

# 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).*

### **JAVA script Project Code Write-up Template (Levels 6 and 7)**

Code Title: Flood Response Chatbot

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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.

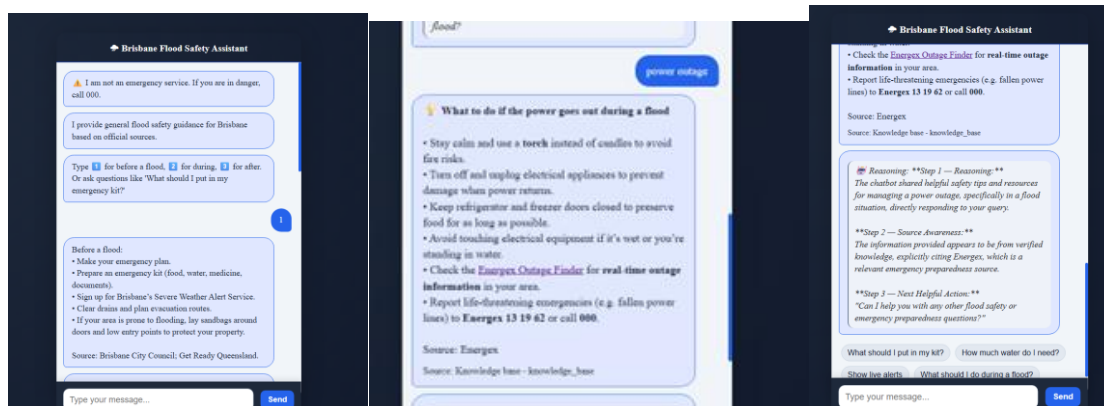
System Modules:

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



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 major challenge was correctly implementing the agentic AI mechanism. It was difficult to integrate the knowledge base responses with the AI’s own generative reasoning while ensuring that the system did not make unsafe or autonomous decisions for users. To address this, I designed a two-step process: first, the retriever searches the knowledge base for verified answers; then, the AI reasoning layer reviews whether the response sufficiently addressed the user’s question and adds empathetic clarification if needed. However, this approach also made some users feel that the AI’s tone was softer and more human compared to the factual knowledge base answers, creating a slight inconsistency in the overall experience.

## 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.