International Federation of Red Cross and Red Crescent Societies

NLP/LLM-Guided Natural Hazard Taxonomisation

By Team 38

Wonjun Lee, Jasper Koenig, Aryan Jain

Gathering User Requirements

After assessing various methods of gathering requirements, we chose to implement an online forms approach. We gathered requirements from a representative of the three user groups, via a reliable source with access to and credible knowledge of these groups.

Requirement Category	Field Workers	Data Analysts	Disaster Risk Experts
Technical Capabilities	Basic to Intermediate	Intermediate	Advanced
Device Compatibility	Mobile, Tablet, Laptop, PC	Laptop, PC	Mobile, Tablet, Laptop, PC
Time Engagement	5-10 minutes	Up to 30 minutes	Up to 30 minutes
Primary Needs	Quick hazard classification	Detailed hazard analysis, multiple hazards	In-depth hazard analysis, direction of causality
English Proficiency	Variable (English might be difficult)	Good English proficiency	Fluent in English
Usability Features	Simple, intuitive UI	Logical multi-hazard addition, flexibility	Detailed analysis options, clarity in wording
Feedback Mechanism	Simple feedback	Detailed feedback options	Expert feedback, critique options
Educational Aspect	Minimal	Basic hazards knowledge	Detailed hazard information, inter-hazard relations
Accessibility Features	Essential (due to device variety)	Preferable	Preferable
Customization	Minimal	Moderate	High (especially for unfamiliar hazards)

Personas

Disaster Risk Expert

"Efficiency is key"

Dr. Nami is a 50 year old Japanese seismologist who works with the IFRC. Born in Tokyo, she attended Keio University in Japan before pursuing a masters degree and a doctorate at UCLA. Having studied in the US, her English is very advanced. Her long career and experience has made her proficient in Excel, GIS-tools, and data handling; she can even program in 4 different languages. Due to her busy schedule, he often laments the fact that her classification paperwork takes so much time. She would very much like ways of making this process more efficient.

Name Dr. Tsu Nami
Type Disaster Risk Expert
Role Seismologist

Needs

- Needs a way of classifying hazards that are beyond her specialty.
- Needs to look beyond singular hazards and explore the potential links and triggers between hazards.
- Requires a faster way to accurately classify disasters. Currently takes her more than thirty minutes to do so.
- Would like to use the tool both at home on her PC and on her phone, when on the go.

Pain points

- An expert in earthquake-related disasters, but not every hazard that can occur.
- Often critiques hazard classifications that are inaccurate according to her knowledge of earthquakes
- Sometimes gets confused about the imprecise and vague wording of the IFRC guidelines when classifying hazards.
- Her skills are invaluable, and she has less and less time to do paperwork and manual classification.

Behaviours

ThoughtWorks

Field Worker

"Efficiency is key in the field."

Steve has spent many years working on-site in various natural environments. They've witnessed firsthand the aftermath of natural disasters and the urgency of response required. Their primary role requires quick, accurate decisions, often under pressure. They frequently rely on digital tools to guide their work, especially when it comes to classifying hazards for further action.

Name Steven Harvey
Type Field Worker
Role Natural Hazard Classifier

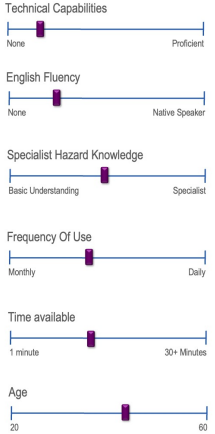
Needs:

- Quickly classify hazards in the field.
- Use a tool that overcomes language barriers.
- Ensure accurate reporting for funding and response.
- Classify hazards swiftly, in under 10 minutes.
- Use the tool on any device, be it mobile, tablet, or PC.
- Avoid technical jargon and complexities.

Pain Points:

- Limited time for hazard classification.
- Technological constraints in the field, e.g., limited internet.
- Language differences that might slow down the classification process.

Behaviours



ThoughtWorks

Data Analyst

"I just love metadata"

Bruce McGrath has a number of years' experience working in the tech sector, and currently works as a data analyst for a disaster tracking and response organisation.

He is conscious of how important proper classification is in trend and data analysis, however, does not have the expertise to classify events by himself.

He is interested in a tool that would help himself and others like him to tag events and analyse their relation to each other

Name Bruce McGrath
Type Data Analyst
Role Data Entry Clerk

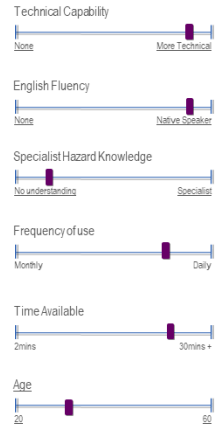
Needs

- Improve the efficiency and accuracy of hazard classification.
- Track the association and relationships between various hazards / events
- The accurate and full classification of hazards, regardless of the time it takes
- Simplify the process of hazard classification

Pain points

- Tools that don't appear to have a logical progression to their outputs.
- Convoluted and non intuitive tools
- He lacks the expertise to classify disasters on his own, so needs to outsource this task to professionals

Behaviours



ThoughtWorks

Dr. Tsu Nami (Disaster Risk Expert)

Dr. Nami is assessing natural hazard risks in the Pacific. Though skilled in earthquake analysis, she lacks a specialization in weather-based hazards. Using the Natural Hazard Classification Decision Tree tool, she is guided through the identification of the meteorological hazards. She is particularly impressed at how the tool swiftly identifies potential connections between seismic activities and weather anomalies. This enables Dr. Nami to classify and explain dual-hazards quickly, making the tool invaluable for her projects.

Steven Harvey (Natural Hazard Classifier)

In the aftermath of a recent natural event, Steve, needs to quickly classify the hazard type to send in an urgent funding request to the IFRC. Given his situation and time pressure, he turns to our tool. With the tool's guidance and a series of non-technical questions, he swiftly identify the hazard category in under 10 minutes. The tool's efficiency in such pressing conditions proves invaluable to Steven, ensuring timely assistance for affected areas.

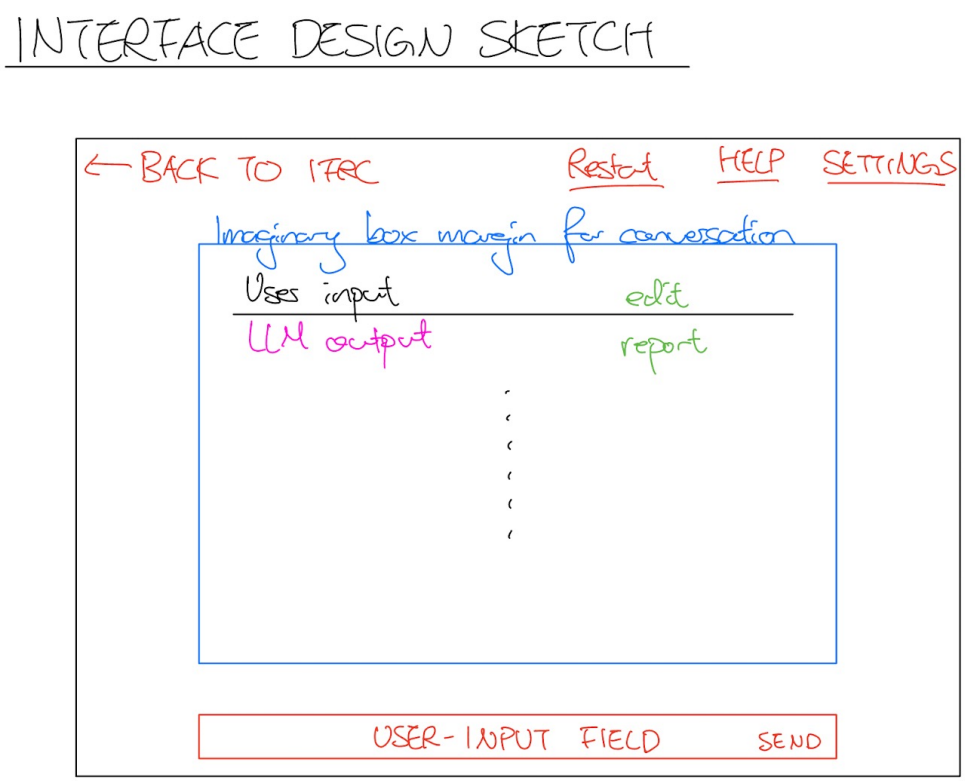
Bruce McGrath (Data Analyst)

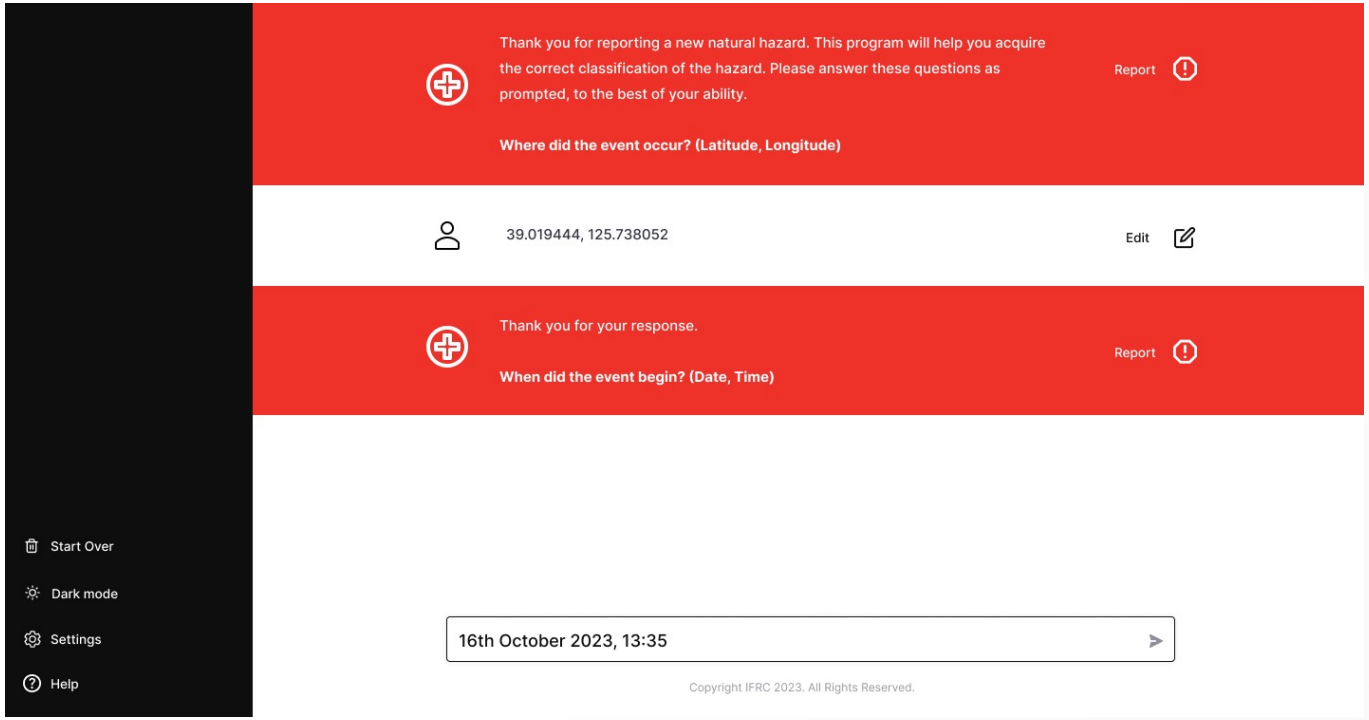
Bruce, a data analyst for a disaster response firm, is tasked with classifying a vast amount of hazard data after recent natural disturbances. Logging into the natural hazard classification decision tree, he inputs specific metadata about the recent events. The tool, with its series of guided queries, efficiently narrows down classifications. He appreciates the intuitive flow, helping him to accurately categorize the data without external consultation. This streamlined experience boosts his confidence in handling future data classification tasks.

Initial Sketches

With a completed list of user requirements and a deeper insight into our user base [4], we generated a variety of sketches to brainstorm potential designs for our UI.

We decided to implement a chat-style interface, reflecting our focus on a simple yet intuitive interface. This design leveraged the familiarity and consistency of an interactive question and response system, making our tool more accessible.



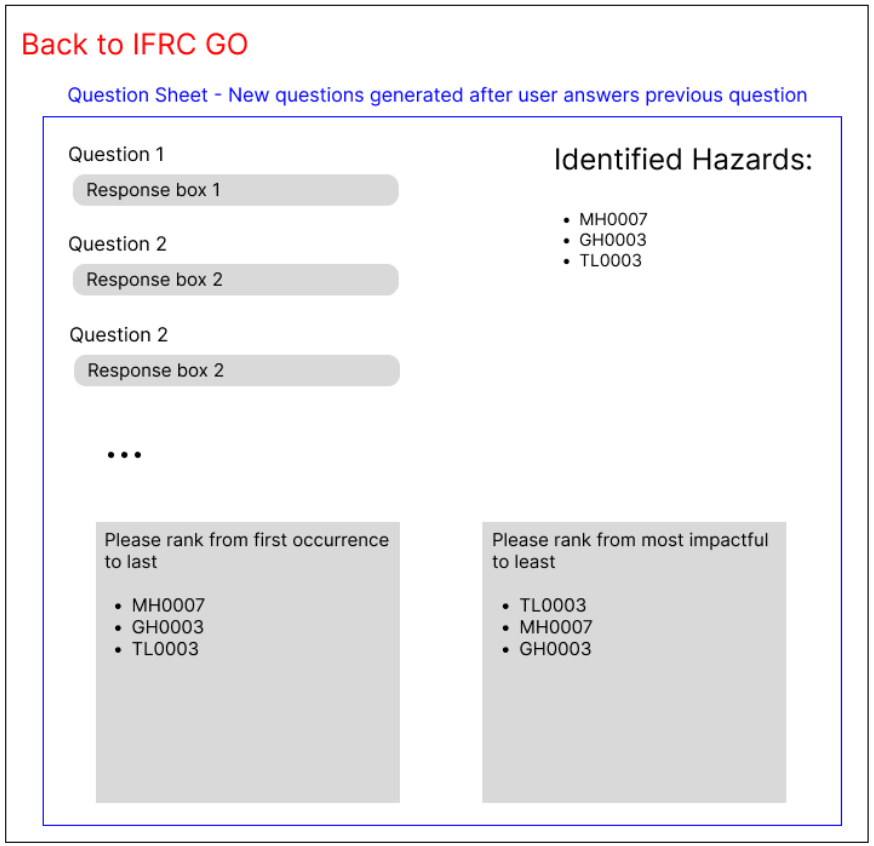


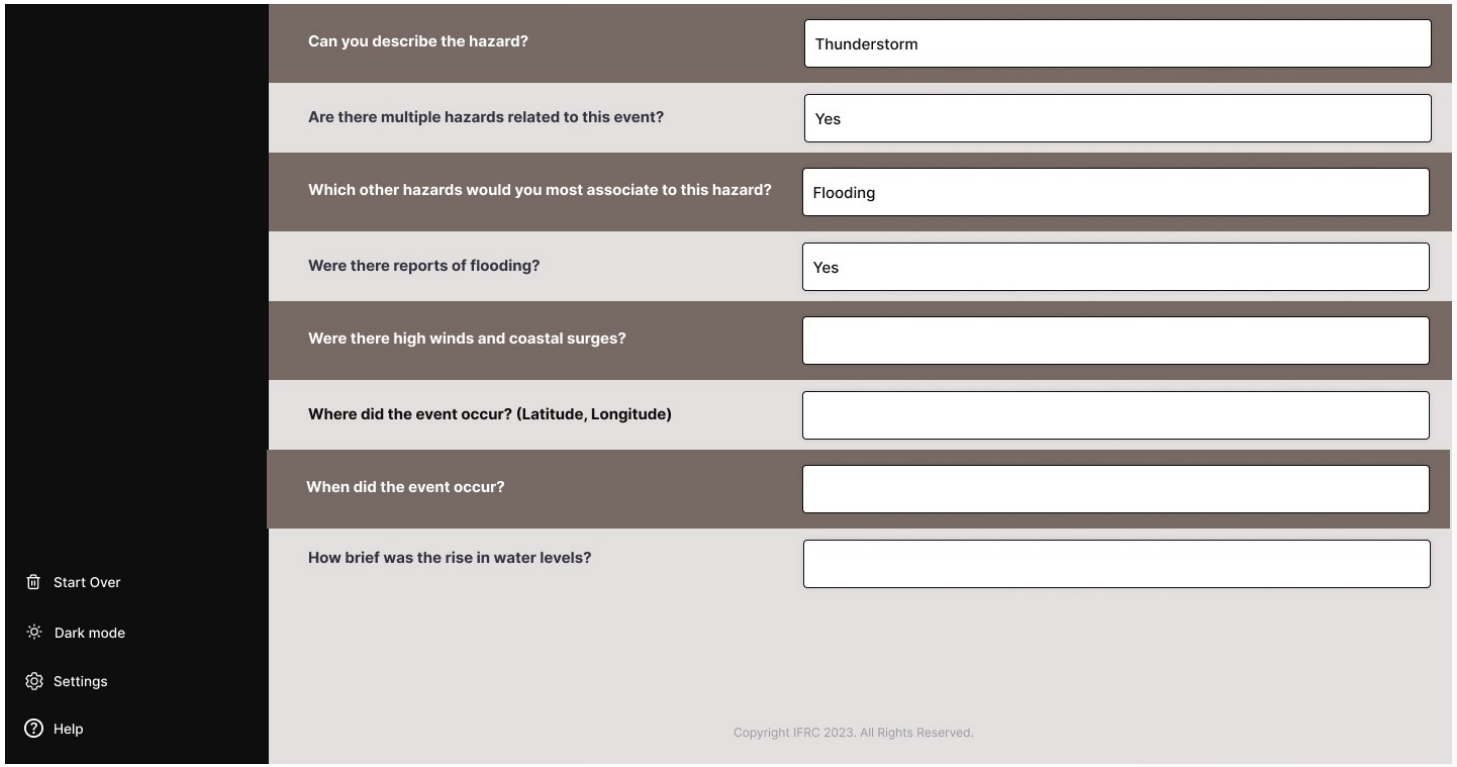
Design Alternatives

Another design that we considered was a form-based approach: users would be presented with a questionnaire that they would fill in. The following questions would be dynamically generated based on the users' previous answers.

However, after getting feedback from the pseudo users, we determined that the previous sketch was the better alternative. Users tended to prefer the chat-like interface [5], as this was more familiar and thus reduced the learning curve. [3] It was also reported that content-heavy pages were visually overwhelming. [6]

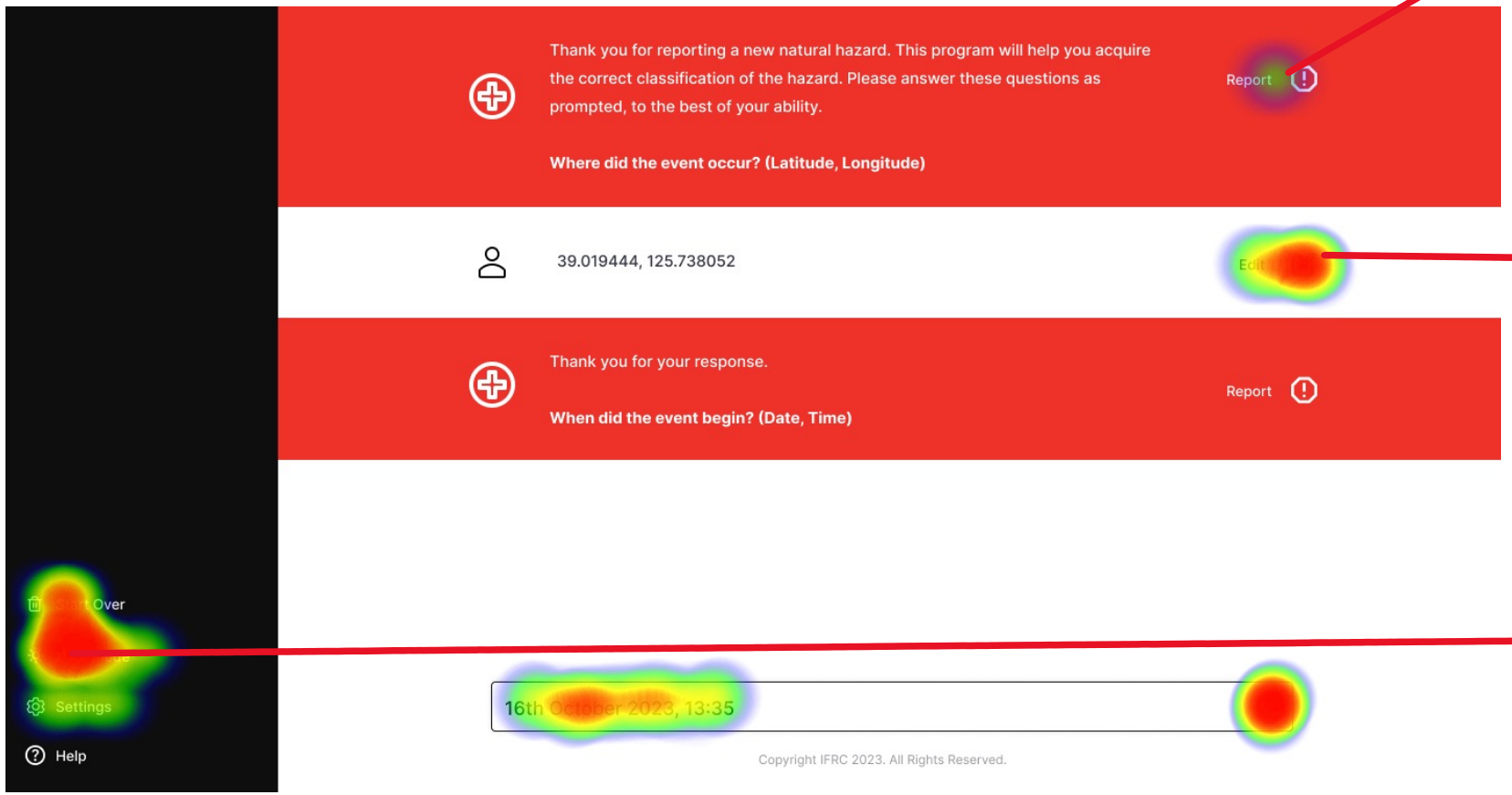
Alternate Interface Design





First Prototype

A round of user testing was conducted using pseudo users and an early prototype of the tool. Clicks were tracked to improve analysis of the tool's performance and create the following heatmap.



There appears to be no need for a report button, so some users clicked on it to see what it would do.

The ability to easily reverse a user's actions proved invaluable. However, its continuous usage highlighted the fact that the response types were not flexible enough for the variety of questions asked (i.e. coordinates were hard to type accurately).

The red used in the tool's responses is too bright and aggravating, as most users immediately attempted to switch to dark mode. This was backed up by the user's comments and comments from the project lead. [2]

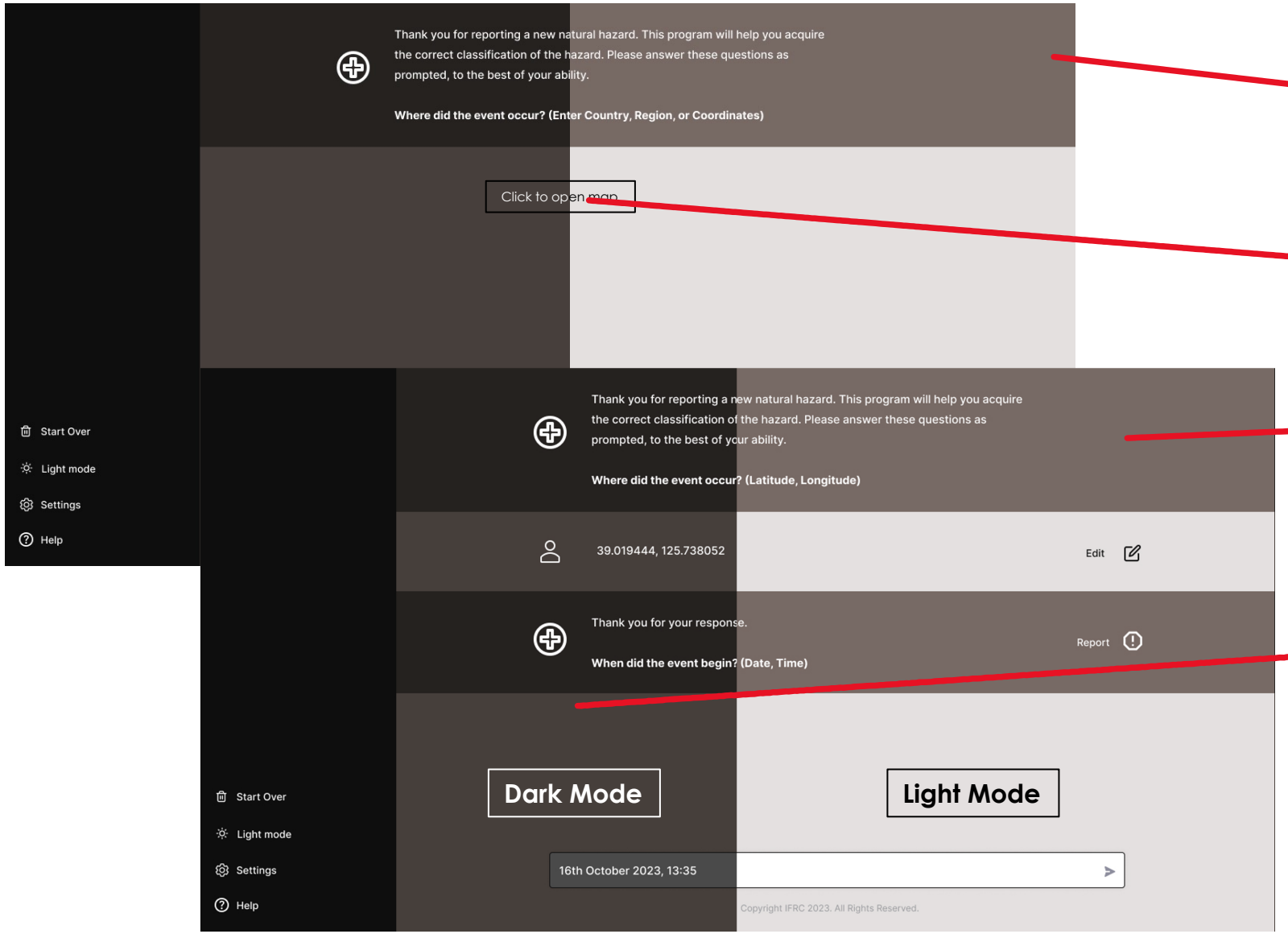
Evaluation of prototype

Evaluating the results of user testing identified several issues of varying severity. We ranked the severity, following certain criteria, from zero to four. 4 denoted a catastrophic mistake, and 0 denoted a false positive usability problem. [1]

HCI Principle	Problem	Solution	Severity
Aesthetics and Visual Comfort	UI colors are too harsh on the eyes	Use the IFRC GO platform's official colour palette	2 (Minor Usability Problem)
Simplicity and Minimalism	Irrelevant UI features can be distracting for users	Remove redundant or irrelevant features	1 (Cosmetic Problem)
Flexibility / Learnability	User response options are limited to text, regardless of the question being asked by the app	Implement more varied response types that fit different question types, e.g. map API for location	3 (Major Usability Problem)

Second Prototype

Next, we developed a prototype for our chosen design using Figma to delve deeper into our initial sketch's feasibility and user-friendliness. The displayed images represent the starting state of our tool, and during its usage.



The UI colors that appeared too aggressive / bright, were tweaked to be less visually stimulating, and to match the IFRC GO color palette.

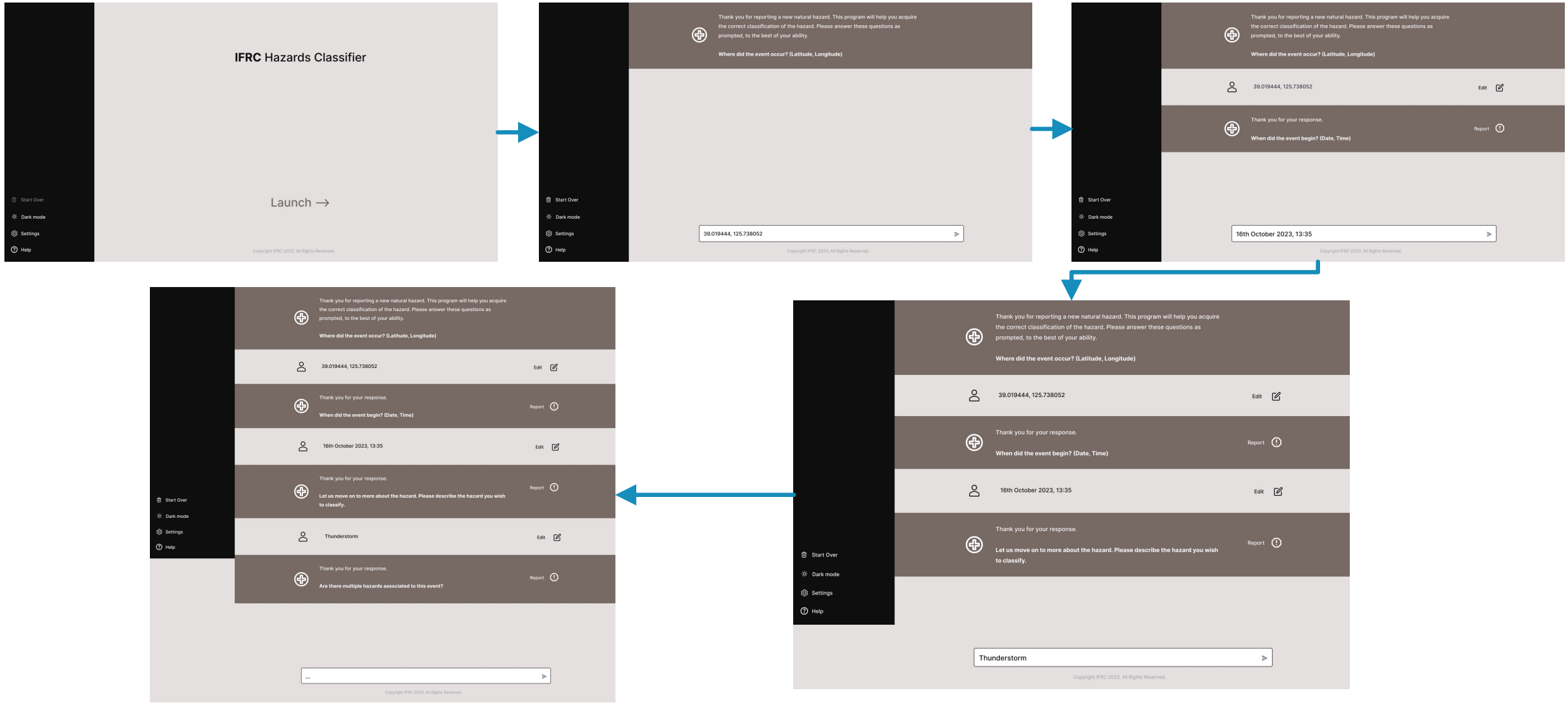
Users struggled with typing in strings of coordinates, so input methods were tweaked to provide users with friendlier alternatives.

The report button was removed for the first prompt due to its redundancy.

Additionally, a dark mode was added to increase accessibility towards certain users.

Second Prototype Flow

The web pages below represent the flow of a user through our improved program. The arrows represent each new step in the decision tree traversal.



References

- [1] Wickramasinghe, B. (2020, December 26). *Human-Computer Interaction-principles, evaluation and Universal Design Principle*. Medium. https://bimalics.medium.com/human-computer-interaction-principles-evaluation-and-universal-design-principle-3687123b5b2a
- [2] Chappal, M. S. (2023, April 26). *The 6 key principles of UI Design*. Maze. https://maze.co/collections/ux-ui-design/ui-design-principles/
- [3] Dewra, H. (2023, January 26). *Why & how familiarity and comfort matter in UX design: A key considerations for UX Designers*. Medium. https://bootcamp.uxdesign.cc/why-how-familiarity-and-comfort-matter-in-ux-design-a-key-considerations-for-ux-designers-283fd35d4e93
- [4] Dix, A. (2023, October 31). *Personas for mobile UX design*. The Interaction Design Foundation. https://www.interaction-design.org/literature/article/user-personas-for-mobile-design-and-development-a-winning-technique-for-great-ux
- [5] Myhill, C. (2023, October 10). *The user experience of Chatbots*. Pixel Fridge. https://www.pixelfridge.digital/the-user-experience-of-chatbots/
- [6] Perry, T. (2017, January 27). *Avoid too much content on your website*. Specialist Partnership Agency Trusted By Global Technology Brands. https://www.thesherpagroup.com/blog/avoid-too-much-content-on-your-website