DAY – 19

25 August 2025

Overall Description of the Project

This project is a **Chatbot-Based Query Response System for PISMS (Punjab Irrigation Support and Management System)**.
The main objective of the project is to help users—especially **farmers and irrigation officials**—by providing **quick, accurate, and easy-to-understand information** related to irrigation services without reading lengthy manuals or visiting offices.

The chatbot works as a **virtual assistant** that answers user questions in **English and Punjabi** using information extracted from:

- A predefined **dataset (FAQ file)**
- The **PISMS User Manual (PDF document)**

The chatbot is integrated into a website as a **popup interface** and is available **24×7**.

How the Project Works (Overall Workflow)

1. **User Input**
   The user types a question in the chatbot popup (for example: *"What is Chakbandi?"* or *"How to create a new request?"*).
2. **Language Detection**
   The system identifies whether the user is asking the question in **English or Punjabi**.
3. **Text Preprocessing**
   The input text is cleaned using NLP techniques such as:
   - Lowercasing
   - Stop-word removal
   - Text normalization

     This helps the system understand the query correctly.

4. **Query Analysis**

   The chatbot analyzes the user's intent using:

   - Rule-based matching
   - Machine learning models (TF-IDF + Logistic Regression)
   - Similarity matching (cosine similarity)

5. **Data Source Matching**

   The chatbot searches for answers in:

   - Dataset file (stored questions and answers)
   - Extracted content from the PISMS PDF manual

6. **Best Answer Selection**

   The most relevant and accurate answer is selected based on confidence score.

7. **Response Generation**

   The selected answer is formatted properly and shown to the user in a readable form.

8. **Display to User**

   The answer is displayed in the chatbot window in real time.

What the User Needs to Use This Project

The user does **not need any technical knowledge**. Only the following are required:

- A **device** (mobile, laptop, or desktop)
- **Internet connection**
- Access to the **PISMS website**
- Ability to type a question in **English or Punjabi**

That's it. The chatbot handles everything internally.

What the Chatbot Helps the User With

- Understanding **PISMS features**
- Guidance on:
    - Registration
    - Login
    - Create new request
    - Application status tracking
    - Chakbandi, CO40, Warabandi
    - Dashboard and profile update
- Saves time by avoiding:
    - Manual reading of long PDFs
    - Office visits
    - Help-desk calls

Why This Project Is Useful

- Reduces workload on irrigation offices
- Provides instant help 24×7
- Supports **bilingual communication**
- Improves user experience
- Helps farmers and officials use digital systems easily

Overall Working of the Project (Step-by-Step)

1. User Interaction

The chatbot is available as a **popup window on the website**.
The user types a question in **English or Punjabi**, such as:

- *What is Chakbandi?*
- *How to create a new request?*
- *How can I check application status?*

2. Language Handling

The chatbot supports **bilingual communication**.
It first identifies whether the user is asking in **English or Punjabi**, so that the response is generated in the same language.

3. Text Preprocessing (NLP Stage)

Before understanding the question, the system cleans the input using **Natural Language Processing (NLP)** techniques:

- Removing unnecessary words (stop words)
- Converting text into a standard format
- Cleaning special characters

This step improves accuracy and helps the chatbot understand different types of questions.

4. Query Understanding & Analysis

The chatbot analyses the user query to understand:

- What the user is asking
- Whether the question is definition-based, procedural, or informational

For this purpose, the system uses:

- **Rule-based matching**
- **Machine learning models**
- **Similarity matching algorithms**

5. Searching the Knowledge Base

After analysing the query, the chatbot searches for answers in:

- A **dataset file** containing predefined FAQs
- Extracted content from the **PISMS User Manual PDF**

The PDF is already processed and cleaned so that only useful information is stored.

6. Best Answer Selection

If multiple answers are found, the system calculates the **confidence score** and selects the **most relevant answer**.
If the confidence is low, the chatbot asks the user to rephrase the question instead of giving a wrong answer.

7. Response Generation

The selected answer is formatted properly:

- Clean text
- Line-by-line explanation (if needed)
- Easy language for common users

8. Response Display

The final answer is displayed in the chatbot window in **real time**, creating a smooth and interactive experience for the user.

Technology Used in the Project

Frontend

- HTML
- CSS
- JavaScript

Used for creating the chatbot popup interface.

Backend

- Python
- Flask Framework

Handles user requests and chatbot logic.

Libraries & Tools

- NLP (NLTK)
- Machine Learning (Scikit-learn)
- PDF text extraction (PyPDF2)

What the User Needs to Use This System

The user only needs:

- A mobile or computer
- Internet connection
- Ability to type a question

No training or technical knowledge is required.

Benefits of the Project

- Saves users' time
- Reduces dependency on offices and help desks
- Easy access to information
- Supports regional language (Punjabi)
- Improves digital adoption among farmers

Limitations (For Viva Honesty)

- Chatbot responses depend on available dataset and PDF content
- Cannot answer questions outside the given domain
- Requires internet connection