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Recommendation of Farming Equipment Using Deep Learning

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***Abstract*—In order to maximize crop productivity and reduce resource waste, precision agriculture significantly depends on the effective use of agricultural equipment. However, because there are so many possibilities and farm circumstances vary so much, choosing the best farming equipment for a certain task can be difficult. In this paper, we provide a deep learning based recommendation system designed specifically for choosing precision agricultural equipment. The recommendation system makes use of a network of deep neural networks architecture that was trained on an extensive dataset that included a range of characteristics, including crop variety, soil type, field size, weather, and equipment performance in the past. Convolutional neural networks, or CNNs, are used by the model to extract temporal and spatial information, that is, from the input data. This enables the system to recognize intricate connections and patterns inside agricultural setting. In order to manage missing values, standardize features, and enhance the data for reliable model training, the dataset is preprocessed. The evaluation measures, which are determined using actual use cases and field testing, includes precision, recall, and F1-score. In addition, current streams of data and feedback from users for ongoing development are incorporated to assess the system's scalability and flexibility. Significant obstacles to agricultural production, stability of the environment, and global food security are presented by plant diseases. The purpose of this abstract is to give a brief introduction to plant diseases, including information on their origins, symptoms, effects on plant and agriculture, preventative and management techniques, and importance for ecosystem health and agriculture.**

***Index Terms*—Farming, Recommendation, Equipment, Deep Learning , CNN**

I. Introduction

Modern agriculture relies on advanced machinery and equipment for efficient crop production. However, choosing the right farming equipment tailored to specific farming needs can be daunting. A deep learning-based recommendation system aims to address this challenge by leveraging machine learning algorithms to suggest optimal equipment for various agricultural tasks. The system gathers diverse data, including soil type, crop variety, weather conditions, field size, historical performance of equipment, and user preferences. This data undergoes preprocessing steps, such as cleaning, normalization, and augmentation, to prepare it for model training. The recommendation system employs a deep neural network architecture, combining convolutional neural networks (CNNs) and . CNNs extract spatial features from geospatial data like soil types and field layouts, capture temporal patterns from weather conditions and historical equipment performance. The model is trained on the prepared dataset, using techniques like transfer learning and regularization to enhance performance. Plant diseases can have devastating effects on individual plants, crop yields, and agricultural economies. They lead to reduced plant vigor, lower yields, poor fruit quality, and in severe cases, plant death. Economic losses due to plant diseases encompass crop losses, increased production costs, and the need for disease management measures.

A. Algorithm Description

• Implement CNN-based models to analyze images captured by drones or mounted cameras on farming equipment.

• Develop CNN models trained on annotated datasets of images showcasing various pests and diseases affecting crops.

• Train the models on diverse datasets containing images of different weed species and crop varieties in various growth stages.

• Develop CNN-based models to estimate crop yield based on visual data collected from the field, such as plant density, canopy cover, and fruit/seed counts.

• Incorporate CNN models to analyze images or sensor data related to soil quality, erosion, compaction, and moisture levels.

II. Problem Statement

To overcome these challenges by leveraging machine learning techniques to provide personalized, data-driven, and adap-

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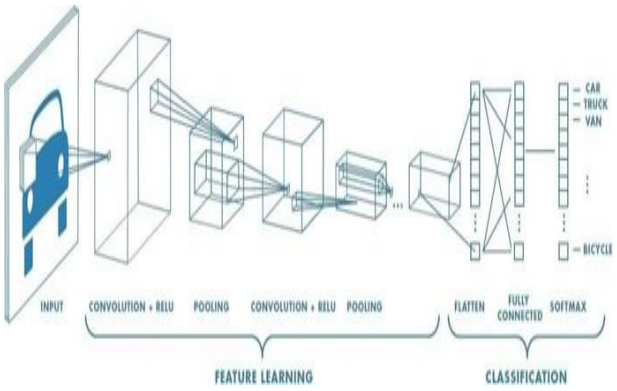


Fig. 1.

tive recommendations. Such a system seeks to empower farmers with a technology-driven solution that optimizes equipment selection, enhances productivity. To Plant diseases present a significant challenge to agricultural sustainability, jeopardizing crop yields, food security, and economic stability worldwide. This problem statement seeks to outline the critical issues associated with plant diseases and highlight the urgency of addressing them to ensure the resilience and productivity of agricultural systems.

III. Goal and Objectivce

• Gather diverse datasets related to farming equipment, including specifications, performance metrics, user reviews, and historical usage data.

• Design and implement deep learning architectures tailored for recommendation tasks, such as collaborative filtering, matrix factorization, or deep neural networks.

• Train the models using the preprocessed data to learn meaningful representations of farming equipment and user preferences.

• Develop and train the selected models using the annotated dataset to learn discriminative features for disease detection.

• Develop a user-friendly interface for the plant disease detection system, allowing users to upload images of diseased plants for analysis.

• Monitor the performance of the deployed system and gather feedback from users regarding accuracy and usability.

IV. Project Scope

• The scope of a farming equipment project utilizing deep learning encompasses various stages, from initial planning to deployment and ongoing maintenance.

• Identify and collect diverse datasets comprising images, sensor data, and other relevant information related to farming operations.

• Develop and train deep learning models to address specific tasks such as crop monitoring, pest detection, weed identification, or yield estimation.

• Develop a deep learning-based system for accurate and efficient detection of plant diseases.

• Gather a diverse dataset of images featuring healthy plants and plants affected by various diseases.

V. Design and Implementation Constraint

A. System Feature

B. Hardware Interface

• System : Intel I3 Processor and above.
• Hard Disk : 20 GB.
• Ram : 8GB

C. Software Interface

• Operating system : Windows 7 or more.
• Coding Language : python
• IDE : Spyder

D. Software Quality Attribute

1. Adaptability: This computer program is versatile by all clients.
2. Availability: This computer program is unreservedly accessible to all clients. The accessibility ofthe program is simple for everybody.
3. Maintainability: After the arrangement of the extend on the off chance that any blunder happens at that point itcan be effortlessly kept up by the computer program engineer.
4. Unwavering quality: The execution of the computer program is way better which is able increment there obligation of the Program.
5. User Friendliness: Since, the program may be a GUI applica- tion; the yield produced is much client neighborly in its behavior.
6. Integrity: Judgment alludes to the degree to which get to to program or information by unauthorized people can be controlled.
7. Security: Clients are verified utilizing numerous security stages so dependable security is given.
8. Testability: The program will be tried considering all the perspectives.

VI. Related work

1. Subhranshu Sekhar Tripathy, Niva Tripathy, A novel thought called ”smart farming” points to extend the efficiency and adequacy of horticulture by utilizing cutting-edge information innovations. Utilizing the foremost later advancements in computerization, fake insights, and organizing, ranchers are way better able to keep an eye on each step of the method and apply correct medications chosen by machines with superhuman exactness. With an extending worldwide populace comes a rise within the require for both work and nourishment. The farmers' conventional hones fell brief of assembly these requests. Modern mechanized strategies were thus proposed.

2. Elsayed Said Mohamed, AA. Belal, Mohammed A El-Shirbeny The nourishment deficiency and the populace development are the foremost challenges confronting maintainable developmentworldwide. Progressed advances such as manufactured insights (AI), the Web of Things (IoT), and the

versatile web can give practical arrangements to the challenges that are confronting the world.Therefore, this work centers on the new approaches re- garding savvy cultivating (SF) from 2019 to 2021,where the work outlines the information gathering, transmission, capacity, investigation, conjointly , appropriate arrangements.

3. N Deepa 1, Dhivya Elavarasan 1, Kathiravan Srinivasan 1 A few modern advances and developments are being executed in agribusiness as an elective to gather and prepare cultivate data. The rapid advancement of remote sensor systems has activated the plan of low-cost and little sensor devices with the Web of Things (IoT) engaged as a doable instrument for automating and decision-making within the domain of agriculture.This inquire about proposes an master framework by joining sensor systems with Manufactured Insights frameworks such as neural networks and Multi-Layer Perceptron (MLP) for the appraisal of farming.

4. Godwin Idoje, Tasos Dagiuklas, Muddesar Iqbal Web of Things (IoT) has been a major impact in Agribusiness since its application to the segment. This paper gives an broad audit of the use of savvy innovations in agricul- ture and explains the state-of-the-art advances for shrewd horticulture counting, Web of Things, cloud computing, machine learning, and manufactured insights. The application of savvy cultivating to edit and creature generation influencing the application of IoT in keen cultivating, and propose encourage research to move forward the current nourishment generation all inclusive, to supply way better nourishment administration and supportability measures over the worldwide.

5. M. Venkata Prathyusha2, A. Bindu Priya Darshini3. Agro promoting is an application which is valuable for both the ranchers and clients. In display promoting framework ranchers are not getting benefit for their difficult work. In nowadays promoting framework the cultivating products are transferred within the showcase by giving moo fetched to the farmers. Clients purchase the items with high cost from showcase additionally they are not sound. In this Agro marketing application agriculturists transfer their items that are developed in their possess areas. Clients moreover login to the site and buy the items that they need to purchase. As the agriculturists transfer characteristic and new items, clients get solid and new quality products that to specifically from composers instead of a advertise. In this site the plans which are valuable for the agriculturists are moreover transferred by the admin which makes a difference agriculturists monetarily.

6. Sahil Parmar 1, K Sai Kishan 1, Shantanu Bikram Karki1. Ranchers confronting parcel of issues, they will develop crops and other agrarian products(fruits,flowers,vegetables), They need to sell their items agreeing to the showcase cost but need of information they will offer their huge sum of items for little sum of cash to the brokers accessible within the nearby and clients will specifically approach to the brokers since of this agriculturists are losing part of money,they are getting cheated,Farmers know that they are offering products to broker for little sum of cash, but need of knowledge to the farmer I thought of doing an application that can offer assistance ranchers can directly offer their possess items to customer with no broker, clients can directly contact to ranchers , Ranchers can offer their own products retail or discount concurring to their amount of generation within the cultivating to the customer directly.

VII. METHODOLOGY

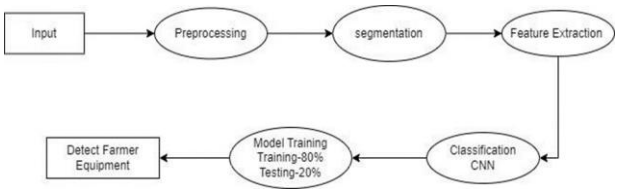


Fig. 2. Methodology

•Implement exchange learning from pre-trained models and customize the design to suit the particular needs of cultivating gear suggestion.

•Split the dataset into preparing, approval, and test sets.

•Ensure the framework gives clarifications or bits of knowledge into why certain gear is prescribed for particular conditions.

•Ensure the dataset covers a wide extend of natural conditions, illness severities, and stages of illness progres- sion.

•Monitor the conveyed model's execution and assemble input from clients to recognize zones for Advancement.

•Gather a differing dataset of pictures delineating solid plants and different sorts of infected plants over diverse trim species.

VIII. ARCHITECTURAL DESIGN

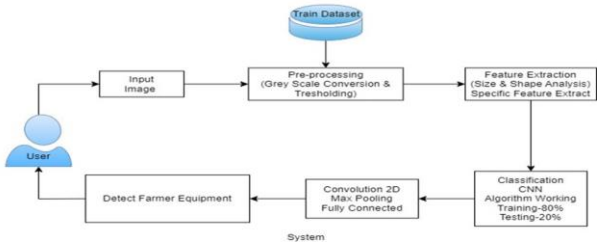


Fig. 3. Architecture

A. MODULE

• Admin

• In this module,the Admin should log in by utilizing substantial client title and secret word. After login fruitful he can do a few operations such as See All Clients and Authorize

• See and Authorize Clients

• In this module, the admin can see the list of clients who all enrolled. In this, the admin can see the user's points of interest such as, client title, e-mail, address and admin authorizes the clients.

• See Charts Comes about

Fig. 4. DFD0

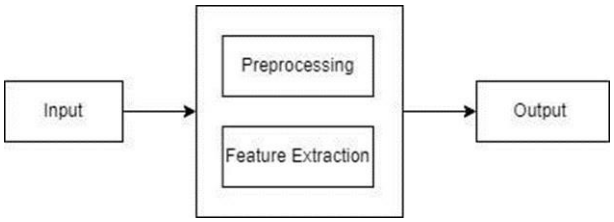


Fig. 5. DFD1

• See All Items Look Ratio,View All Catchphrase Look Results,View All Item Survey Rank Comes about.

• Conclusion Client

• In this module, there are n numbers of clients are display. Client ought to enlist some time recently doing any operations. Once client registers, their subtle elements will best or to the database. After enlistment successful,he has got to login by utilizing authorized client title and secret word. Once Login is fruitful client will do a few operations like Oversee Account.

B. DATA DESIGN

Planning cultivating hardware utilizing profound learning information includes a multi-step handle that combines information collection, demonstrate preparing, and gear plan.

• Decide the particular cultivating gear you need to plan or make strides. • Utilize verifiable information related to edit yields, climate designs, soil quality. • Assemble a assorted dataset of pictures highlighting sound plants as well as plants influenced by different maladies. • Assess the prepared show utilizing the approval set to evaluate its execution in identifying plant infections.

C. GLOBAL DATA STRUCTURE

Designing a global data structure for farming equipment using deep learning involves creating a standardized format for storing and exchanging data across different types of farming equipment and agricultural systems.

D. TEMPORARY DATA STRUCTURE

Designing a temporary data structure for farming equipment using deep learning involves organizing data in a format that facilitates real-time processing, analysis, and decision-making during farming operations.

E. SDLC Model

SDLC Models stands for Computer program Improvement Life Cycle Models. In this article,we investigate the foremost broadly utilized SDLC strategies such as Spry . Each computer program advancement life cycle demonstrate begins with the investigation, in which the Too, here are defined the advances utilized within the extend, group stack. One of the fundamental ideas of the computer program improvement handle is SDLC models which stands for Computer program Improvement Life Cycle models. SDLC – may be a ceaseless prepare, which begins from the minute, when it's made a choice to dispatch the venture, and it closes at the minute of its full expel from the misuse. There's no one single SDLC model.They are separated into fundamental bunches, each with its highlights and shortcomings.

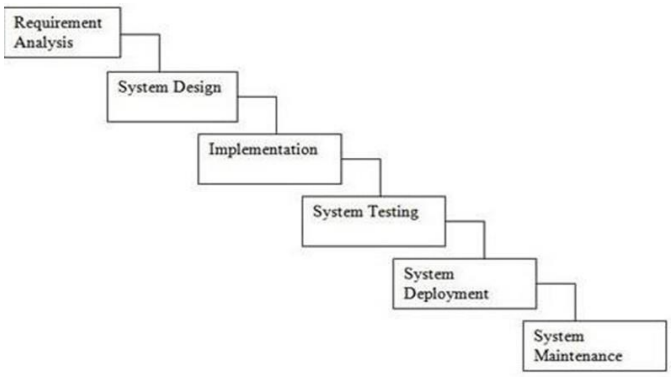


Fig. 6. SDLC MODEL

F. INTERNAL SOFTWARE DATA STRUCTURE

Planning inside computer program for cultivating gear utilizing profound learning includes making a vigorous information structure to handle different sorts of information productively. Execute a information preparing pipeline to preprocess crude information some time recently nourishing it into profound learning models. Preprocessing steps may incorporate information cleaning, normalization, resizing, and increase for pictures, as well as include scaling for numerical sensor information.Create apparatuses for clarifying and labeling crude information, particularly picture information, to form labeled datasets for show preparing.

G. Requirement Analysis

Prerequisite Investigation is the foremost critical and vital arrange in SDLC. The senior individuals of the group perform it with inputs from all the partners and domain experts or SMEs within the industry. Arranging for the quality confirmation prerequisites and identifications of the dangers related with the ventures is additionally done at this organize. Trade examiner and Venture organizer set up a assembly with the client to accumulate all the information like what the client needs to build,who will be the conclusion client, what is the objective of the item. Some time recently making a item, a center understanding or information of the item is exceptionally fundamental.

H. System Design

The following stage is almost to bring down all the information of necessities, examination, and plan of the computer program extend. This stage is the item of the final two, like inputs from the client and prerequisite gathering.

I. Implementation

In this stage of SDLC, the genuine improvement begins,and the programming is built. The execution of plan starts concerning composing code. Designers got to take after the coding rules portrayed by their administration and programming devices like compilers, mediators, debuggers, etc. are utilized to create and execute the code.

IX. Advantages

• Profound learning can be utilized for prescient upkeep of cultivating gear by analyzing sensor information to identify potential flaws or disappointments some time recently they happen.

• This versatility permits ranchers to reply rapidly to developing challenges and optimize their cultivating hones in like manner.

• This data can be utilized to form exact choices with respect to edit planting, water system, fertilization, and bother administration, driving to optimized asset utilization and higher trim yields.

• Profound learning models can identify plant infections at early stages by analyzing pictures of plants captured by cameras.

• Mechanizing malady location utilizing profound learning diminishes the require for manual labor and seriously checking, coming about in fetched investment funds for ranchers.

X. Limitations

• Insufficient or biased data can lead to poor model performance and unreliable equipment recommendations.

• Deep learning models are often considered ”black boxes” due to their complex architectures and internal representations.

• Managing plant diseases often requires additional investments in disease control measures such as fungicides, pesticides, and other agricultural chemicals.

XI. Results and Discussion

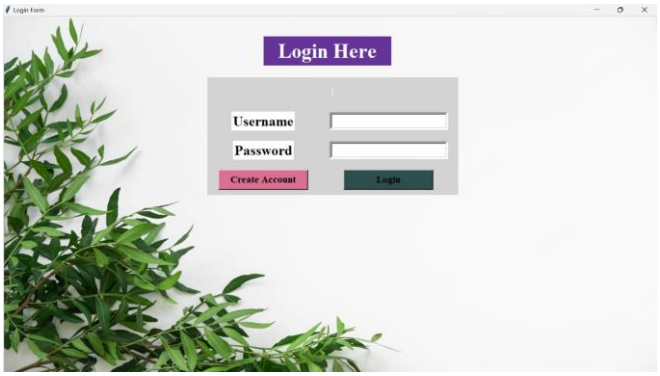
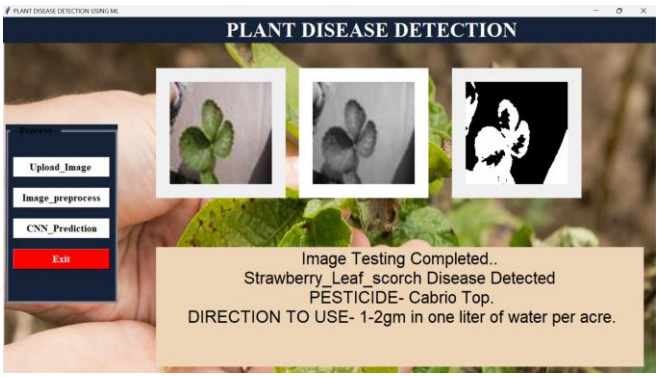


Fig. 7. Login Page

(a) Registration Page

(b) Main Page

(c) Output 1



(d) Output 2

XII. CONCLUSION

The development and implementation of a deep learning-based recommendation system for farming equipment mark a significant step forward in empowering farmers with advanced technology-driven decision-making tools. This project aimed to address the complex challenge of selecting the most suitable equipment for diverse farming tasks and conditions by leveraging machine learning techniques. This project lays the foundation for further advancements and applications in precision agriculture, promising continual enhancements and contributions to the evolving needs of the farming community. In conclusion, leveraging deep learning for plant disease detection presents a promising approach to revolutionizing agricultural practices. By harnessing the power of advanced algorithms and vast datasets, farmers can enhance their ability to detect and manage diseases affecting crops more effectively. The integration of deep learning into farming equipment and agricultural systems enables real-time monitoring, early disease detection, and precise intervention strategies, ultimately leading to improved crop health, increased yields, and sustainable agricultural practices.

REFERENCES

[1] T. Talaviya, D. Shah, N. Patel, H. Yagnik, and M. Shah, ”Implementation of artificial intelligence in agriculture for optimization of irrigation and application of pesticides and herbicides”, Artificial Intelligence in Agriculture, vol. 4, pp. 58–73, 2020.

[2] P. S. Nishant, P. Sai Venkat, B. L. Avinash, and B. Jabber, ”Crop Yield Prediction based on Indian Agriculture using Machine Learning,” 2020 International Conference for Emerging Technology (INCET), 2020, pp. 1-4, doi: 10.1109/INCET49848.2020.9154036..

[3] M. . Parhi, A. Roul, B. Ghosh, and A. Pati, “IOATS: an Intelligent Online Attendance Tracking System based on Facial Recognition and Edge Computing”, Int J Intell Syst Appl Eng, vol. 10, no. 2, pp. 252– 259, May 2022.

[4] S. S. Tripathy, D. S. Roy, and R. K. Barik, “M2FBalancer: A mistassisted fog computing-based load balancing strategy for smart cities. Journal of Ambient Intelligence and Smart Environments, vol. 13, no. 3, pp. 219-233, 2021.

[5] M. . Parhi, A. Roul, B. Ghosh, and A. Pati, “IOATS: an Intelligent Online Attendance Tracking System based on Facial Recognition and Edge Computing”, Int J Intell Syst Appl Eng, vol. 10, no. 2, pp. 252– 259, May 2022.

[6] B. Sahu, A. Panigrahi, S. K. Rout and A. Pati, ”Hybrid Multiple Filter Embedded Political Optimizer for Feature Selection,” 2022 International Conference on Intelligent Controller and Computing for Smart Power (ICICCSP), 2022, pp. 1-6, doi: 10.1109/ICICCSP53532.2022.9862419.