Jagriti

Savoring coherence through awareness

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SOCIAL SERVICE COUNCIL

IIT (BHU) Varanasi

Problem statement

Natural disasters like earthquakes pose significant challenges to communities worldwide. Analyzing global earthquake data from 1995 to 2023 provides an opportunity to mitigate risks and enhance disaster preparedness. This competition tasks participants with creating a data-driven solution to improve seismic risk assessment, predict earthquake impacts, and optimize early warning systems.

Participants will assess high-risk earthquake zones, examine the correlation between tsunami risks and seismic parameters, and develop predictive models for community impact. Additionally, they will evaluate the effectiveness of alert systems and propose strategies to optimize thresholds. The challenge includes visualizing key insights and building a dashboard to inform stakeholders about earthquake trends and vulnerabilities, ultimately helping reduce casualties and infrastructure damage.

Dataset overview

The dataset provides a comprehensive view of global seismic activity spanning nearly three decades (1995–2023), enabling an in-depth analysis of earthquake trends, impacts, and risk mitigation strategies. It is structured into multiple categories capturing key metadata, geographical data, and impact-related metrics.

1. Earthquake Metadata:

- **Title**: Short description of the event (e.g., "M 6.7 - 20 km SE of Los Angeles, CA").
- **Magnitude**: Numerical value quantifying the earthquake's intensity (e.g., 6.7).
- **Date/Time**: Precise timestamp of the occurrence (e.g., 2020-01-05 04:43:21).
- **Depth (km)**: Depth of the earthquake’s epicenter (e.g., 10.2 km).
- **Location**: General text description of the earthquake's location.
- **Latitude/Longitude**: Geographic coordinates for precise mapping (e.g., 34.05°N, 118.25°W).

2. Impact Metrics:

- **Community Determined Intensity (CDI)**: A crowd-sourced measure of the earthquake's felt intensity (e.g., 6.3).
- **Modified Mercalli Intensity (MMI)**: Qualitative categorization of seismic effects (e.g., VI: Strong).
- **Tsunami Indicator**: Binary flag (1: tsunami occurred; 0: no tsunami).
- **Alert Level**: Color-coded seismic risk (e.g., green, yellow, red).

3. Geographical Data:

- **Continent/Country**: Metadata about the region (e.g., North America, United States).
- **Specific Location (if available)**: Nearby cities or landmarks (e.g., Los Angeles, CA).

4. Additional Metrics:

- **Significance Score (Sig)**: Composite metric quantifying the event's impact (e.g., 540).
- **Distance to Nearest Station (Dmin)**: Proximity to seismic detection equipment (e.g., 12.5 km).
- **Gap**: A measure indicating station coverage around the event (e.g., 120°).
- **Magnitude Type**: Calculation method for magnitude (e.g., MW: Moment Magnitude).

Link to dataset:

https://drive.google.com/drive/folders/1Mv_DB3SMDpgGs6wfX-OFkaDim3G9jFDW?usp=drive_link

Example Format:

Title	Magnitude	Date/Time	Depth (km)	Latitude	Longitude	CDI	MMI	Tsunami	Alert	Continent	Country	Significance	Dmin	Gap	Magnitude Type
M 6.7 - 20 km SE of LA, CA	6.7	2020-01-05 04:43	10.2	34.05	-118.25	6.3	VI	0	Yellow	North America	United States	540	12.5	120	MW

Participant Deliverables:

- **Geospatial Risk Maps:** Highlighting high-seismicity and tsunami-prone zones.
- **Predictive Model:** Capable of estimating CDI and MMI from earthquake features.
- **Alert System Evaluation:** Analysis of gaps and strategies for optimized alerts.
- **Final Report & Dashboard:** Compelling visualizations and actionable insights.

This structured dataset empowers participants to apply advanced analytics, develop predictive models, and create impactful visual narratives, fostering global awareness and preparedness for seismic disasters.