AN EXPLAINABLE AND TRANSFERABLE AI-DRIVEN EARLY WARNING APP FOR FLOODS IN NORTH VIETNAM: A VALUE SENSITIVE DESIGN APPROACH

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ABSTRACT

Floods are one of the most devastating natural disasters, affecting millions of people annually. The increasing frequency of floods due to climate change and population growth underscores the need for effective early warning systems. However, existing AI-based flood prediction models lack explainability and usability which undermines trust in AI. This study applies Value Sensitive Design (VSD) principles to develop a human-centered, explainable AI (XAI) early warning app that integrates local knowledge with other data such as satellite data. The research will evaluate the system's usability, interpretability, and real-world effectiveness.

INTRODUCTION

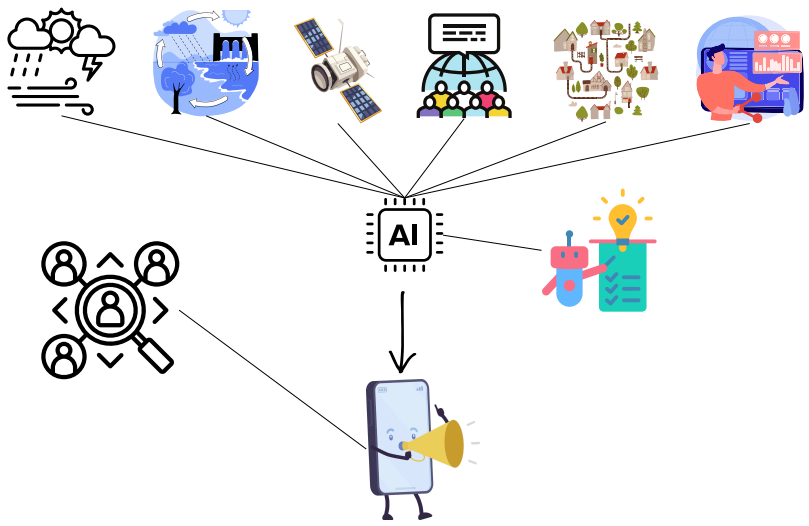
In 2023, floods affected 30 million people, leading to significant casualties, economic losses, and property destruction [1]. In the same year in Libya a flood caused 12,352 deaths, 8,000 missing persons, and $6.2 billion in damages [2]. The increasing frequency of floods is due to an increase in population and climate change amongst many other factors [3]. Early warning apps, such as Japan's Yurekuru Call app, are widely used globally for disaster alerts [4]. However, in Vietnam's northern mountainous regions, limited high-quality data makes flood prediction challenging. AI-based models also struggle due to data scarcity, poor data integration and a lack of local real-time data [3,5,6]. This research aims to develop an explainable AI model with an interactive early warning app tailored for community engagement.

Figure 1. 500 casualties and 1.8 million people misplaced due to the floods in Chennai. The concequences could have been greatly reduced with preventative measures [7].

LITERATURE REVIEW

Key parameters for flood prediction include rainfall, water levels, soil moisture, river flow, satellite imagery, and social media data [5]. AI models improve prediction accuracy but often lack interpretability and trustworthiness [6]. Explainability is crucial, as false alarms can lead to unnecessary panic and economic losses. Existing studies emphasize the need for the fusion of different data and explainable AI solutions in flood warning systems for increased accuracy [5,6].

METHODOLOGY



We use VSD to design a user-centered system, combining local and external data for better flood predictions, tested with XAI and field trials in Vietnam.

PRELIMINARY CONSIDERATION

This study advances AI-driven flood response, promotes human-centered AI by ensuring interpretability, and extends to other flood-prone regions beyond Vietnam.

CONCLUSION

AI-driven flood warnings must be explainable to ensure effective community response. By integrating Value Sensitive Design (VSD), the system enhances usability, making AI predictions more accessible and actionable. Additionally, its scalability allows for broader implementation, strengthening disaster preparedness in flood-prone regions worldwide. The AI models can potentially save millions of lives.

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