

Wilson Diep diepw50@iastate.edu, Ule Mewanu umewanu@iastate.edu, and Cameron MacKenzie camacken@iastate.edu

Testing ChatGPT as a Source of Information for Natural Disasters

Background

- Natural disasters cause significant damage in the United States
- Impacts include loss of life, destroyed infrastructure, economic damages, and environmental damage
- Researching natural disasters requires significant time trying to find information
 - Information can be buried in text documents (e.g., news articles)
 - Data on disasters is largely disaggregated
- Large language learning models and artificial intelligence can identify and extract information from text documents

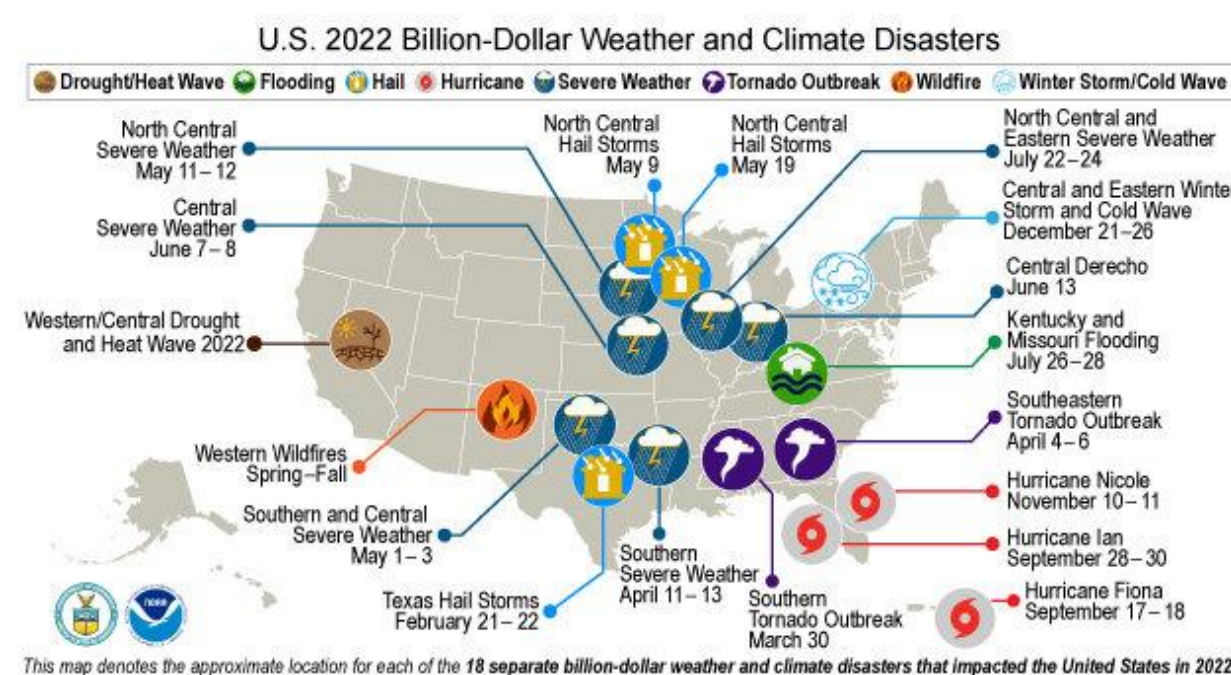


Figure 1. A map showing 18 separate billion-dollar disasters that occurred in the USA during 2022.

Objectives(s)

- Test if ChatGPT can be used to discover information about natural disasters in the United States
- Compare answers from ChatGPT to information contained in Wikipedia articles on disasters



Figure 2. An example of wildfire damage.

Methods and Materials

- Collect information about natural disasters in the United States from Wikipedia
- Generate questions to query ChatGPT to test its ability to depict accurate data
- Analyze responses from ChatGPT to determine its responses provide correct information and statistics that align with Wikipedia



Figure 3. Grain silos collapsed after being hit by a derecho.

Results

- We asked ChatGPT about 5 wildfires, 4 hurricanes, 3 floods, 1 heat wave, and 1 tornado
- No information for 1 hurricane and 1 tornado
- Results were categorized according to type of question and type of disaster (**Figure 4** and **Figure 5**)

Types of questions:

- Characteristic – Defining disaster such as wind speed or temperature
- Human impact – Number of affected people such as lives lost, homes destroyed, and people evacuated
- Financial impact – Dollar or economic damage
- Natural impact – Loss of agriculture and environmental damage
- Infrastructures impact – Disruption of large systems and buildings such as power outages and flooded dams

196 total questions

- 44 accurate
- 35 partially accurate
- 117 inaccurate

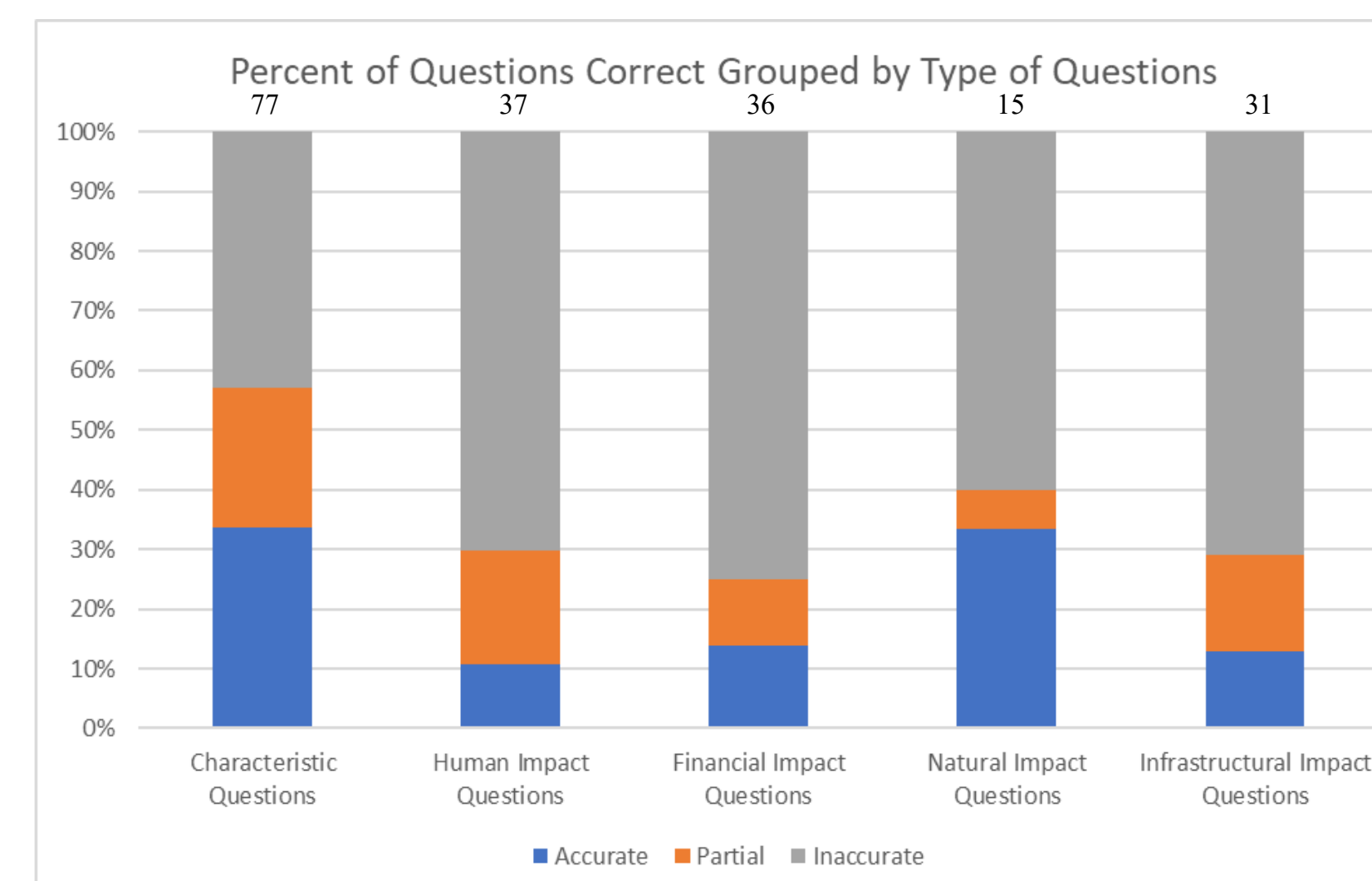


Figure 4. Break down of questions answered by ChatGPT grouped by the type of question.

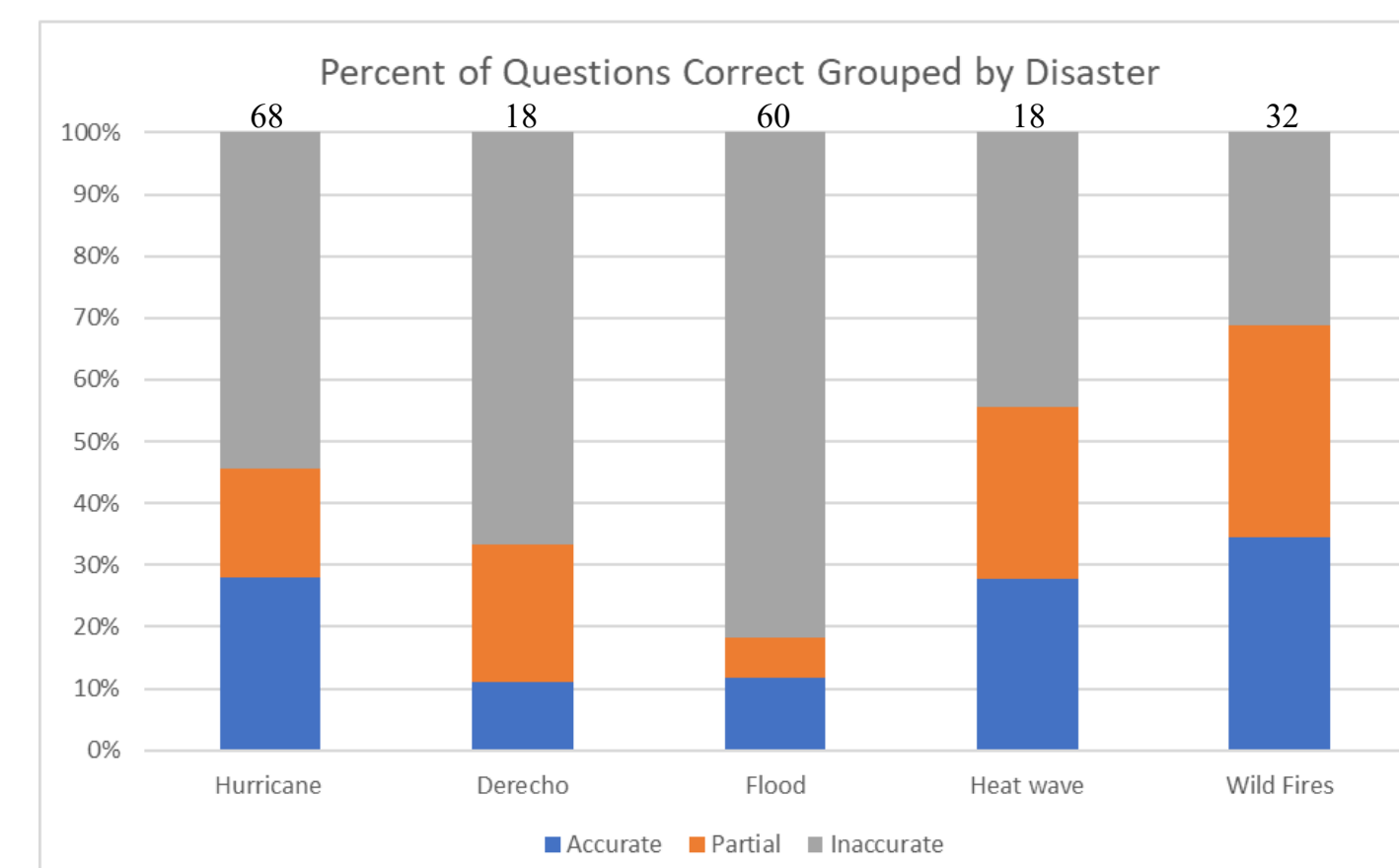


Figure 5. Break down of questions answered by ChatGPT grouped by the type of disaster.

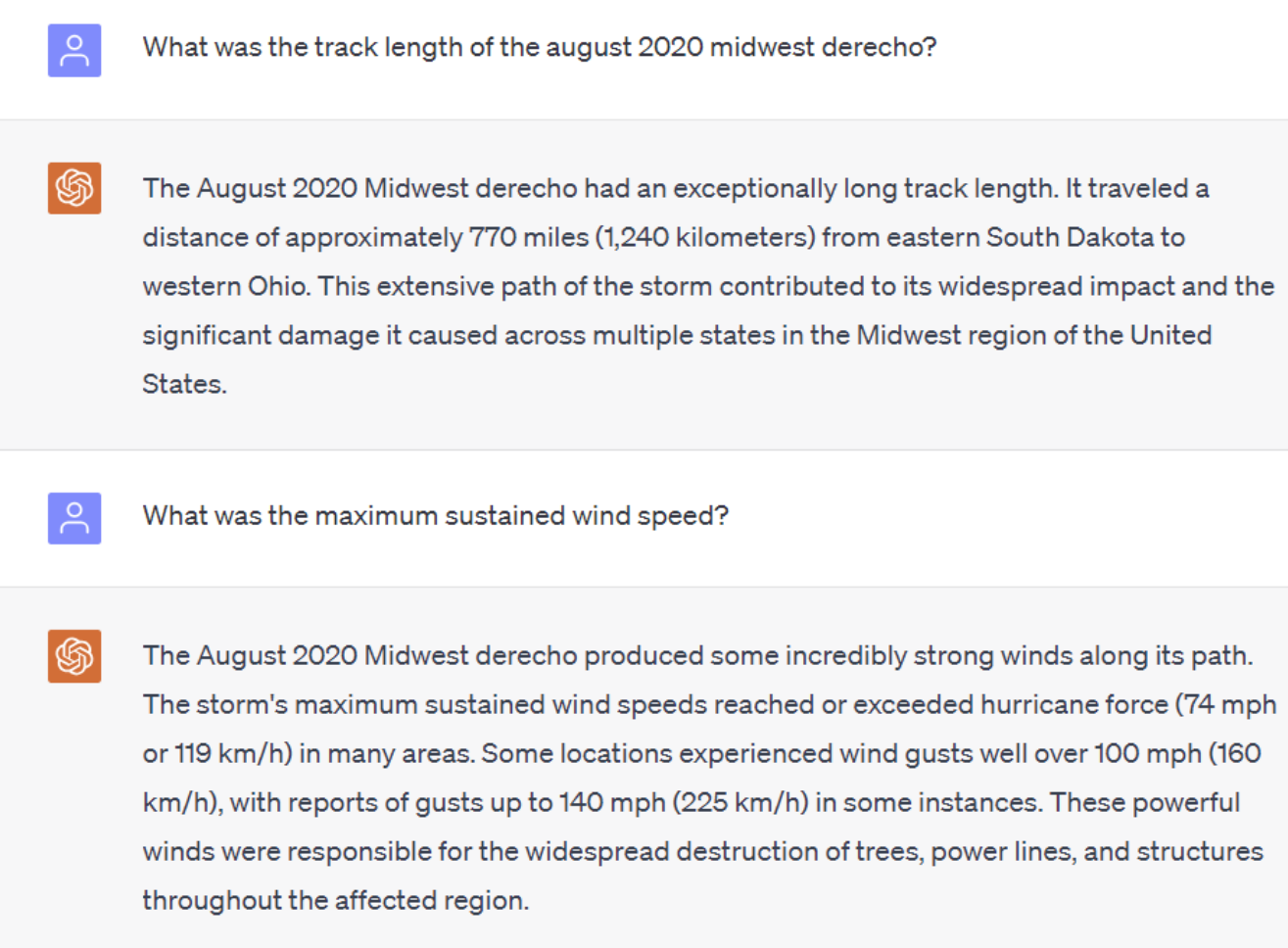


Figure 6. ChatGPT responding accurately to two characteristic questions about the August 2020 Midwest Derecho.

Discussion

- ChatGPT is not very accurate, cannot be used as a reliable source of information for research in natural disasters
- ChatGPT responds more accurately to questions about a natural disaster's characteristics (e.g., wind speed, temperature)
- ChatGPT performs better on well-known documented events: For example, ChatGPT knew more about large, named hurricanes than a series of floods
- ChatGPT struggles to find relevant facts for natural disasters happening in 2021 as its cutoff is in September 2021

How many acres of forested land was damaged by Hurricane Michael?

Hurricane Michael caused significant damage to forested land in the southeastern United States, particularly in Florida. According to estimates, the hurricane impacted approximately 2.8 million acres of forested land. This includes both public and private forests, and the damage ranged from severe tree loss to complete deforestation in some areas.

The destruction of forested land has wide-ranging ecological and economic impacts, affecting wildlife habitats, carbon sequestration, timber resources, and the overall health of forest ecosystems. Efforts are typically undertaken to assess and mitigate the impacts of the storm on forested areas, including reforestation and restoration initiatives.

It's important to note that the figure provided is an estimate and can vary depending on the source and the specific criteria used for assessment. For more accurate and detailed information on the extent of forest damage caused by Hurricane Michael, I recommend referring to official reports from forestry agencies, environmental organizations, or research institutions that specialize in forest management and conservation in the affected regions.

Figure 7. ChatGPT responding accurately to an agricultural impact question about Hurricane Michael.

Conclusions

- Served as an introduction to guided research using critical thinking and an engineering mindset
- Learned to verify information against various sources
- Connected with professionals across countless industries and careers through APEX E
- Gained insight into collegiate lifestyles and experience with making and maintaining professional relations