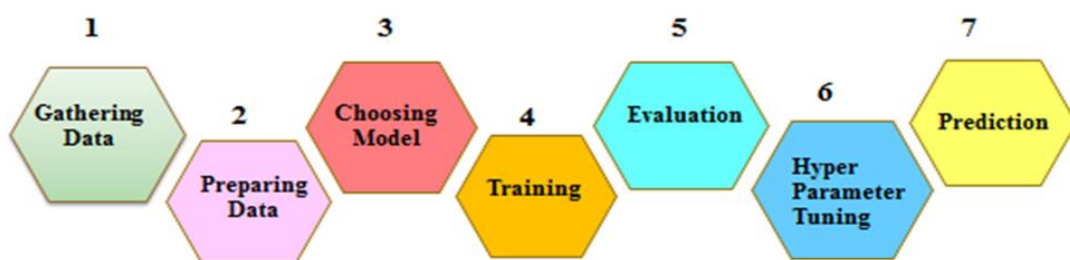
**III . DIFFERENCE BETWEEN MACHINE LEARNING AND AUTOMATION**



**Fig. 2 Difference between automation and machine learning**

Automation is Software that follows Preprogrammed Rule. It is Logic driven Programming. This system plays an important role in human life , it provides comfort but reduces energy, efficiency and time consumption. In automation which has a predefined set of rule & step to be configured. According to that system will work. An automatic irrigation system does the work quite efficiently and with a positive impact on the place where it is installed. For Example- The area having heavy rain an automation process will work as defined, maintain moisture level 30% but it will fail to predict that is going to rain. Machine learning is a promising an integral part of the application of artificial intelligence, which is used to design algorithm based on the data trends and historical relationship. We teach our machine with various data and also teach what would be predicted the output of that input data. The first step in machine learning is identifying the pattern of data, Recognizing those pattern when the machine sees them again. Machine Learning Is Data Driven system. Most Important factor in machine learning is 'Data'. In case if there is less data is available the It's easier to find the outcome but it's impossible to find the correct outcome which could predict the future. Vice versa For More number of data Set, the result of Machine learning would be better. 'Training' and 'Predication' process together is 'Model'. We train the model to make increasingly better and more useful predictions, using our datasets. This predictive model can then be deployed to serve up predictions on previously unseen data.

**IV .STEPS OF MACHINE LEARNING**



**Fig. 3 Steps of Machine Learning**

**4.1 Gathering Data:-** It is the initial stage of the Machine learning process. Numeric Data is collect from Moisture Level sensor, Humidity Sensor. This data which we will use for training. Quantity and quality of data dictate how accurate our Model is. This data is saved in a CSV file on a daily bases.

**4.2 Preparing Data:-** Wrangle all data taken from all sensors and prepare for training. In this Step Remove duplicate data, correct error, deal with missing value, Randomize data, which erases the effects of the particular order in which we collected.

**4.3 Selecting a Model:-**There are many Model using Machine Learning Process. Different algorithms are for different tasks.

**4.4 Training:-** The goal of training is to answer a question or make a prediction correctly as often as possible. Depending On Temperature, Humidity value & Moisture Level we training. The model whether having to 'ON' Or 'OFF' the Pump. We use the data and incrementally improve the Model ability.

**4.5 Evolution:-** Test the model against previously unseen data. This unseen data is meant to be somewhat representative of model performance in the real world but still helps tune the model.

**4.6 Hyper parameter Tuning:-** Tune model parameters for improved performance i.e How many times we run through training data. These values all play a role in the accuracy of the training model, and how long the training will take.

**4.7 Prediction:-** This is the point where the value of machine learning is realized. Here you can Finally use your model to predict the outcome of what we want.

**v. SOFTWARE USED**

Python is widely used programming languages for Raspberry pi computer. The main advantage is programmer can write low number of codes that might be considered other types programming languages. Examples C++ or JAVA at large scale programming modules. Python is not a web programming language but works also like a PHP code cold FUSION and comfortable for server programming languages.

**5.1 Berryconda?**

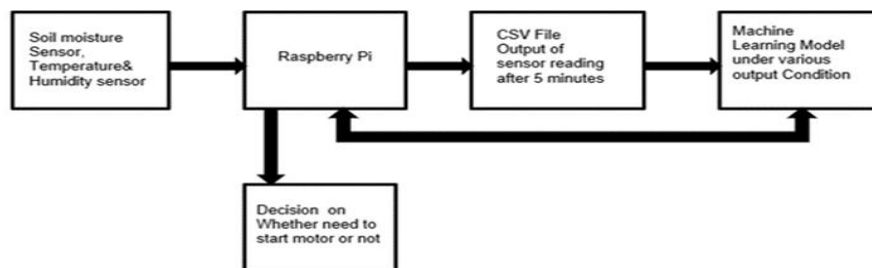
Berryconda is a conda based python distribution for the Raspberry Pi. With it we can install and manage a scientific and py data stack on your raspberry Pi using conda, a package & Environment management system. In our system we use a python library called scikit learn which includes lots of well-designed tool for performing common machine learning task. We used to install scikit learn and its dependencies using anaconda, which is a python based platform focused on Data science and Machine Learning.

**5.2 Anaconda?**

Anaconda is free open source distribution of the python that aim to package management and deployment. The open source package can be individually install with conda install command & The pip install command that is install with anaconda. Anaconda Navigator is a Desktop graphical user Interface (GUI) included in anaconda distribution that allows users to launch application & manage conda packages. Following are the steps to create virtual berry conda environment in Raspberry pi:-

- A. Check conda is installed in correct path
- B. Check conda is up to date
- C. Create a virtual environment for your project
- D. Activate your virtual environment
- E. Install additional python package to a virtual Environment
- F. Deactivate virtual Environment

**VI. WORKING OF MODEL**




**Fig.4 Working Of Model**

The system mainly focuses moisture variations correlate with temperature changes data by smart sensors and controls irrigation system. Sensor Output is given Raspberry pi with digital conversion. The Data obtain from sensor saved in CSV file on daily based Training model trained by using sensors Data using Historical data and present value from sensor output, the prediction is done by trained machine learning model to get whether to Start or stop motor with maintaining moisture level up to threshold value.

**VII. RESULT & DISCUSSION**

The Smart irrigation system through Machine learning system proves to be useful system as it Supply water to plants depending on correct atmospheric condition and moisture level of soil without any manual intervention. We have Tried to collaborate two domains i.e. Machine learning With IOT which will give usa advantage to automate the irrigation system with properly distributing the adequate amount of water required by the plant.



	A	B	C	D	E	F
1114	19:01:16	30	37	32	OFF	
1115	19:01:21	30	37	32	OFF	
1116	19:01:26	30	37	32	OFF	
1117	19:01:31	30	37	32	OFF	
1118	19:01:36	30	37	32	OFF	
1119	19:01:42	30	36	32	OFF	
1120	19:01:47	30	36	32	OFF	
1121	19:01:52	30	36	32	OFF	
1122	19:01:57	30	37	32	OFF	
1123	19:02:02	30	37	32	OFF	
1124	19:02:07	30	37	32	OFF	
1125	19:02:12	30	37	32	OFF	
1126	19:02:17	30	37	32	OFF	
1127	19:02:22	30	37	32	OFF	
1128	19:02:27	30	37	31	ON	
1129	19:02:33	30	37	31	ON	
1130	19:02:38	30	37	31	ON	
1131	19:02:43	30	37	31	ON	
1132	19:02:48	30	37	31	ON	
1133	19:02:53	30	37	32	OFF	
1134	19:02:58	30	37	32	OFF	
1135	19:03:03	30	37	32	OFF	

**I. ACKNOWLEDGMENT**

All that goes with this project is a compromise between theoretical consideration and practical limitation. It involves all technical and non-technical experience from various sources. I would like to express my feeling of gratitude towards the number of people who were instrumental and supportive in successfully making the project. I also express my profound thanks to my project guide Prof. Dr. A.P Dhande. Whose cheerful encouragement, invaluable suggestion and technical support of vital importance have helped me complete this project successfully.

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