DECO2801 / DECO7821 Human Centred AI 2025 S2 Assignment Helper

Assignment write up guidance: For assignments with programming

Document your code and make it accessible through a GitHub repository. Write a concise but informative document that covers the following key areas for your code.

The headings provide a common structure, but you can use any relevant framework, for example, from a software engineering course (state the name and source of your framework if different).

Python Project Code Write-up Template (Levels 6 and 7)

Code Title: Flood Response Chatbot
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Date: 10/27/2025
Repository Link: https://github.com/YunTong09/flood-response-chatbot

1. Code Overview

The Flood Response Chatbot is a human-centered web prototype designed to help Brisbane residents access verified flood safety information quickly and ethically. It consolidates official guidance from the Bureau of Meteorology (BoM), Brisbane City Council, and Get Ready Queensland into a conversational, mobile-friendly interface. The implementation is fully functional, demonstrating transparency, empathy, and accountability through agentic AI reasoning and emotional support mechanisms.

2. Main Features & Structure

The system integrates verified information retrieval, rule-based safety logic, emotional awareness, and transparent reasoning. It is designed to follow Human-Centered AI (HCAI) principles by ensuring usability, clarity, and ethical communication.

Main Features:

Verified Information Delivery: All responses come from official sources (BoM, Brisbane City Council, Get Ready Queensland).

Rule-Based & Retrieval Logic: Combines structured intent matching with local text similarity search for accurate and context-aware responses.

Agentic Reasoning: Every chatbot answer includes a “Reasoning” explanation generated via Google Gemini or fallback logic, ensuring interpretability.

Emotion Detection & Empathy: Detects user emotions (fear, anger, gratitude) and responds in a supportive tone.

Ethical Safeguards: Displays disclaimers such as “I am not an emergency service. If you are in danger, call 000.” to define responsibility boundaries.

Usability Features: Supports shortcut inputs (“1”, “2”, “3”) and quick-reply “chips” for common queries.

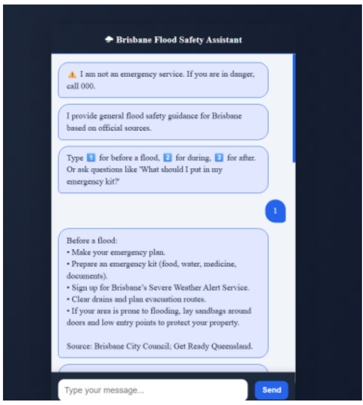
System Modules:

File / Module	**Primary Function**	**Description**
server.js	Local Server	Hosts the chatbot and proxies Gemini API requests securely.
main.js	Orchestrator	Connects UI, emotion, logic, and reasoning layers.
helpers.js	Utility + Reasoning	Renders messages and generates transparent reasoning explanations.
emotion.js	Emotion Layer	Detects emotions and produces empathetic tone responses.
logic.js	Decision Engine	Handles rule-based guidance for before, during, and after flood stages.
knowledge_base.js	Data Repository	Stores verified flood safety data from BoM and local councils.
retriever.js	Semantic Retriever	Matches free-text queries with knowledge base entries by similarity scoring.
suggestions.js	Interaction Layer	Displays adaptive quick-reply chips to assist users.
gemini_api.js	API Client	Connects to the Google Gemini API for reasoning generation.
node.js	Development Setup	Supports Node-based local testing.

3. Core Logic

The chatbot operates on a hybrid rule-based and retrieval-based model. When a user enters a query, the system first detects emotion, then checks for predefined intents (e.g., “evacuate,” “power outage,” “financial help”). If no direct intent match is found, the retriever performs text similarity matching to identify the most relevant entry from the knowledge base. The system then displays the verified answer with a “Reasoning” explanation generated by Gemini, clarifying why that answer was chosen and which source it came from. This layered logic ensures ethical, explainable, and human-centered communication.

4. Sample Usage



Brisbane Flood Safety Assistant

⚠️ I am not an emergency service. If you are in danger, call 000.

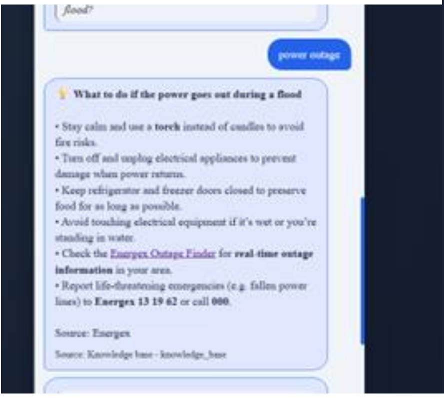
I provide general flood safety guidance for Brisbane based on official sources.

Type 1️⃣ for before a flood, 2️⃣ for during, 3️⃣ for after. Or ask questions like 'What should I put in my emergency kit?'

1

Before a flood:
• Make your emergency plan.
• Prepare an emergency kit (food, water, medicine, documents).
• Sign up for Brisbane's Severe Weather Alert Service.
• Clear drains and plan evacuation routes.
• If your area is prone to flooding, lay sandbags around doors and low entry points to protect your property.

Source: Brisbane City Council; Get Ready Queensland.



flood?

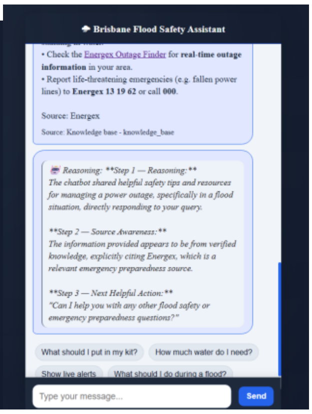
power outage

💡 **What to do if the power goes out during a flood**

• Stay calm and use a **torch** instead of candles to avoid fire risks.
• Turn off and unplug electrical appliances to prevent damage when power returns.
• Keep refrigerator and freezer doors closed to preserve food for as long as possible.
• Avoid touching electrical equipment if it's wet or you're standing in water.
• Check the Energex Outage Finder for **real-time outage information** in your area.
• Report life-threatening emergencies (e.g. fallen power lines) to **Energex 13 19 62** or call **000**.

Source: Energex

Source: Knowledge base - knowledge_base



Brisbane Flood Safety Assistant

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*Reasoning: **Step 1 — Reasoning:***
The chatbot shared helpful safety tips and resources for managing a power outage, specifically in a flood situation, directly responding to your query.

Step 2 — Source Awareness:
The information provided appears to be from verified knowledge, explicitly citing Energex, which is a relevant emergency preparedness source.

Step 3 — Next Helpful Action:
"Can I help you with any other flood safety or emergency preparedness questions?"

What should I put in my kit?
How much water do I need?
Show live alerts
What should I do during a flood?
Type your message...
Send

The chatbot integrates an explainable reasoning layer that enhances transparency and user trust. Users can interact with the system by either entering quick shortcuts such as “1” (Before a flood), “2” (During a flood), or “3” (After a flood), or by typing any flood-related question such as “power outage,” “how to prepare,” or “where to get sandbags.”

The system first detects the user’s intent and emotional tone, then retrieves verified guidance from the knowledge base or applies rule-based logic to generate the most relevant response. After each reply, the chatbot automatically produces a “Reasoning” section using the Google Gemini API, explaining why that answer was provided and where the information came from. This reasoning follows a three-step structure: (1) Reasoning, which clarifies the logic behind the response; (2) Source Awareness, which identifies whether the content was drawn from verified government sources such as Energex or the Bureau of Meteorology; and (3) Next Helpful Action, which offers an empathetic follow-up suggestion to guide users safely.

For instance, when users ask about a power outage, the chatbot retrieves Energex’s official safety instructions and transparently explains that the advice was sourced from verified data. This design ensures that the chatbot remains explainable, ethically responsible, and supportive key principles of Human-Centered AI (HCAI), allowing users to not only access accurate safety information but also understand how and why it was delivered.

5. Challenges and Solutions

A key challenge was preventing the chatbot from giving unsafe or predictive advice during emergencies. I solved this by adding rule-based filters that redirect high-risk queries to verified official sources. Another difficulty was ensuring the system worked when the Gemini API was unavailable, which I addressed with local fallback logic. These solutions improved the chatbot’s reliability, transparency, and ethical integrity.

6. Reflection & Improvements

Through developing the Flood Response Chatbot, I learned how to integrate ethical principles with technical design, ensuring that AI systems remain transparent, accountable, and human-centered. The project deepened my understanding of how emotion detection, rule-based logic, and reasoning layers can work together to build user trust during crisis communication. In the future, I would enhance intent recognition through improved natural language understanding and redesign the interface using card-based layouts to make responses more concise, readable, and mobile-friendly.