**Problem Definition & Design Thinking**

**Name:** Salman Faris R

**Reg No:** 311623243044

**Department:** B.Tech - Artificial Intelligence and Data Science

**college code :** 3116

**college name :** Misrimal Navajee Munoth Jain Engineering college

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**Title:** Natural Disaster Prediction and Management System

**Problem Statement:**

India frequently experiences natural disasters such as earthquakes, floods, and heatwaves, often resulting in significant human and material loss. A major challenge lies in the lack of timely prediction and response, especially in densely populated and infrastructure-vulnerable regions. Many people live in buildings not rated for seismic resistance, flood-prone zones with no early alerts, and regions that suffer silently from heatwaves.

The problem is to create an AI-powered system that can predict such disasters using historical and real-time data, assess risk (e.g., building collapse), and issue early warnings to minimize loss and prepare people effectively.

**Target Audience:**

* Residents in earthquake- or flood-prone areas
* Urban planners and disaster management authorities
* Elderly and vulnerable individuals in heat-affected regions
* General public in disaster-prone districts
* Emergency response teams

**Objectives:**

* To predict earthquakes, floods, and heatwaves using AI models trained on historical and real-time data.
* To assess the risk level of specific buildings in case of an earthquake.
* To alert the local population in advance for each type of disaster.
* To provide clear awareness guidance and emergency protocols to people.
* To visualize disaster zones and risk levels via maps and dashboards.

**Design Thinking Approach:**

**Empathize:**

People often get caught off-guard by natural disasters. Many live in risky buildings unknowingly. Floods and heatwaves impact the health of vulnerable populations like children and the elderly. Lack of awareness and early warning causes chaos and loss.

**Key User Concerns:**

* Lack of early information and proper alerts
* Not knowing if their building is safe
* Not knowing what to do when disaster strikes
* Trust in the system's prediction accuracy
* Accessibility for non-tech-savvy individual

**Define:**

The solution should be able to:

* Predict heatwaves using weather data (temp, humidity, wind)
* Predict floods using rainfall and water level data
* Analyze earthquake impact on buildings using structure data
* Issue alerts and show affected zones on a map
* Provide educational steps (like "evacuate now", “stay indoors”)

**Key Features Required:**

* Heatwave, flood, and earthquake prediction modules
* SMS/Email-based public alert system
* Location-wise dashboard with map view
* Earthquake building resistance analysis
* Public awareness content and alerts
* Admin portal for disaster officials to update zones

**Ideate:**

* Potential ideas for this solution include:
* ML models trained on historical disaster data
* A web dashboard + mobile alert app
* Real-time integration with IMD, USGS or open satellite APIs
* Community feedback module to report incidents
* Voice alerts or regional language support for rural areas

**Brainstorming Results:**

* Map-based interface to show danger zones
* Alert delivery via SMS and app notifications
* Awareness articles and instructions in multiple languages
* Disaster drill reminders and evacuation paths

**Prototype:**

A modular system that includes:

**1. Earthquake Analysis**

**Input:** Building structure data + earthquake data

**Output:** Safe/Unsafe + awareness alert

**2. Flood Prediction**

**Input:** Rainfall patterns

**Output:** Flood risk % and zone alert

**3. Heatwave Prediction**

I**nput:** Temp, humidity, wind speed

**Output:** Heatwave alert with health advice

**Key Components:**

* Weather & seismic datasets
* ML Models (Random Forest, Logistic Regression, LSTM)
* Flask/Django frontend
* Google Maps integration

**Test:**

Prototype will be tested with:

* Students and citizens in Chennai flood-prone zones
* Local municipal staff for building safety reports
* Families from heat-prone areas in Tamil Nadu

**Testing Goals:**

* Check accuracy of heatwave and flood predictions
* Get user feedback on alert timing and clarity
* See if people understand the awareness messages
* Evaluate if buildings are correctly classified safe/unsafe
* Test dashboard usability for disaster response staff

**Team Members:**

1. Sidharth R - 311623243050
2. Mruthun Murugan VS – 311623243032
3. Praveen S – 311623243037
4. Mayuri Thilak- 311623243030