SMART AGRICULTURAL, BASED ARTIFICIAL INTELLIGENCE BOT FOR FARMERS

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ABSTRACT

Agricultural sector and farmers are the power of our nation. Technology development has a vast process in many sectors expect agricultural field. Farmers are suffering a lot without knowing getting a single touch option in everything they wish to have. Advance development in AI has been taken into consideration on overcoming the problem of farmers. In this proposed solution, an efficient bot based agricultural system for providing question and answering system. Soil data and fertility analysis with image based extraction. A recommendation of disease prediction and pest problems has been implemented. This system focus to bring a complete one step solution for farmers instead of going for other options. Here the chatbot can be done with Recurrent Neural Network(RNN) system. Artificial Neural Network for any disease based recommendation and Random Forest for the detection soil analysis. Thus these methodology systems focus to give an efficient approach for the farmers. Effectively bot assistance for the farmers with a smart novel and unique interface can be created with our proposed implications. The accuracy development gives a higher solution with cost effective planning for farmers.

Keywords: Chatbot, Analysis, Agriculture

1. INTRODUCTION

Machine Learning methodologies involve a learning process to learn from "experience" (training data) to perform a task. Data in ML consists of a set of examples. Usually, an individual example is described by a set of attributes, also known as features or variables. A feature can be nominal (enumeration), binary (i.e., 0 or 1), ordinal (e.g., A+ or B−), or numeric (integer, real number, etc.). The performance of the ML model in a specific task is measured by a performance metric that is improved with experience over time. Various statistical and mathematical models are used to calculate the performance of ML models and algorithms. After the end of the learning process, the trained model can be used to classify, predict, or cluster new examples (testing data) using the experience obtained during the training process.

2. METHODOLOGY

2.1 Existing System- In the existing system, the soil-based prediction will be done by using some hardware components and testing. The generated values will be used to analyze the soil in each way. smart automated irrigation system with disease detection. The system design includes soil moisture sensors, temperature sensors, and leaf wetness sensors deployed in the agriculture field, the sensed data from sensors will be compared with pre-determined threshold values of various soil and specific crops. The deployed sensor data are fed to the Arduino Uno processor is linked to the data center wirelessly via a GSM module. The data received by the data center is stored to perform data analysis using data mining techniques such as the Markov model to detect the possible disease for that condition. Finally, the analysis results and observed physical parameters are transmitted to an Android smartphone and displayed on the user interface. The user interface in the smartphone allows a remote user to control the irrigation system by switching on and off the motor pump with the Arduino based on the commands from the Android smartphone.

2.2 Disadvantages

- The cost of implementation is totally high and takes time to analyze
- The user has to manually know the values and the soil details
- Time consumption is too high
- Singles step solution is not provided

2.3 Proposed System - The proposed system will suggest a technique that proves to be beneficial in monitoring large fields of crops. Automatic detection of the diseases by just seeing the symptoms on the plant leaves makes it easier as well as cheaper. This also supports machine vision to provide image-based automatic process control, inspection, and robot guidance. Here machine learning-based training and testing functions can be done where the labeled set of disease-affected crops will be trained. For the training system, Multi-Layer Perceptron (MLP) is used and the training

model is done. Matching with the trained model the testing system will be done using the prediction of the disease with the fertilizer recommendation system. In proposed system, an android-based soil prediction system is implemented. Here the user will just take the image input and then the data will be selected. Thus the user will get the soil details and the crop prediction details using this system with nutrients which indirectly affects crop's health. The proposed system predicts the level of toxicity present in the soil and makes farmers aware of it. Many farmers depend on rainfall which is one of the factors for poor growth and decreases crop yield. Thus the proposed system recommends the farmer about the crop, fertility of soil, level of toxicity, and water supply. For this recommendation system, the sensor's accuracy is very important as well as the classification algorithm. For classification, ANN and random forest algorithms are used which are simple to implement and have more accuracy as compared with other classification algorithms. The PH values are known which they are helps in the identification of toxicity in the soil. The works analyzed were categorized in crop management, including applications on yield prediction The filtering and classification of the presented articles demonstrate how agriculture will benefit from machine learning technologies. By applying machine learning to sensor data, farm management systems are evolving into real-time artificial intelligence-enabled programs that provide rich recommendations and insights for farmer decision support and action.

3. ADVANTAGES

- Early information on crop health and disease detection can facilitate the control of diseases through proper management strategies.
- This technique will improve the productivity of crops.
- This project also compares the benefits and limitations of these potential methods.
- The crop yield can be easily analyzed using an Android mobile phone itself.
- The accuracy of prediction is high compared to the existing system.
- The accuracy of the prediction is high.
- The time conception is completely low.
- A single-step solution for formers can be created using an Android interface.

4. MODELLING AND ANALYSES

A system architecture or systems architecture is the conceptual model that defines the structure, behavior, and views of a system. An architecture description is a formal description and representation of a system organized in a way that supports reasoning about the structures and behaviors of the system. A system architecture can comprise system components, the externally visible properties of those components, and the relationships (e.g., the behavior) between them. It can provide a plan from which products can be procured and systems developed that will work together to implement the overall system. There have been efforts to formalize languages to describe system architecture; collectively these are called architecture description languages (ADLs).

Image Processing: Image Processing is the process where the image is given as input to the system. In image processing, it is defined as the action of retrieving an image from some source, usually a hardware-based source for processing. It is the first step in the workflow sequence because, without an image, no processing is possible, so the leaf image dataset will be given as input to the system. The image that is acquired is completely unprocessed.
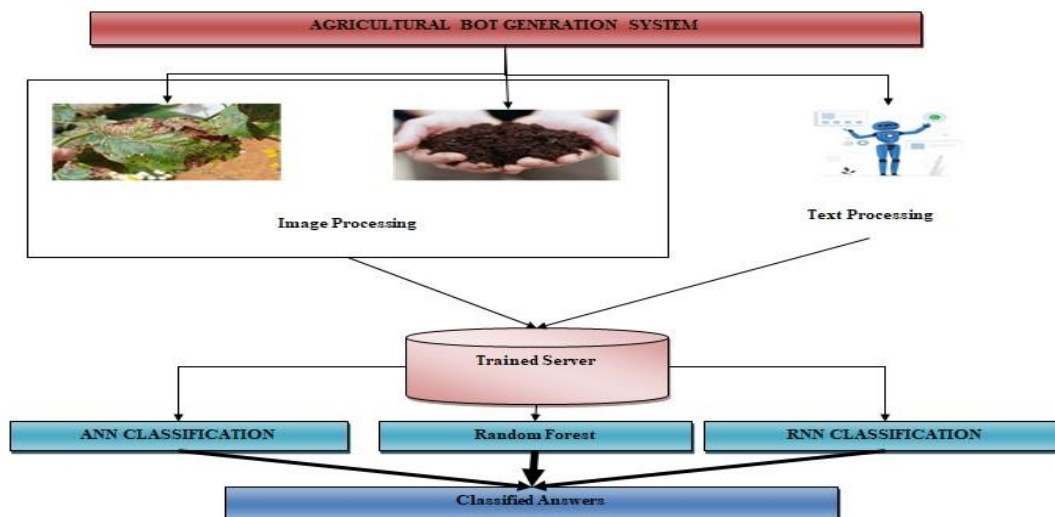

Figure 1: System Architecture

ANN Classification:

In the vast field of machine learning, there are numerous algorithms and techniques available to solve classification problems. One such powerful algorithm is the Artificial Neural Network (ANN) classifier. MLP is a type of artificial neural network that has proven to be effective in handling complex classification tasks. MLPs are suitable for classification prediction problems where inputs are assigned a class or label. They are also suitable for regression prediction problems where a real-valued quantity is predicted given a set of inputs. The rice leaf data are labeled with the model abstraction, which helps with the classification system.

Random Forest Processing:

The Random Forest (RF) algorithm (Breimann 2001) belongs to the realm of supervised classification algorithms. RFs builds upon the concept of decision tree learning presented in the last session. The RF relies on many self-learning decision trees, which, in their sum, make up a "forest." The idea behind using not one but many decision trees (i.e., an ensemble) is that many base learners can come to a more accurate and robust decision compared to a single DT. Different from the manual (expert-based) definition of decision rules we defined last week, the RF uses self-learning decision trees. This "self-learning" involves automatically defining rules at each node based on a training dataset for which feature inputs and labels are known.

RNN Classification:

RNN is implemented with a chatbot-based interface system. Classify the features of the query information carried out with NLP preprocessing and TF-IDF. The implementation will help classify those queries with trained data set matching.

5. RESULTS AND DISCUSSION

The implementation of a smart agricultural-based artificial intelligence (AI) bot for farmers has yielded promising results, as evidenced by several key metrics. Firstly, the AI bot has demonstrated a significant improvement in crop yield, attributed to its ability to provide timely and accurate insights into crop health, weather patterns, and optimal planting practices. Farmers utilizing the AI bot have reported notable reductions in resource usage, including water, fertilizer, and pesticides, leading to both cost savings and environmental benefits. Moreover, the bot has streamlined farming operations, saving time and labor while enhancing overall efficiency. User feedback has been overwhelmingly positive, with farmers praising the bot's usability and effectiveness in decision-making processes. Despite these successes, challenges remain, including the need for robust data infrastructure and ongoing technical support. Looking ahead, further enhancements to the AI bot hold promise for extending its capabilities and addressing emerging agricultural challenges. Overall, the deployment of this technology marks a significant step forward in sustainable farming practices, with implications for food security, environmental stewardship, and the future of agriculture.

6. CONCLUSION

This approach has proposed a system that uses Neural Networks to predict soil quality, pest control, and chatbot systems. The reason behind using neural networks is for more accurate results. This system can reduce the difficulties faced by farmers to some extent by helping them to choose the crop to be sown depending on the soil quality with leaf disease detection.

This system can be further enhanced to add functionality for the detection of crop diseases by using image processing. For this, we need to collect the images of diseased crops and train the machine to detect any kind of disease by using image processing.

The idea presented in this project can help increase the economy of the agriculture sector and reduce chatbots for the farmers on the identification of the multiple query answering system.

7. REFERENCES

[1] A. Kamilaris, A. Fonts, and F. P.-Boldv, "The rise of blockchain technology in agriculture and food supply chains," Trends in Food Science & Techn., Vol. 91, pp.640-652, 2023.

[2] H. M. Kim, and M. Laskowski, "Agriculture on the blockchain: Sustainable solutions for food, farmers, and financing" Supply Chain Revolution, Barrow Books, 2023.

[3] N. C. Eli-Chukwu, "Applications of artificial intelligence in agriculture: A review," Eng., Techn. & Applied Sci. Research, Vol. 9, No. 4, pp.4377-4383, 2023.

[4] W. B.-Vera, "Blockchain in agriculture: A systematic literature review," In Proc. Int. Conf. on Techn. and Innovation, pp. 44-56, Springer, Cham, Nov. 2020.

[5] A. S. Patil, B. A. Tama, Y. Park, and K. H. Rhee, "A framework for blockchain-based secure smart greenhouse farming," Adv. in Computer Sci. and Ubiquitous Computing, Springer, Singapore, pp. 1162-1167, 2020.

[6] A. Di Vaio, F. Boccia, L. Landriani, and R. Palladino, "Artificial intelligence in the agri-food system: Rethinking sustainable business models in the COVID-19 scenario," Sustainability, Vol. 12, No. 12, p.48-51, 2020.

[7] K. Demestichas, N. Peppes, T. Alexakis, and E, Adamopoulou, "Blockchain in Agriculture Traceability Systems: A Review," Applied Sciences, vol. 10, No. 12, pp. 1-22, 2020.

[8] T. Mohamed and A. E. Hassanein, "Integrating blockchain and the inter of things in precision agriculture: Analysis, opportunities, and challenges," Computers and Electronics in Agriculture, Vol. 178, Nov. 2020.

[9] R. Mark, "Ethics of using AI and big data in agriculture: The case of a large agriculture multinational," The ORBIT Journal, 2(2), pp.1-27, 2020.