

Next Generation Web Technologies for Hydrological Applications on Client-side Systems

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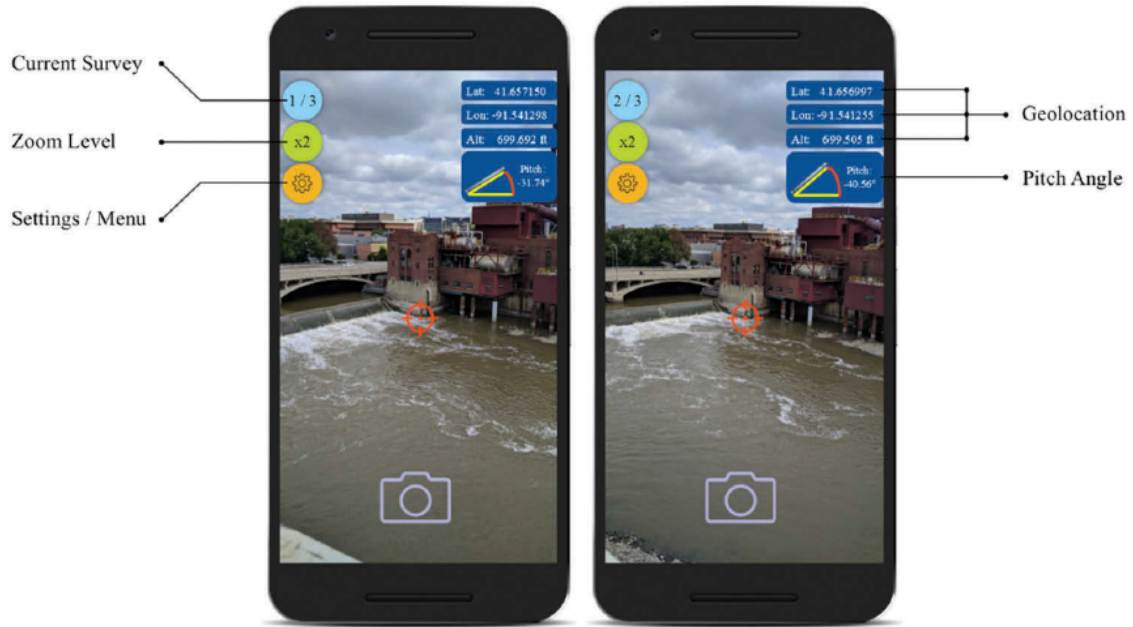


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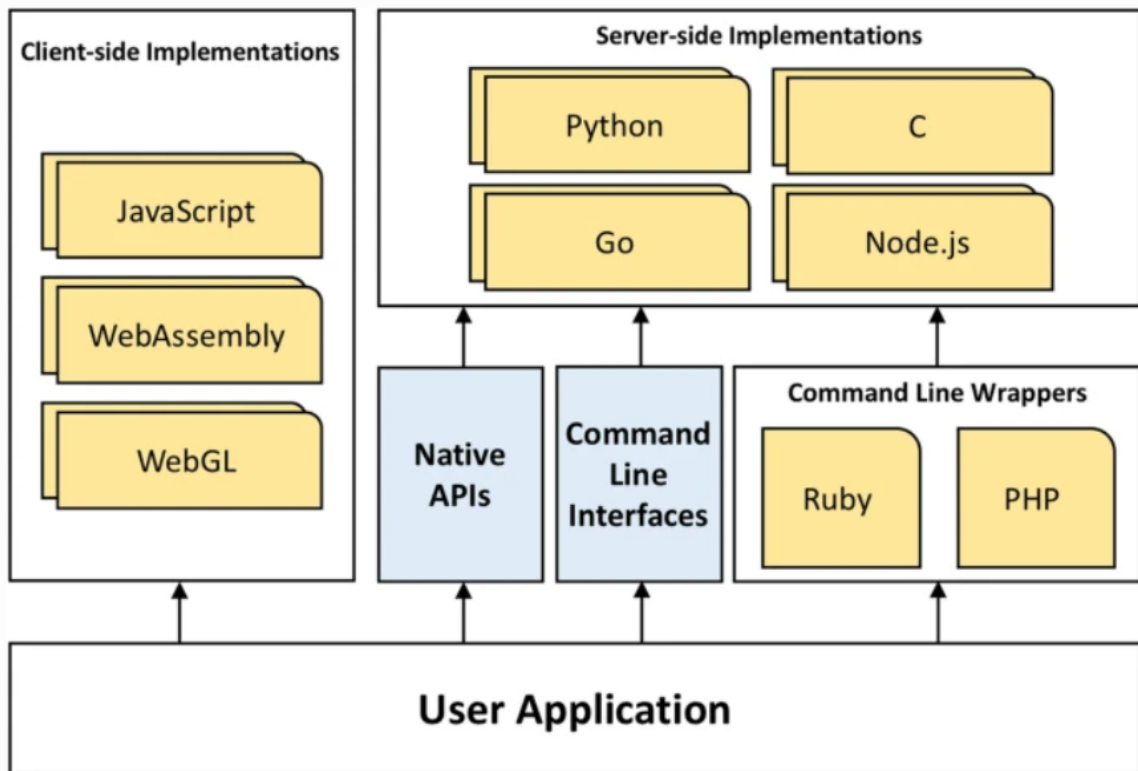


IOT & DATA STANDARDS

Sample figures from highlighted projects. Please check references for details.

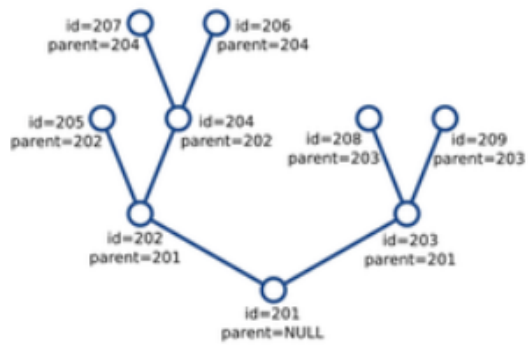


Screenshots of the smartphone application for the initial two surveys.

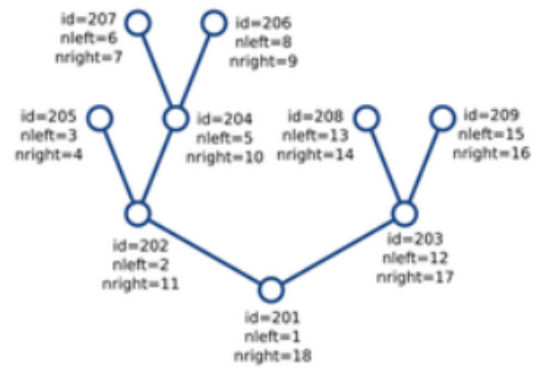


Overview of the watershed delineation implementations

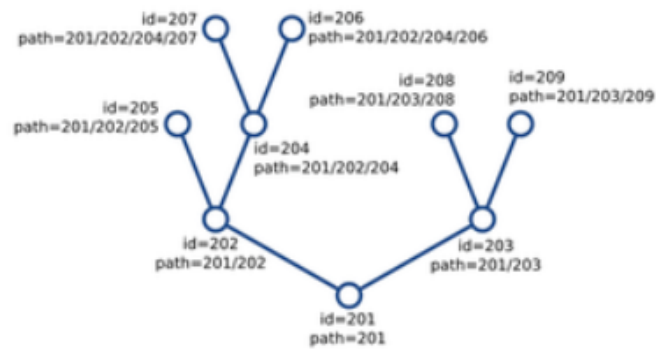
Adjacency List



Nested Set

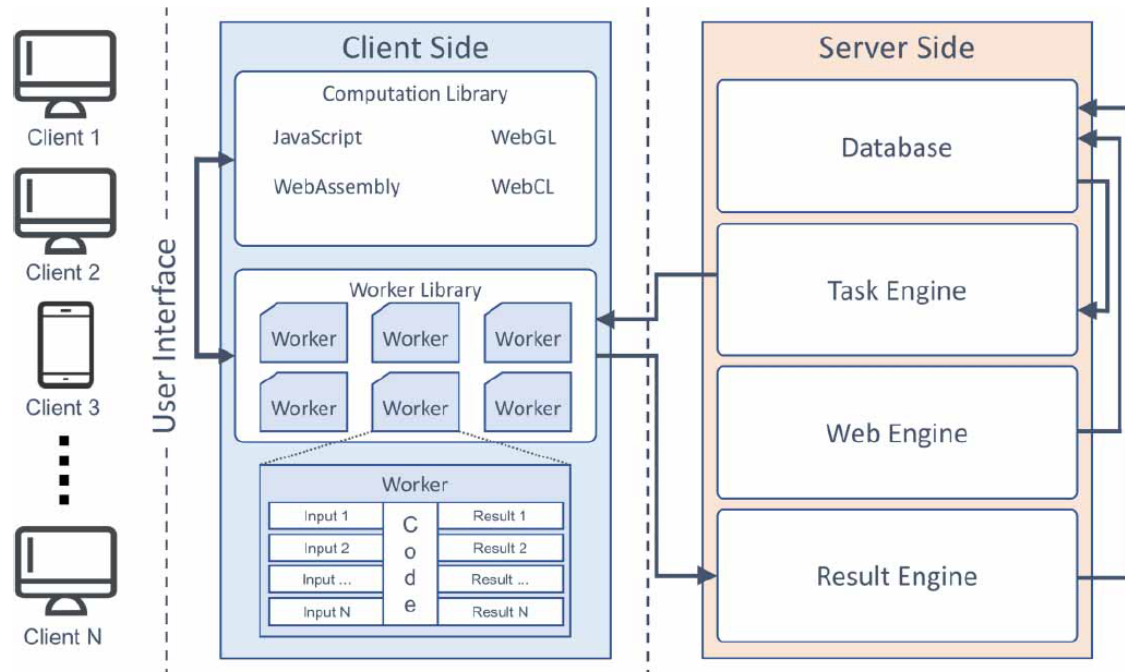


Path Enumeration

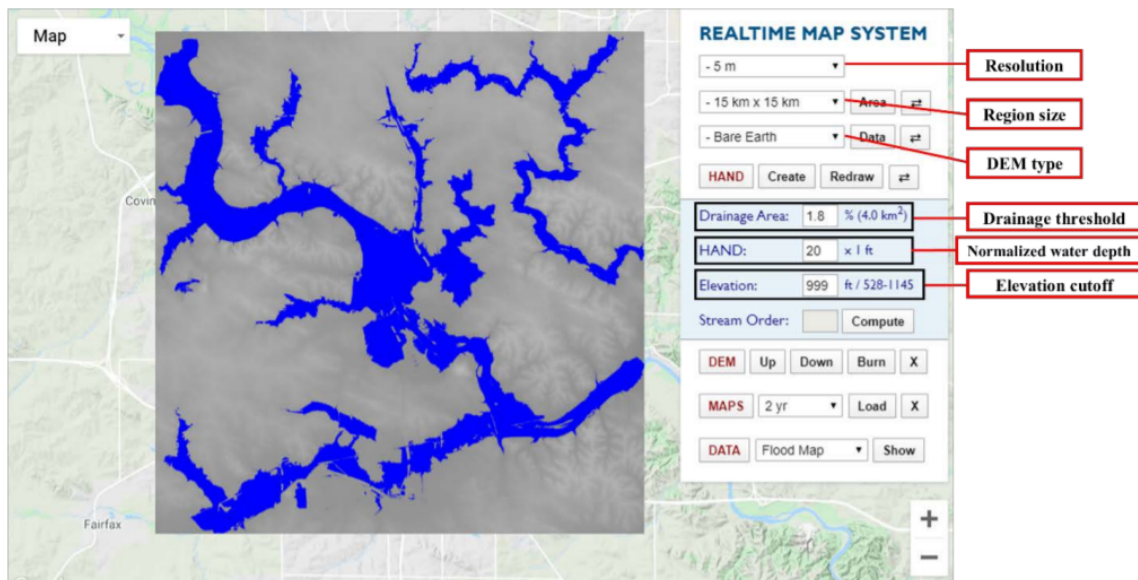


Tree network models—Adjacency List, Nested Set, and Path Enumeration.

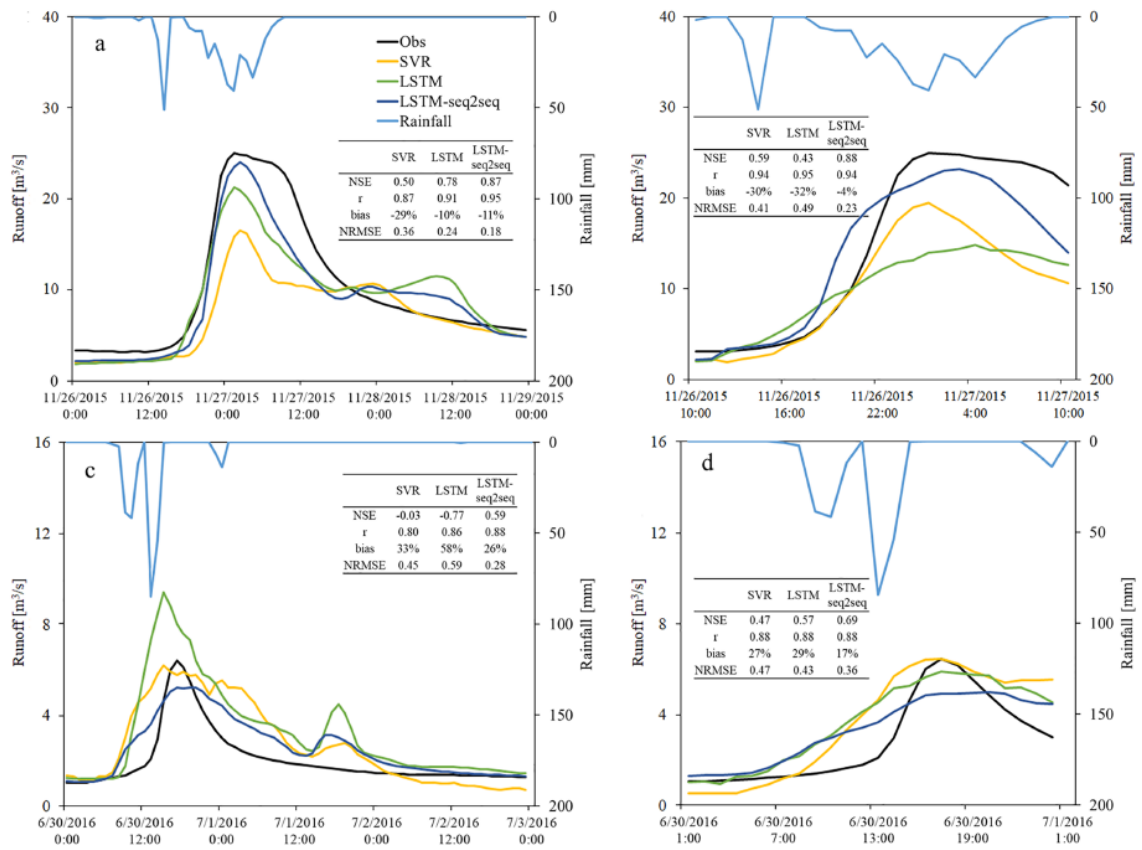
SCIENTIFIC COMPUTING



Architecture of the volunteer distributed computing framework.

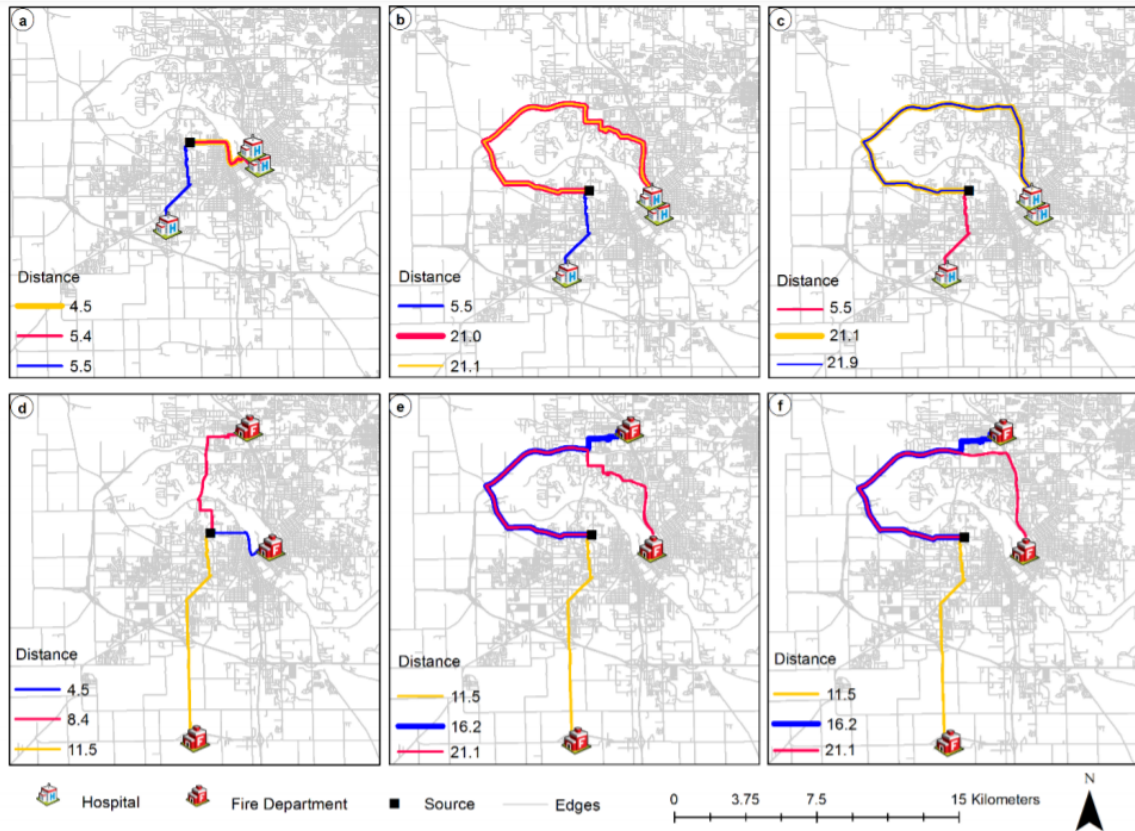


The interface of the real-time map system developed by the UIHILab

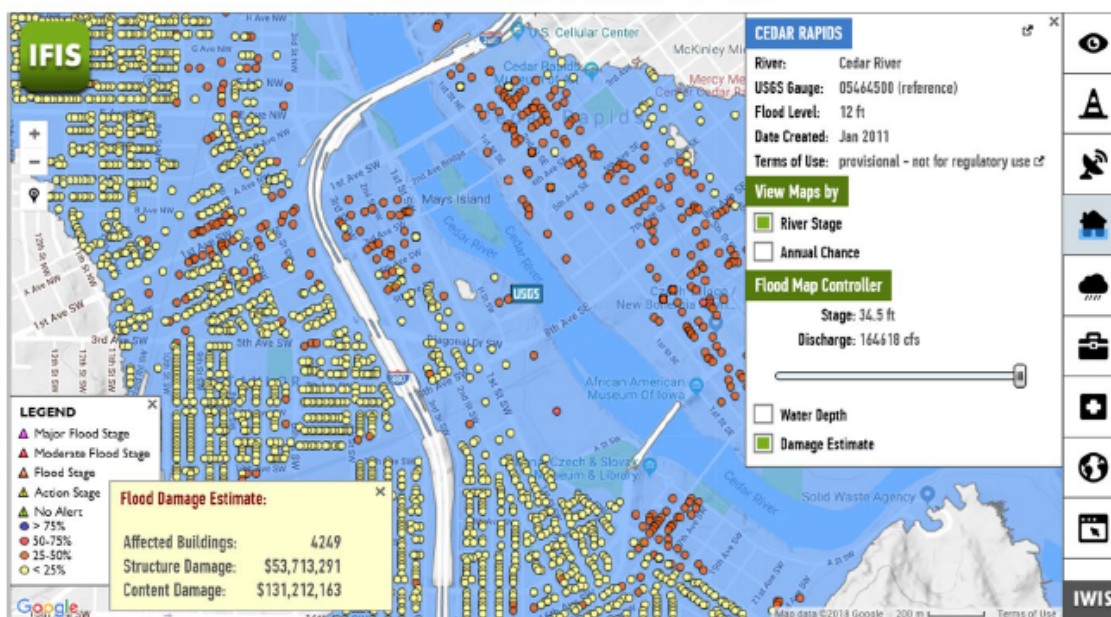
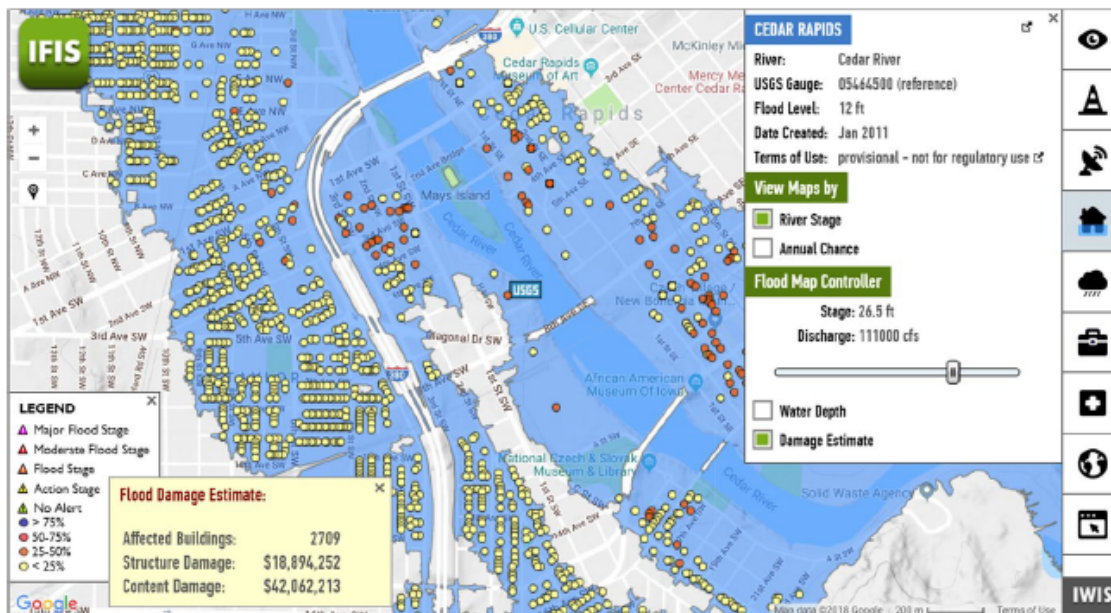


Observations and model predictions of two rainfall events in WY2016. (a, c) The 24-hour-ahead predictions for two events in a 3-day window. (b, d) A single prediction for the next 24 hr on November 26, 2015, 10 a.m., and June 30, 2016, 1 a.m.

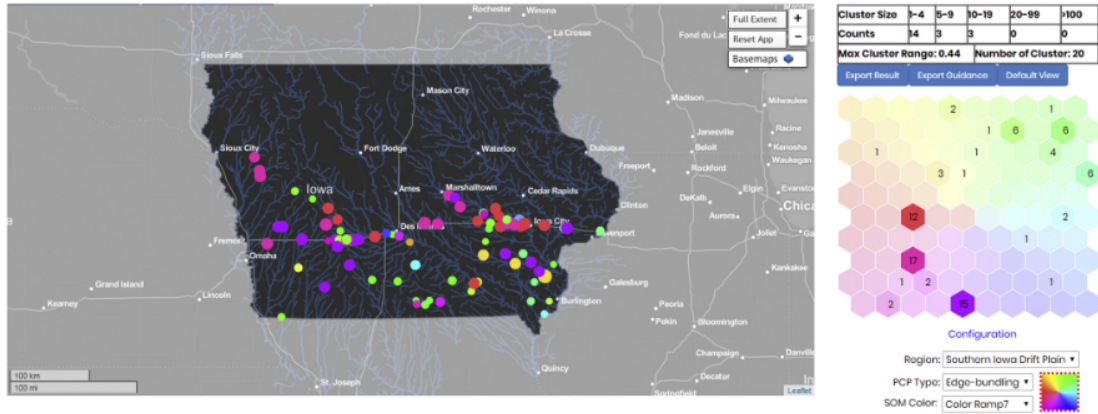
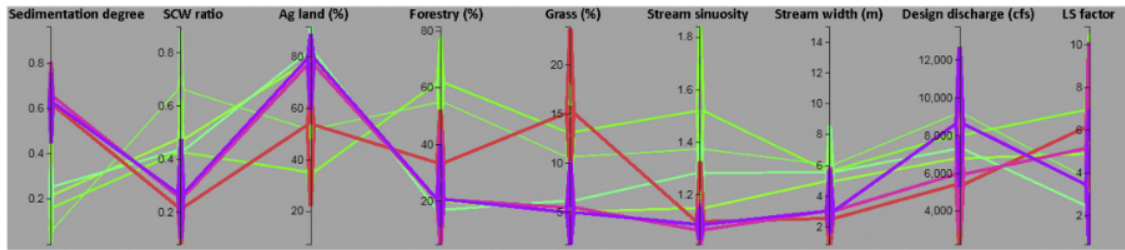
DATA ANALYTICS



Distance (km) to reach the closest hospital under no flood (a) 100-year flood extent (b) and 500-year flood extent (c) and the closet fire department under no flood (d), 100-year flood extent (e), and 500-year flood extent (f).

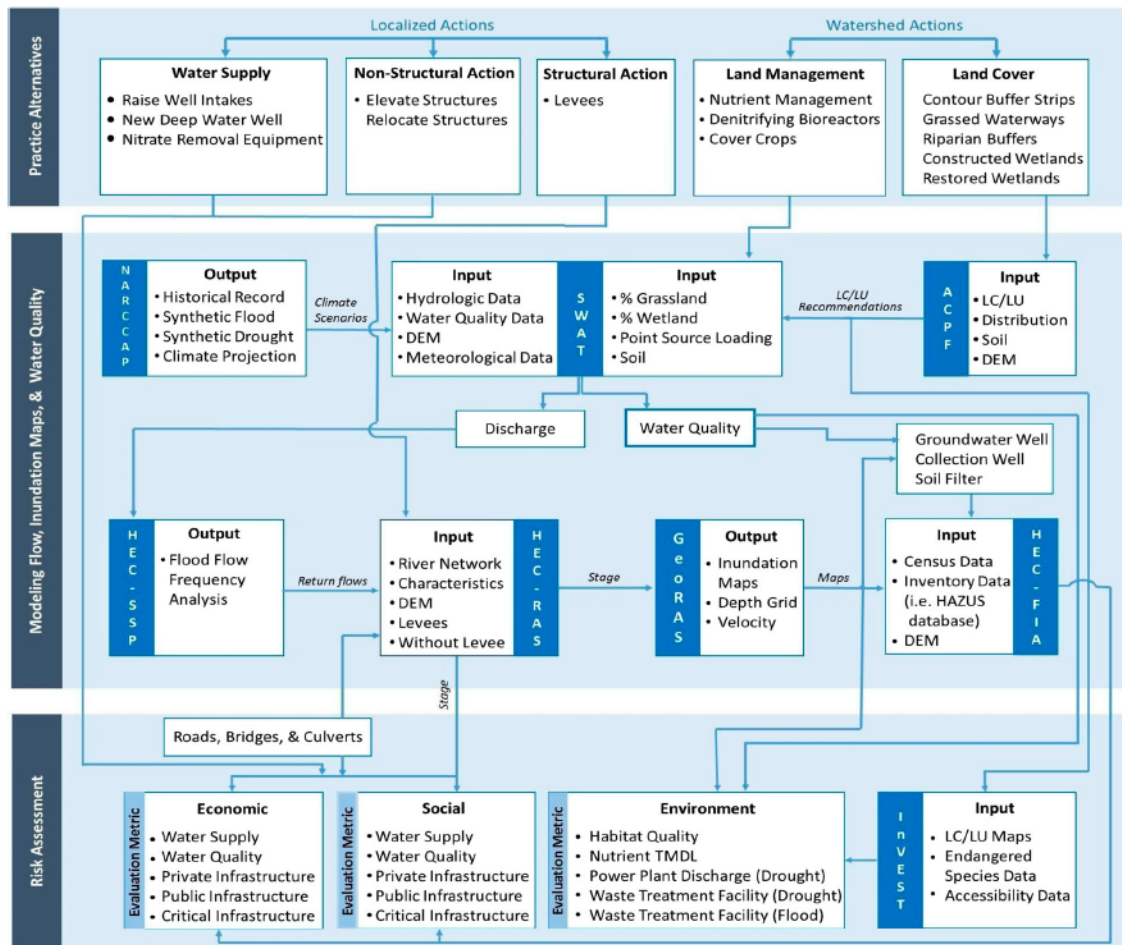


Flooded buildings in 26.5-foot (~200-year, top) and 34.5-foot (~500-year, bottom) stage height floods in Cedar Rapids

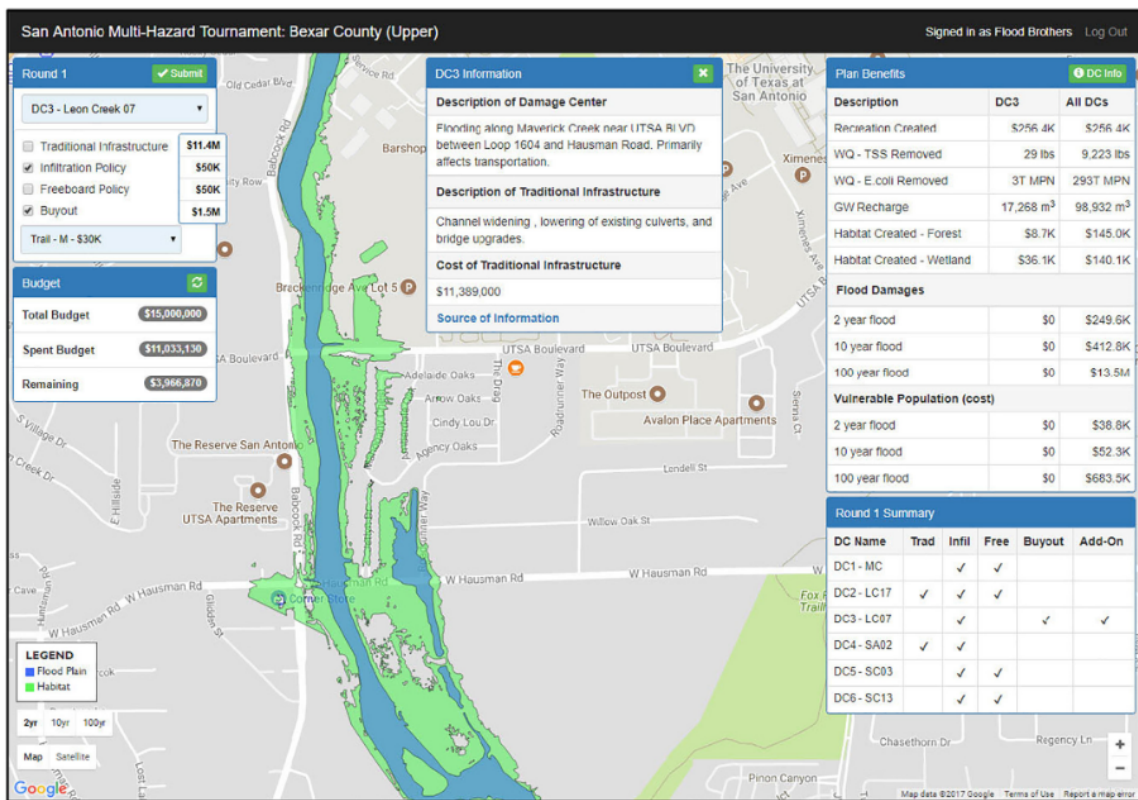


Empirical relationships between drivers and the culvert sedimentation degrees in the Southern Iowa Drift Plain regions.

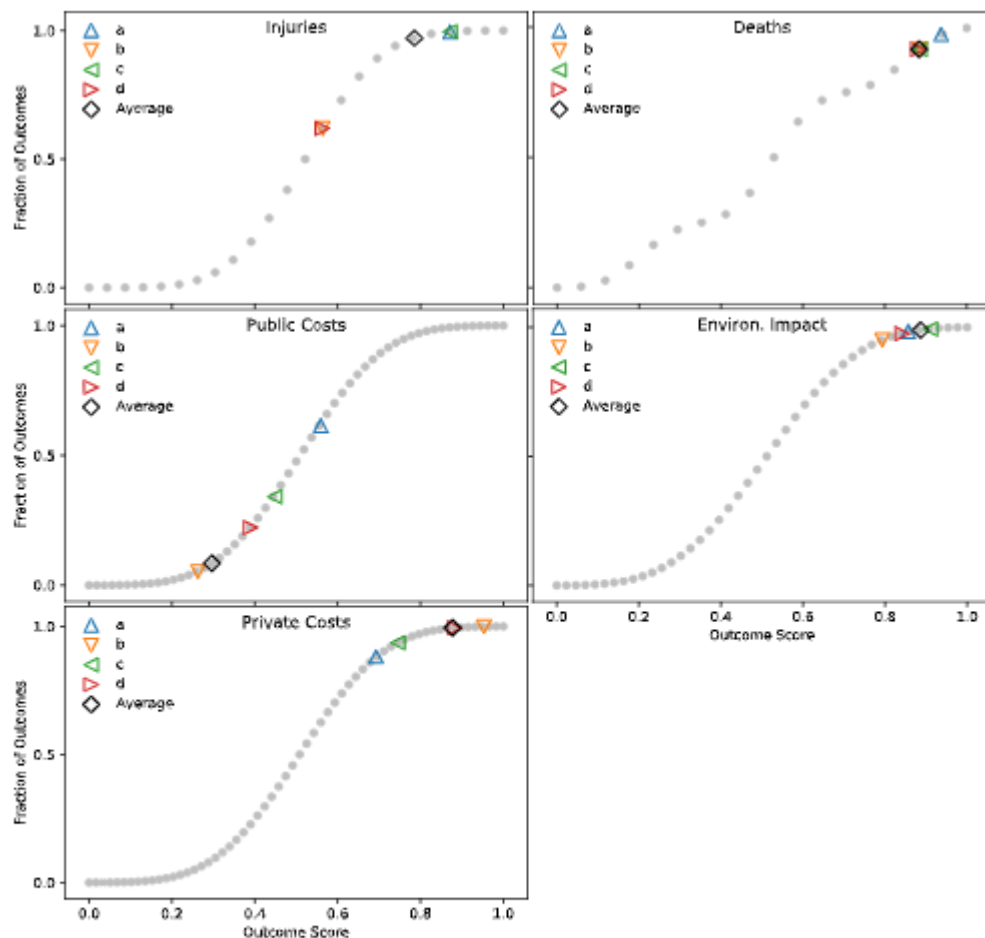
DECISION SUPPORT



The modelling components that drive the loWaDSS scoring output with examples of model inputs and outputs.



Gameplay - multi-hazard tournament main application page.

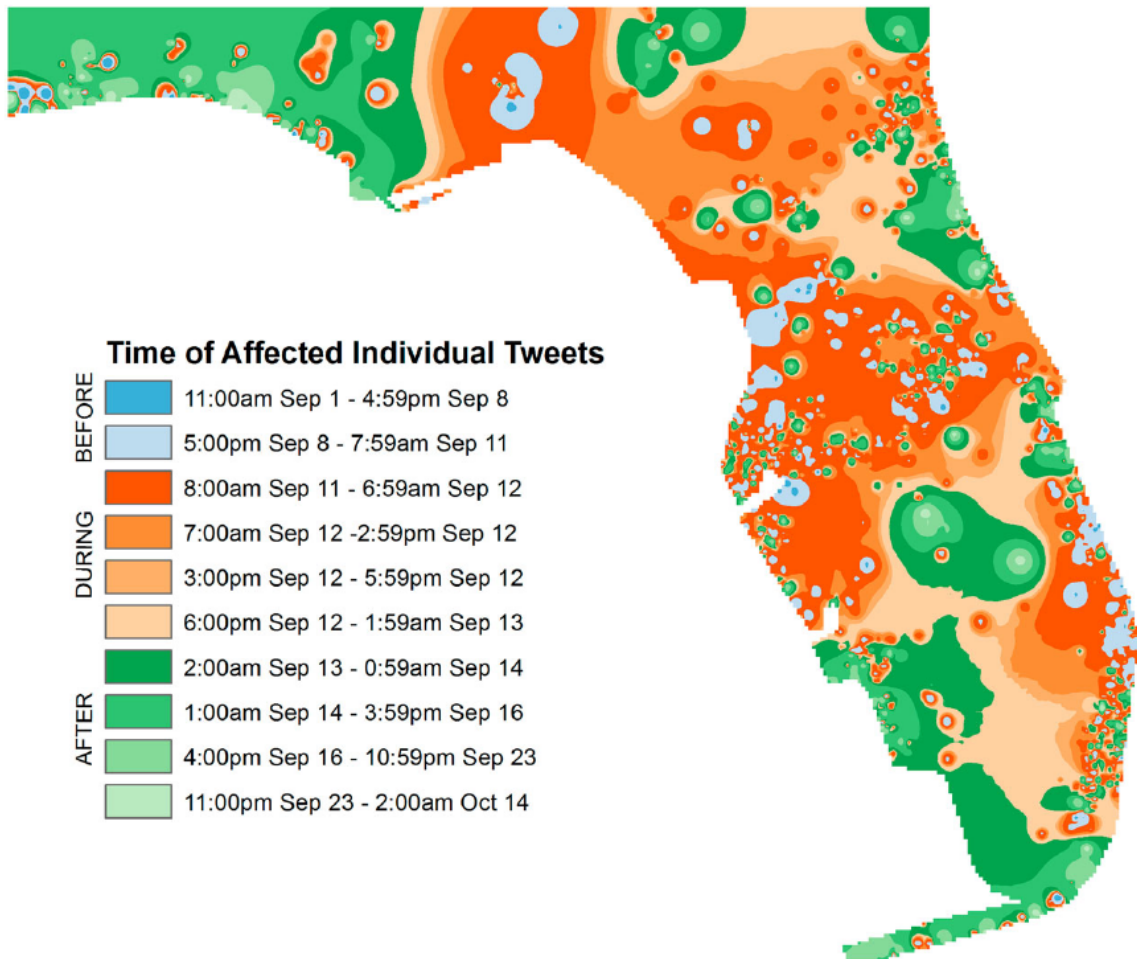


Ranking curves for each of the five learned models along each of the five relevant belief features. Overall, the learned models performed well. Model a, which had the highest cumulative score when considering minimization of damages, scored highest among the models in three categories: deaths, injuries, public costs. Yet, it also performed the worst in minimizing private costs and was third in environmental impact minimization.

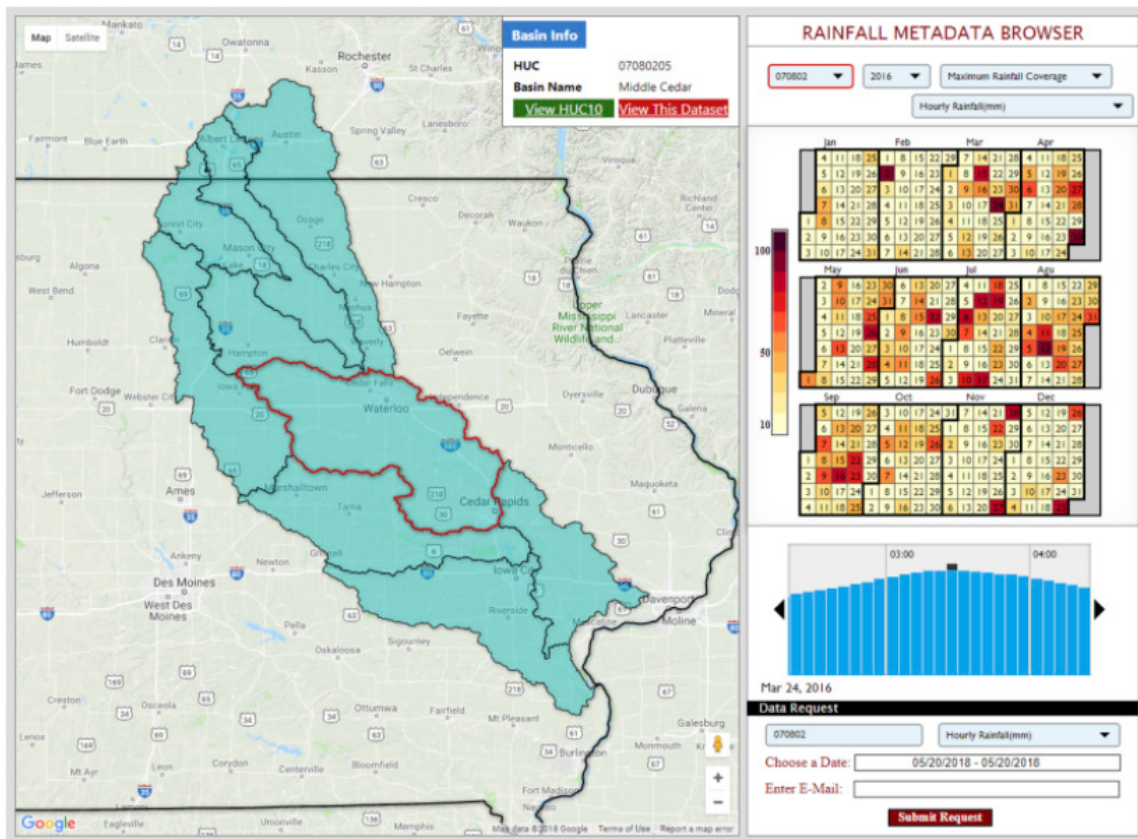
DATA PROCESSING



Set of 256x256 GAN-Generated Satellite River Imagery. Across these 64 images, the final results show highly realistic river satellite imagery with little to no flaws in image quality. Specifically, this set of images was generated by the last checkpoint (iteration #96,000 for the 256x256 generation block of the PGGAN).



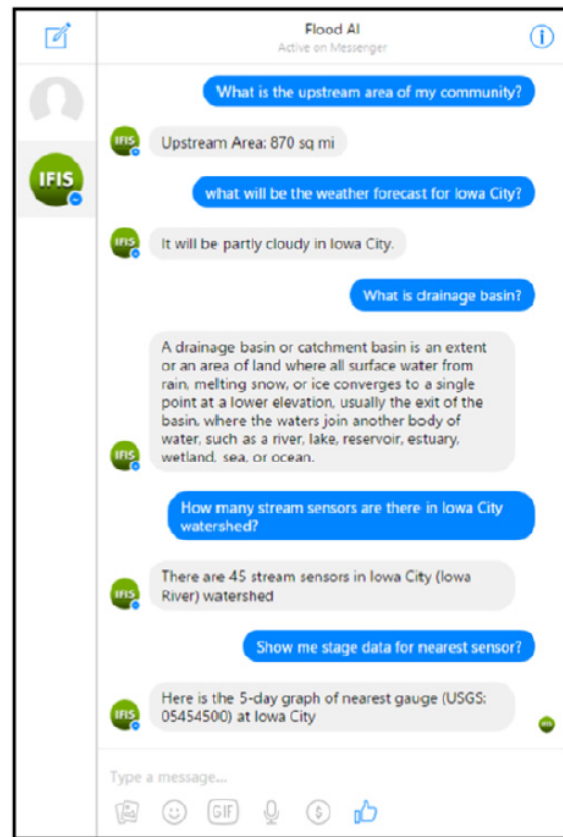
Temporal progression of affected individuals and infrastructure tweets by area. On average, Blue areas tweeted before, orange areas tweeted during, and green areas tweeted after Hurricane Irma.



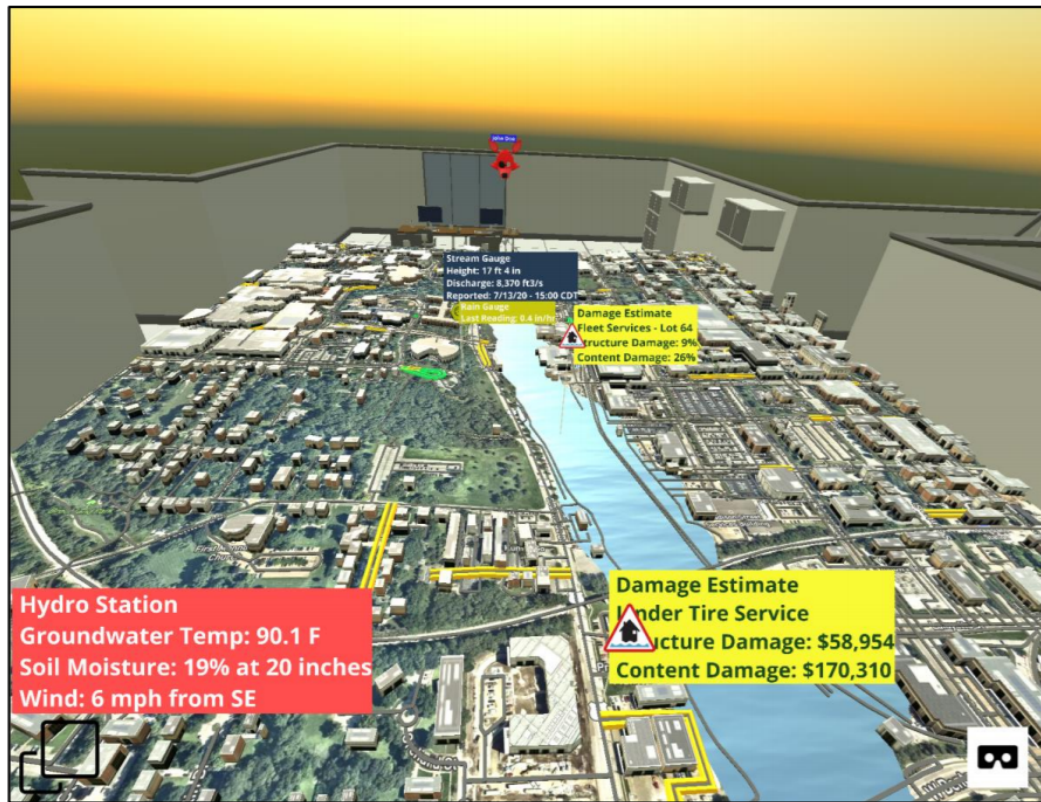
A screenshot of the IFC-Cloud-NEXRAD Graphical User Interface.

VISUALIZATION





Instant messaging interfaces integrated to Flood AI chatbots.



A case study for flood management use case for Iowa City, IA, showing a flood animation and relevant data layers (i.e. stream gauges, rain gauges, hydro stations for groundwater and soil moisture data, estimated flood damages for current or forecasted flood scenarios, and traffic congestion).

AUTHOR INFORMATION

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Dr. Demir received his PhD in Environmental Informatics from University of Georgia. He is an Assistant Professor at the Civil and Environmental Engineering, and Electrical and Computer Engineering departments at the University of Iowa. Dr. Demir's research focuses on hydroinformatics, environmental information systems, scientific visualization, big data analytics, intelligent systems, and information communication. His research projects include intelligent systems, smart assistants and chatbots for flooding, crowdsourced augmented reality applications for environmental monitoring, virtual reality and cyber learning systems for hydrological simulations, and holographic applications for emergency management. Dr. Demir currently serves as Editor for Journal of Hydroinformatics (IWA), Environmental Modeling and Software (Elsevier) and Smart Water (Spring) and various national and international informatics and cyberinfrastructure leadership committees including the CUAHSI Informatics Committee, NSF EarthCube Technology and Architecture Committee and International Joint Committee on Hydroinformatics (IWA/IAHR/IAHS).

ABSTRACT

As scientists are confronted with increasingly massive datasets from observations to simulations, one of the biggest challenges is having the right tools to gain scientific insight from the data and communicate the understanding to stakeholders. Recent developments in web technologies make it easy to manage, analyze, visualize, and share large data sets with the public. Web technologies, intelligent systems, artificial intelligence, and virtual and augmented reality techniques provide advanced capabilities for big data analytics, knowledge discovery and smart communication platforms. This talk provides an overview of developments in web systems for hydrological analysis and communication, and presents real-world applications of these techniques in water resources and disaster mitigation.



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Check our website for project details and full list of references.

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