

1. Data Domain:

The dataset includes six years of global earthquake records from 2011–2016. Each event contains the following attributes:

Datetime — the exact time of occurrence

Latitude & Longitude — geographic coordinates

Depth (km) — depth of the earthquake

Magnitude — event strength

The dataset does not include higher-level geographic attributes such as country or region. Because spatial lookup is often essential for earthquake analysis (e.g. “earthquakes in Japan”), the application enriches the dataset at load time by deriving a Country field from the coordinates using a lightweight geographic boundary lookup. This derived attribute enables regional queries while keeping the original dataset unchanged.

2. Storyboard

Global Earthquake Map

Earthquakes plotted as circles of different sizes, where larger circles represent higher magnitudes.

Simple depth color scale (light-to-dark) to indicate depth

Users would pan and zoom to explore geographic regions.

Hovering would reveal basic event details via tooltip.

Magnitude Histogram

A histogram showing the overall distribution of magnitudes.

Brushing would allow selecting a magnitude interval, updating the map accordingly.

Temporal Timeline

A time-series bar chart showing daily earthquake counts.

Brushing on the timeline would filter the map to earthquakes occurring within the selected period.

Search, Reset

A simple search bar intended to filter by region keywords.

Reset would clear all filters.

Zoom controls would offer manual scaling.

3. Why the Chosen Interaction Techniques Are Effective

Each interaction mechanism in the application directly supports one of the analytical question categories in the earthquake domain:

- **Timeline brushing**

Temporal brushing allows users to isolate earthquakes occurring within a specific interval.

This is essential for tasks such as identifying spikes in seismic activity or comparing different periods.

- **Magnitude histogram brushing**

The histogram provides an overview of magnitude distribution, and brushing enables users to focus on low-, mid-, or high-magnitude events.

This interaction is effective because it visually reinforces how different magnitudes contribute to spatial patterns.

- **Interactive map with zoom & pan**

Earthquake patterns are inherently spatial, and meaningful analysis requires examining regional clusters.

Zooming and panning reveal local detail, while the global context stays intact.

- **Glyph encoding**

Encoding magnitude and depth directly in the map allows users to reason about multiple dimensions simultaneously.

This reduces cognitive load and makes spatial patterns more interpretable.

- **Tooltip**

Earthquake datasets contain dense event-level information.

Tooltips prevent clutter while still enabling inspection of exact values (datetime, depth, magnitude).

- **Search bar**

Many users ask regional questions (“What about Japan?”).

Search provides direct access to country-specific events and auto-zooming supports fast, targeted analysis.

- **Reset button**

Because analysis in this domain often involves multiple filters, a reset function preserves usability and prevents state confusion.

Together, these interactions form a coherent analytical environment tailored to the multidimensional nature of earthquake data.

Overall Analytical Workflow Supported:

The system is intentionally designed to support a complete analysis session:

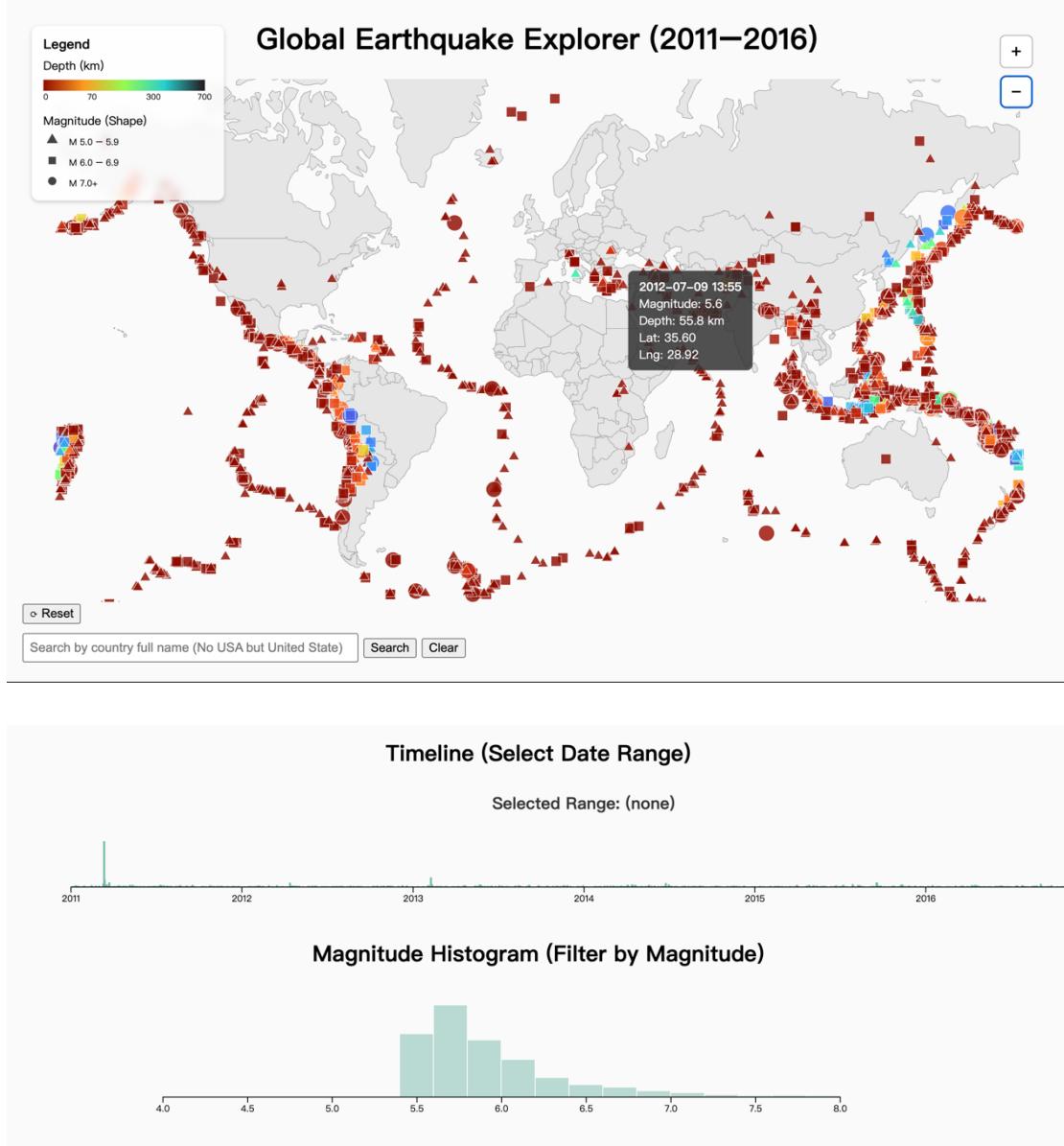
1. Start with a global overview
2. Search for a region or zoom manually
3. Brush a time period
4. Brush a magnitude subset
5. Inspect depth variations
6. Zoom into areas of higher density
7. Reset and repeat

The combination of techniques allows the user to extract insight across multiple dimensions in a fluid, exploratory process.

4. Brief Description of Final Application:

The final application, Global Earthquake Explorer (2011–2016), is an interactive visualization tool that enables users to explore six years of global seismic activity across spatial, temporal, and magnitude dimensions. The central world map encodes earthquakes using shaped glyphs (triangles, squares, circles) and depth-based color, with smooth zooming and dynamic point scaling to support detailed regional inspection. A magnitude histogram and a daily-frequency timeline provide coordinated brushing filters that instantly update the map, allowing analytical questions such as identifying active periods or comparing depth distributions. A

search bar, powered by a derived Country attribute, enables users to jump directly to earthquakes in a specific nation. Tooltips, reset controls, and linked interactions create a fluid analysis environment suited for both overview exploration and targeted investigation.



5. Differences Between Storyboard and Final Implementation:

Storyboard Plan	Final Implementation	Reason for Change
Simple depth color scale	Tuned Turbo scale for shallow-depth separation	Small-depth variation needed more perceptual contrast
Magnitude represented by size	Switched to shapes (triangle/square/circle)	Easier to categorize 5–6, 6–7, 7+ events at a glance

6. Commentary on the Development Process:

Time Spent

Approximately 18 days

Most Time-Consuming Aspects:

Zoom and Glyph Scaling

Search with Derived Country Field

UI State Management

7. Dataset Source:

<https://www.kaggle.com/datasets/usgs/earthquake-database?resource=download>