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Flood AI: An Intelligent Systems for Discovery and Communication of Disaster Knowledge

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Abstract: The National Research Council report in 2012 puts forth a vision of a nation that is resilient to extreme events by the year 2030. The report highlights the importance of data, notes existing gaps in information, and acknowledges the need to address these challenges, suggesting that every individual should have access to the risk and vulnerability information they need to make their communities more resilient. Recent breakthroughs in sensor networks and remote sensing technologies greatly facilitate this process and allow scientists to gather large-scale high-resolution datasets on the environment, water quality, and weather conditions. Most of these datasets are shared through custom interfaces and technical formats for limited stakeholders, making it difficult for the public or other non-targeted groups to effectively access and understand the data. Advancements and new information technology techniques are making it possible to manage, analyze, and present large-scale environmental data and modeling results acquired from various sources on the web. This project presents an intelligent knowledge and communication framework, Flood AI, to improve societal preparedness for flooding. The framework is based on a knowledge engine using voice recognition, artificial intelligence, and natural language processing. The knowledge engine is based on a generalized ontology for disasters with a primary focus on flooding. It utilizes the flood ontology and concepts to connect user inputs to relevant knowledge discovery channels on flooding by providing a data acquisition and processing framework utilizing environmental observations, forecast models, and knowledge bases. Communication channels of the framework includes web-based systems, agent-based chat bots, smartphone applications, automated web workflows, and smart home devices. Diversity of communication channels allows opening the knowledge discovery for flooding to many unique use cases.

Keywords: intelligent systems; natural language processing; knowledge generation; disaster preparedness; information communication