

## INTRODUCTION

Disaster response systems often rely on fragmented alerts that require users to interpret critical information under time pressure, which can be especially challenging for vulnerable populations.

**Example Scenario:** during severe weather, separate alerts (e.g., tornado watch and power outage) may lack prioritization and context, forcing users to determine appropriate actions themselves.

To address these limitations, we propose an AI-driven disaster response system that consolidates alerts from multiple sources, interprets their combined context based on the user's location, and generates adaptive, user-specific preparedness checklists in real time.

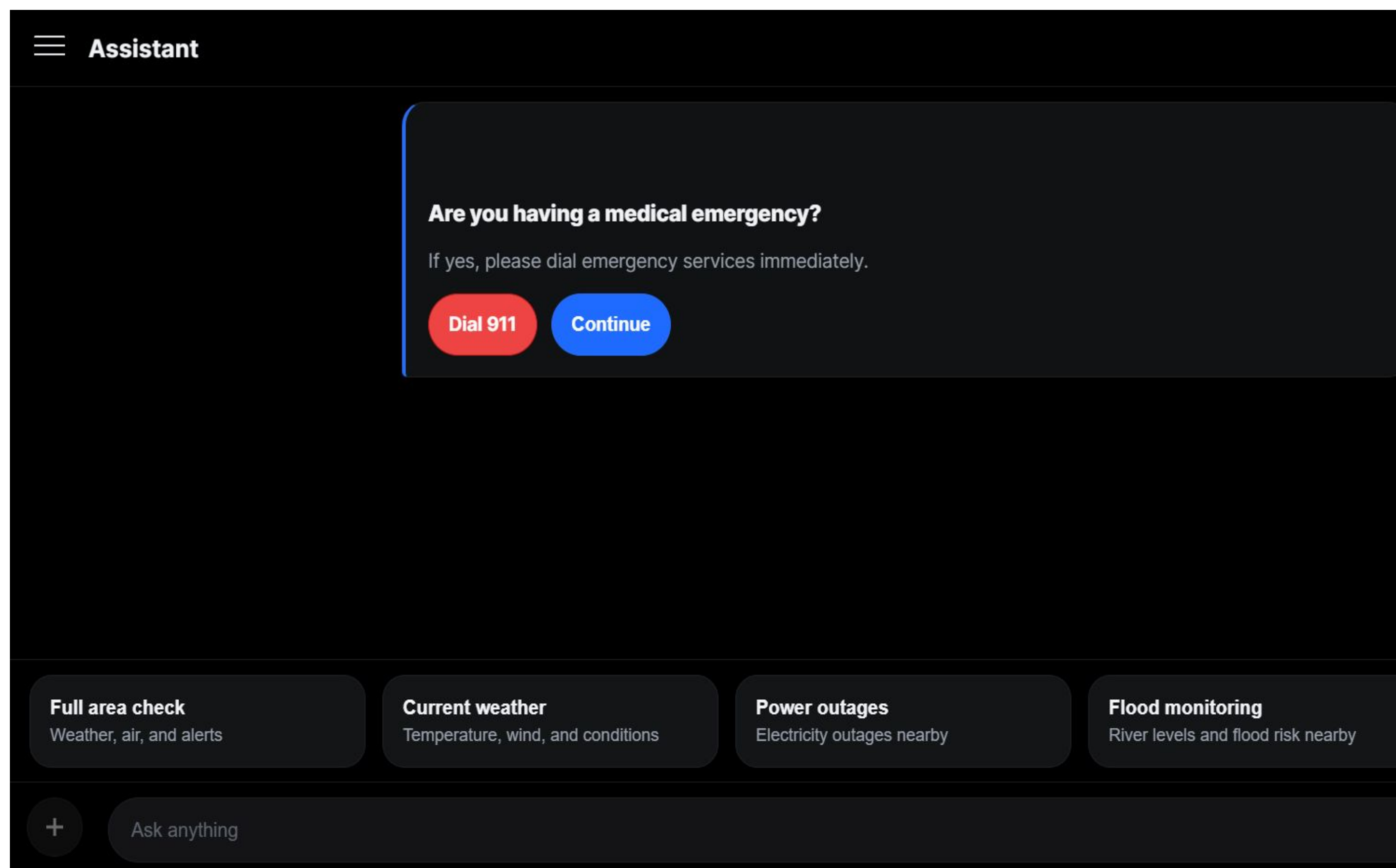


Figure 1: Initial User Interface Showing Emergency Check and Available Services

## METHODS

Our system integrates real-time data ingestion, AI-driven alert interpretation, and automated checklist generation to transform fragmented emergency alerts into clear, prioritized, and actionable guidance.

- Real-Time Alert Detection:** Integrates external APIs (NOAA, Open-Meteo, ODIN etc.) to continuously monitor user location and automatically retrieves alerts without requiring manual input.
- Context Aware Processing:** Eliminates rigid keyword matching by leveraging AI-based interpretation and uses contextual understanding to determine the severity and type of emergency.
- Dynamic Checklist Generation:** Generates actionable checklist items based on detected alerts, and adapts recommendations to the specific disaster context (e.g., tornado, flood, power outage)
- User-Centric Integration:** Seamlessly renders generated tasks into a unified checklist interface and ensures real-time updates without disrupting user workflow
- Dual-Mode Architecture:** A mobile application and an SMS-based interface makes provisions for different states of connectivity.

## METHODS

The system ensures effective emergency response by interpreting real-time alerts in the context of a user's location, generating clear, actionable safety checklists tailored to the situation. By transforming raw alert data into structured guidance, the platform delivers consistent, context-aware support while reducing reliance on manual interpretation and rigid rule-based logic.

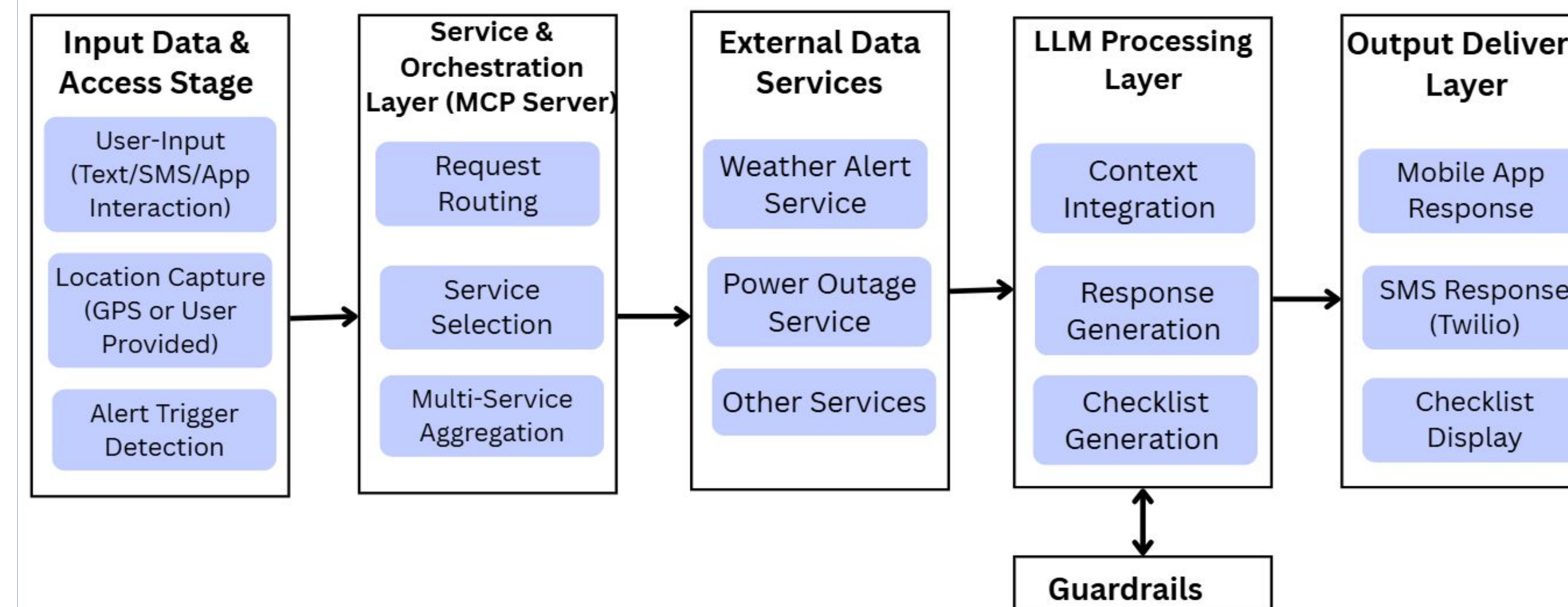


Figure 2: Working Architecture of the AI-Driven Disaster Response System

## RESULTS

The system was evaluated through simulated disaster scenarios and qualitative testing, delivering real-time guidance from live alert data. By using external APIs as sources of truth and enforcing guardrails, it produced reliable, structured responses without hallucinations.

Capability	Performance	Specific Example
Context-Aware Alert Interpretation	The system aggregates alerts from multiple services and interprets their combined impact, providing prioritized and relevant guidance.	<b>Example:</b> User receives a tornado watch and power outage alert. <b>System Response:</b> "A tornado watch is in effect in your area. Prepare to seek shelter immediately and ensure essential devices are charged in case of outages."
Grounded Response Generation	Responses are generated using verified API data, ensuring factual accuracy and reducing hallucinations.	<b>Example:</b> User asks: "Is there a shelter nearby?" <b>System Response:</b> "The nearest emergency shelter is located 1.2 miles away at [Location], currently open based on local emergency updates."
Adaptive Checklist Generation	The system dynamically generates structured checklist items based on real-time alerts without relying on static keyword mappings.	<b>Example:</b> Tornado alert triggers checklist: <ul style="list-style-type: none"> <li>Identify nearest shelter</li> <li>Secure loose outdoor items</li> <li>Prepare emergency kit</li> </ul>
Resilient Multi-Channel Access	The system maintains functionality across both mobile and SMS interfaces, ensuring accessibility during connectivity disruptions.	<b>Example:</b> User loses internet connection. <b>System Behavior:</b> Continues delivering alerts and checklist steps via SMS through Twilio.

Table 1: Performance Evaluation of the AI-Driven Disaster Response System

## RESULTS

Our initial results demonstrate that the proposed pipeline effectively addresses key limitations in traditional emergency alert systems by transforming real-time, location-based alerts into structured, actionable checklists.

### Emergency Checklist

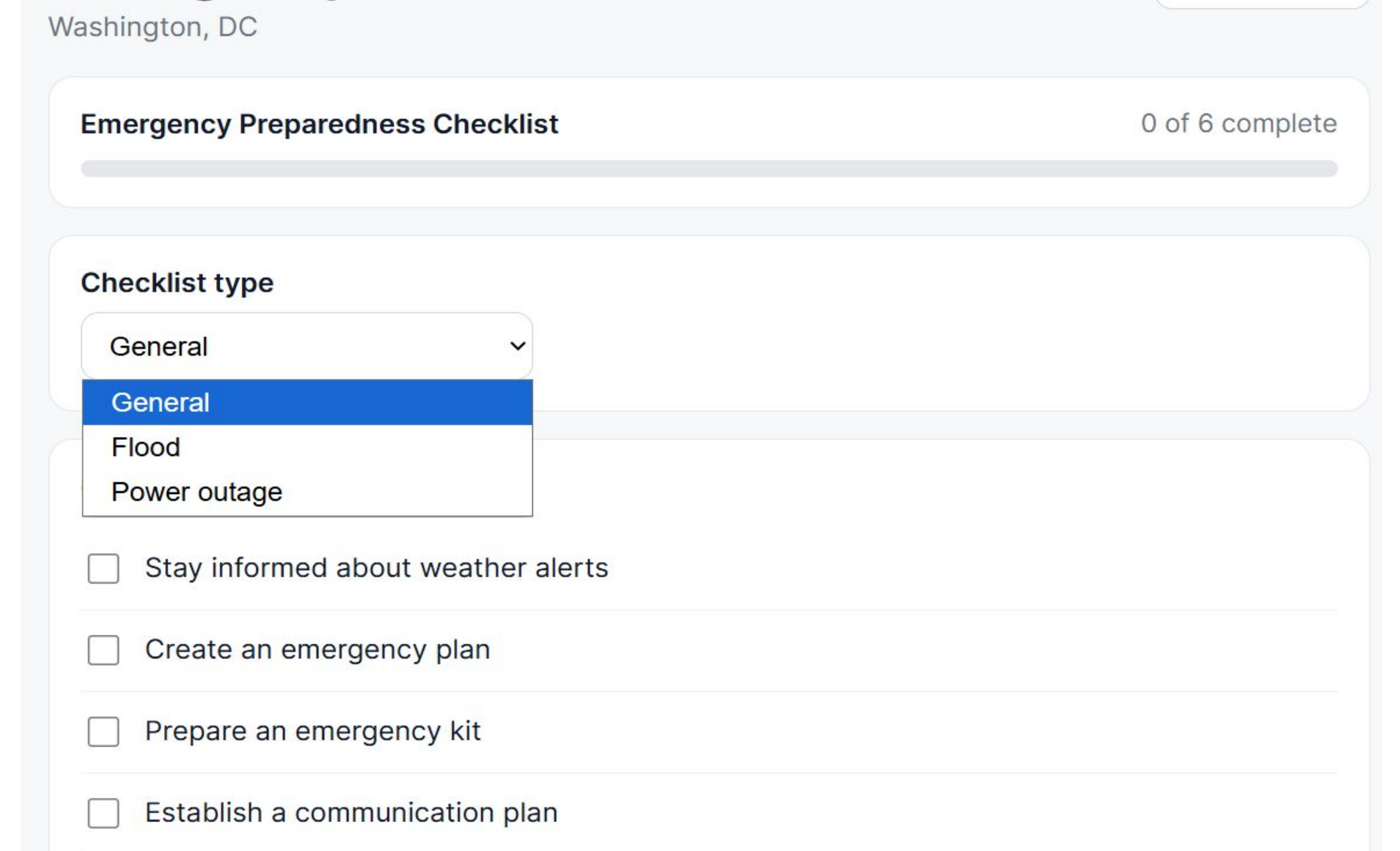


Figure 3: GenUI Emergency Checklist

## CONCLUSION

This project presents an AI-powered disaster response system that replaces keyword-based logic with context-aware interpretation to deliver adaptive, real-time emergency guidance. It enhances preparedness through automated checklist generation, with future work focused on multi-hazard support, personalization, and predictive risk modeling.

## REFERENCES

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## ACKNOWLEDGEMENTS

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