

The Transformative Potential of AI (and ML)

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Artificial Intelligence (AI) and Machine Learning (ML) technologies offer capabilities that revolutionize manufacturing, healthcare, finance, transportation, retail, etc.



01

Floods are the most common natural disaster worldwide. A flood is defined as an overflow of water that submerges land that is usually dry.

02

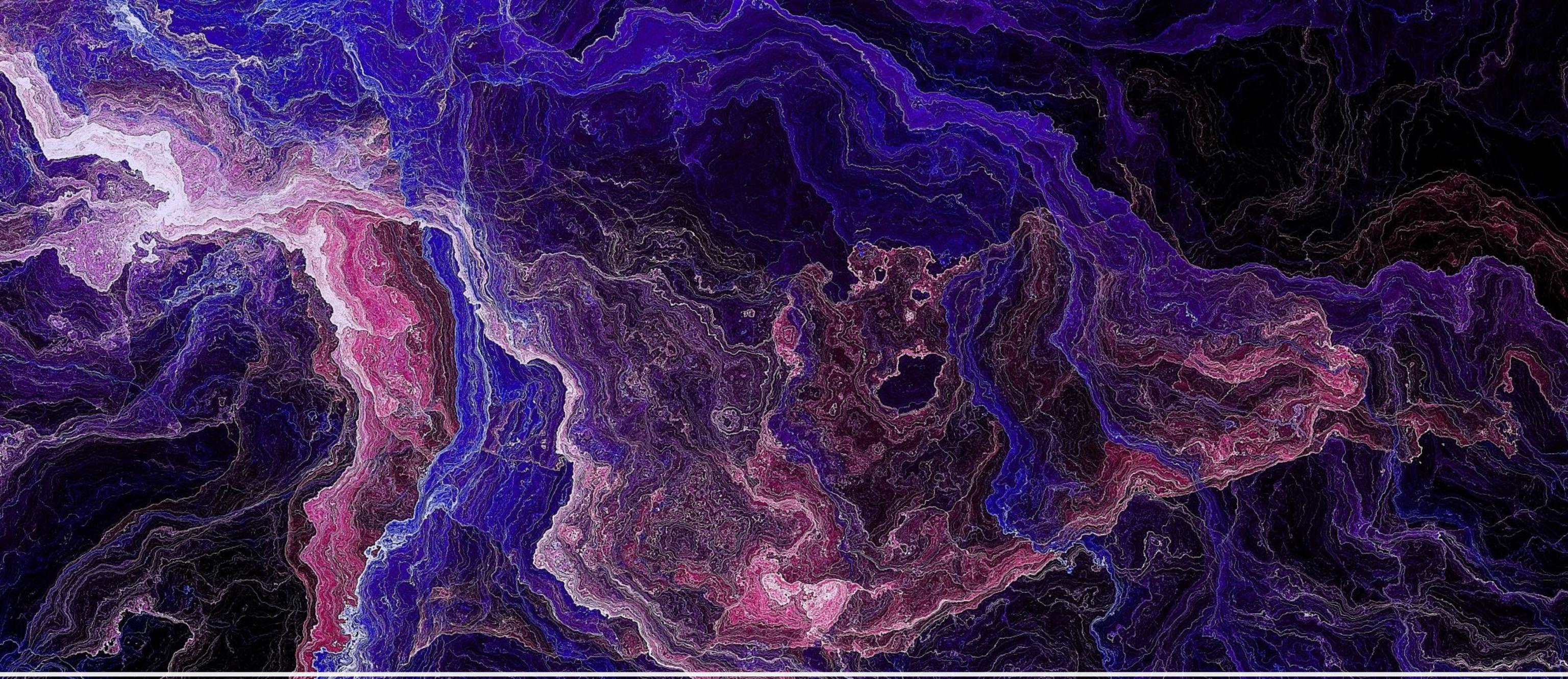
In 2023, Bangladesh, Vietnam, and Myanmar, were the countries most exposed to flood risk.

03

Globally, 12% of municipal solid waste (MSW) is made up of plastics

04

Floods accounted for 16 percent of weather-, climate-, and water-related deaths recorded between 1970 and 2021



Multi Input Disaster Response

Enhancing Disaster Response with AI/ML

Predictive Analytics (ML)

Forecast disaster impacts and proactively deploy aid and relief efforts.

Computer Vision

Rapidly identify affected areas, damaged infrastructure, and mobilize resources.

Natural Language Processing

Analyze social media and other data sources to understand and respond to urgent needs.





Above normal flood alert

Khaliajuri Upazila, Danu River ⋮

Flood situation near Danu River

From Bangladesh Water Development Board · [Learn more](#) · Last updated 22 mins ago

Flooding is expected to be similar by this morning



By this morning, Danu River is expected to be the same as yesterday evening. Use caution if going near the riverfront.

See more in Flood Hub →

Affected area





BUSINESS ANALYTICS
COMPANY



APEX NGO WITH A
DEDICATED HELPLINE PORTAL



MULTIPLE LOCAL NGOS

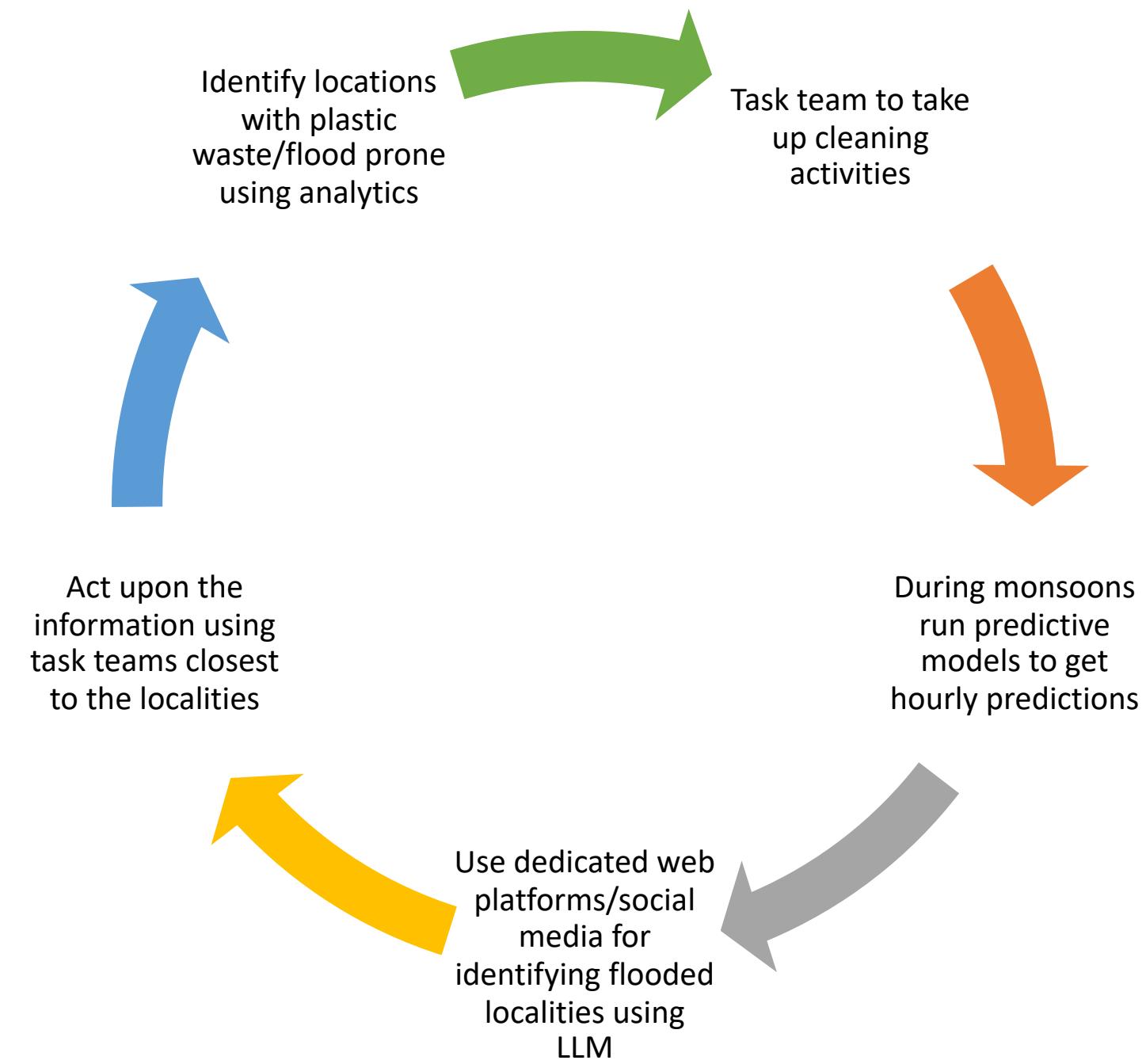


Image Classification

[Custom Vision](#)

Satellite imagery to understand plastic waste

The image displays two side-by-side screenshots of the Microsoft Custom Vision web interface, specifically the 'PovertyAssessment' project.

Left Screenshot (Performance View):

- Header:** Safari browser window title bar.
- Top Bar:** Navigation links: File, Edit, View, History, Bookmarks, Window, Help; tabs: Training Images, Performance, Predictions; buttons: Train, Quick Test.
- Left Sidebar:** Iterations section showing 'Iteration 2' (Trained moments ago with General [A2] domain) and 'Iteration 1' (Trained on: 12/5/2023 with General [A2] domain). Probability Threshold: 50%.
- Content Area:**
 - Iteration 2:** Finished training on 5/5/2024, 8:55:35 PM using General [A2] domain. Iteration id: 4f52a150-4ac5-4996-b4cf-c7a22082e0e3. Classification type: Multiclass (Single tag per image).
 - Performance Metrics:** Three donut charts showing 100.0% for Precision, Recall, and AP.
 - Performance Per Tag:** Table showing precision, recall, AP, and image count for 'Unclean' and 'Clean' tags.

Tag	Precision	Recall	A.P.	Image count
Unclean	100.0%	100.0%	100.0%	5
Clean	100.0%	100.0%	100.0%	8

Right Screenshot (Quick Test View):

- Header:** Safari browser window title bar.
- Top Bar:** Navigation links: File, Edit, View, History, Bookmarks, Window, Help; tabs: Training Images, Performance, Predictions; buttons: Train, Quick Test.
- Left Sidebar:** Iterations section showing 'Iteration 2'.
- Content Area:**
 - Quick Test:** A modal dialog showing a photograph of a slum area with numerous shacks and debris. The dialog includes fields for 'Image URL' and 'Browse local files'.
 - Predictions:** Table showing the predicted tags and their probabilities.

Tag	Probability
Unclean	99.9%
Clean	0%

Predictive Analytics

Safari File Edit View History Bookmarks Window Help

app.minitab.com Minitab License Portal Minitab Sun May 5 15:24

Minitab Google Drive™ Untitled project - Saved

File Edit Data Calc Stat Graph View Help Predictive Analytics Module Additional Tools Search Share

Navigator Forecast with Best ARIMA ...

Forecast with Best ARIMA Model for Water Level

Worksheet 1

Observation Order

Forecasts from Time Period 125

Time Period	Forecast	SE Forecast	95% Limits		Actual
			Lower	Upper	
126	24.1935	0.839453	22.5478	25.8391	
127	23.9661	0.846427	22.3068	25.6255	
128	23.3586	0.850892	21.6905	25.0267	
129	23.3253	0.853347	21.6524	24.9982	
130	23.8683	0.859832	22.1827	25.5539	

Time Series Plot for Water Level
(with forecasts and their 95% confidence limits)

27

C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12

Water Level Hour

Worksheet 1



Harnessing Satellite Imagery and Social/Web Media Analysis for Flood Monitoring and Response

In this proposed paper, I present a novel approach that combines the power of machine learning algorithms, satellite imagery analysis, natural language processing using large language models to address the pressing issue of water floods in Bangladesh. By leveraging a multifaceted data analysis framework, we aim to provide disaster response teams with insights that improve preparedness, assess severity and extent of flooding, enabling them to prioritize their efforts and reduce turnaround time



Satellite Imagery Analysis: Detecting Water Clogs

1

Satellite Data Acquisition

We begin by acquiring high-resolution satellite imagery covering the geographical region of Bangladesh with the inputs received through dedicated disaster response web portal and social media sites. These satellite data provide a bird's-eye view of the landscape, allowing us to accurately identify and track the flooded areas.

2

Image Processing and Segmentation

We employ advanced convolutional neural networks (CNNs) to analyze the satellite images, segmenting the scenes and detecting the presence of water bodies. This step is crucial in identifying areas affected by water clogs and potential and real-time flood situation

3

Flood Mapping and Severity Assessment

By processing the satellite imagery and identifying the extent and depth of water bodies, we can create detailed flood maps that highlight the severity and impact of the flooding. This information is vital for disaster response teams to prioritize their efforts and allocate resources effectively.

Natural Language Processing

Safari File Edit View History Bookmarks Window Help

language.cognitive.azure.com

Environments - Azure AI | Machine Learning Studio

Azure AI services - Microsoft Azure

A Language Studio: Named entities tryout

mallelai43@northwood.edu Bot2Indu (southcentralus, F0)

Azure AI | Language Studio

Language Studio > Named entities tryout

Bangladesh and India share 54 rivers, most of which flow from India
Location Loc... Q... Loca... Loc...

southwards into Bangladesh. The upstream flow of water from India,
Location Loc...

and also from China, influences downstream river discharge. This means
Loc...

that interventions in those countries, such as the control of water flow

during the flooding season, can have significant impacts on flooding
Event Event

in Bangladesh. In the past, Bangladesh has suffered due to flood
Location Location Eve...

management policies in these upstream countries, with water receding
Skill

into low-lying Bangladesh and worsening the flood situation.
Location Eve...

Bangladesh experiences four different types of flood: monsoon, flash,
Location Qu... Eve... Event Eve...

rainfall-induced and tidal (Rumana et al., 2018). The main short-term
Pers... Da...

causes of flooding are monsoon downpours and the synchronisation of the
Event Event

major rivers' flood peaks, while the long-term causes include compaction
Loca... Eve... Event

and subsidence of sediment, build-up of riverbed sediment (aggradation),
Locati...

deforestation, river damming, and soil erosion resulting from tilling (ibid.).
Event Event Event

Language Studio

The screenshot shows a detailed view of the NER results across the document. Entities are identified and categorized:

- Bangladesh, India, China: Location
- flood, flooding season: Event
- management: Skill
- flood peaks: Location
- subsidence, sediment, riverbed, aggradation: Location
- deforestation, river damming, soil erosion, tilling: Event

Entity Extraction

Safari File Edit View History Bookmarks Window Help ⓘ 🔍 ⚡ ⚡ Sun May 5 15:13

language.cognitive.azure.com

Environments - Azure... Azure AI services - Mic... Language Studio: Nam... R⁶ Flood Affected Area of... SN Assessment of Storm S... Satellite monitoring of t... Waterlevel Table

Azure AI | Language Studio

Language Studio > Named entities tryout

Examine the results

Result JSON

Named entities identified

Show cards On Sort Filter

Location CountryRegion	Location Geographical	Quantity Number	Location	Location Structural	Location City	DateTime DateRange	Quantity Percentage	Quantity Number
Entity value: Bangladesh Confidence: 100.00%	Entity value: Bengal Delta Confidence: 94.00%	Entity value: one Confidence: 80.00%	Entity value: countries Confidence: 63.00%	Entity value: world Confidence: 58.00%	Entity value: Dastagir Confidence: 59.00%	Entity value: 2015 Confidence: 96.00%	Entity value: 80% Confidence: 100.00%	Entity value: three Confidence: 80.00%
Entity value: rivers Confidence: 69.00%	Entity value: Ganges Confidence: 98.00%	Entity value: Brahmaputra Confidence: 100.00%	Entity value: Meghna Confidence: 100.00%	Entity value: GBM Confidence: 58.00%	Product Computing	Entity value: 700 Confidence: 80.00%	Entity value: rivers Confidence: 76.00%	Entity value: two-thirds Confidence: 80.00%
Entity value: country Confidence: 72.00%	Quantity Dimension	Location CountryRegion	Location CountryRegion	Quantity Number	Location CountryRegion	Location CountryRegion	Location CountryRegion	Location CountryRegion
Entity value: China Confidence: 100.00%	Entity value: five metres Confidence: 97.00%	Entity value: Bangladesh Confidence: 100.00%	Entity value: India Confidence: 100.00%	Entity value: 54 Confidence: 80.00%	Entity value: rivers Confidence: 70.00%	Entity value: India Confidence: 99.00%	Entity value: Bangladesh Confidence: 100.00%	Entity value: India Confidence: 100.00%
Entity value: Bangladesh Confidence: 100.00%	Event	Event	Location CountryRegion	Location CountryRegion	Event	Skill	Location CountryRegion	Event
Entity value: four Confidence: 80.00%	Entity value: flooding season Confidence: 67.00%	Entity value: flooding Confidence: 86.00%	Entity value: Bangladesh Confidence: 99.00%	Entity value: Bangladesh Confidence: 100.00%	Entity value: flood Confidence: 94.00%	Entity value: management Confidence: 100.00%	Entity value: Bangladesh Confidence: 100.00%	Entity value: flood Confidence: 61.00%
Entity value: rivers Confidence: 76.00%	Event	Event	Event	Event	Person	DateTime DateRange	Event	Event
Entity value: flood Confidence: 65.00%	Entity value: flood Confidence: 65.00%	Entity value: compaction Confidence: 52.00%	Entity value: riverbed Confidence: 70.00%	Entity value: monsoon Confidence: 96.00%	Entity value: flash Confidence: 96.00%	Entity value: Rumana Confidence: 98.00%	Entity value: flooding Confidence: 86.00%	Entity value: monsoon downpours Confidence: 82.00%
Entity value: Qu... Confidence: 94.00%	Location	Location	Location	Location	Event	Entity value: 2018 Confidence: 100.00%	Entity value: flooding Confidence: 86.00%	Entity value: tilling Confidence: 51.00%
Entity value: Dastagir, 2015. Nearly 80% of the country's surface area is floodplain	Entity	Entity	Entity	Entity	Entity	Entity value: 2015 Confidence: 96.00%	Entity value: monsoon downpours Confidence: 82.00%	Entity value: river damming Confidence: 69.00%

Original text

Bangladesh's location in the Bengal Delta and its flat, low-lying Location Location topography make it one of the most flood-prone countries in the world Qu... Location Location

(Dastagir, 2015). Nearly 80% of the country's surface area is floodplain Location DateT DateT

Social Media Sentiment Analysis: Amplifying the Voice of Communities

Collecting Social Media Data

In parallel with the satellite imagery analysis, we gather relevant social media data, focusing on posts and tweets related to flooding events in Bangladesh. This additional data source provides valuable insights into the real-time experiences and sentiments of the affected communities.

Sentiment Classification

Using advanced natural language processing techniques and large language models, we analyze the sentiment expressed in the social media posts. This allows us to identify areas where people are expressing distress, concern, or requests for assistance, further informing our prioritization of disaster response efforts.

Integrating Satellite and Social Data

By combining the insights from satellite imagery analysis and social media sentiment analysis, we create a comprehensive map that highlights the most severely affected areas, taking into account both the physical extent of the floods and the expressed needs and concerns of the local communities.

Object Detection

Chrome File Edit View History Bookmarks Profiles Tab Window Help

Pi Pi, your personal AI

Vision Studio

portal.vision.cognitive.azure.com/demo/video-summary-and-frame-locator

Azure AI | Vision Studio

Vision Studio > Video summary and frame locator

Locate a frame in the video

Find a specific moment in the video based on a natural language search:

ballo

Search

balloon

Results

"water" appeared at:

- 01:49
- 01:50
- 01:51
- 01:48
- 01:52

Show more

"balloon" appeared at:

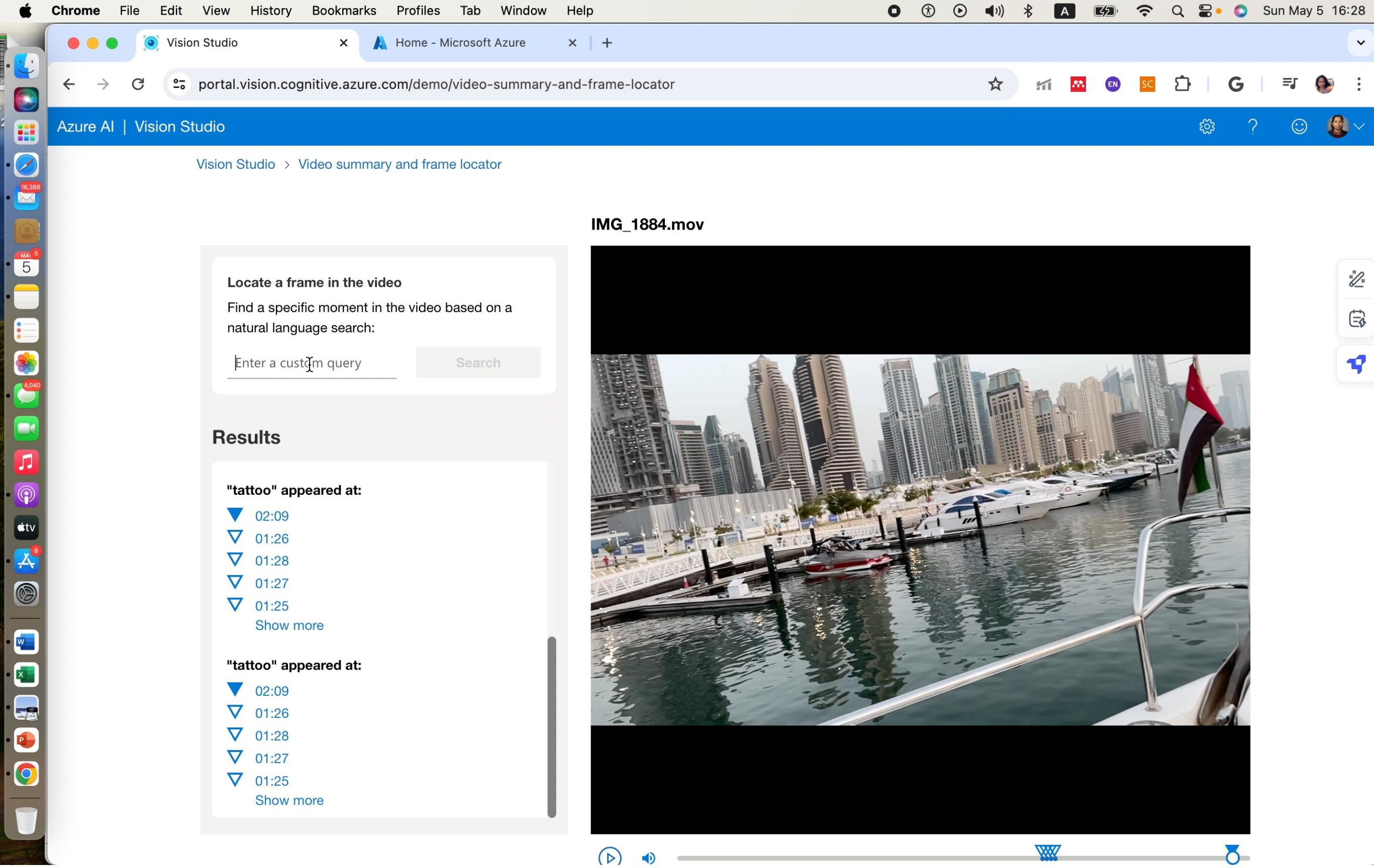
- 02:01
- 02:09
- 02:00
- 01:59
- 02:02

Show more

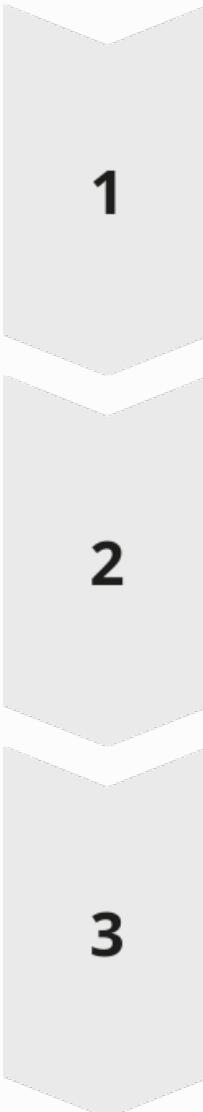
2:01

2:12

Object Detection



Prioritizing Disaster Response: A Holistic Approach



The satellite imagery analysis provides us with a detailed understanding of the extent and depth of the water bodies, enabling us to create a comprehensive flood severity map for Bangladesh.

Social Media Sentiment Analysis

By leveraging social media data, we can identify the areas where people are expressing the most distress and urgent need for assistance, further informing our disaster response prioritization.

Integrated Disaster Response Prioritization

By combining the insights from both satellite imagery and social media sentiment analysis, we can create a holistic view of the flood situation, allowing disaster response teams to prioritize their efforts and allocate resources where they are needed most.



Enhancing Disaster Preparedness through Collaboration

Partnerships with Local Authorities

Fostering strong partnerships with local NGOs and disaster management agencies in Bangladesh is crucial for the successful implementation and integration of our flood monitoring and response system. This collaboration will ensure the system is tailored to the specific needs and challenges of the region.

Community Engagement and Feedback

Engaging with local communities and incorporating their feedback is essential for the long-term sustainability and effectiveness of our approach. By actively listening to the voices of those directly affected by floods, we can refine our methods and better align our efforts with the needs of the people.

Knowledge Sharing and Capacity Building

Sharing our knowledge and insights with the broader scientific community and disaster response teams can contribute to the advancement of flood monitoring and management practices, not only in Bangladesh but also in other flood-prone regions around the world.





Addressing Ethical Considerations

1

Privacy Concerns

As our approach relies on social media data, we must address privacy concerns and ensure the ethical handling of personal information. Strict data protection protocols and informed consent mechanisms are crucial to maintain the trust of the affected communities.

2

Data Availability and Bias

The quality and availability of data, both satellite imagery and social media, may vary across different regions and socioeconomic settings. We must acknowledge these potential biases and work to ensure equitable coverage and representation in our analysis.

3

Responsible AI Deployment

The deployment of our AI-powered flood monitoring and response system must be done with a strong emphasis on transparency, accountability, and ongoing evaluation to ensure the model's accuracy and fairness in serving the diverse communities of Bangladesh.

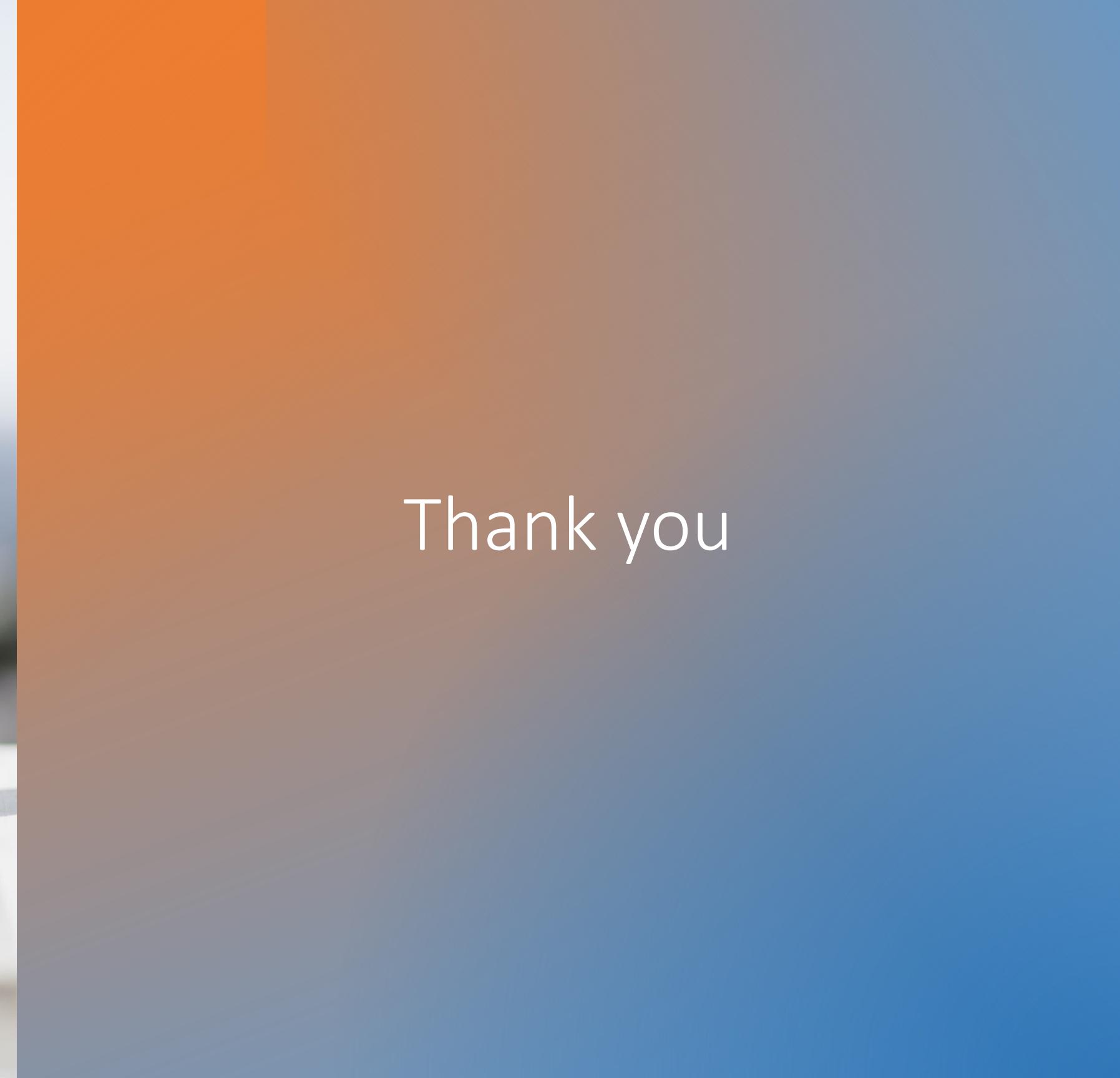
Conclusion: A Holistic Approach for Flood Resilience

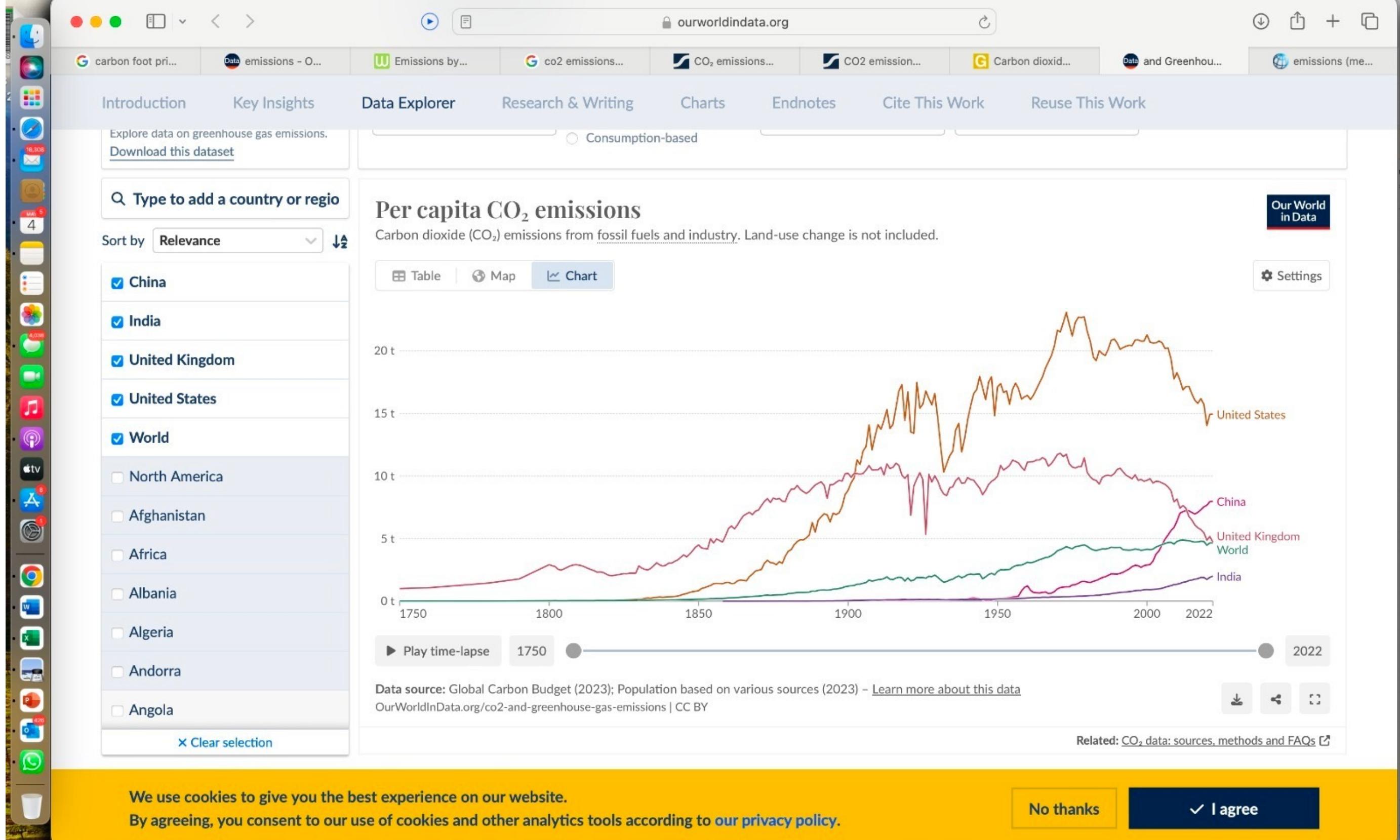
Key Achievements

- Developed a comprehensive flood monitoring system that combines satellite imagery analysis and social media sentiment analysis
- Achieved high accuracy in detecting water clogs and classifying flood severity and social media sentiment
- Created a prioritized disaster response framework to help allocate resources effectively

Future Directions

- Expand satellite imagery coverage and processing capabilities to monitor floods in larger geographical areas
- Enhance social media analysis techniques to better capture the evolving needs and concerns of affected communities
- Foster cross-regional collaborations to create a globally coordinated flood resilience network





So my concept is - UK achieved its peak carbon emissions around 1916 stayed same for six decades until 1973 to start reducing and now it is at 4.7. USA peaked around 1973 and gradually reduced it to 15 now. China is at 8 and India is at 2 now (in 2022).

can we build models to understand when China and India will peak and start reducing its carbon emissions? Does it make sense to you?
lemme know once you wake up.