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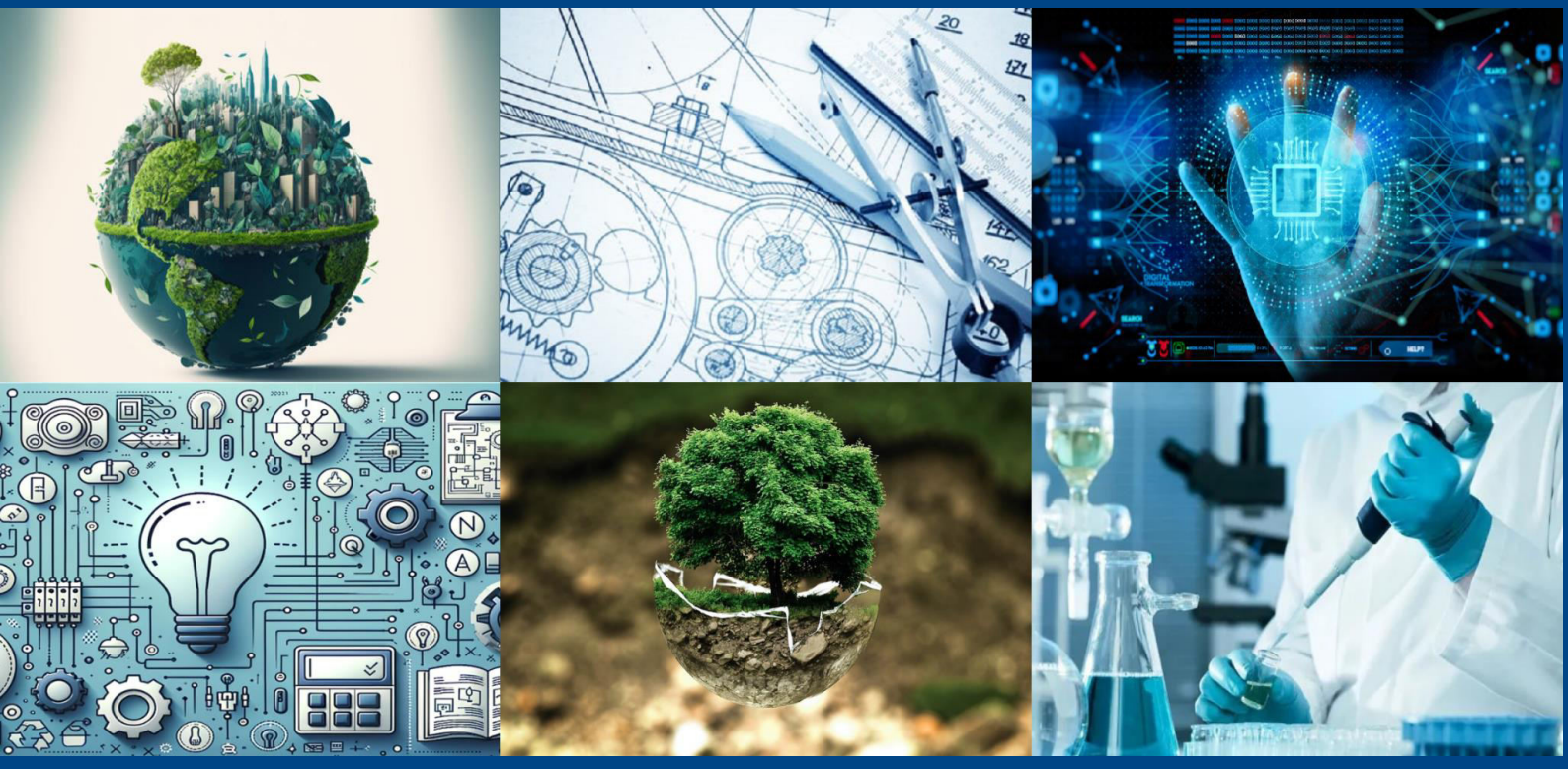

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Crop Market Price Prediction Using LLM

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ABSTRACT: The project implements an advanced DistilBERT-based intelligent system that predicts agricultural crop prices depending on the region and date. The model is trained on historical data containing state, district, year, season, and type of crop. Based on the backend built with Hugging Face Transformers in Python and a responsive frontend made with Flask, HTML, CSS, and JavaScript, the system successfully predicts prices and calculates MSE as the evaluation metric. The farmers and traders can estimate the price by entering certain crop-related parameters which are updated in real-time. To improve the model's performance, token length, early stopping, and hyperparameter tuning were applied. System responsiveness is prioritized to ensure users get near-instant feedback. The system is able to provide insights into the pricing trends and provides farmers, traders, and policy makers with the tools needed to make informed decisions, thus enabling data-driven agricultural decision-making.

I. INTRODUCTION

Agriculture is an important field for many developing countries, where a large population depends on agriculture for their livelihoods. A major challenge in this domain is unpredictable ups and downs in crop prices, influenced by factors such as region, weather, crop type, market demand, politics and climate. Profhems for accurate crop price can help farmers make informed decisions on crop choices, crop time and sales. By taking advantage of progress in natural language treatment (NLP) and large language models (LLM), the project uses distilbert to predict crop prices from text inputs such as state, district, weather, year and crop names. A sharp and light version of Burt provides an effective solution for this task. The system is designed with python and integrated into a grid area with flask, HTML, CSS and JavaScript. Users can enter crop -related data, and the model predicts prices based on historical trends. This mild solution increases the intelligence of the agricultural market and supports data -handled decisions. It is especially beneficial for farmers, traders and decision makers who receive timely and accurate information about the crop price.

II. LITERATURE REVIEW

Recent works in NLP and AI point out the capabilities of building multilingual agricultural chatbots using DistilBERT and Gemini AI. The addition of Google Translate and gTTS provides multilingual capabilities with spoken responses that improves interaction with rural users. SQLite for easy data storage and Flask for quick generation of web responses are standard for efficient web services. Research indicates better access is provided with local languages and audio interfaces. This project fills the void in integrated chatbot systems by using translation, speech, prediction, and intelligent response technologies.

C.Y. Prajwal et al.(2022) Crop Price Prediction Using Deep Learning- Proposed a neural network model for predicting agricultural produce prices, aiming to assist farmers in decision-making.

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Year	Paper Title	Author Name	Description	Drawbacks
2024	Crop Price Prediction System Using ML	Sumit Pandey	Developed a system using regression and ensemble methods, integrating historical price, meteorological, and socio-economic data. Achieved ~95% accuracy.	Limited consideration of factors like temperature, soil fertility, and regional variations; potential for model enhancement.
2024	Crop Price Prediction Using Machine Learning	B. Laxman Kumar	Studied and compared ML algorithms for predicting crop prices, emphasizing the need for accurate forecasting in agriculture.	Limited discussion on data preprocessing and feature selection; absence of real-world application results.
2023	Agricultural Commodity Price Prediction Model: A Machine Learning Framework	Manas Kumar Mohanty	Introduced a framework combining crop yield prediction, supply-demand analysis, and price forecasting using time series and ML techniques.	Complexity in integrating multiple modules; requires extensive data for accurate predictions.
2022	Crop Price Prediction Using Deep Learning	C.Y. Prajwal	Proposed a neural network model for predicting agricultural produce prices, aiming to assist farmers in decision-making.	Lack of detailed performance metrics and comparison with other models; limited dataset scope.
2021	Automated Agriculture Commodity Price Prediction System with Machine Learning Techniques	Zhiyuan Chen	Developed a web-based system comparing ARIMA, SVR, Prophet and LSTM models for price prediction; LSTM achieved the best performance.	Challenges in selecting appropriate historical data and model parameters; potential overfitting.

Table 1: Literature survey review

In summary, the work presented in this paper is built on previous research to predict crop market value using machine learning techniques such as regression, time chain models and deep learning. While these models show promising accuracy, common challenges include data quality, regional variation and limited model lecturers.

III. METHODOLOGY

The project benefits from Kolben for the production of a multilingual chatbot and crop costspredication application, and integrates machine learning and natural language treatment (NLP) models. The system of the system includes a disturbance -based model to predict crop costs, which take users inputs such as state, district, year, weather and crops to result in an estimated cost. The model is trained and loaded, which is loaded with 'distilberttocenizer` and' distilbertforceclassification 'with predictions that occur when using the neck. In addition, the Gemini AI model of Google is integrated to offer a communist interface that can respond to many languages, including English, Kannada and Hindi. This allows Chatbot users to interact in their favorite language, and translate user input and chatbot reactions using Google Translator API. The system also includes a text-to-spicch feature, which converts reactions to sound using 'GTTS' (Google Text-to-Spich) and plays back through the 'Pygame' library.

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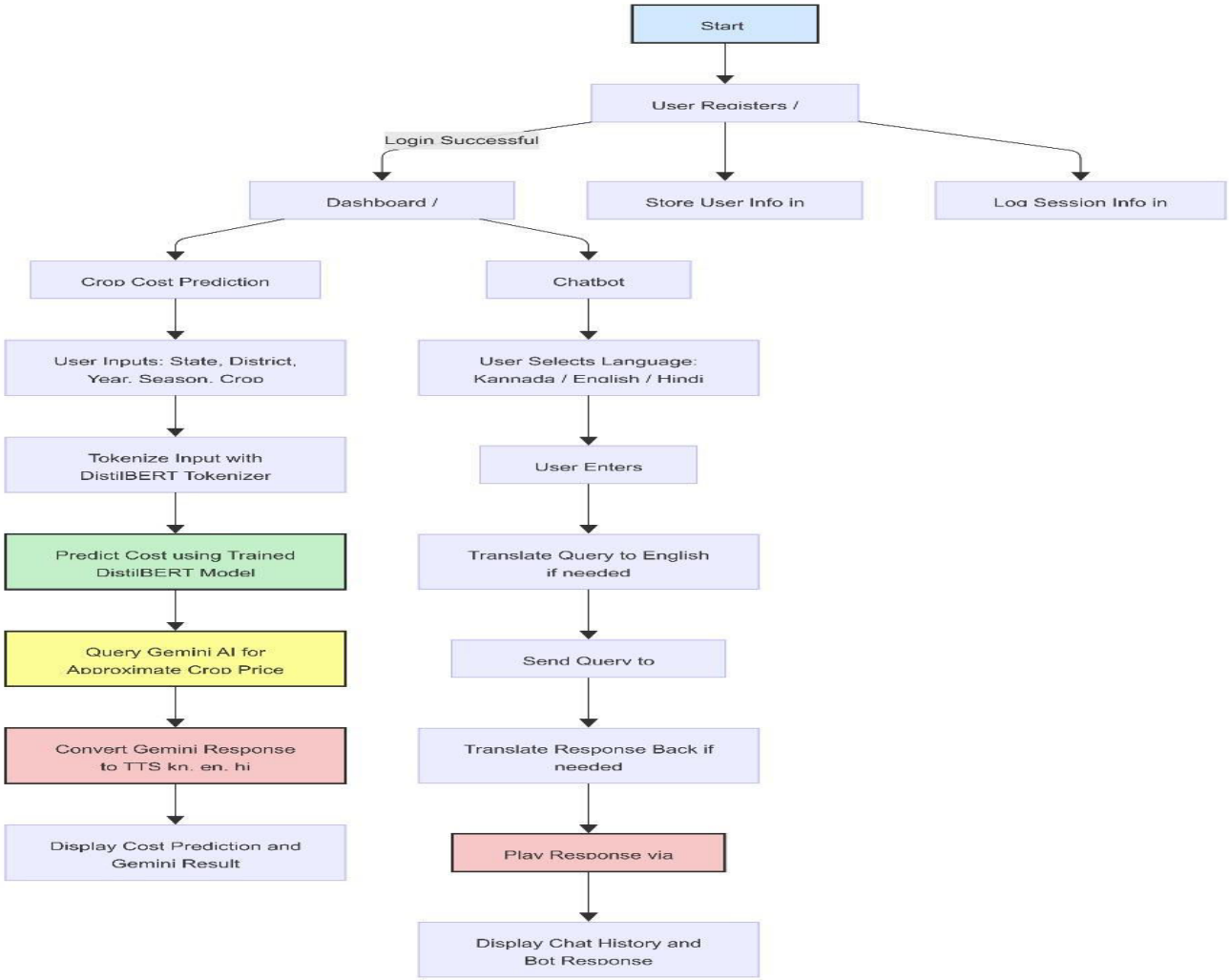
In the context of user administration, the application supports user registration, login and sessions tracking, user with SQLITE is used for frequent storage of identification and session data. The web interface is designed to be comfortable and provides real -time interaction through different routes for each language, ensuring that the user receives reactions in both text and voice. The application also includes a functionality to get the approximate crop price data, where the system responds to specific value issues. The acting machine emphasizes spontaneous integration of learning, NLP and multilingual support, and provides a comprehensive solution for the prediction of crop value and user interaction in a multilingual context. This approach may be beneficial for farmers and agricultural center



IV. IMPLEMENTATION

The project implements a multilingual chatbot web application manufactured with flask, and utilizes different AI models and APIs to provide crop costs and interactive user help. The system integrates a disturbance model to predict crop costs based on entrance parameters such as condition, district, year, weather and crop types. Google Gemini AI is used to generate reactions to many languages, including Kannada, Hindi and English for natural language treatment. Text-to-sprout functionality is activated using GTT and Pyigem, which has multilingual support for seamless interactions. The user is handled through certification, registration and session administration through SQLITE, which ensures safe access to the platform. The application offers an individual, multilingual experience to interact with users, achieve crop conditions and get in touch with Chatbot in your favorite language.

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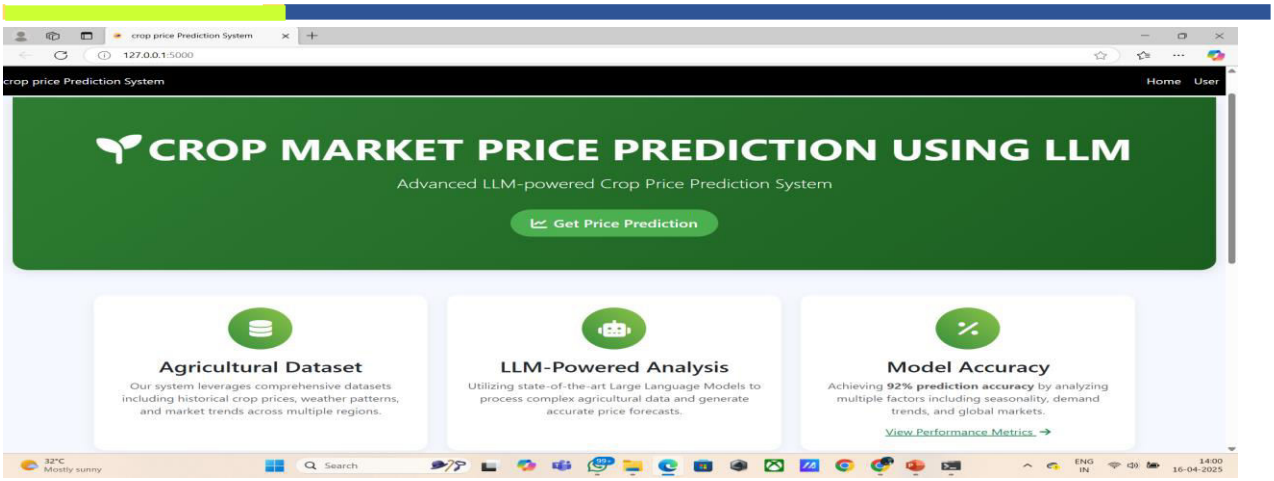

Fig 2: Home page

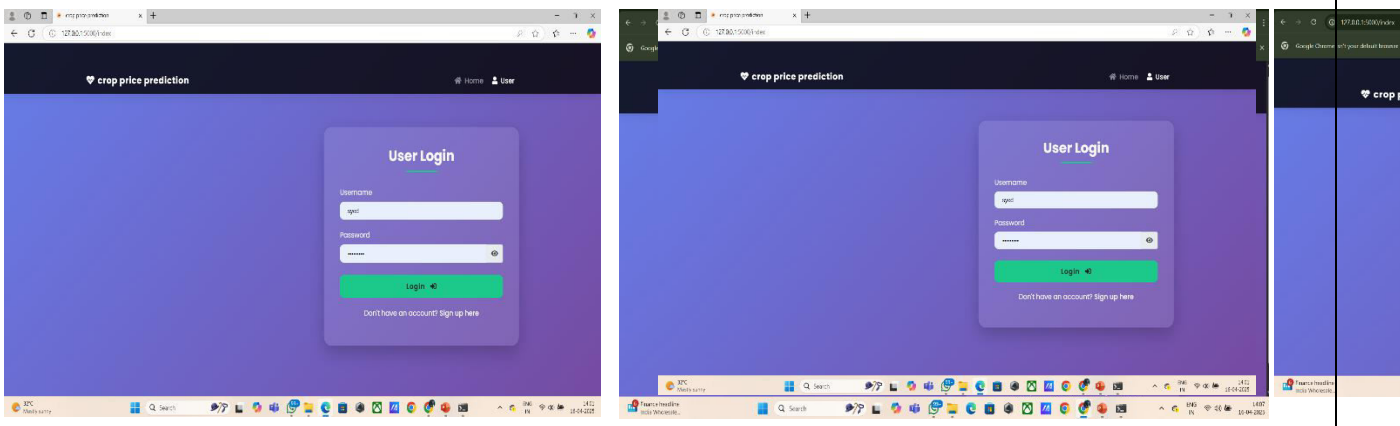

Fig 3: User Login And User Registration

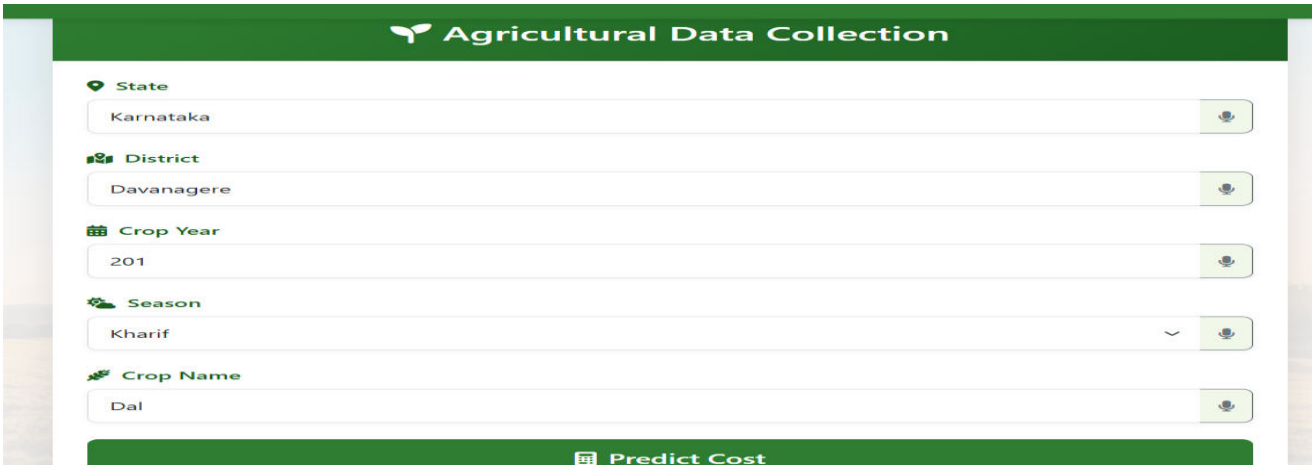

Fig 4: Agricultural Data Collection

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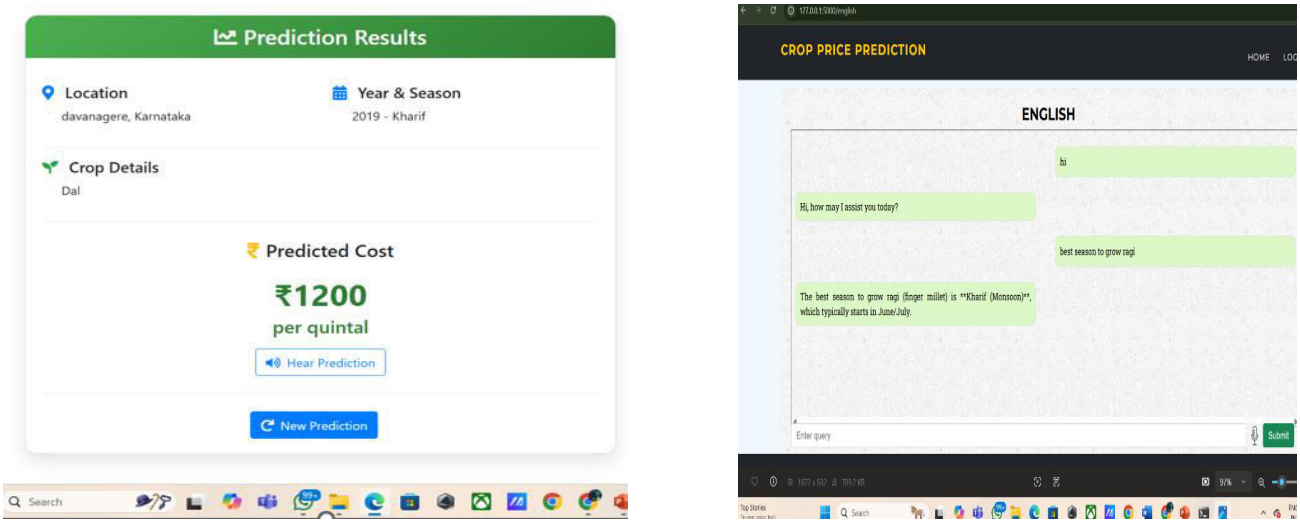

Fig 5: Predicted Cost and Chatbot

V. CONCLUSION AND FUTURE WORK

The Crop Price Prediction system uses a Large Language Model (LLM), DistilBERT, and other Natural Language Processing (NLP) technologies to leap forward with applying state-of-the-art NLP methods in the agri-food Supply Chain. By converting agricultural structured data into natural language data, we can deploy a transformer model that provides predictions in an accurate and efficient manner. DistilBERT is a smaller version of BERT, a lightweight model that provides fast inferences. Since it provides rapid inferences, it could be deployed in real-time through a web interface created in Flask. Both features and their context such as states, districts, the crop type, & the season, play an important role in determining the price prediction. We'd developed a fast easily scaled model that could also provide meaningful prices for farmers, traders, and policymakers, as well as facilitate the decision-making process, while also providing improvement opportunity for market-based forecasting and agri-food risk management.

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