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Week 3

W3 Lesson 1:

How text data can help guide disaster response

DeepLearning.AI

AI and Disaster Management

Welcome to Week 3

Project scenario

Konbit Sante
CAP-HAITIEN HEALTH PARTNERSHIP

THE LAMBI FUND OF HAITI

UNITED NATIONS

COMITE INTERNATIONAL GENEVE

FAS Fondation Aquin Solidarité

fokal

Text message analysis

Please we need help, food and toiletries.

2010-01-18

What to do if you have influenza?

2010-03-16

Are schools closed?

2010-05-16

Fire at the Perpetuel Secours Church.

2010-01-20

I need information about Port-au-Prince.

2010-04-03

Mission 4636 Report

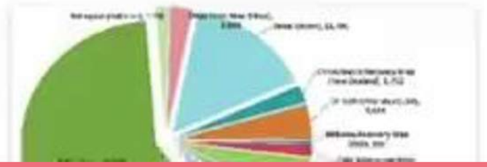
The full report about Mission 4636 is "Crowdsourcing and the crisis-affected community", published by the *Journal of Information Retrieval*. It is the only comprehensive report on the crowdsourced response to Haiti that has passed blind peer review, and the only to focus on the role of the Haitian population, both in and outside of Haiti. It is considered the canonical account, now taught in Disaster Management schools.

Update, 2013: More than two years since we wrote the article, it has gone into print! It was worth the wait: it is right that the first blind peer-reviewed journal article about humanitarian crowdsourcing, in any context, takes the perspective of the crisis-affected population. We are also grateful that the first major journal to have a special issue on crowdsourcing thought it appropriate to review and accept a paper on technology for good. The paper is:

> Munro, Robert. 2013. Crowdsourcing and the Crisis-Affected Community: lessons learned and looking forward from Mission 4636. *Journal of Information Retrieval*. Volume 16, Issue 2, pp 210-266

This page is to accompany this first full report about Mission 4636. It was the first time that crowdsourcing had been used for disaster response, and is still the largest deployment of its kind to date.

Just over two years ago, Haiti was hit by one of the worst natural disasters in living memory. Despite the scale of the earthquake, most of the communication infrastructure remained intact. The Haitian community came together via radio and sms to share information about the quickly changing conditions: the locations of operational clinics and hospitals, information about missing people, the status of the international relief efforts that were arriving in the country.



Most of the international relief workers arriving in the country did not speak Haitian Kreyol or know the geography of Haiti. I had the privilege to support an effort to bridge the gap between the Haitian community and the international

ABOUT MISSION 4636

- Mission 4636
- Mission 4636 Report
- The Process
- Access to data
- Collaborating organizations and history
- Blog

RECENT ENTRIES

- Mission4636 at Relief 2.0 in Haiti
- Were you a 4636 volunteer?
- Successful training in Mirebalais
- The heart and soul of 4636
- Some positive feedback

DeepLearning.AI

AI and Disaster Management

Haiti Earthquake (2010)

The Haiti earthquake

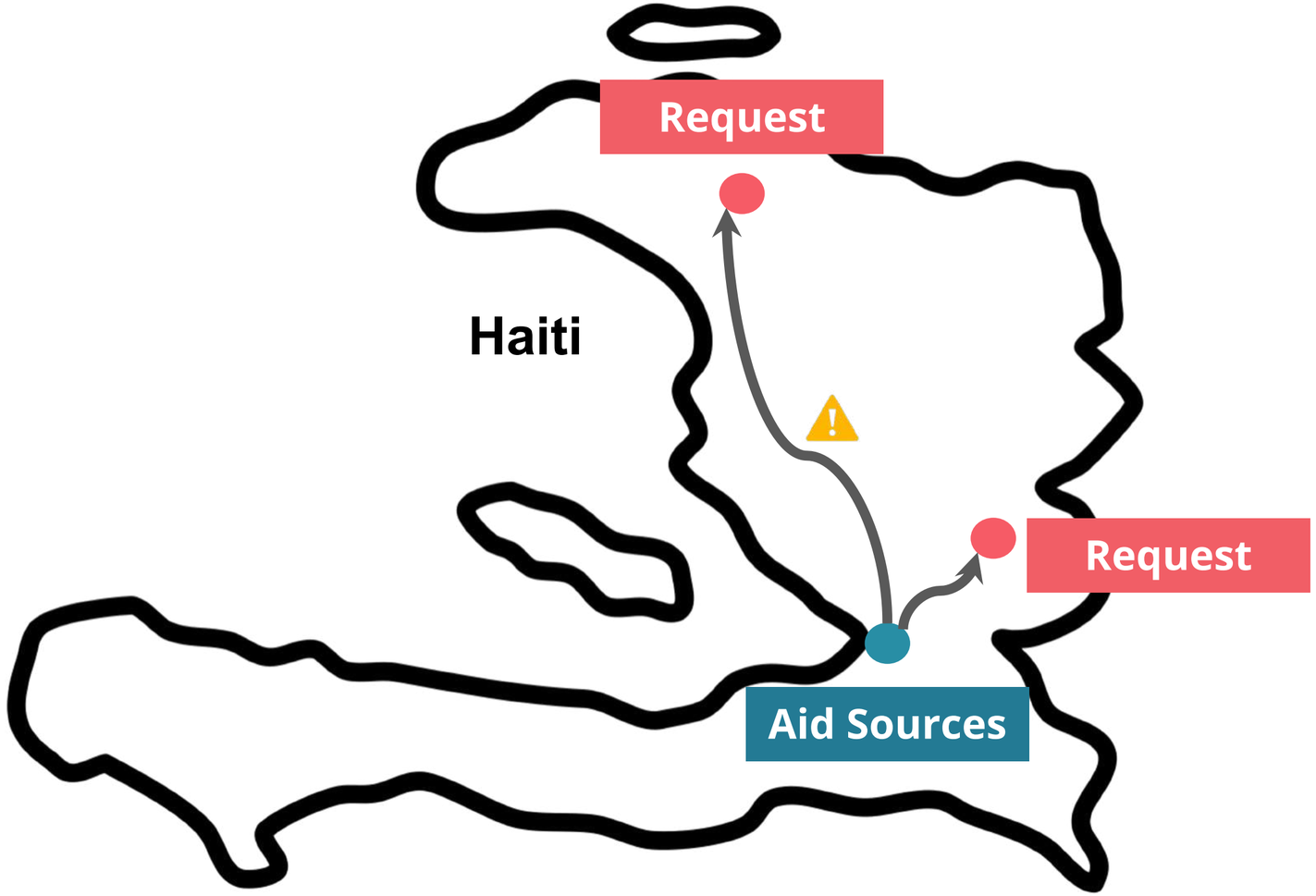
January 12, 2010

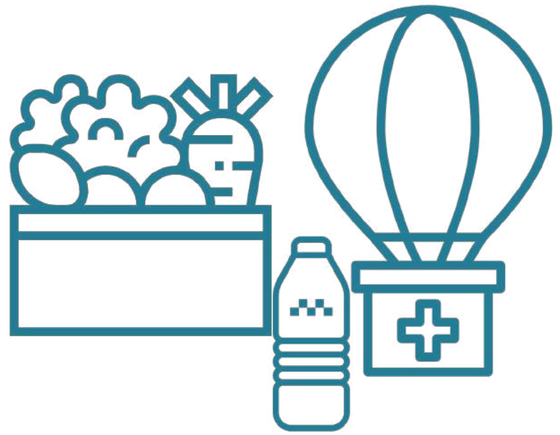
7.0
Magnitude

100,000+
deaths

Location map of North America by Uwe Dedering, and Haiti map adapted from CIA. Both distributed under CC BY-SA 3.0

Massive Logistics Problem





Coordinate response teams and aid

Infrastructure

Most **cell towers remained functional**, while most local services failed

Mission 4636

Input → **Output**

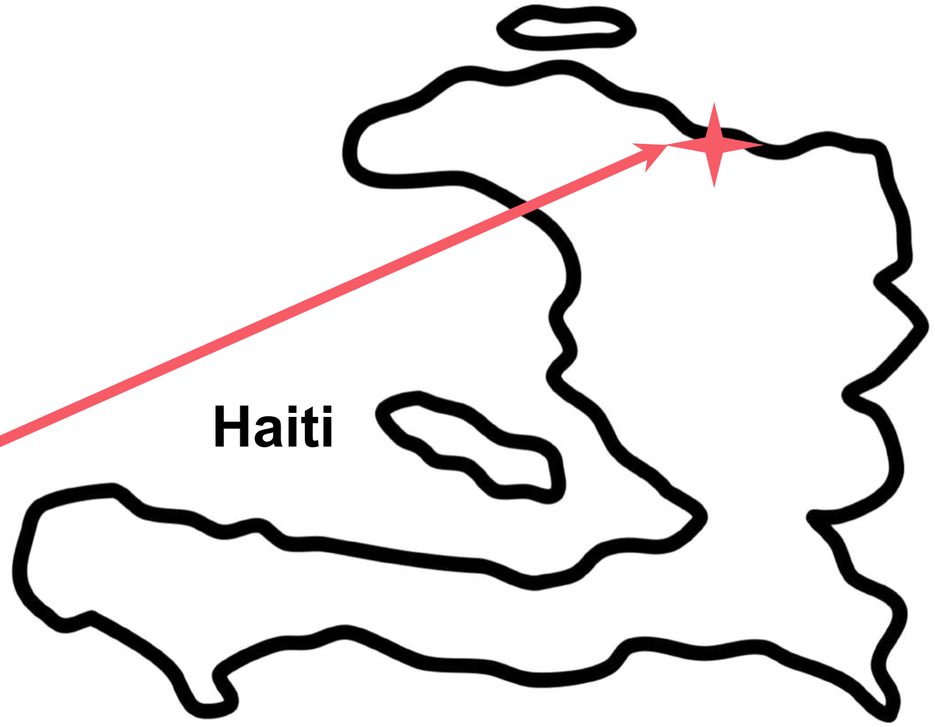
Messages in Haitian Kreyol	Translation	Category	Location
Fanm gen tranche pou fè yon pitit nan Delmas 31	Woman in labor having a child at Delmas 31	Medical Emergency	18.561, -72.305
Comment nou ka jwen dlo ak manje nan font 43 cite tinante	How can we get water and food in Fontamara 43 cite Tinante?	Aid Related	18.525, -72.371
ESKE apre midi a tranbleman ap pase f vre yo di se satelit ki bay yon ti limye svp	Will there be another earthquake this afternoon?	Information	None

Requests mainly in Haitian Kreyol

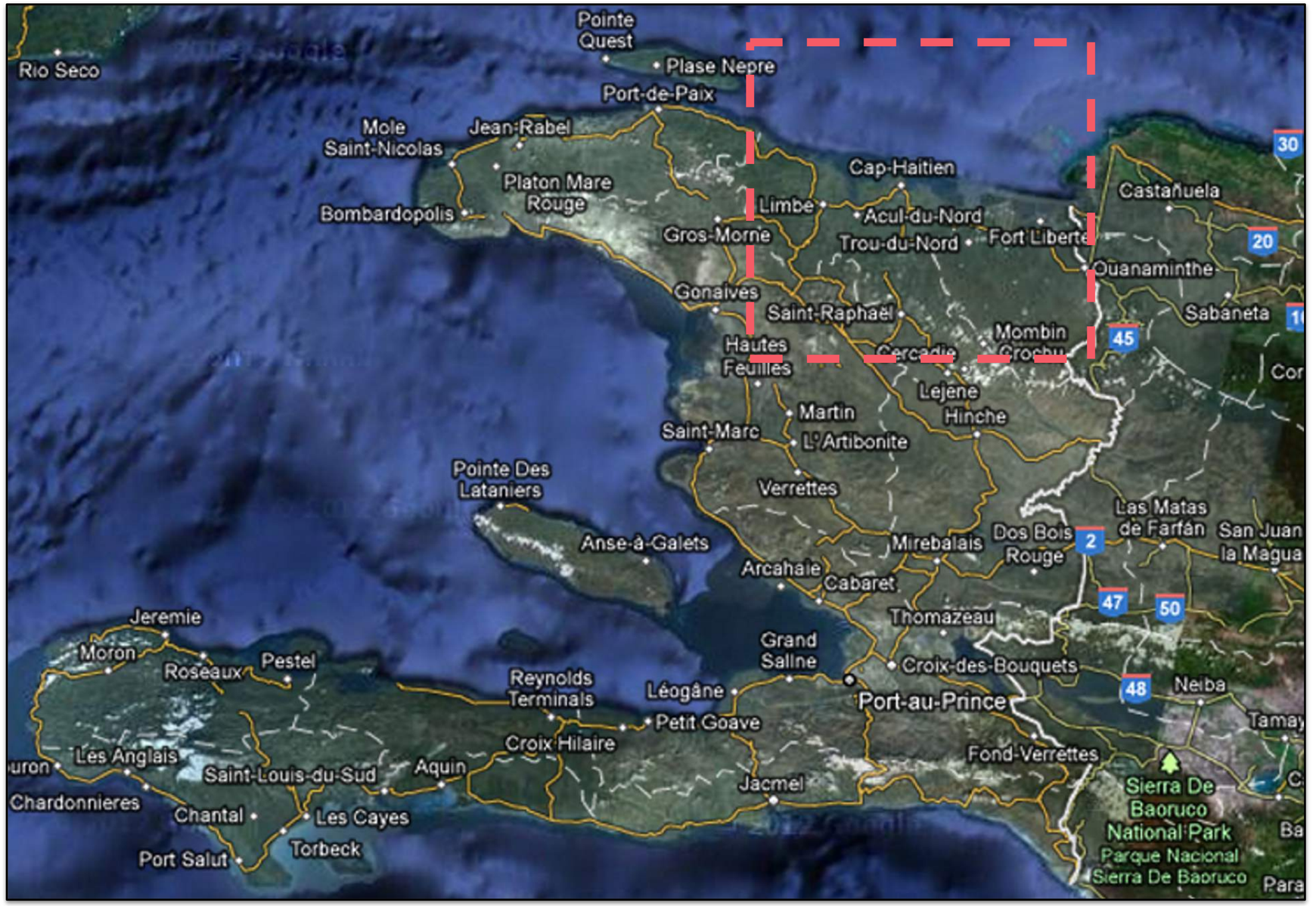
Original → **Translation**

Lopital Sacre-Coeur ki nan vil Okap, pre pou li resevwa moun malad e lap mande pou moun ki malad yo ale la.

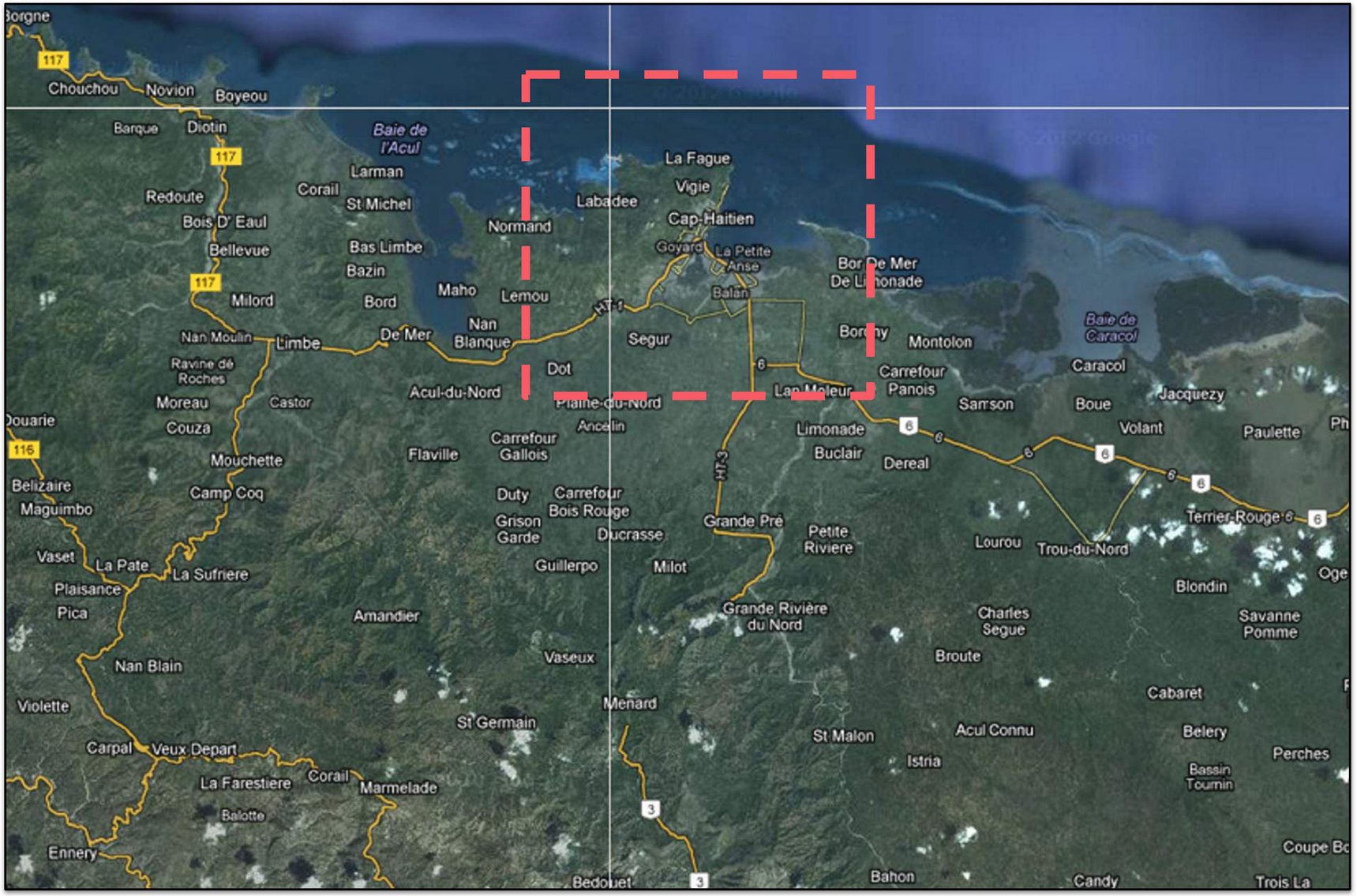
"**Sacre-Coeur Hospital** which located in this village of **Okap** is ready to receive those who are injured. Therefore, we are asking those who are sick to report to that hospital."



“**Sacre-Coeur Hospital** which located in this village of **Okap** is ready to receive those who are injured. Therefore, we are asking those who are sick to report to that hospital.”



“**Sacre-Coeur Hospital** which located in this village of **Okap** is ready to receive those who are injured. Therefore, we are asking those who are sick to report to that hospital.”



“**Sacre-Coeur Hospital** which located in this village of **Okap** is ready to receive those who are injured. Therefore, we are asking those who are sick to report to that hospital.”

Haiti 4636
volunteers

rmunro / disaster_response_messages Public

Watch 1 Fork 0 Star 0

Code Issues Pull requests Actions Projects Security Insights

main 1 branch 0 tags Go to file Add file Code

rmunro Minor edit 1657e1c on Nov 11, 2021 18 commits

LICENSE	Added data files and license	2 years ago
README.md	Minor edit	2 years ago
disaster_response_test.csv	Added data files and license	2 years ago
disaster_response_training.csv	Added data files and license	2 years ago
disaster_response_validation.csv	Added data files and license	2 years ago

README.md

Disaster Response Messages

Summary

This dataset contains 25,000 messages drawn from events including an earthquake in Haiti in 2010, floods in Pakistan in 2010, Hurricane Sandy in the USA in 2012, and news articles spanning a large number of years and 100s of different disasters. The data has been encoded with 38 different categories related to disaster response and has been stripped of messages with sensitive information.

This dataset is released under creative commons attribution license (see below). Please cite:

Robert Munro. 2012. Processing short message communications in low-resource languages. [PhD dissertation, Stanford University]. *Stanford Digital Repository*. Retrieved from https://purl.stanford.edu/cg721hb0673

About

This dataset contains 25,000 messages drawn from events including an earthquake in Haiti in 2010, floods in Pakistan in 2010, super-storm Sandy in the U.S.A. in 2012, and news articles spanning a large number of years and 100s of different disasters. The data has been encoded with 38 different categories related to disaster response and has been...

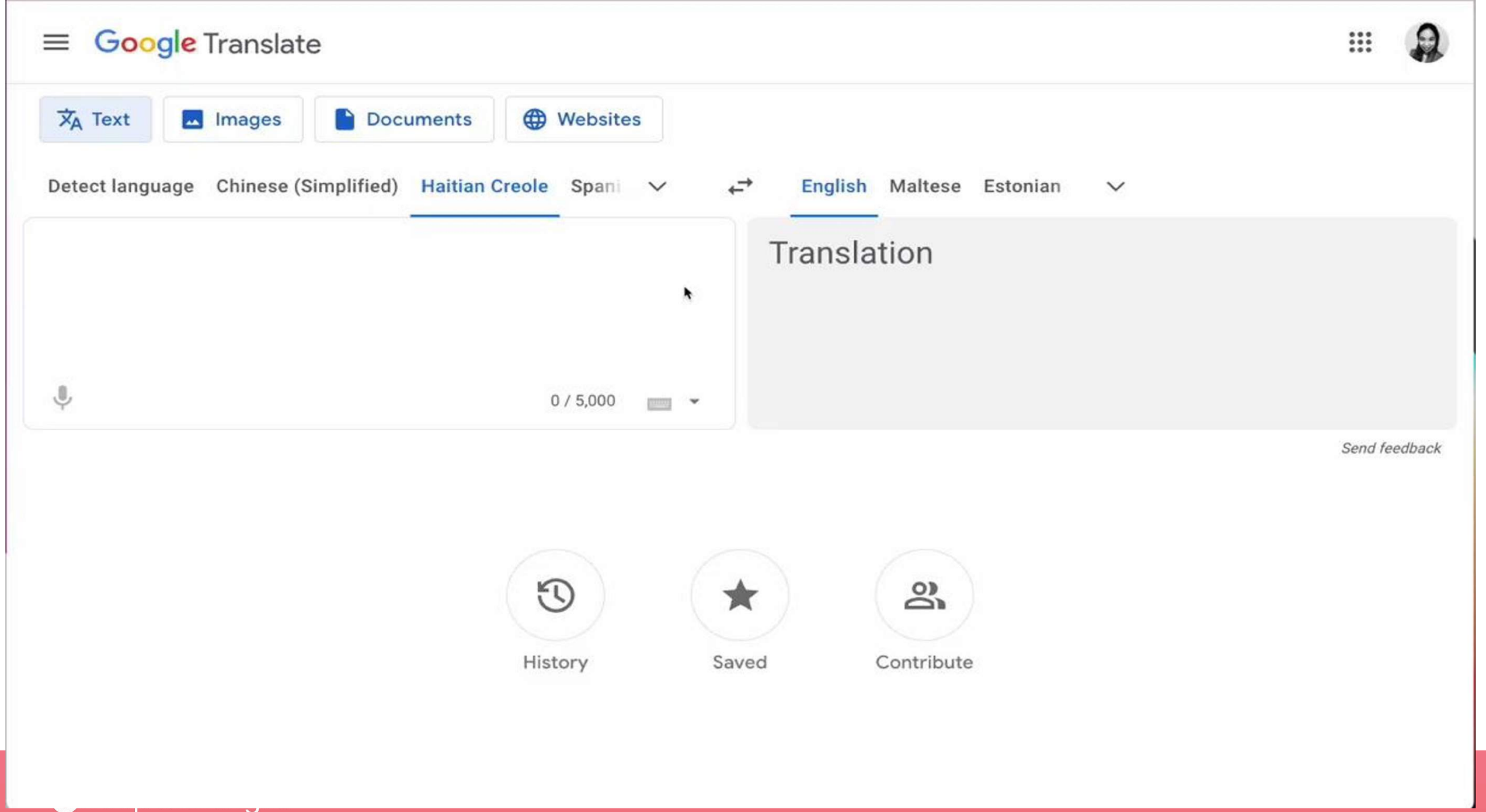
Readme
CC-BY-4.0 license
Activity
0 stars
1 watching
0 forks
Report repository

Releases

No releases published

Packages

No packages published

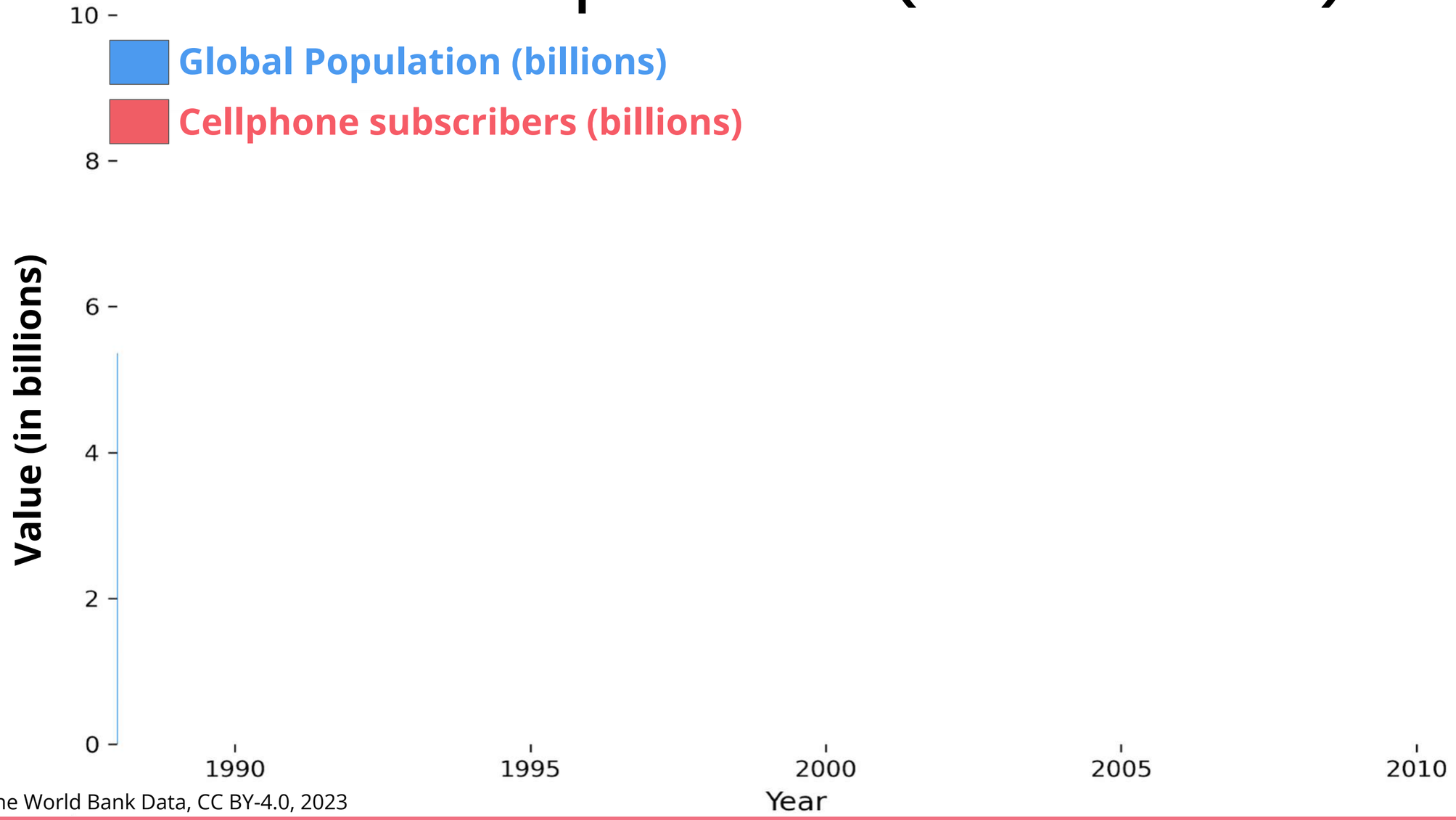

Google Translate
Text
Images
Documents
Websites
Detect language
Chinese (Simplified)
Haitian Creole
Spani
English
Maltese
Estonian
Translation
0 / 5,000
Send feedback
History
Saved
Contribute

DeepLearning.AI

AI and Disaster Management

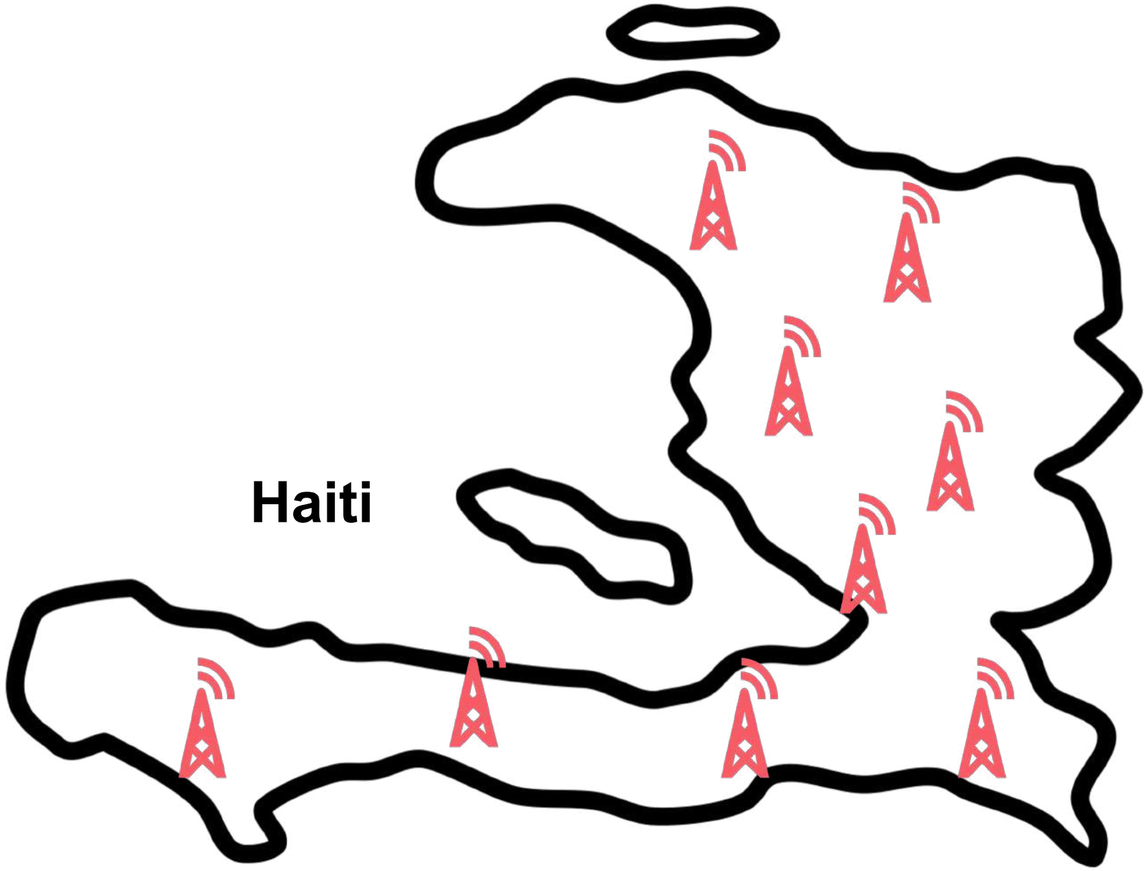
Topic Modeling
Explore Phase

Evolution of cell phones (worldwide)

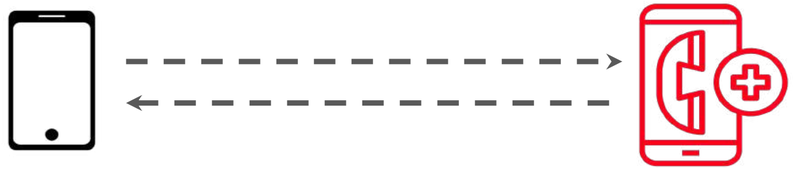


Data from The World Bank Data, CC BY-4.0, 2023

Digital Communications



Cell towers remained functional

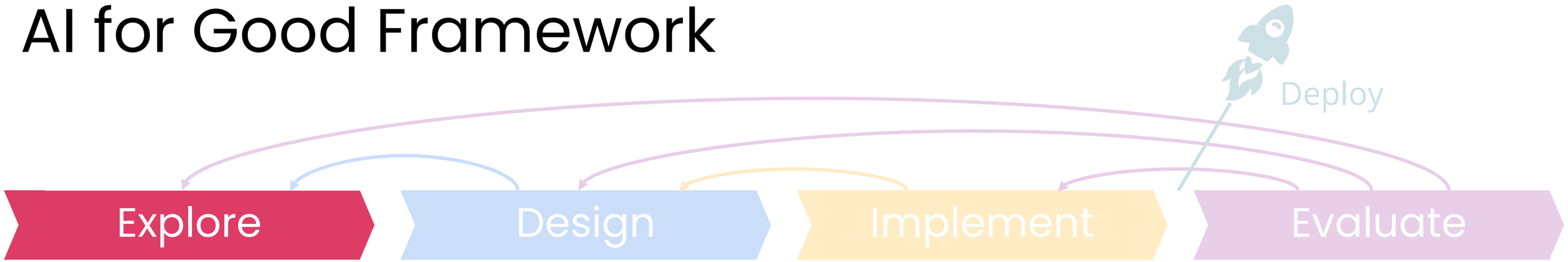


Digital communications would be primary source of communication

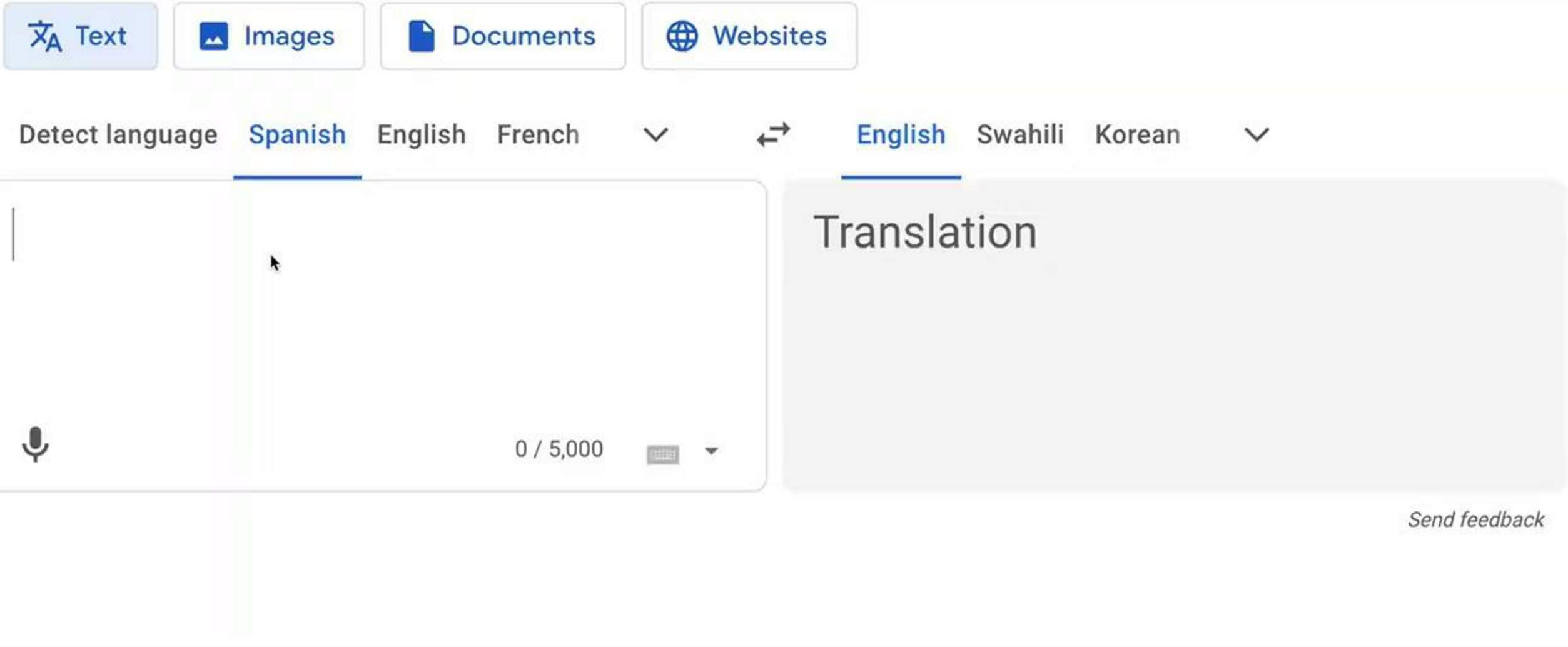
AI for Good Framework

1. Engage stakeholders
2. Define the problem
3. Determine if AI could help

AI for Good Framework



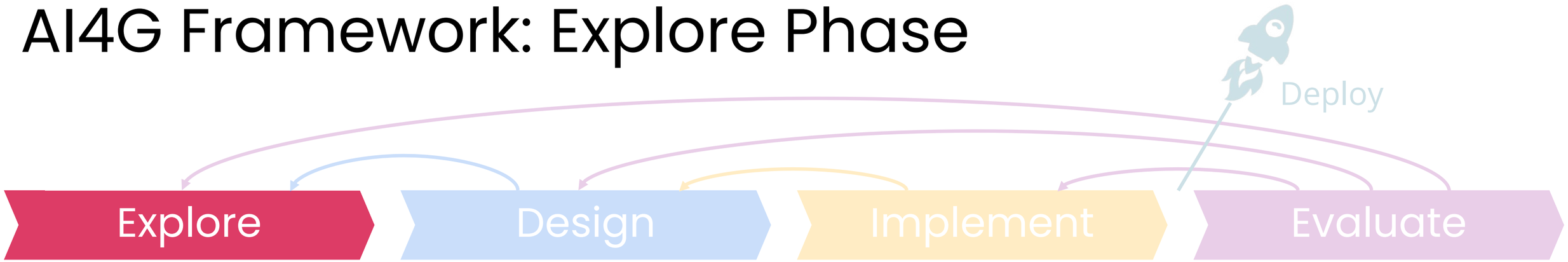
1. Engage stakeholders
2. Define the problem
3. Determine if AI could add value


Text
Images
Documents
Websites
Detect language
Spanish
English
French
English
Swahili
Korean
0 / 5,000
Translation
Send feedback

0:00

Community
Other Involved Parties
Relief Organizations
Communications Companies

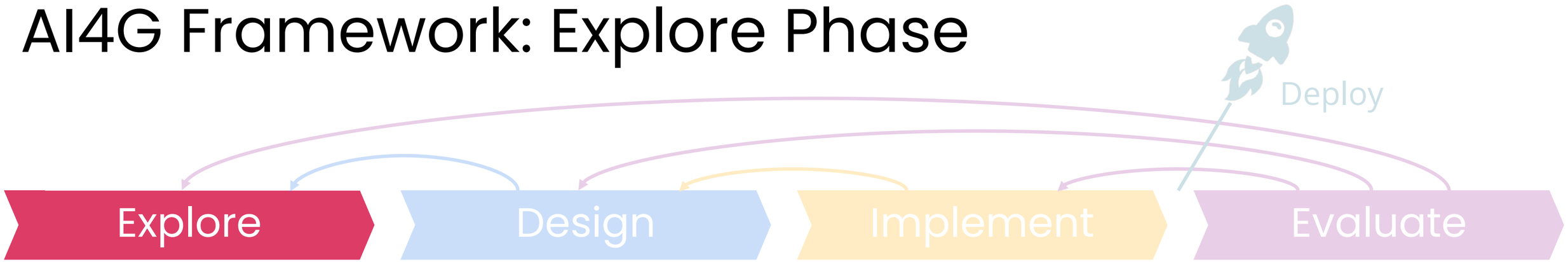
AI4G Framework: Explore Phase



1. Engage stakeholders
2. Define the problem
3. Determine if AI could add value

"People in impacted communities and aid organizations want to understand how **requests for aid change over time** following a sudden onset disaster, in order to better plan for future disasters anywhere in the world."

AI4G Framework: Explore Phase



1. Engage stakeholders
2. Define the problem
3. Determine if AI could add value

DeepLearning.AI

AI and Disaster Management

Topic Modeling
Explore the Data

DeepLearning.AI

AI and Disaster Management

Topic Modeling
Visualize the Data

DeepLearning.AI

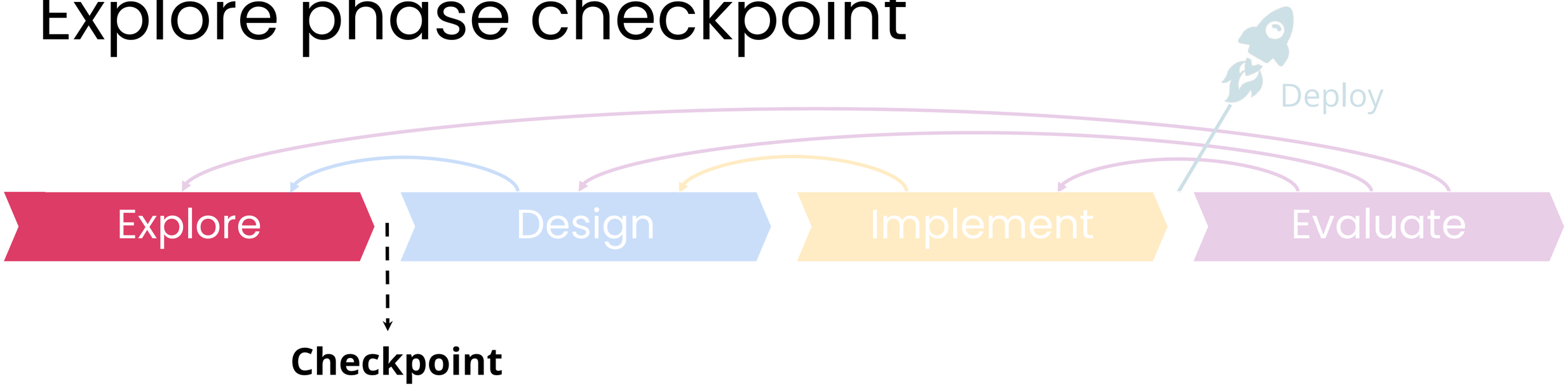
AI and Disaster Management

Topic Modeling
Explore Phase Checkpoint

AI for Good Framework

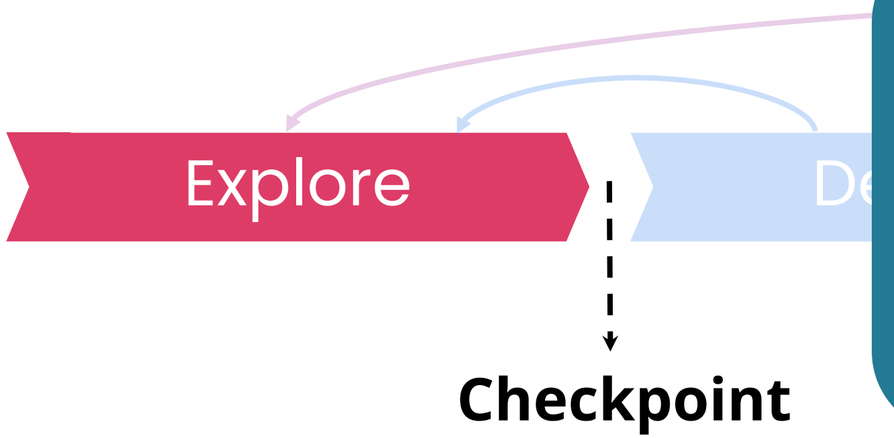
1. Engage stakeholders
2. Define the problem
3. Determine if AI could help

Explore phase checkpoint



- What is the specific problem you are addressing?
- Who are the stakeholders?
- Do you have access to or can you collect the necessary data?
- Could AI add value? Where and how specifically?
- How does the “do no harm” principle come into play?

Explore phase checkpoint



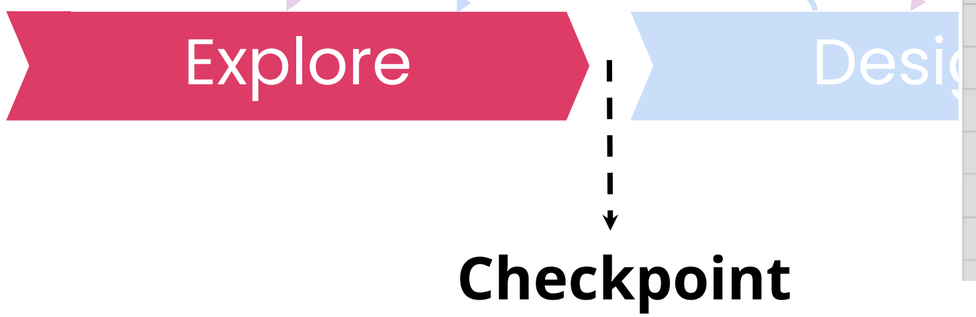
"People in impacted communities and aid organizations want to understand how **requests for aid change over time** following a sudden onset disaster, in order to better plan for future disasters anywhere in the world."

- What is the specific problem you are addressing? ✓
- Who are the stakeholders?
- Do you have access to or can you collect the necessary data?
- Could AI add any value? Where?
- How does the "do no harm" principle come into play?

Explore phase checkpoint

- What is the specific problem you are addressing? ✓
- Who are the stakeholders? ✓
- Do you have access to or can you collect the necessary data?
- Could AI add any value? Where?
- How does the “do no harm” principle come into play?

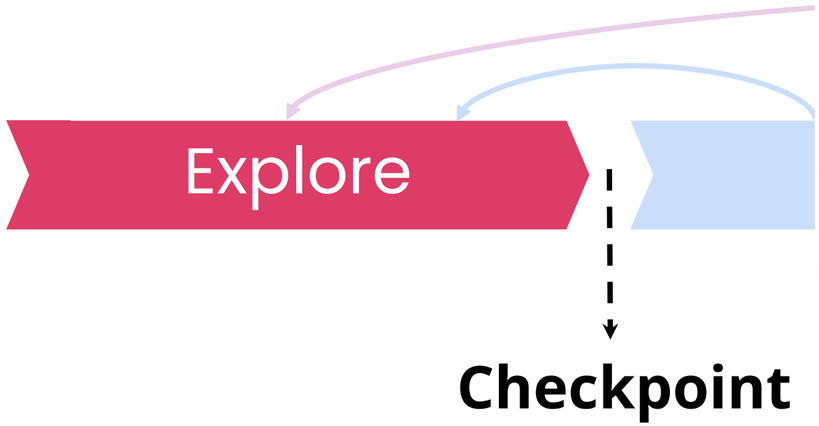
Explore phase checkpoint

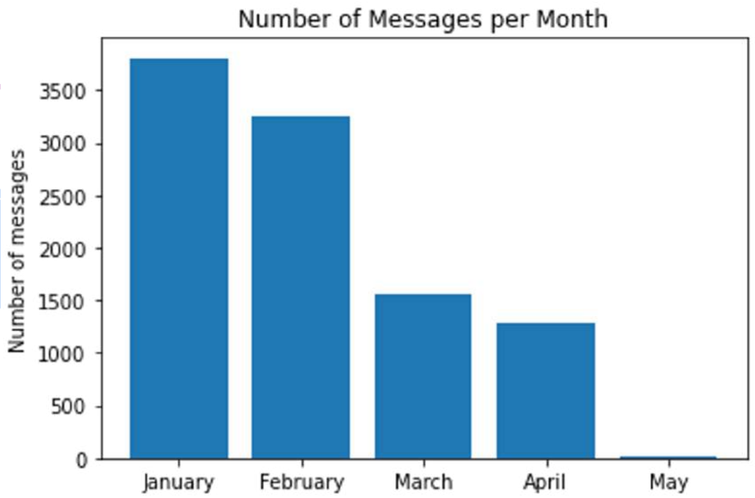


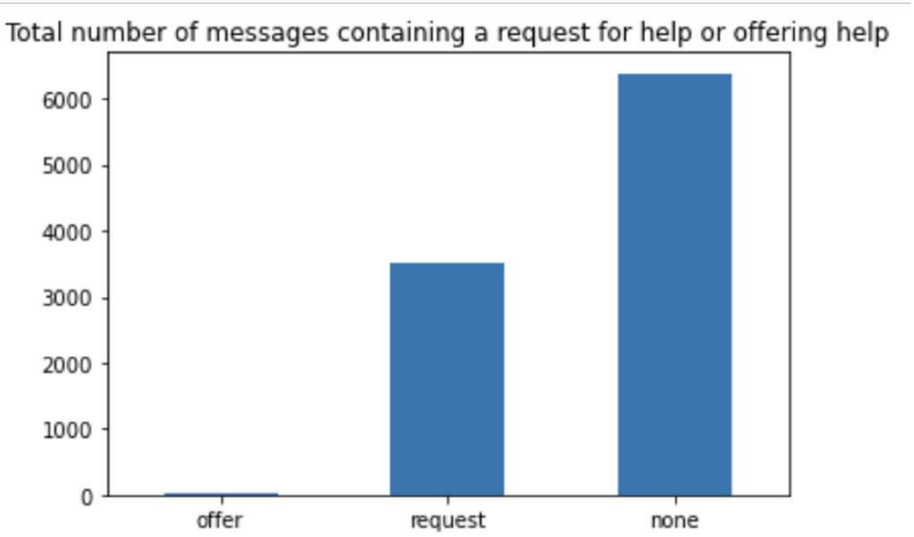
id	split	message
2	train	Weather update - a cold front from Cuba that could pass over Haiti
7	train	Is the Hurricane over or is it not over
12	train	says: west side of Haiti, rest of the country today and tonight
14	train	Information about the National Palace-
15	train	Storm at sacred heart of jesus
16	train	Please, we need tents and water. We are in Silo, Thank you!
17	train	I would like to receive the messages, thank you
20	train	There's nothing to eat and water, we starving and thirsty.
21	train	I am in Petionville. I need more information regarding 4636

- What is the specific problem you are addressing? ✓
- Who are the stakeholders? ✓
- Do you have access to or can you collect the necessary data? ✓
- Could AI add any value? Where?
- How does the “do no harm” principle come into play?

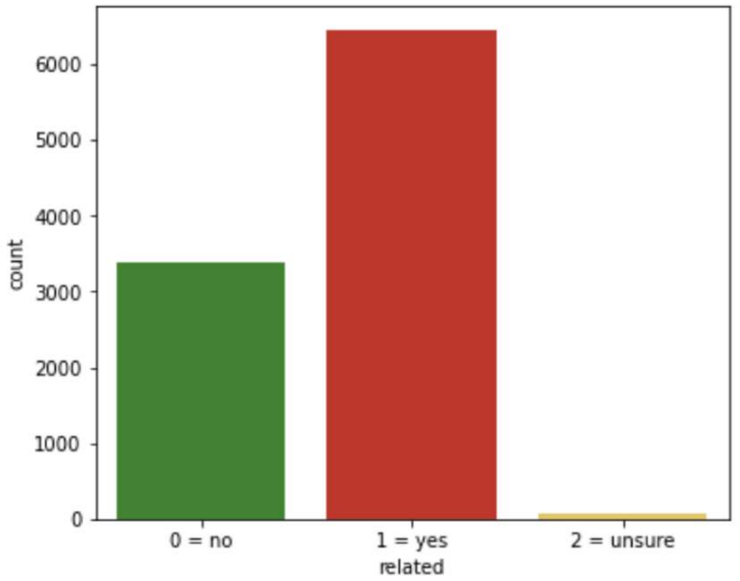
Explore phase checkpoint



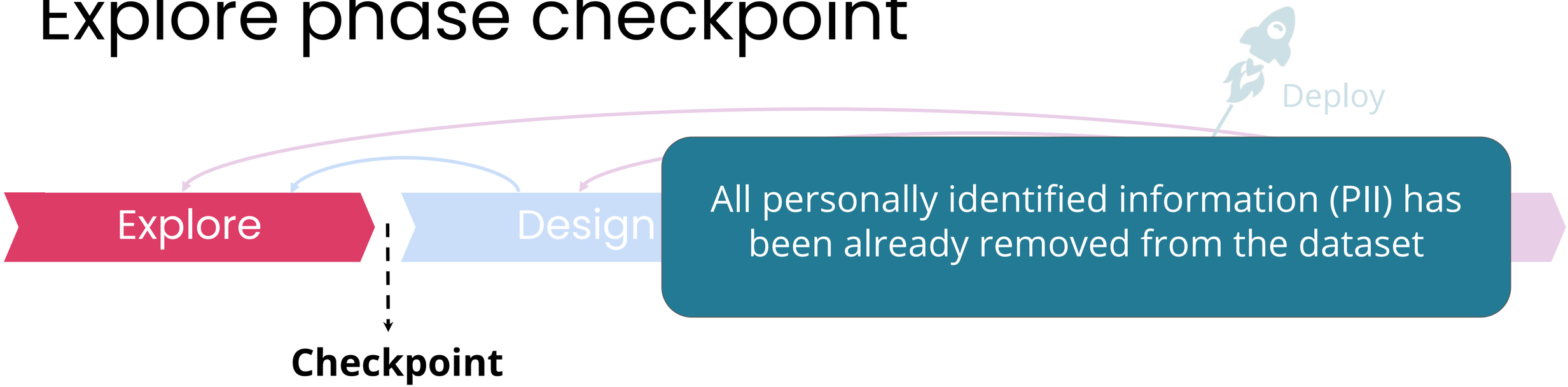




- What is the specific problem you are addressing? ✓
- Who are the stakeholders? ✓
- Do you have access to or can you collect the necessary data? ✓
- Could AI add any value? Where? ✓
- How does the “do no harm” principle come into play?



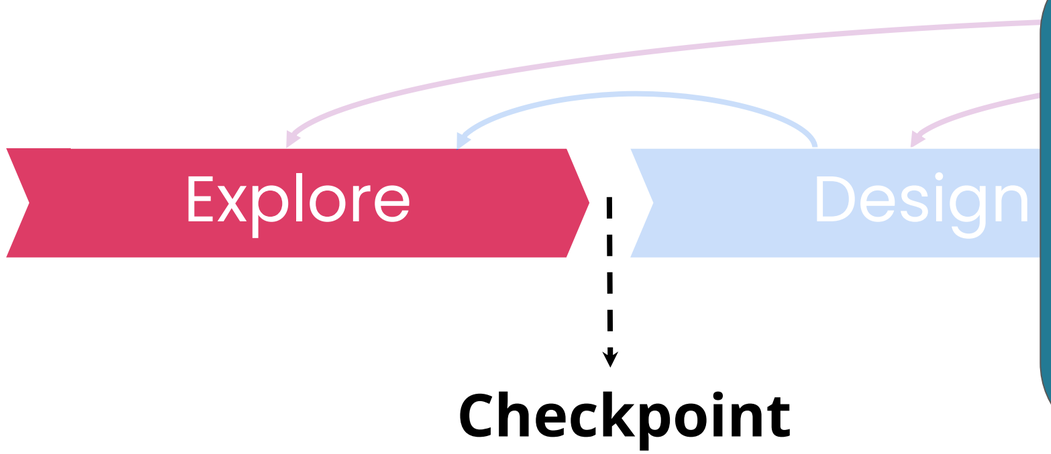
Explore phase checkpoint



Checkpoint

- What is the specific problem you are addressing? ✓
- Who are the stakeholders? ✓
- Do you have access to or can you collect the necessary data? ✓
- Could AI add any value? Where? ✓
- How does the “do no harm” principle come into play?

Explore phase checkpoint



Consider **unique elements and challenges** related to Haiti and this specific disaster in 2010 and how they might fail to address or even exacerbate problems in new disaster scenarios

- What is the specific problem you are addressing? ✓
- Who are the stakeholders? ✓
- Do you have access to or can you collect the necessary data? ✓
- Could AI add any value? Where? ✓
- How does the “do no harm” principle come into play? ✓

W2 Lesson 2:

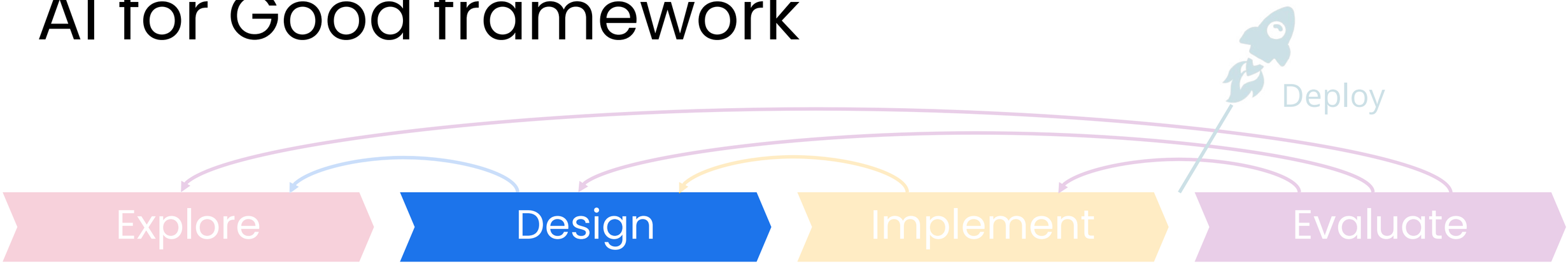
Processing text data

DeepLearning.AI

AI and Disaster Management

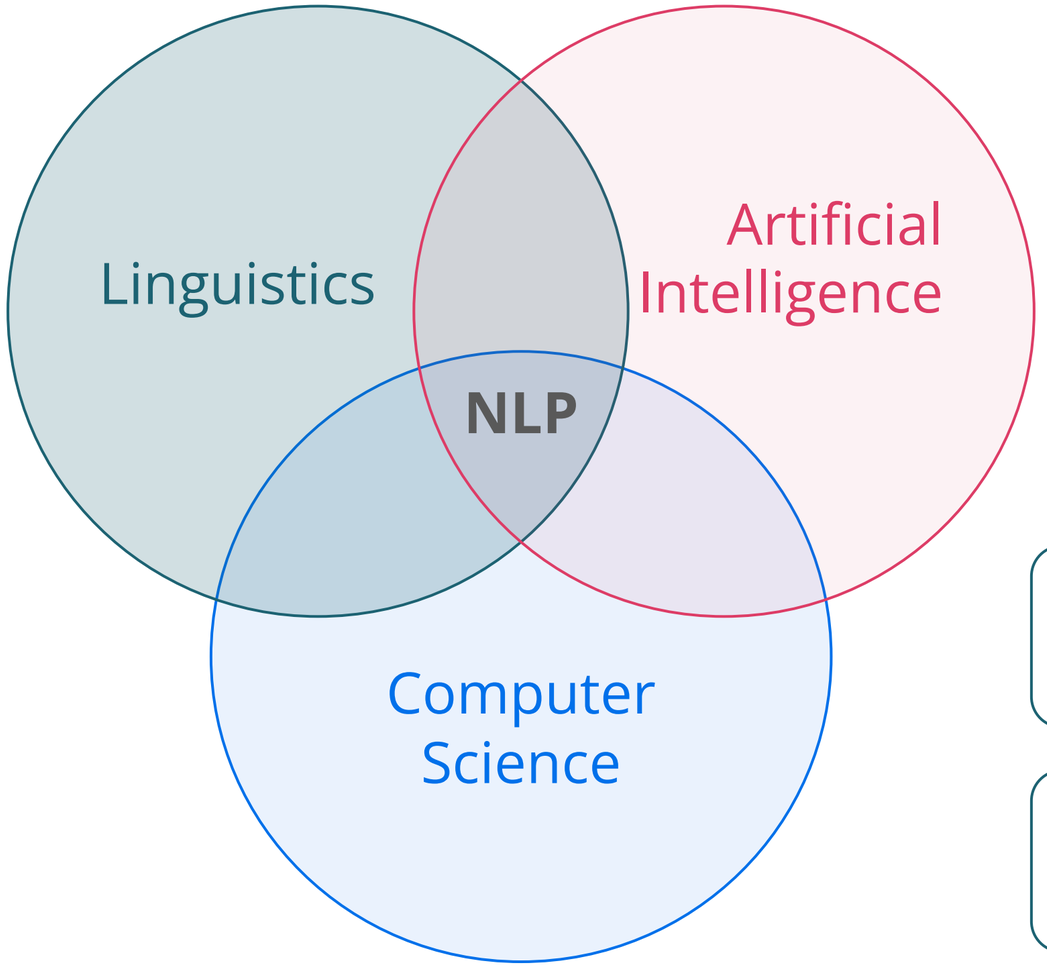
Processing Text Data

AI for Good framework



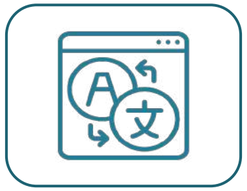
1. Prototype your solution
2. Ensure data privacy
3. Design the user experience

Natural Language Processing (NLP)



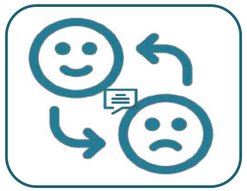
Text data with NLP

Combines **linguistics** with **artificial intelligence** and **computer science**



Machine Translation

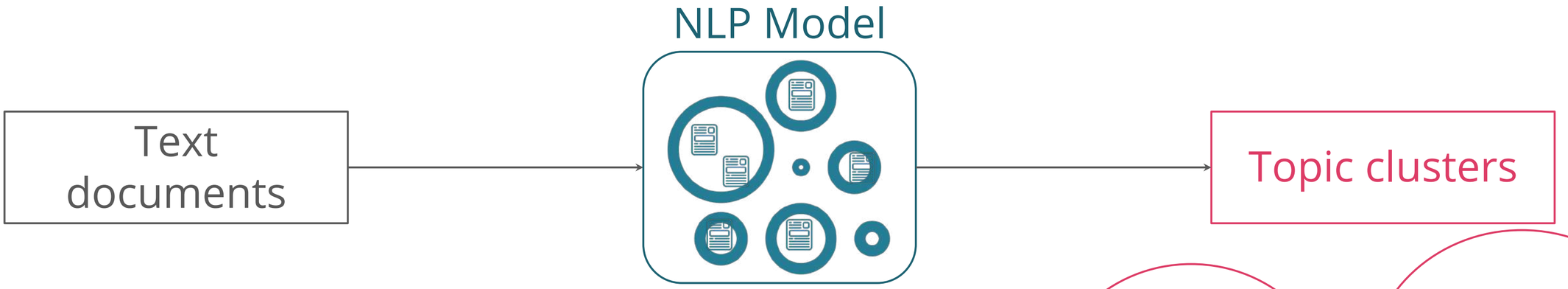
Generation



Sentiment Analysis

Summarization

Topic modeling



"The Hubble space telescope is currently …"

"The new pizza place you must visit in …"

"The US delegation for the olympics is still …"

You don't need to know the topics beforehand

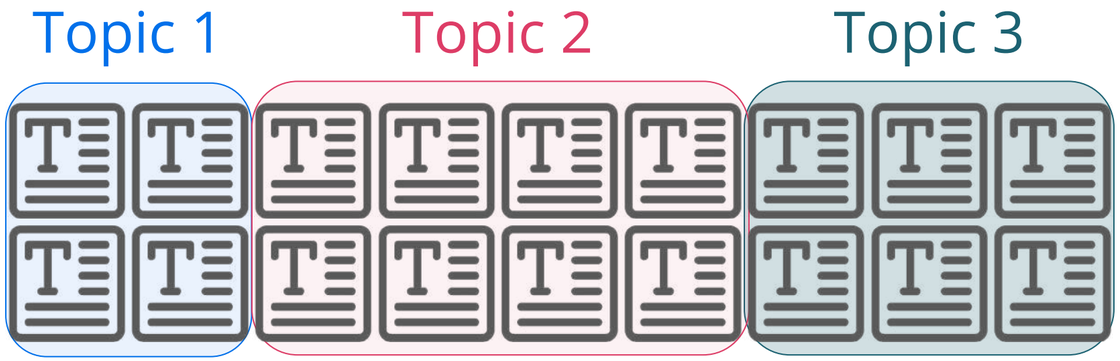
"The new pizza place you must visit in …"

"The Hubble space telescope is currently …"

"The US delegation for the olympics is still …"

Topic modeling

Documents
(Messages)



“Please bring everything. We do not have any food, clothes, water”

“THE LOCAL INHABITANTS NEEDING FOOD AND SHELTER”

“we need help please. Food, medicine and water.”

Separate words

Input sentences

“Please bring everything. We do not have any food, clothes, water”

“THE LOCAL INHABITANTS NEEDING FOOD AND SHELTER”

“we need help please. Food, medicine and water.”

Separate Words

[“Please”, “bring”, “everything”, “.”, “We”, “do”, “not”, “have”, “any”, “food”, “clothes”, “water”]

[“THE”, “LOCAL”, “INHABITANTS”, “NEEDING”, “FOOD”, “AND”, “SHELTER”]

[“we”, “need”, “help”, “please”, “.”, “Food”, “,”, “medicine”, “and”, “water”]

Remove punctuation

[“Please”, “bring”, “everything”, “.”, “We”, “do”, “not”, “have”, “any”, “food”, “clothes”, “water”]

[“THE”, “LOCAL”, “INHABITANTS”, “NEEDING”, “FOOD”, “AND”, “SHELTER”]

[“we”, “need”, “help”, “please”, “.”, “Food”, “,”, “medicine”, “and”, “water”]

Remove punctuation

[“Please”, “bring”, “everything”,“We”, “do”, “not”, “have”, “any”, “food”, “clothes”, “water”]

[“THE”, “LOCAL”, “INHABITANTS”, “NEEDING”, “FOOD”, “AND”, “SHELTER”]

[“we”, “need”, “help”, “please”, “Food”, “medicine”, “and”, “water”]

Lowercase

“Please”, “bring”, “everything”, “We”, “do”, “not”, “have”, “any”, “food”, “clothes”, “water”]

[“THE”, “LOCAL”, “INHABITANTS”, “NEEDING”, “FOOD”, “AND”, “SHELTER”]

[“we”, “need”, “help”, “please”, “Food”, “medicine”, “and”, “water”]

Lowercase

“please”, “bring”, “everything”, “we”, “do”, “not”, “have”, “any”, “**food**”, “clothes”, “water”]

[“the”, “local”, “inhabitants”, “needing”, “**food**”, “and”, “shelter”]

[“we”, “need”, “help”, “please”, “**food**”, “medicine”, “and”, “water”]

Remove stop words

[“please”, “bring”, “everything”, “we”, “do”, “not”, “have”, “any”, “food”, “clothes”, “water”]

[“the”, “local”, “inhabitants”, “needing”, “food”, “and”, “shelter”]

[“we”, “need”, “help”, “please”, “food”, “medicine”, “and”, “water”]

Remove stopwords

[“please”, “bring”, “everything”, “food”, “clothes”, “water”]

[“local”, “inhabitants”, “needing”, “food”, “shelter”]

[“need”, “help”, “please”, “food”, “medicine”, “water”]

Lemmatization

[“please”, “bring”, “everything”, “food”, “clothes”, “water”]

[“local”, “inhabitants”, “needing”, “food”, “shelter”]

[“need”, “help”, “please”, “food”, “medicine”, “water”]

Lemmatize

[“please”, “bring”, “everything”, “food”, “clothes”, “water”]

[“local”, “inhabitant”, **“need”**, “food”, “shelter”]

[**“need”**, “help”, “please”, “food”, “medicine”, “water”]

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AI and Disaster Management

Topic Modeling
Process Text Messages

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Topic Modeling
Latent Dirichlet Allocation (LDA)

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Topic Modeling
Analyze Top Trends

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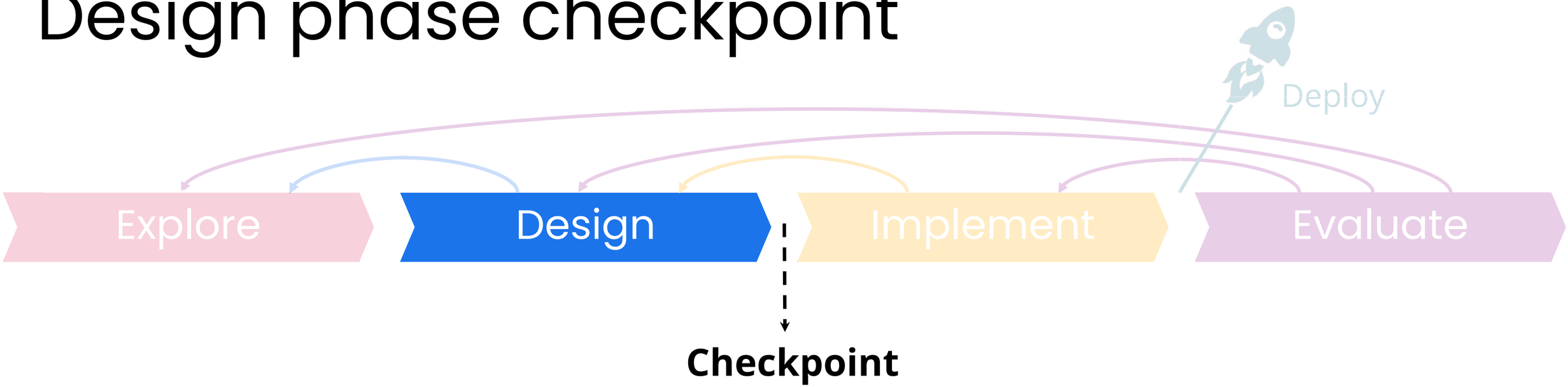
AI and Disaster Management

Topic Modeling
Project Wrap Up

Design phase checkpoint



- How will you address issues with imbalances, biases, privacy, or other concerns with your data?
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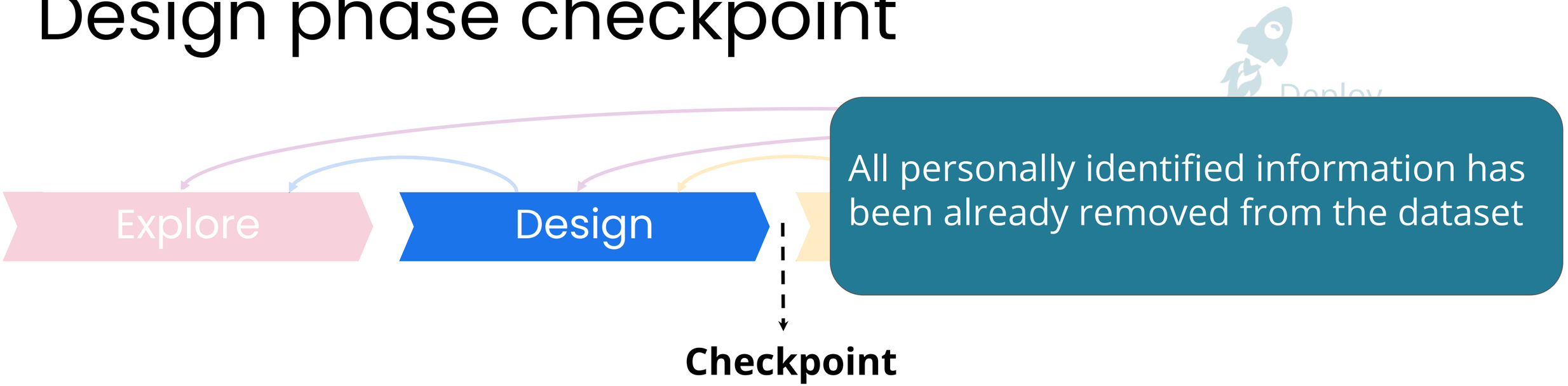
- How will your design address the problem you set out to work on?
- How will the end user interact with your system?

Design phase checkpoint



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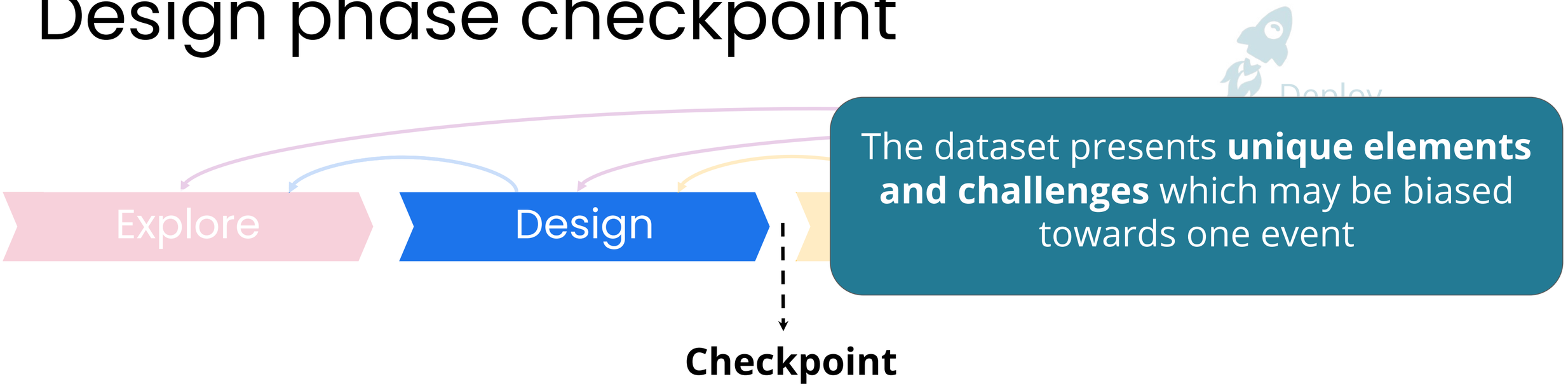

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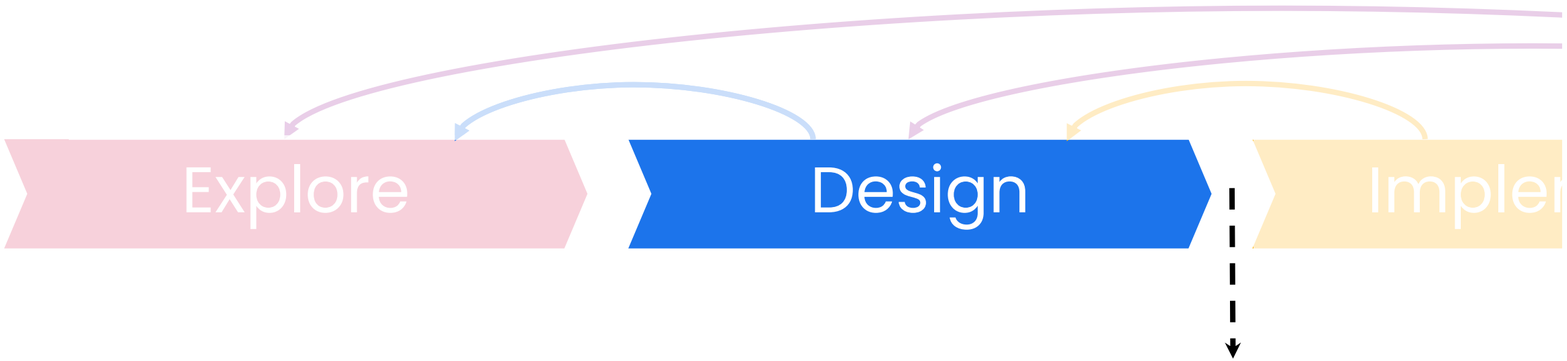
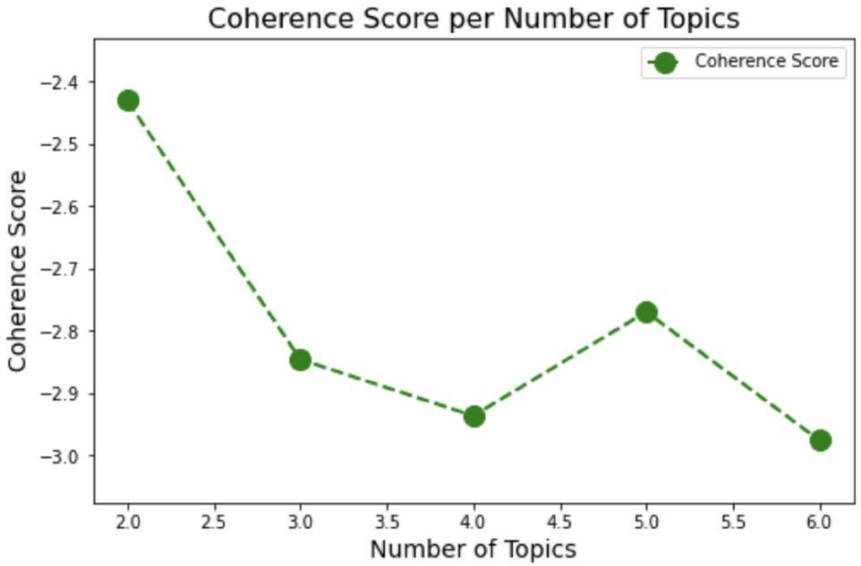


Checkpoint



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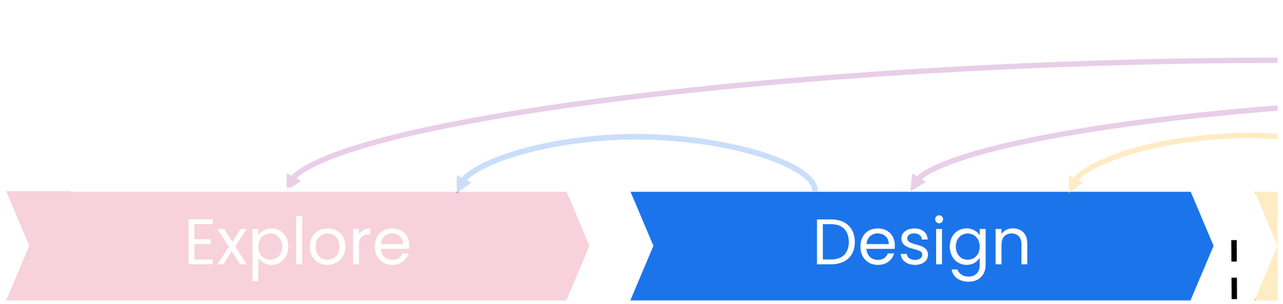

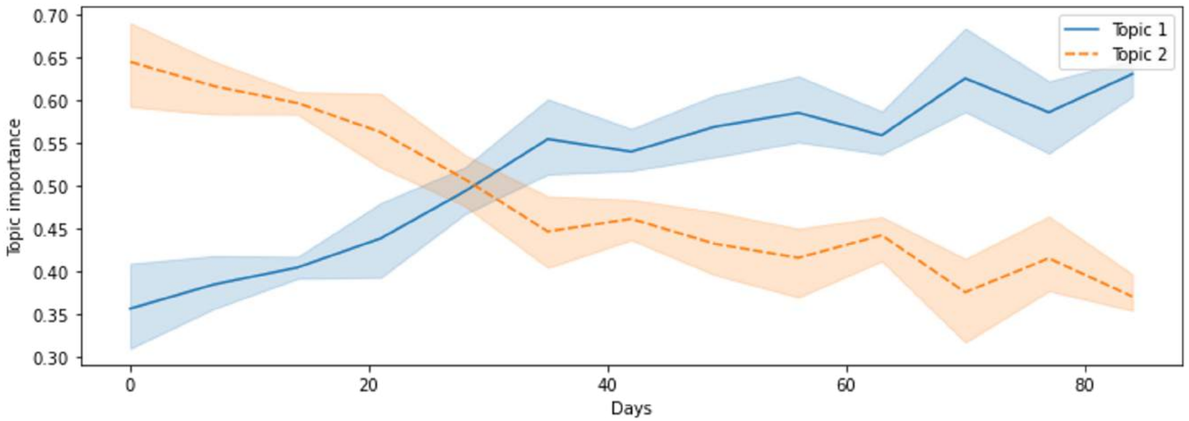

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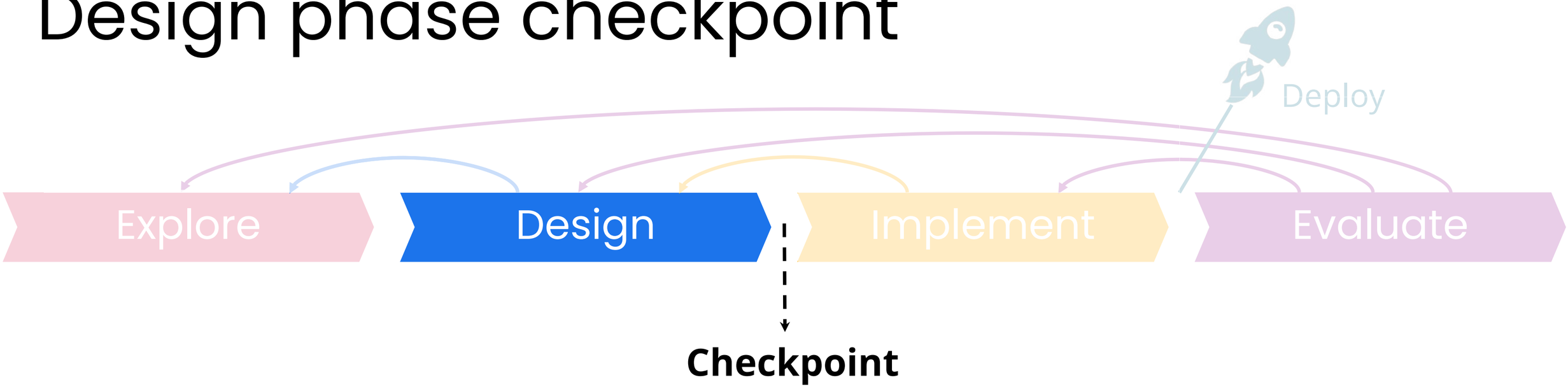

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Implement Phase

1. Productionize AI models
2. Integrate the user experience
3. Test with end users

Evaluate phase

1. Measure project impact
2. Communicate results
3. Determine next steps

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AI and Disaster Management

Week 3 and Course Summary

Mission 4636

“Fanm gen tranche pou fè yon pitit nan Delmas 31”

Medical team to 18.50, 72.32

Message translated, categorized & geolocated

Location is refined & actionable items are identified

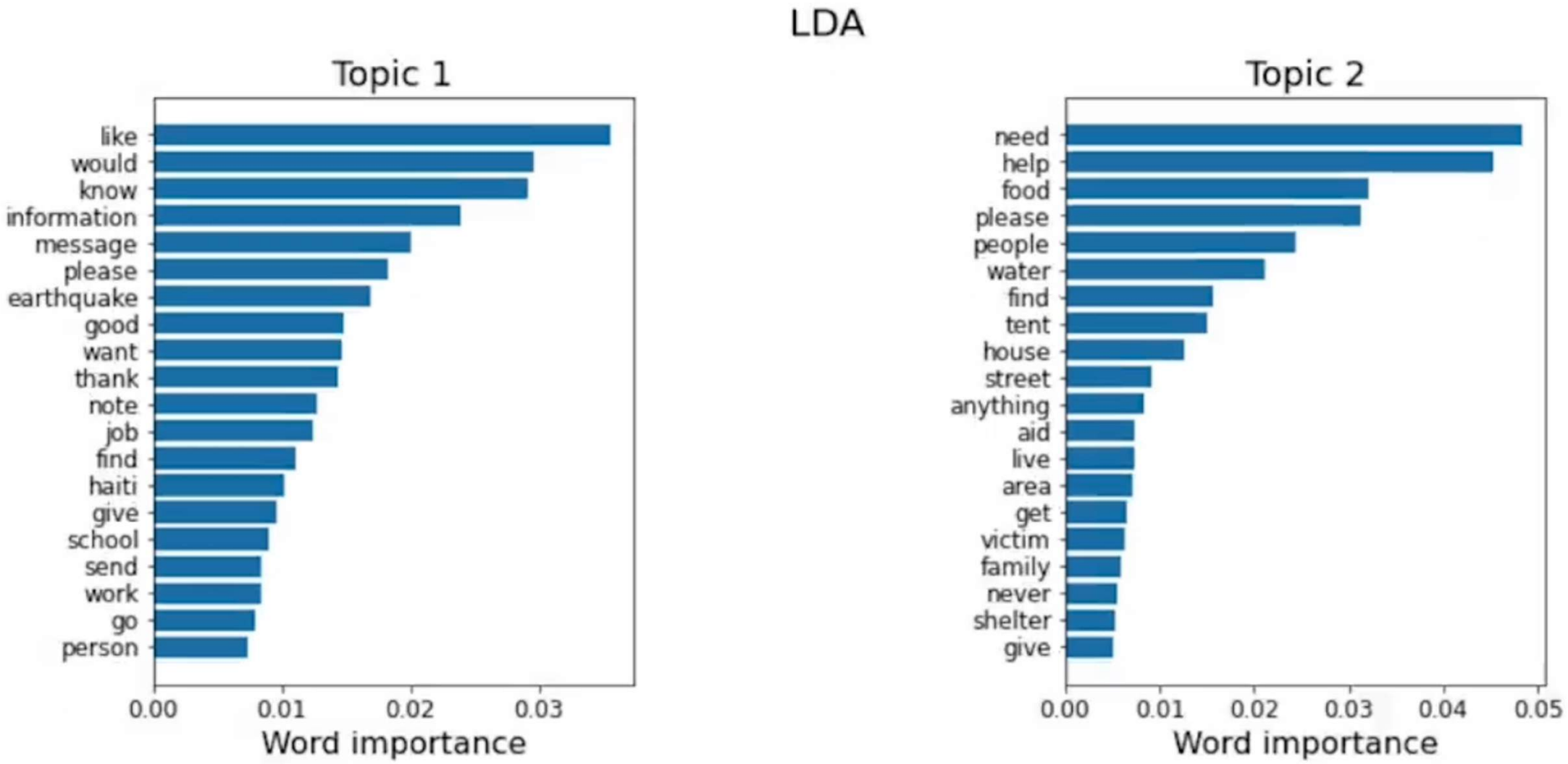
Translation: Woman in labor having a child at Delmas 31

Location: 18.50, 72.32

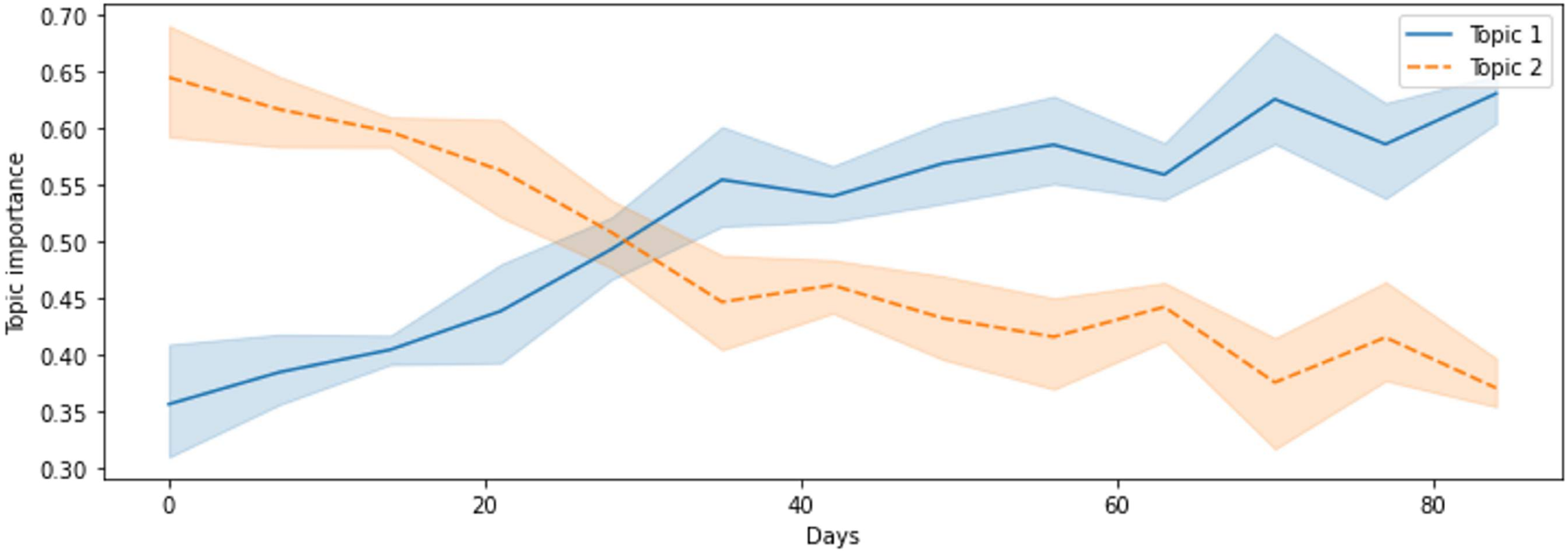
Category: Medical

Emergency

Haiti Earthquake Lab



Haiti Earthquake Lab



Pre-Disaster

Post-Disaster

Disaster Strikes

Preparation

Emergency plans
Training and drills

Response

Search & rescue,
Provide essential aid

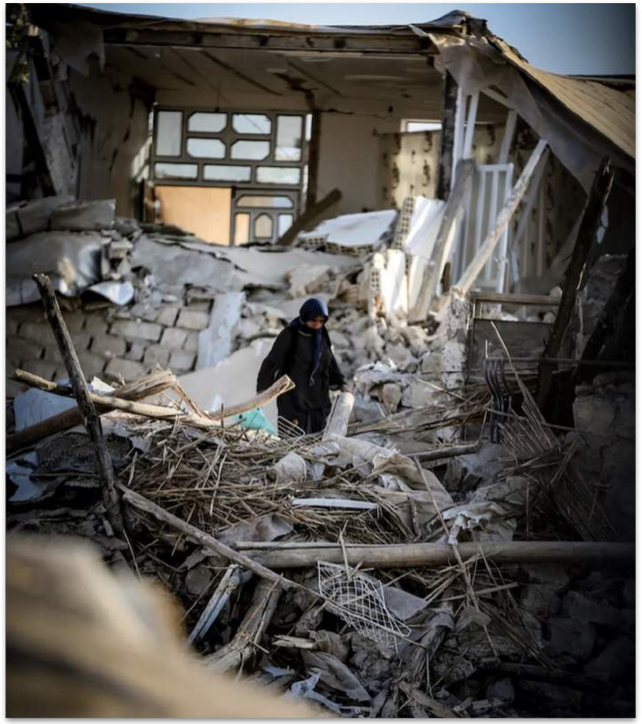
Mitigation

Resilient infrastructure
Early warning systems

Recovery

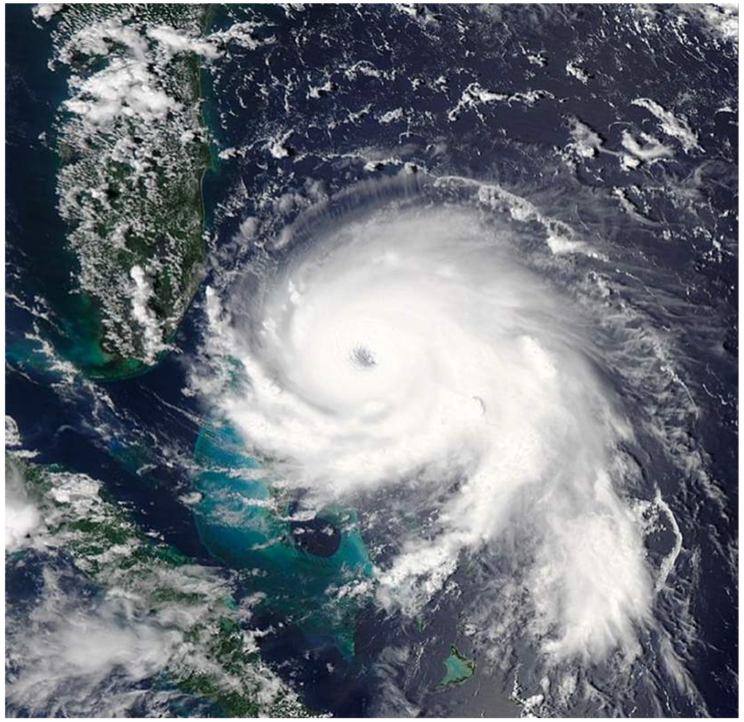
Assess damage
Financial assistance

Disasters

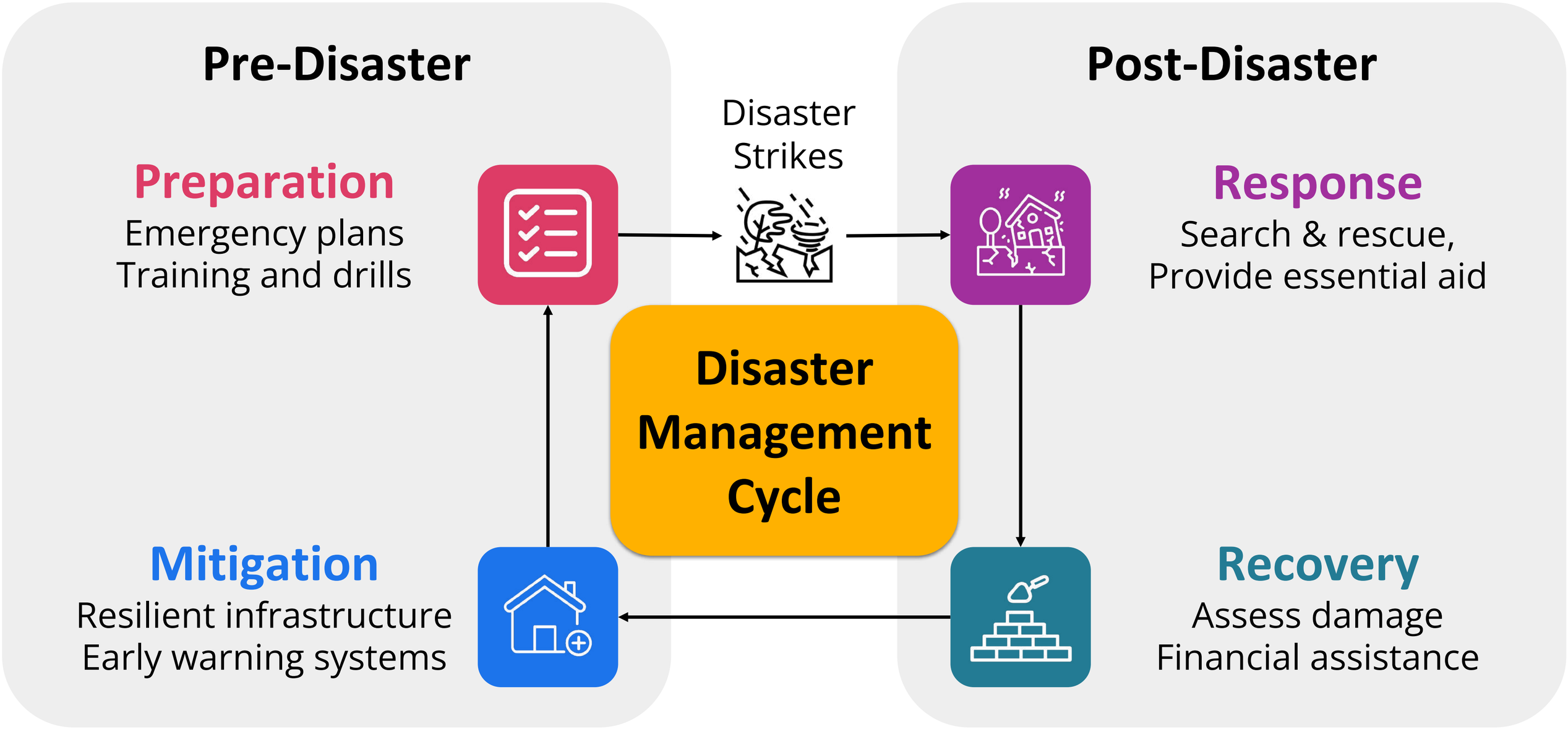


Kermanshah earthquake, 2018

California Drought, 2009



Hurricane Dorian, 2019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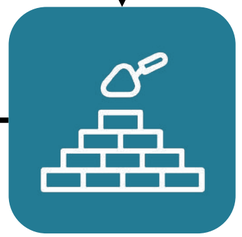

1. Work on general-purpose technologies to help communities help themselves
2. Support low-resource languages with better technologies like translation and search
3. Default to private data practices. Aggregate data and ML models can amplify privacy risks
4. Avoid projects that involve analysis of social media data and work funded by oppressive governments
5. Engage with impacted communities