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Farmer's Assistant using AI Voice Bot

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Abstract: *The agricultural sector contributed approximately 19% of country's total Gross Domestic Product and employ's in an around 62% of the India's population in 2020, making it an essential part of the nation's economic development. This figure was previously around 15.41% until 2018, but the introduction of cutting-edge technologies such as IoT, AI, and ML has helped to increase this number. A system is created to assist farmers through a voicechat bot. The voicechat bot will address farmer queries in various languages, the voicechat bot has been developed using Google translate and its dataset. This application aims to help farmers enhance their farming practices and thus growth in their crop production. By providing guidance on crop selection and pesticide usage, this technology is expected to lead to an overall growth in the agriculture sector.*

Keywords: Voice Chat Bot, Agriculture, And Gross Domestic Production.

I. INTRODUCTION

Till 2050, the global population is predicted to exceed 9 billion people, and this will require a 70 percent increase in agricultural production to meet needs. However, current agricultural performing methods require high energy inputs, and the market demands high-quality food. The scarcity of labor, rising labor costs, crop failures due to pests, drought, climate changes, soil fertility loss, and fluctuating market prices for agricultural products have all negatively affected the social and economic status of this crucial population. On the other side, the growing population has resulted in higher demand of food grains, leading to the system provides support in three native languages: English, Hindi, and Marathi.

It consists of two modules: Base Input and Registration of Profile. For farming-related consultations, a recommendation algorithm is utilized, which leverages natural language processing and neural networks to identify and address farmer queries. Inflation in agricultural product prices. In 2015-16, 95.18% of people in India were protected by the National Foods Securities Act 2013. The agricultural sector in India faces significant challenges and needs to expand more rapidly to meet the rising demand of the population. Despite the support for research and development, as well as technology, this industry has not seen significant growth. However, with the emergence of new technologies such as smartphones, it is easier to provide technology to farmers through mobile phones. Several initiatives have been launched with the latest technological advancements in mind, including the Indian government's Kisan Call Center (KCC) program, which provides information about the government's interactions with farmers. The KCC dataset is a resource that is available to the public for research and analysis. To overcome the language barrier and provide support to local users in their native language, the system will include a tool that can be used in localized languages, such as English, Hindi, and Marathi .

II. LITERATURE SURVEY

S. Kanaga et al., (2021) [1] have proposed the use of an interactive chatbot in e-agriculture to enable farmers to sell their products directly to consumers without the involvement of middlemen. The proposed chatbot is accessible to consumers on any social media platform, allowing farmers to communicate via a network (like Facebook Messenger) and cultivate a specific crop for a fee. Through the aid of a smart system, consumers can hire farmers who can supply

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the food and provide all the necessary inputs for farming, resulting in a fair and profitable price for both buyers and sellers.

Anchal Jaiswalet al., (2020) [2] The AgriBot is a portable and intelligent system that assists farmers in choosing the best crops and farming strategies based on the current weather, soil and geographical characteristics of the designated area. The lack of a single resource that can address all of the farmers' questions about market prices, storage facilities, seeds, fertilizers, and government schemes is a challenge. To address this issue, the study proposes the use of a chatbot that utilizes natural language
processing methodology. The chatbot enables farmers to enter agricultural-related questions in audio format, simplifying farmer contact. In case the system fails to respond to any of the specified queries, the request is sent to assistance lines.

Vijay S. Rajpurohitet al., (2019) [3] This paper presents a survey on chat-bot systems for the agriculture domain. Chat-bot systems use natural language processing to understand user needs and provide appropriate responses. Agriculture is a vital sector for national growth, but many farmers lack knowledge of modern farming methods and technologies. Machine learning techniques have been applied to enable chat-bots to provide meaningful responses to agricultural queries. This survey examines expert systems and cutting-edge machine learning methods used for question and answer systems in agriculture. Chat-bot systems enable farmers to easily make inquiries and receive specific answers to their questions.

Dheeraj Singh Chaudharyet al., (2020) [4] Agribot is a conversational chatbot designed for agricultural applications, which not only provides answers to frequently asked questions but also focuses on crop disease detection and weather forecasting. The system is based on an end-to-end trainable sequence-to-sequence learning model, which is designed to achieve conversational task-oriented communication with minimal assumptions on sequence structure.

II. PROPOSED SYSTEM ARCHITECTURE

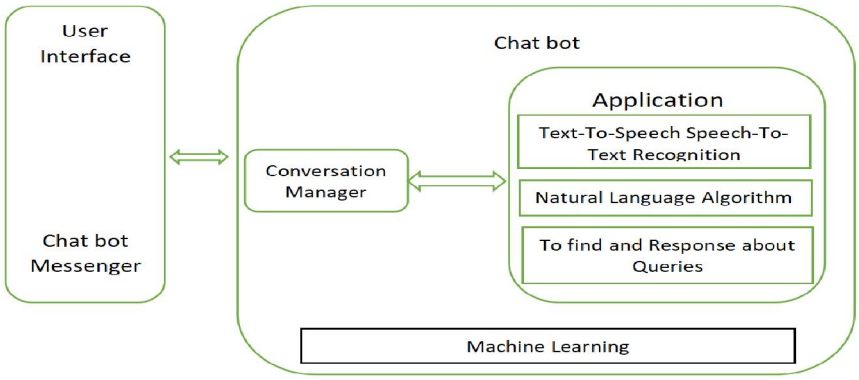

Fig. 1: Proposed system architecture

Over the past few years, we have collected data from a government website with information on all states in India. As part of our project, we have developed voices and Chabot's.Shachi Mall et al. [10], Xu Wu et al. [11], N. Shelke et. al. [12] and S. L. Bangare et. al. [13-16], Ajay S. Ladkat et al. [17] and V. Durga Prasad Jasti et. al. [18] have shown different methods for machine learning.

2.1 Data Analysis

Data analysis is the first step in analysing and responding to farmers' productions. In southern India, irrigation is an important element of food security. It is the application of water to the ground to grow. Various studies have been carried out and the crops are analyzed and recommendations are tabulated based on parameters such as crops, yield, productivity, agro climate, and soil type we will make recommendations for crops and fertilizers.

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A. Convolutional Layer

The main function of the convolution layer is to perform pattern recognition by performing a series of convolution operations on its input. During forward propagation, this layer convolves each input with a filter or kernel, producing an output that exposes the temporal moments that affect the classification.

B. Pooling Layer

The grouping layer divides the input dimension into a nonlinear layer to ensure that the most relevant information is retained. In order to perform its down sampling function, a clustering layer must be configured with a clustering window and a clustering step. Typically, these variables are set to the same value to avoid overlap, and the window moves through the input data and selects a segment of input values to apply to the grouping function. This down-sampling process is performed by the clustering layer.

- Max Pooling –The output of a pooling layer is determined by choosing the maximum value present in the pooling window.
- Average Pooling – Unlike the previous statement, the output of a pooling layer is calculated as the average of the values in the pooling window. An illustration of this function applied to a 1D input with both pooling window and pooling step set to 2 can be seen in Figure 1-

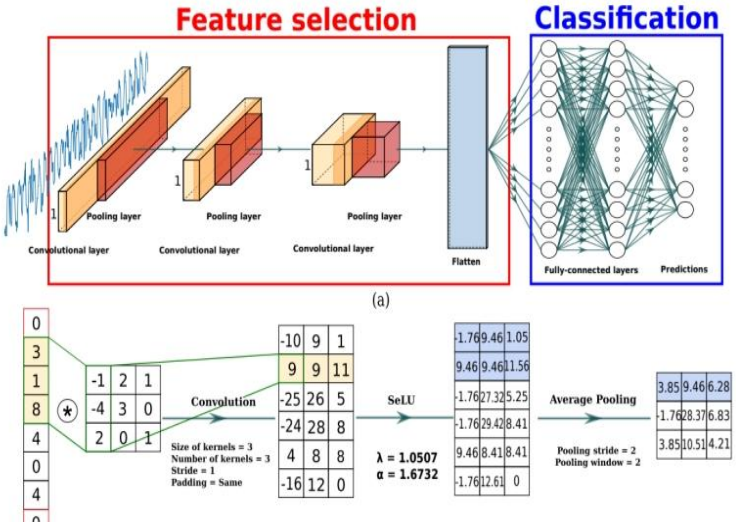
C. Flatten layer

The flat layer is responsible for concatenating each intermediate feature map of the final convolution block, reducing the 2-D space corresponding to the output dimension of the convolution part to a 1- space. D which can be entered in the classification part of the network.

- Kolomgewys – C = t 0 [x0], t 1 [x0], t 2 [x0], ..., t n−1 [xd−1] ,
- Rygewys – C = t 0 [x0], t 0 [x1], t 0 [x2], ..., tn−1 [xd−1]

D. Fully-Connected Layers

Fully Connected Layer After the convolutional layer extracts relevant features from the input data, the fully connected (FC) layer, denoted λ, combines each neuron in a way that facilitates accurate and efficient classification of the input . FC layers can be compared to multi-layer perceptron (MLP) networks, which operate on the output of the previous layer.



2.2 Voice Bots

Figure 2 illustrates the process in which a farmer provides voice input, which is then fed into a voice-to-text synthesizer that utilizes Google Translator. The synthesizer converts the farmer's voice into text, which is then inputted into an

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information retrieval block that searches for answers of the query by using a search Engine such as Google. The result of the search is then converted back into the voice format by a Text-To-Voice synthesizer.

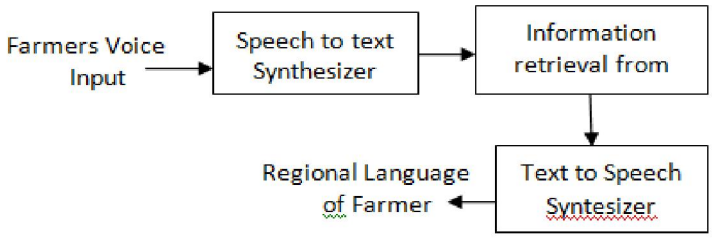

Fig-02 Block Diagram of Voice Bot

Voice to Text Synthesizer:

- **Enable for The Ambient Noise Adjustment:** Due to the variance in ambient noise levels, it is essential to allow the software a few seconds to Adjust the recording the energy threshold to match the external noise level.
- **Speech to the Text Translation:** Speech to text translation: Google voice recognition is used to convert speech to text. This service requires an active Internet connection to operate. While some offline recognition systems (such as Pocket Sphinx) have a long setup process and require you to install lots of dependencies, Google Speech Recognition is one of the easiest to use.
- **Google Translation:** Google Translator is a python library that utilized the Google Translator API to translate text from regional languages into the English. It is a free and unlimited library that relies on the Google Translates AJAX API to perform functions such as identification and translation. The library is compatible with Python 3.6 and higher versions, and is known for its speed and reliability, leveraging the same servers as translate.google.com. Additionally, it features auto language detection capabilities.
- **Voice Repeater (pysttsx3):** After the text has been translated, it is spoken aloud to confirm that the text spoken by the farmer has been accurately captured. This is achieved using the pyttsx3 library, which is a Python-based Text-To-Speech conversion Library. Unlike other libraries, it works offline and is compatible with both Python 2,3. To obtain the references to a pyttsx3 Engine instances, an application must call the pyttsx3.init () Factories function.
- **Information Retrieval (Using google search, web browser):** The Google Search Python library can be used to search for information on Google. This library uses queries and Beautiful Soup4 to retrieve search results. By default, Google returns ten search results. The Web Browser module can be used to open web pages in the default browser. To use this module, you simply need to import it and call its open() function with a URL. After using Google Translate to translate the web page into the farmer's local language, the translated text can be fed into a text-to-speech synthesizer. This will allow the computer to speak the translated text in the farmer's local language.

2.3 Suggestion Bot

- **Crops Suggestions:** Based on location and weather information provided by the farmer, crop suggestions are made. The farmer provides the location where they plan to cultivate the crops as Input. This input is processed using an algorithm that leverages to the services of the openweathermap.org to obtain weathers-related information for the specified location.
- **Open weather map:** Open Weather Map is a service that provides weather data for web services and mobile applications. The service offers current weather data, forecasts, and historical data through an API with JSON, XML, and HTML endpoints. There is a free usage level available, but users must obtain an API key by creating an account on the Open Weather Map website. The API provides information such as current weather conditions, extended forecasts, and graphical maps depicting cloud cover, wind speed, pressure, and precipitation.

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- **Request and JSON:** The algorithm uses the request module to fetch the data from the website and processes it with help of the JSON Module. The requests module is used to send the HTTP requests using Python, while the JSON module is built-in package in Python that enables working with JSON data. Based on the weather, soil type, and region provided by the farmer, the algorithm suggests the type of crop that would be suitable for cultivation. The suggestions are determined by referring to Table 2, which lists the suitable crops based on climate, location, and the soil type.
- **Fertilizer Suggestion Based On Nutrition:** This algorithm utilizes machine learning decision tree classification to suggest the appropriate fertilizer for a crop based on the results of a soil test. By analysing the nutritional composition of the soil, the algorithm can determine the optimal fertilizer that will promote a good crop yield.

III. RESULT

The Voice Bot enables farmers to ask questions using their regional language through voice input. Once the input is provided, it is converted into text, and the bot retrieves the appropriate information fertilizers. In Fig.03, the farmer selects their mother tongue and provides voice input to the bot, which retrieves information from websites to answer the query. Fig.04 displays the results obtained by the bot. The suggestion bot is specifically designed to aid farmers in selecting crops based on weather and soil conditions. It can also provide fertilizer recommendations based on soil test ratings. Upon using the suggestion bot, the final output consists of recommended crops along with suggested fertilizers.

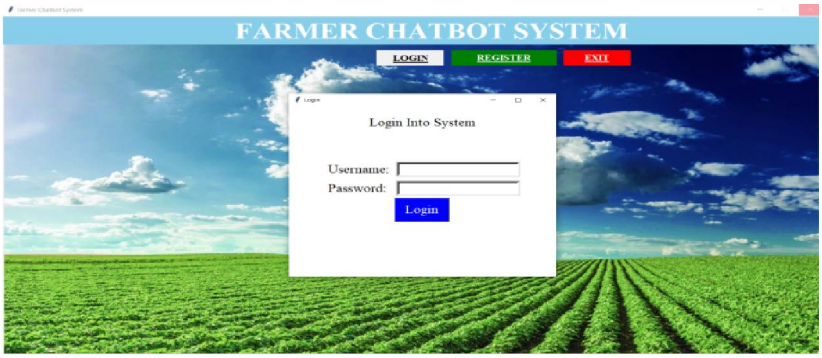

Fig 03. Registration and Login

Fig-04 Results of Crop and Fertilizer Suggestions

Performance Check with Monte Carlo Cross Validation: The entire Ground Truth (GT) dataset is partitioned into k subsets or "folds". To achieve this, the data is randomly shuffled and 80% of the GT is selected for training, while the remaining 20% is reserved for testing. The shuffling process is repeated multiple times to obtain several accuracy values, and the average accuracy is calculated. For instance, if the total GT is 25 and the shuffling process is repeated 5 times, resulting in the following accuracies: After shuffling the data five times, the accuracy values were as follows: Shuffle 1 Accuracy = 64 (16+9), Shuffle 2 Accuracy = 72 (18+7), Shuffle 3 Accuracy = 70 (17+8), Shuffle 4 Accuracy = 80 (20+5), Shuffle 5 Accuracy = 70 (17+8). The average accuracy is calculated as 71.2, which is obtained by summing up correct predictions (17) and incorrect predictions (8) and dividing the result by the total number of

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instances (25).The NLU system recognized 25 user inputs, with 17 being predicted correctly and 8 being predicted incorrectly. The precision is calculated as ~0.712 (17/ (17+8)), which is the number of correct predictions for the user input divided by the total number of predictions for the user input. The accuracy of the system is approximately 71%, which is lower than that of some other text bots, but compared to a voice bot, it is considered very efficient.

"**Suggestion Bot**: Crops and fertilizers suggestion based on the Weather, Location and Soil.

Fig. 05. Result of the Crop And Fertilizer Suggestion

IV. CONCLUSION

The implementation of an AI voice bot system as a farmer's assistant can provide significant assistance to the agricultural community. This application offers farmers access to relevant agriculture related data, and general information such as weather forecasts, recommended crops for planting, and suitable fertilizers to use. The system is designed to be multilingual and includes a voiceover feature, as well as entity extraction for farmer queries. This enables farmers from different regions and with different language preferences to ask queries and receive responses/answers in their regional language. The voice bot system can also suggest crops, pesticides depending on the climate and soil type, thus making modern farming technology accessible to a vast community of farmers. As a next step, the system could be expanded to identify crop diseases and provide remedies for them. Additionally, the system could suggest better crops and better time for their harvest based on market rates, climatic conditions, and land conditions

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