Project drAIn

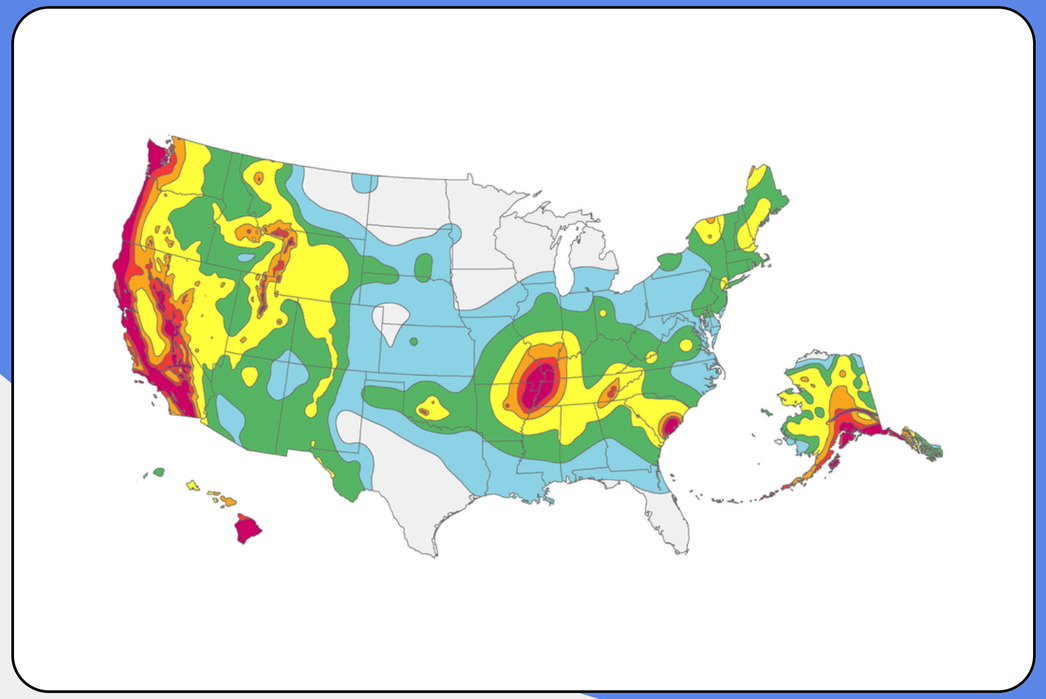
a decision-support system that uses **hydrologic simulation, AI, and community data** to help cities.

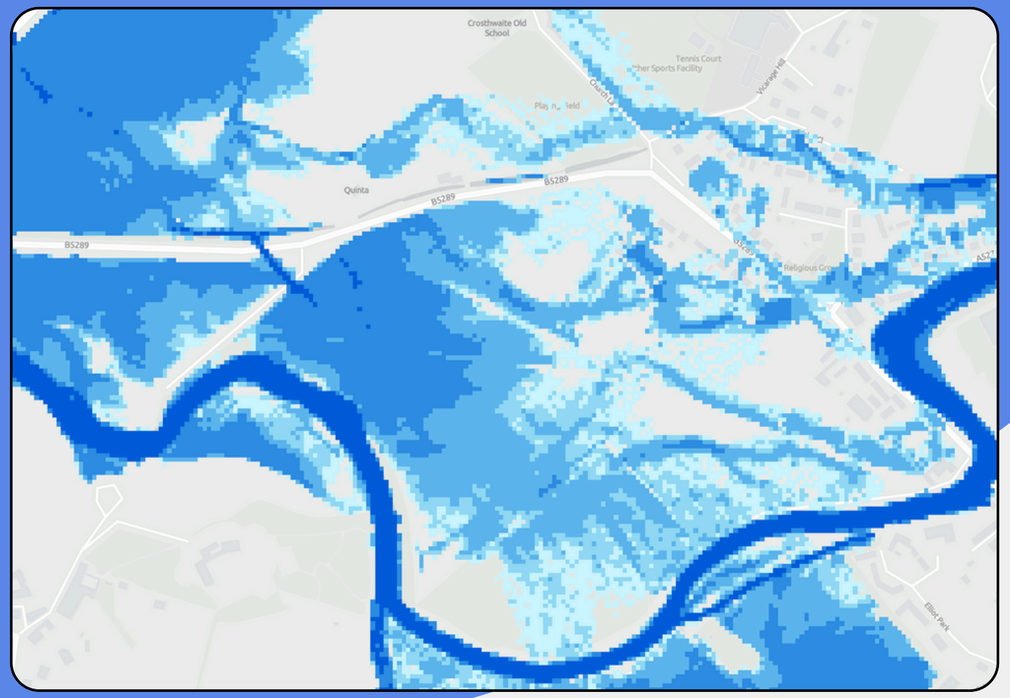
drainage systems & flood resilience

What a **drainage system** is and how it floods?

The **flooding problem** in Mandaue City

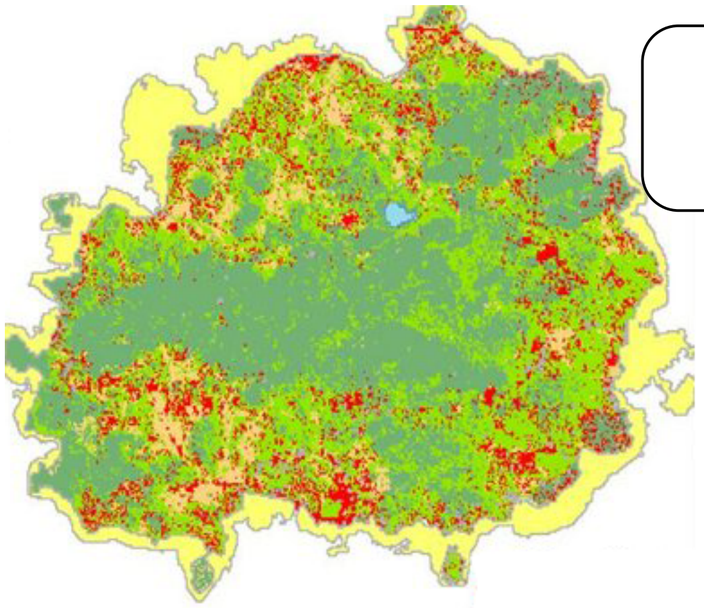
The current problem & **literature gap**





they don’t explain which drainage components fail, why the system gets overwhelmed, or how to respond in real time

how drAIn works?



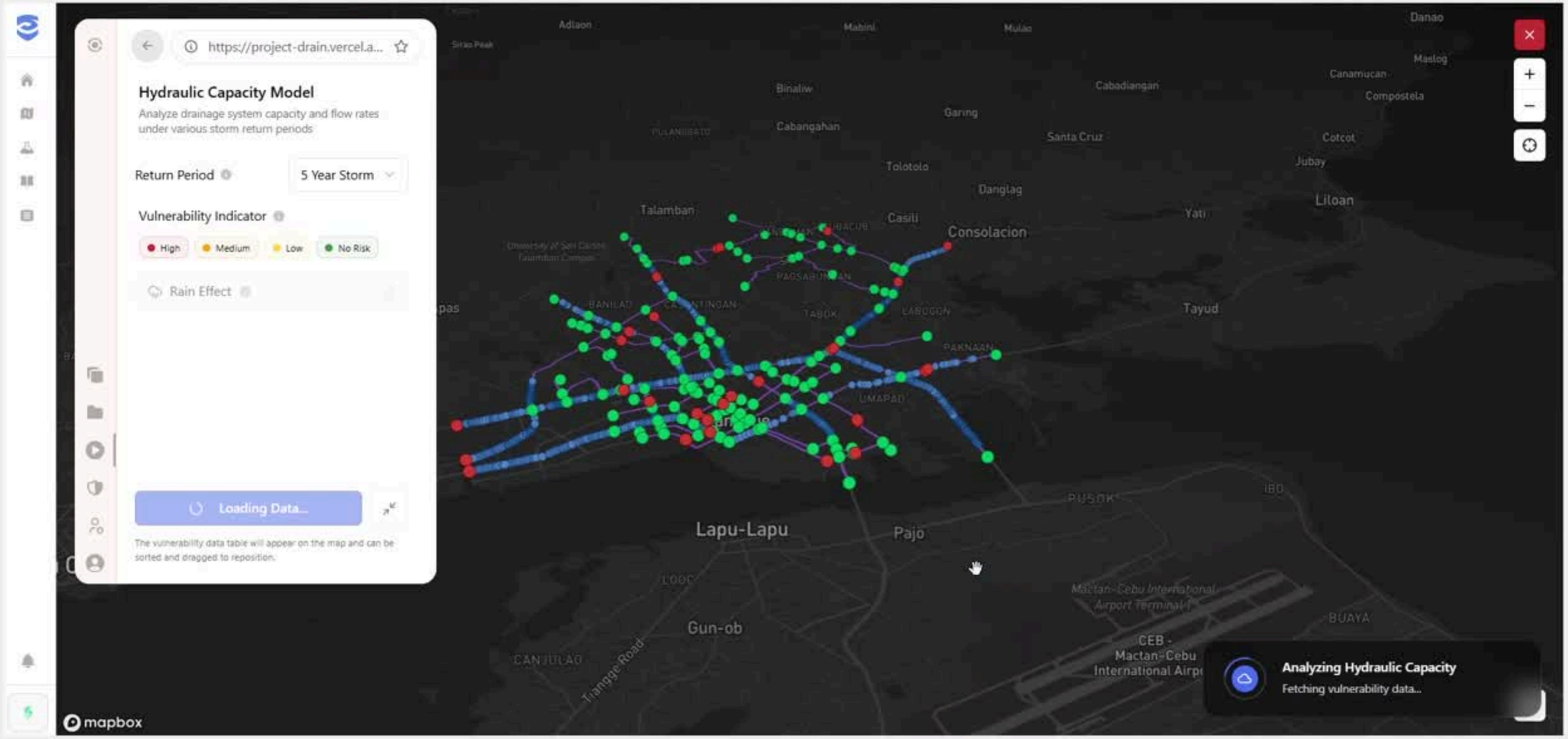
LiDAR elevation to capture true ground shape

Land cover classification for surface runoff behavior

PAGASA rainfall intensities for realistic storm scenarios

Mandaue City’s complete **drainage network**

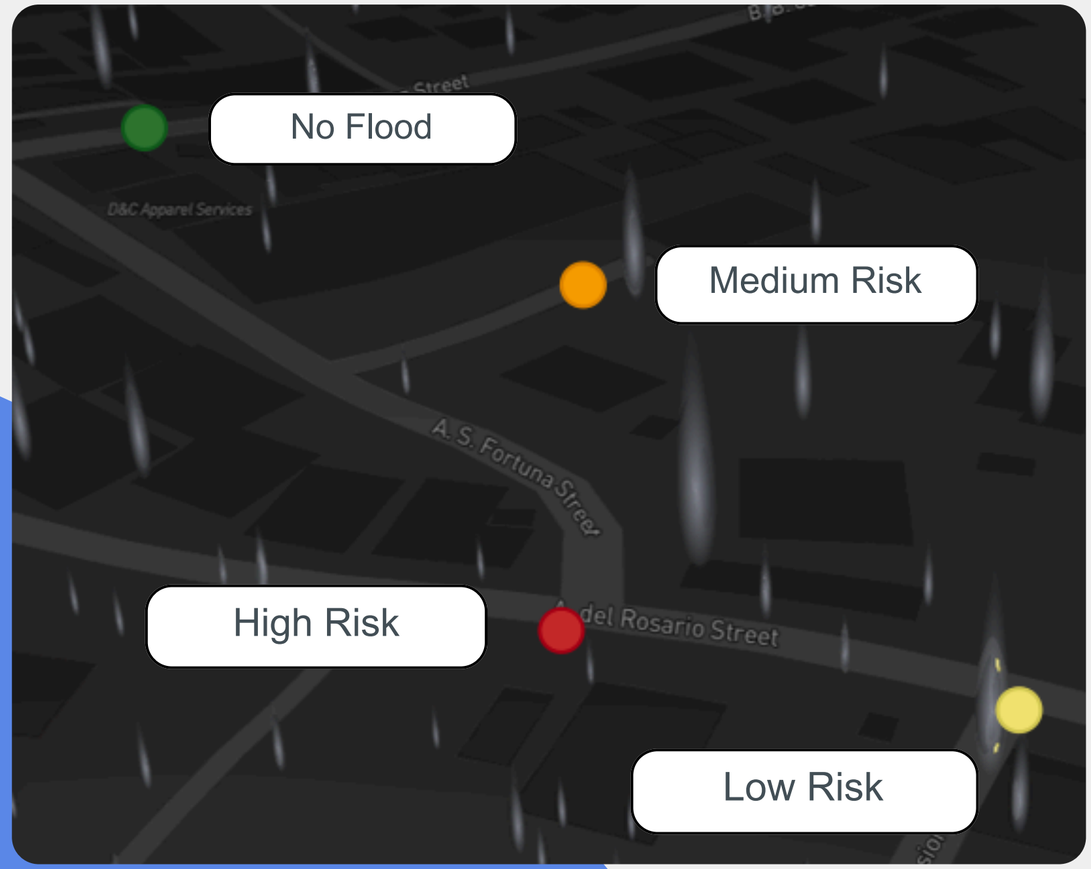
performance metrics



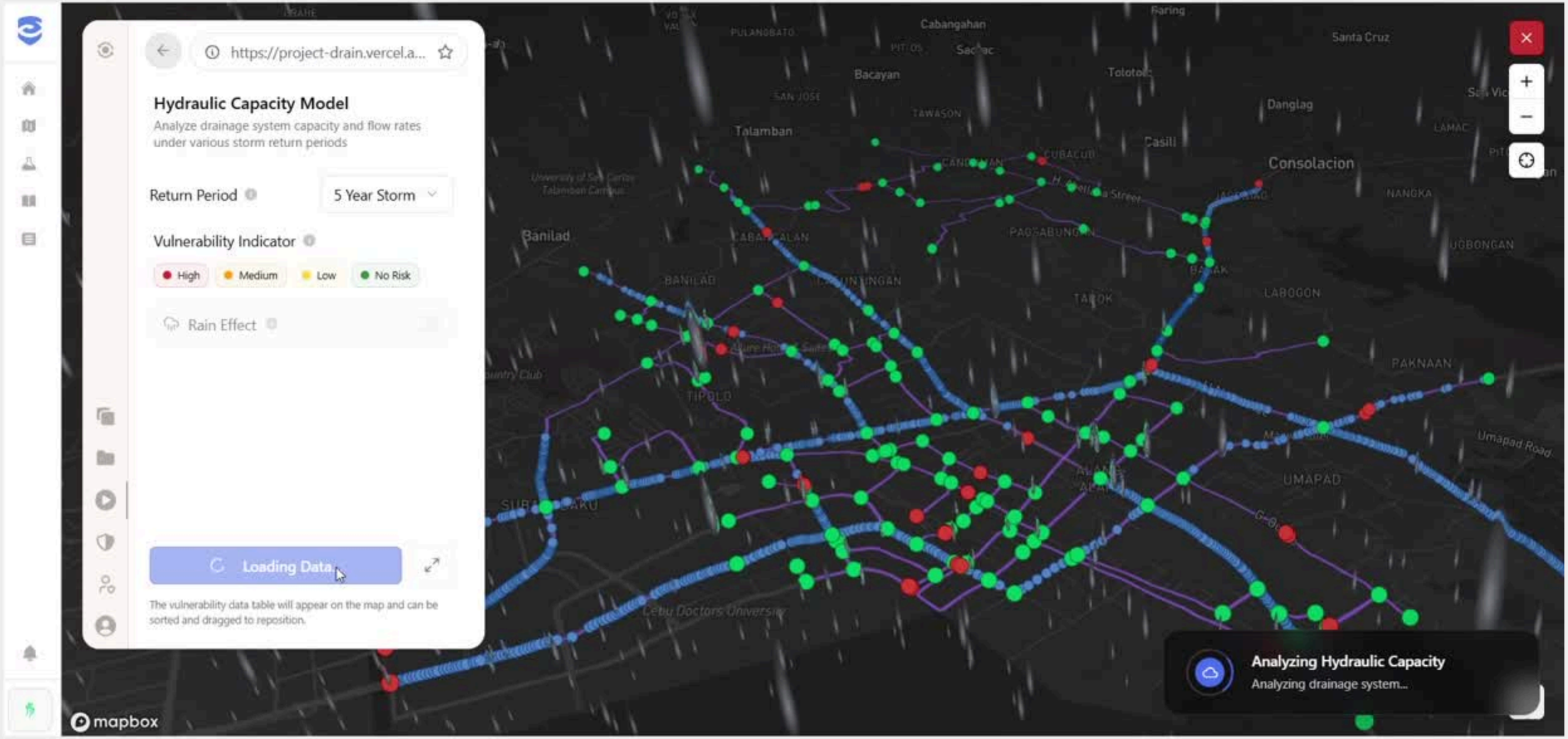
K-Means clustering

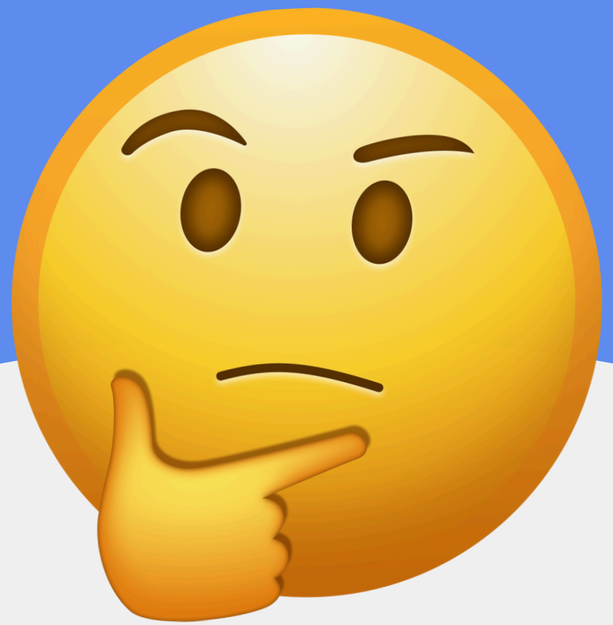
an **unsupervised machine learning algorithm** used to automatically group data into clusters based on similarity

the **weakest points** in the system or the **exact drains** most likely to fail during intense storms.



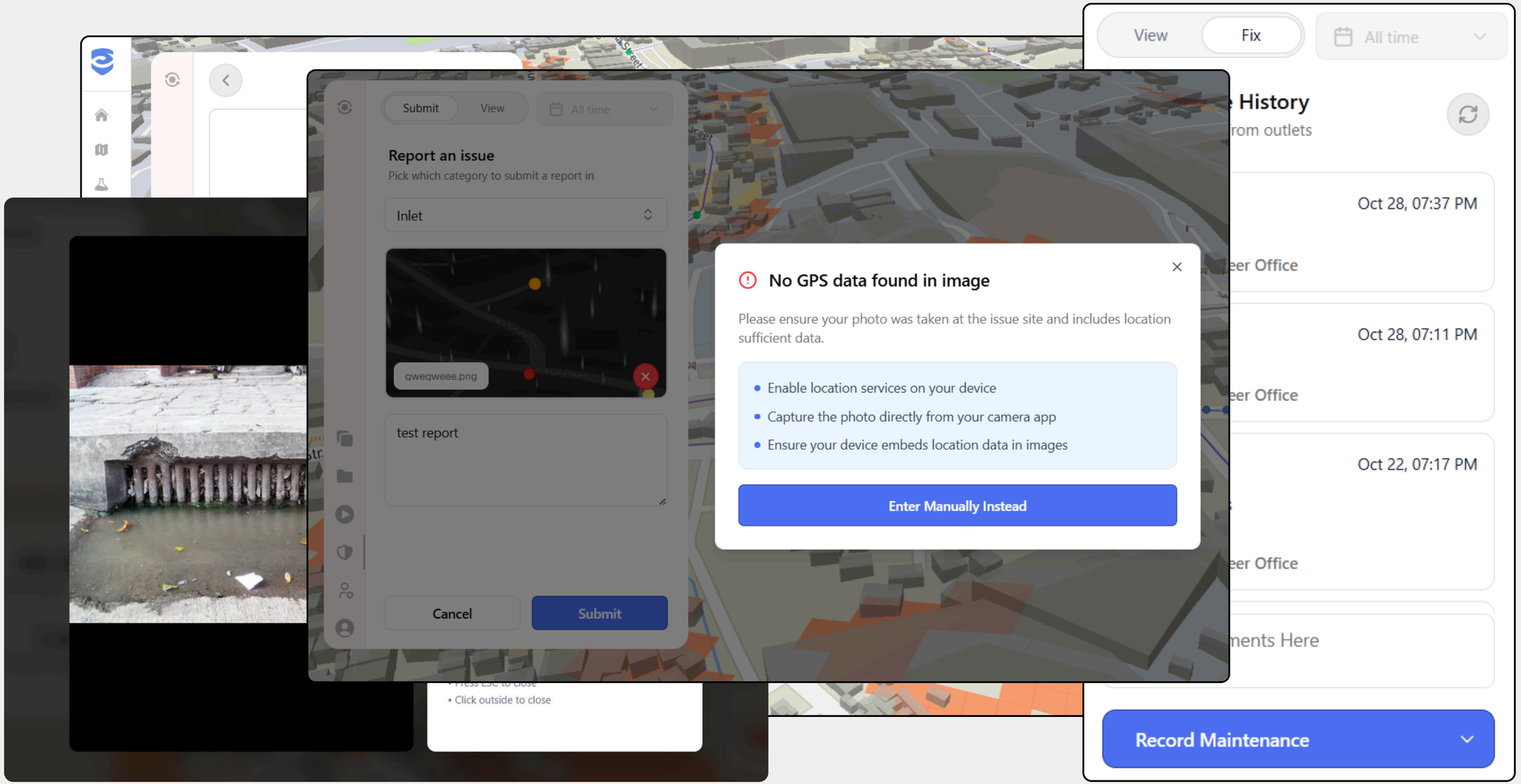
without complex hydrology setup





real world applications?

~~historical flood data~~ community participation

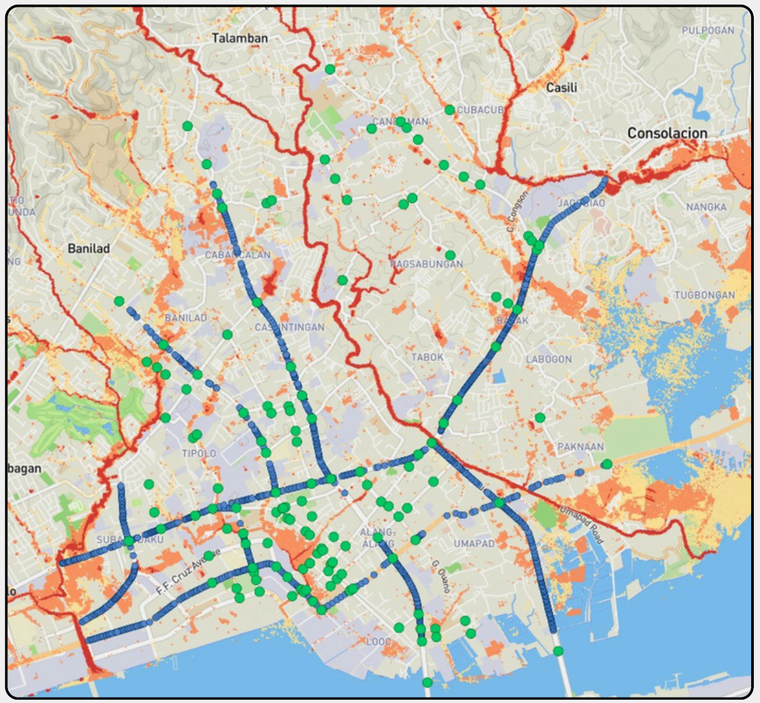


turns drAIn into a living, learning, city-scale **diagnostic tool**

user
admin
ecosystem

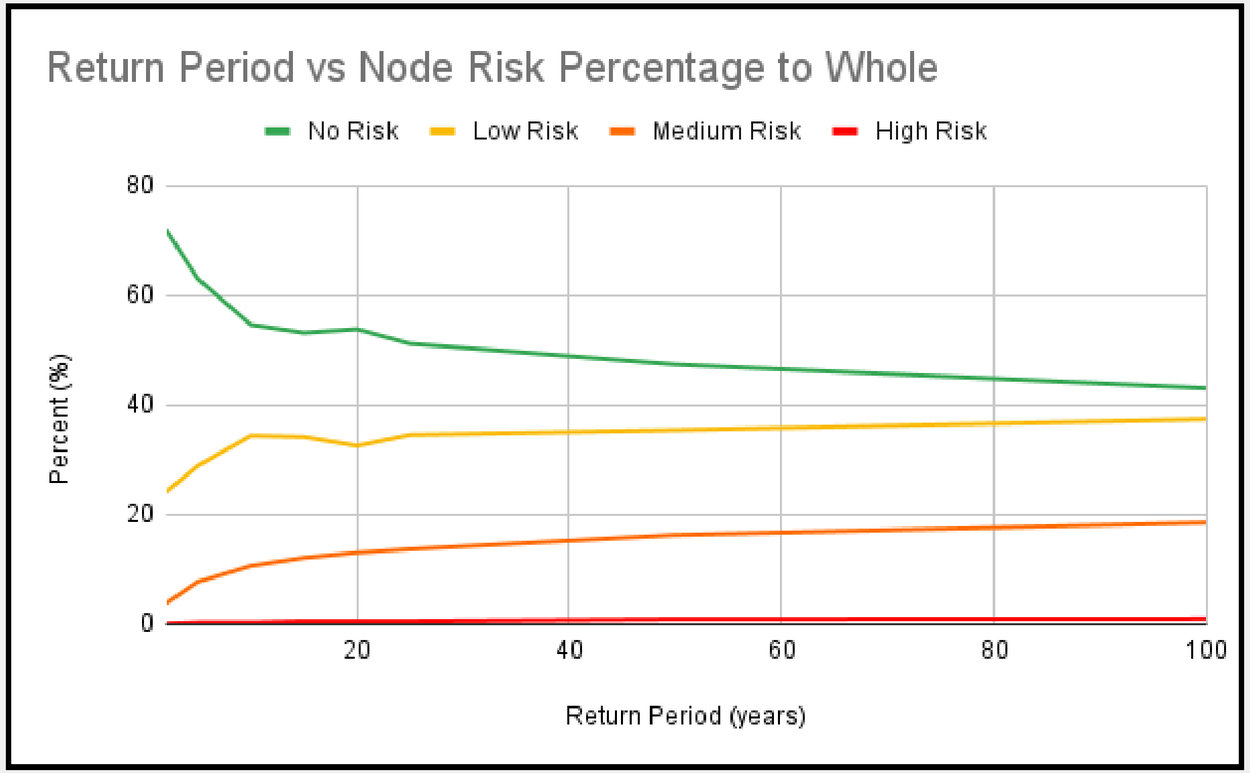
Heatmap Comparison

drAin Drainage Vulnerability Map at 25-yr Rain Return Period (Project drAIn)



Flood Hazard Map at 25-yr Rain Return Period (Bañados and Quijano, 2023)

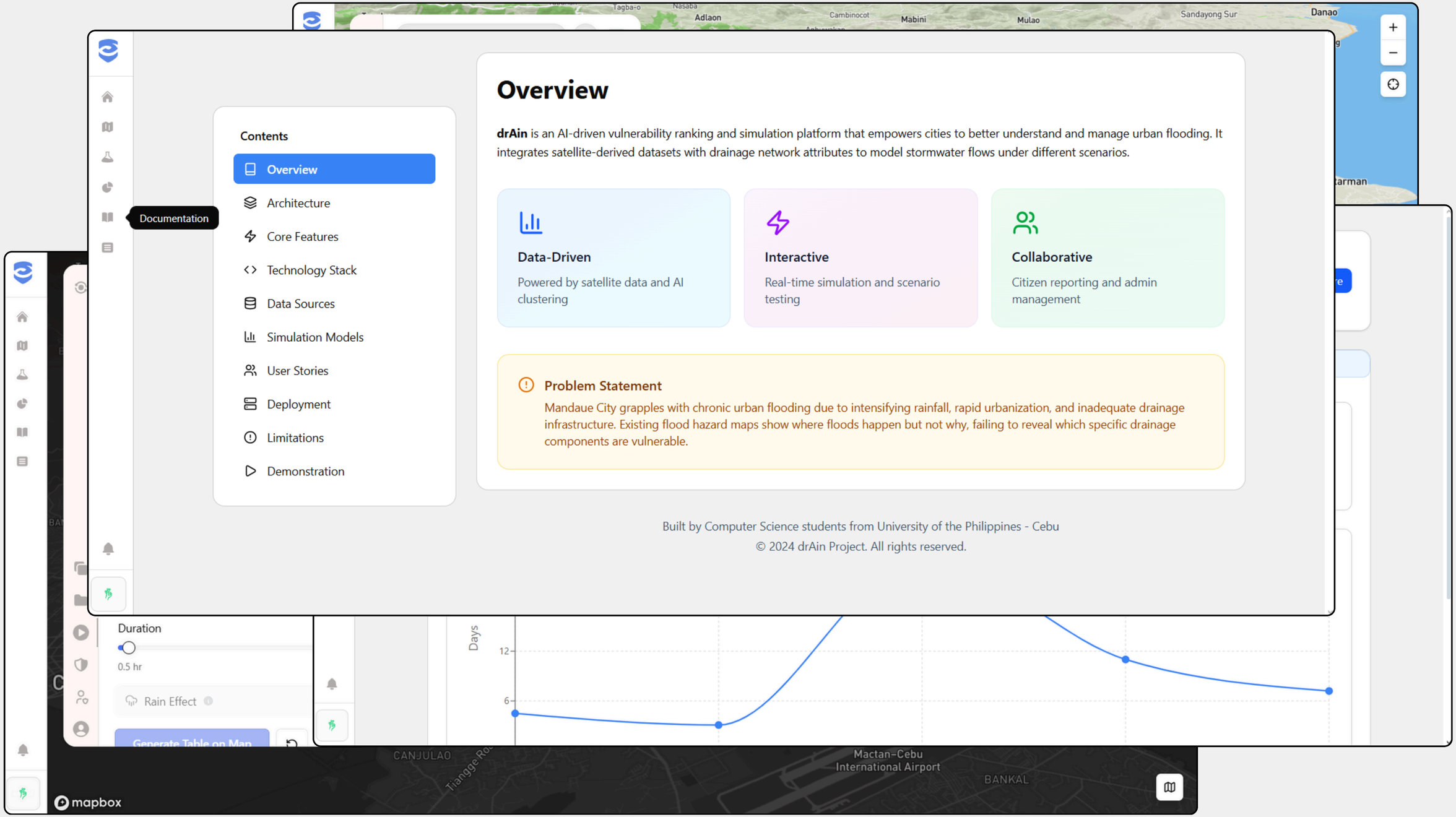
Drainage Vulnerabilities



Parameter Correlation

	Vulnerability Rank	Time to Overflow	Hours Flooded	Maximum Rate	Time of Max	Total Flood Volume
Vulnerability Rank	1					
Time to Overflow	-0.860590545	1				
Hours Flooded	0.814013864	-0.519836036	1			
Maximum Rate (CMS)	0.551748696	-0.380768748	0.41333664	1		
Time of Max (hr:min)	0.866308698	-0.796820944	0.603307331	0.429515328	1	
Total Flood Volume (10^6 ltr)	0.492720887	-0.23047634	0.519287465	0.786059582	0.34297414	1

Vulnerability Rank strongly correlates with most flood indicators, making it a good proxy for overall flood impact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Overview
drAin is an AI-driven vulnerability ranking and simulation platform that empowers cities to better understand and manage urban flooding. It integrates satellite-derived datasets with drainage network attributes to model stormwater flows under different scenarios.
Data-Driven
Powered by satellite data and AI clustering
Interactive
Real-time simulation and scenario testing
Collaborative
Citizen reporting and admin management
Problem Statement
Mandaue City grapples with chronic urban flooding due to intensifying rainfall, rapid urbanization, and inadequate drainage infrastructure. Existing flood hazard maps show where floods happen but not why, failing to reveal which specific drainage components are vulnerable.
Built by Computer Science students from University of the Philippines - Cebu
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Duration
0.5 hr
Rain Effect
Generate Table on Map
Days
12
6
Adlaon
Cambinocot
Mabini
Mulao
Sandayong Sur
Danao
CANJULAO
Mactan–Cebu International Airport
BANKAL
mapbox

Future Vision

project drAIn is designed to scale so our next steps include

- Collaborating with civil engineers and hydrologist to refine parameters and model accuracies
- Expanding drAIn to other Metro Cebu cities
- Integrating real-time sensors for dynamic simulation
- Developing a mobile-first version for field teams
- Adding climate-change projections for long-term planning

Our goal is a nationwide, AI-driven flood resilience ecosystem.

~~this area might flood~~

“This exact drainage drain will fail first — and here’s why.”

The Sources

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