PROJECT REPORT

(Project Term August-December 2021)

(AI Based Agriculture chatbot for farmers)

Submitted by

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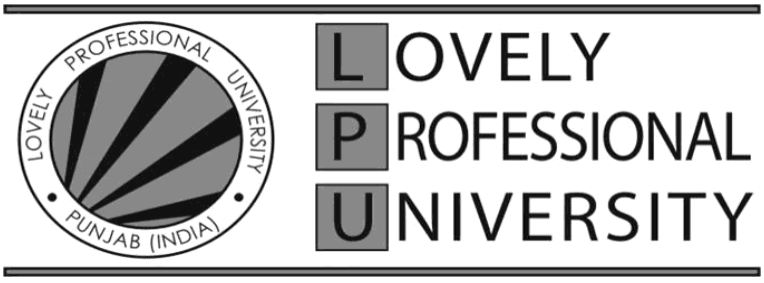
Project Group Number:

Course Code: INT246

Under the Guidance of

(Dr. Sagar pande**)**

School of Computer Science and Engineering



DECLARATION

We hereby declare that the project work entitled “AI Based Agriculture chatbot for farmers” is an authentic record of our own work carried out as requirements of Project for the award of B-Tech degree in computer science from Lovely Professional University, Phagwara, under the guidance of Dr. Sagar Pande, during August to December 2021. All the information furnished in this project report is based on our own intensive work and is genuine.

Project Group Number: ……

Name of Student 1: Masapeta Akhileshwar Reddy

Registration Number: 11904738

Name of Student 2: Chimaladenne Dayakar Sainath

Registration Number: 11912411

(Signature of Student 1)

Date:

(Signature of Student 2)

Date:

CERTIFICATE

This is to certify that the declaration statement made by this group of students is correct to the best of my knowledge and belief. They have completed this Project under my guidance and supervision. The present work is the result of their original investigation, effort and study. No part of the work has ever been submitted for any other degree at any University. The Project is fit for the submission and partial fulfillment of the conditions for the award of B. Tech degree in computer science from Lovely Professional University, Phagwara.

Signature and Name of the Mentor

Designation

School of Computer Science and Engineering,
Lovely Professional University,
Phagwara, Punjab.

Date:

ACKNOWLEDGEMENT

I would like to express my special thanks of gratitude to Dr. Sagar Pande sir. who gave me the golden opportunity to do this wonderful project on the topic (AI Based Agriculture chatbot for farmers), which also helped me in doing a lot of Research and I came to know about so many new things I am really thankful to have this opportunity.

INTRODUCTION

We want to build a chat bot which can answer basic queries of a farmers and can also provide a possible information related to agriculture.

Features: The farmers and Agri-experts provided the researchers with similar questions as the ones they found in the KCC dataset. Based on both sources, they identified four major areas requiring information support

Plant Protection: the KCC dataset, 60.6% of the farming calls were related to remedies for protecting

Pests and diseases: Agri-experts stated that a majority of farmers seek suggestions on which medicine to spray for a particular crop disease. None of the farmers the researchers interviewed were aware of any disease name. Usually, farmers describe crop diseases by their visible symptoms to the Agri-expert; with a few back-and-forth questions, the Agri-expert hypothesizes the issue and recommends medicine with dosage information**.**

Weather: In the KCC dataset, 39.4% of the overall calls were about weather-related questions; 13.5% o farming questions were about weather. Farmers eagerly sought weather information, as rains can wash away expensive sprayed pesticides and weather conditions determine the best time to harvest crops.

Best Practices: Information related to best practices can help increase yield in terms of the quantity or quality of potatoes. Common questions were: “Till what height should I put water?” “After how many days, should I harvest?” These best practices questions comprise of 6.6% of the potato farming calls in the KCC dataset. Agri-experts also stated that farmers consistently asked them tips to increase yield and, consequently, income.

Unbiased Recommendations on Products: Farmers wanted recommendations from Agri-experts on products they should purchase. Questions such as “Which fertilizer to put and how many times?” and “Which seeds are the best for red potatoes?” were commonly asked. They prefer to ask these questions to Agri-experts instead of local shopkeepers, believing that Agri-experts would provide unbiased and trustworthy response; they feared that shopkeepers may be motivated by the profit margin of products.

2. Proposed solution

2.1 The Chatbot will have to learn to identify the following

Chatbot basic features (answering queries related to following)

• Weather

• Government Schemes,

• Market Information

• field information and

• cultural practices

2.2 Solution Workflow:

We propose a solution of chatbot which is interactive for the farmers and easy to answer their queries in an effective manner

The Workflow starts with the hello message reply by the bot and queries will be asked by farmers in which the possible solution will be listed out based on the trained dataset which we give for training

2.3 **Literature survey**

The survey on artificial intelligence using chatbot works on various purposes and makes human life easier in daily requirements. By Chatbot research papers we concluded that they are very useful in various forms like communication, agriculture, medical, ecommerce, banking etc.

[1] Farm Chat: A Conversational Agent to Answer Farmer Queries The researchers developed a knowledge base for potato farming using the KCC dataset and information collected from formative interviews with smallholder farmers and Agri-experts. For each of the identified topics, they asked the two Agri-experts (who participated in the Formative Study) to provide examples of typical farmer questions, the follow-up questions that they would ask in order to understand the problem, and the final advice they would provide.

All such conversations were added to the IBM Watson Conversation dialogue flow, and the informational advice was included in the Farm Chat knowledge base. In the current version, the knowledge base is a SQL database consisting of four tables, one for each of the topics they identified above.

[2] AgronomoBot- a smart answering Chatbot applied to agricultural sensor networks: For agricultural purposes, it is important that the data about field conditions, such as air and soil temperature, air relative humidity, soil moisture, rainfall, wind speed and other relevant variables, be rapid and easily available for use by farm management systems, by specialists, or the farmer itself in decision-making processes.

AgronomoBot was developed focused on the search and display of data acquired from a Wireless Sensor Network deployed on a vineyard. It is based on Telegram Bot API and is able to access information collected by echo field sensors, bringing it back to a user through interaction over the Telegram application. The IBM Watson cognition services platform was also used for improving the user experience by enabling the use of natural language during the conversation experience, providing intention detection.

Further developments are planned for AgronomoBot, such as the expansion to other messaging platforms, the implementation of speech communication capacity, image classification and continuous data analysis. It is hoped that with analytical capacity over the mass of available data, it becomes possible to work towards the prevention of harmful

situations to agricultural productions, early detection of diseases in crops, energy and water waste reduction, and advanced management capabilities for the farmer. It was possible to achieve the objectives, presenting a satisfactory solution for the search and display of data on a WSN applied to wine production, based on the use of natural language that combines the functionalities of the electronic message service Telegram and the power of the cognitive services platform Watson from IBM

Natural Language Processing

Natural Language Processing (NLP) is a theory-motivated range of computational techniques for the automatic analysis and representation of human language (CAMBRIA; WHITE, 2014).[3] According to Lehnert and Ringle (2014), research on NLP should not be mistaken by speech recognition but is concerned with the symbolic manipulations of meaning and interface that are needed once words are recognized. In fact, a speech recognition algorithm needs to be paired to a language processing program in order to implement actual verbal dialogues with computers.[4] The authors Cambria and White (2014) state that NLP research is in a paradigm shift, they are no longer based on techniques of recognition and understanding of loose words. But now begin to explore semantic techniques more consistently, which the authors call a jump from syntactics curve to the semantics curve, and ultimately will arrive at the pragmatics curve, where computational programs will be able to investigate and build entire narratives.

Chatbots New technologies have favoured the creation of intelligent and autonomous systems, and among them is the emergence of Chatbots. The term “chatbot” or “chatterbot” indicates a robot that can talk and can be defined as a software that allows the simplification of interactions between humans and machines.

These interactions can occur through speech or writing in the natural language, through motion sensors, interaction with devices, and in other ways. [5] According to Hill et al. (2015), humans can easily adapt their language to human-chatbot communication, although there are notable differences in the content and quality of these conversations.

Results presented by the authors show that people communicate with chatbots for longer periods, but with shorter messages when compared to human conversation. Also emphasizing that human-chatbot communication has impoverished the vocabulary used by humans and increased in the occurrence of profanity.

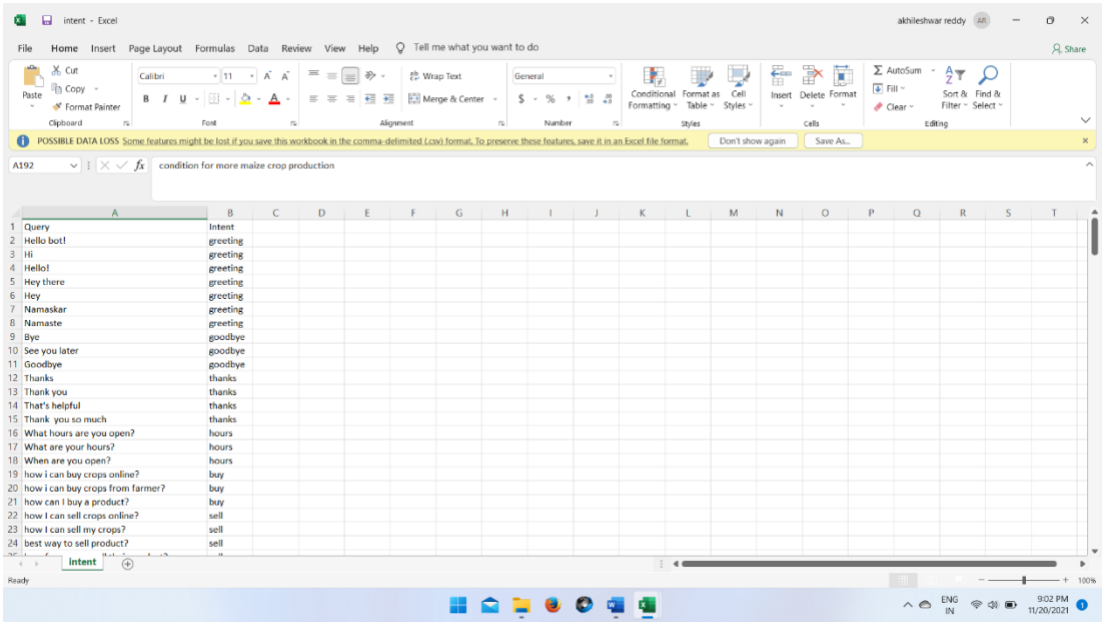
Chatbots can be categorized in two ways:

(i) rules-based, operating by means of specific commands (or keywords), which generally obey well-defined navigation flows and produce targeted conversations;

(ii) AI-based, making use of more advanced technologies such as machine learning, NLP, among other artifices to increase its capacity for dialogue and interaction.

The engine is the most important feature of a chatbot. It is responsible for the transformation of natural language into machine-understandable actions. Chatbots engines are usually developed using several Natural Language Processing and Machine Learning models to provide acceptable levels of accuracy.

3 . Data sets



Query	Intent
Hello bot!	greeting
Hi	greeting
Hello!	greeting
Hey there	greeting
Hey	greeting
Namaskar	greeting
Namaste	greeting
Bye	goodbye
See you later	goodbye
Goodbye	goodbye
Thanks	thanks
Thank you	thanks
That's helpful	thanks
Thank you so much	thanks
What hours are you open?	hours
What are your hours?	hours
When are you open?	hours
how i can buy crops online?	buy
how i can buy crops from farmer?	buy
how can I buy a product?	buy
how I can sell crops online?	sell
how I can sell my crops?	sell
best way to sell product?	sell

The Dataset contains following columns

- Query
- intent

3.1 Data Preparation

The preparation of data has majorly done, we have to do a clean-up of data for the better performance of bot, EDA will be used to clean up the data

4. Exploratory Data Analytics

4.1 Tokenization:

Given a character sequence and a defined document unit having sentences, tokenization breaks it up into pieces, called tokens, perhaps at the same time throwing away certain characters, such as punctuation.

A token is an instance of a sequence of characters in some particular document that are grouped together as a useful semantic unit for processing

4.2 NER: Named Entity Recognition:

While building any conversational bots/ Dialog system one can employ the following approaches to do so

1. Generative Based
2. Retrieval Based
3. Heuristic Based

we use Retrieval Based Approach

All of these approaches rely on NER some or the other way

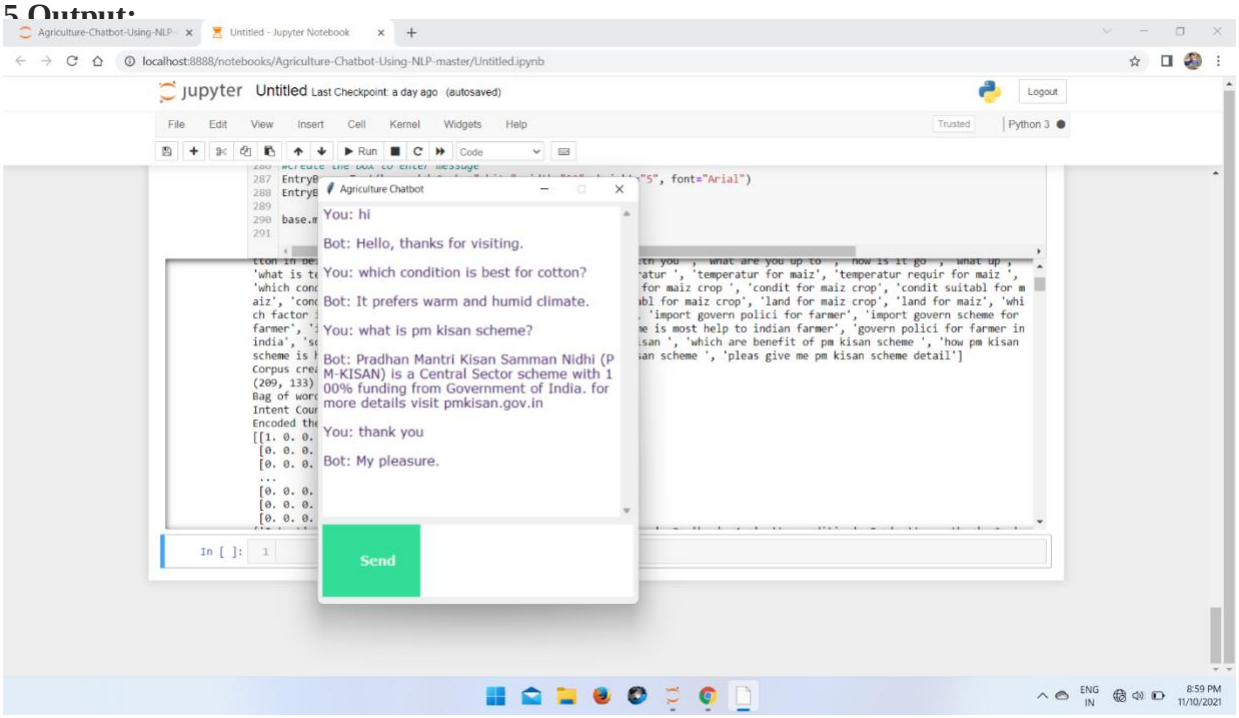
NER is a subtask of information extraction that seeks to locate and classify named entities in text into predefined categories such as the name of a person, location, organization, contact detail, expressions of time, quantity, monetary value, percentage, etc.

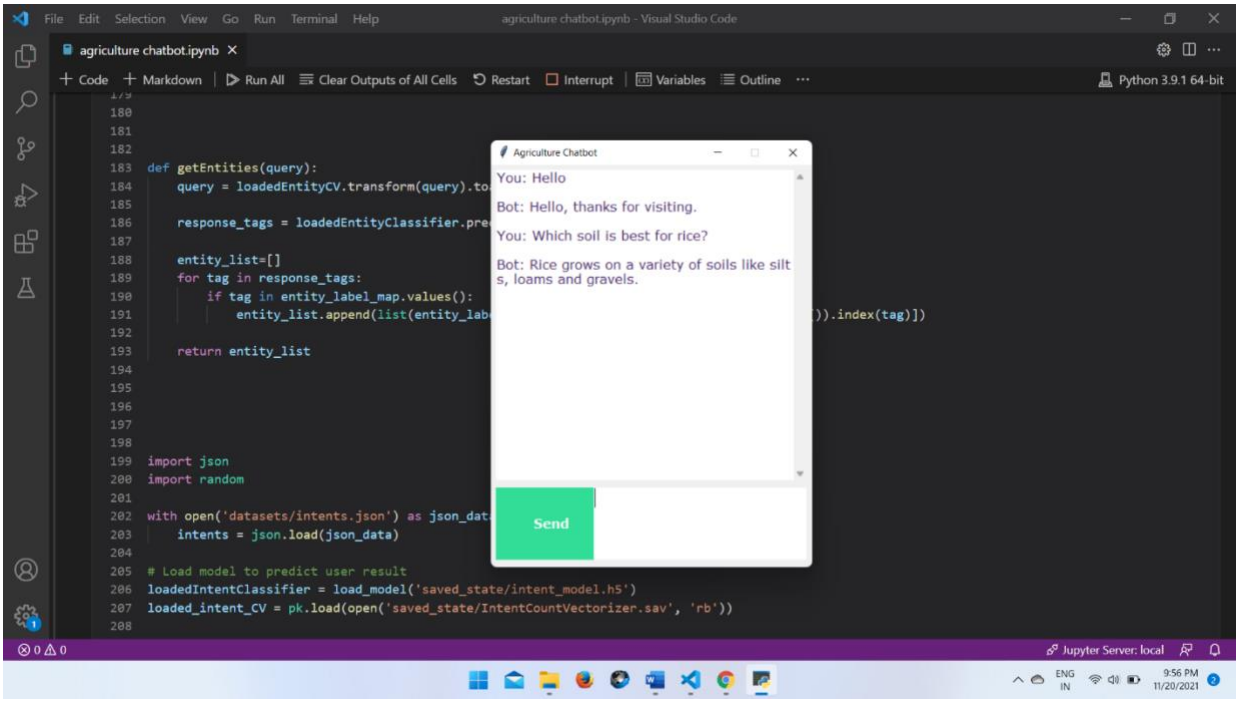
Most of Entities being retrieved falls into following broader category

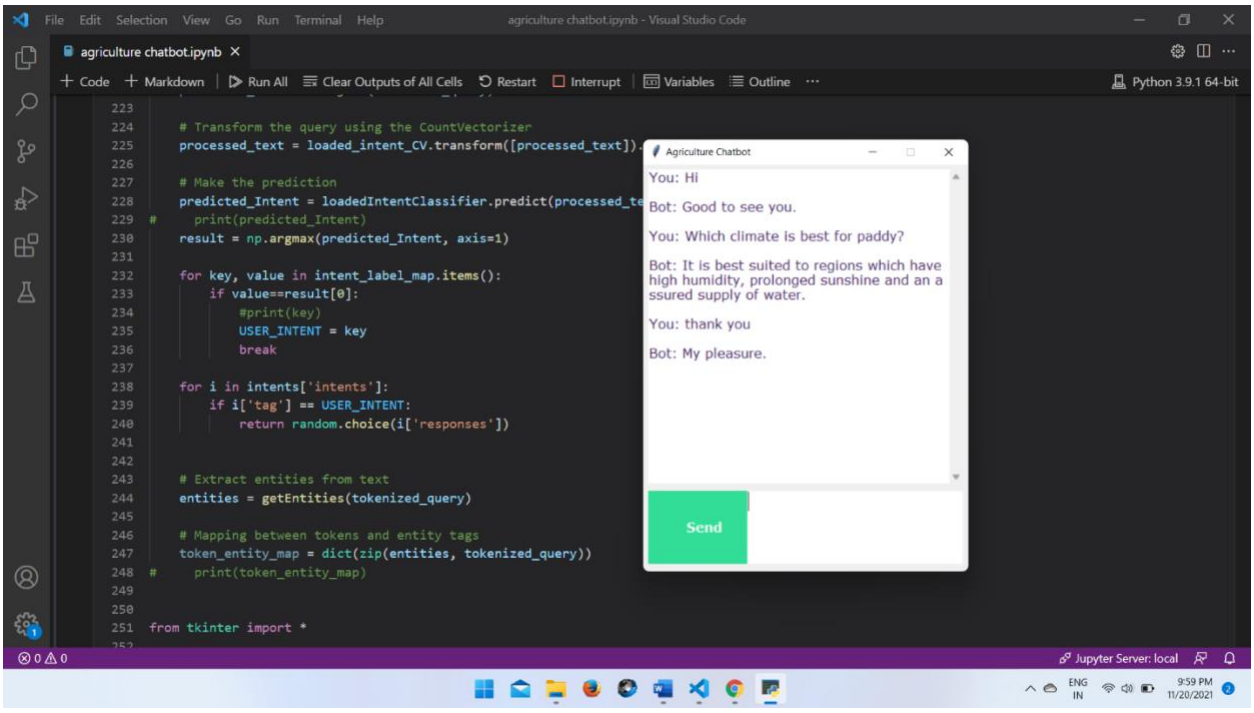
1. Numeral: Detecting numbers
2. Temporal: Detecting with time
3. Pattern: Understanding patterns and regular expression like email, mobile number etc
4. Textual: Detecting entities by looking at the dictionary

While NER looks for entities in pre-defined categories (for example, place names or addresses). They might also use a library called a N**ormalizer**, which catches common spelling errors, expands contractions and abbreviations etc...

5 Output:


Agriculture-Chatbot-Using-NLP
Untitled - Jupyter Notebook
localhost:8888/notebooks/Agriculture-Chatbot-Using-NLP-master/Untitled.ipynb
jupyter Untitled Last Checkpoint: a day ago (autosaved)
Logout
File Edit View Insert Cell Kernel Widgets Help
Trusted
Python 3
Run
Code
Agriculture Chatbot
You: hi
Bot: Hello, thanks for visiting.
You: which condition is best for cotton?
Bot: It prefers warm and humid climate.
You: what is pm kisan scheme?
Bot: Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) is a Central Sector scheme with 100% funding from Government of India. for more details visit pmkisan.gov.in
You: thank you
Bot: My pleasure.
Send
In [ ]:
ENG IN
8:59 PM 11/10/2021


File Edit Selection View Go Run Terminal Help
agriculture chatbot.ipynb - Visual Studio Code
agriculture chatbot.ipynb
Code Markdown Run All Clear Outputs of All Cells Restart Interrupt Variables Outline
Python 3.9.1 64-bit
def getEntities(query):
query = loadedEntityCV.transform(query).to
response_tags = loadedEntityClassifier.pre
entity_list=[]
for tag in response_tags:
if tag in entity_label_map.values():
entity_list.append(list(entity_lab
return entity_list
import json
import random
with open('datasets/intents.json') as json_dat
intents = json.load(json_data)
# Load model to predict user result
loadedIntentClassifier = load_model('saved_state/intent_model.h5')
loaded_intent_CV = pk.load(open('saved_state/IntentCountVectorizer.sav', 'rb'))
)).index(tag)])
Agriculture Chatbot
You: Hello
Bot: Hello, thanks for visiting.
You: Which soil is best for rice?
Bot: Rice grows on a variety of soils like silts, loams and gravels.
Send
Jupyter Server: local
ENG IN
9:56 PM 11/20/2021



6. Plain Results -Learning from model building

We found some key learning while building this chatbot model, While using such tools for building chatbot there were many versions' dependencies between the model and framework Bot response accuracy were majorly based on the intent definition

7. Conclusion:

Precise and Localized Answers

Specificity and localization were identified as keys to the information needs of farmers. With the help of Agri-experts, the researchers carefully tailored the system responses to local conditions. Participants appreciated such information contents:

Trust

Trust is another key design requirement. In general, participants trusted the responses

Stories — Stories define the sample interaction between the user and chatbot in terms of intent and action taken by the bot. Like in the example above bot got the intent of booking the table and entities like place and time but still, there is an entity missing — no of people and that would make the next action from the bot.

Actions — Actions are basically the operations performed by the bot either asking for some more details to get all the entities or integrating with some APIs or querying the database to get/save some information.

This model is based on the LSTM model which is the improvised version of Recurrent Neural Networks, which is of more convenient way to make the conversation flow

provided Six participants even asked the facilitator to write down the recommended medicines, seeds variety, and/or fertilizer with their quantities for them to refer later.