

# Complementary Data for “Towards Democratized Flood Risk Management: An Advanced AI Assistant Enabled by GPT-4 for Enhanced Interpretability and Public Engagement” (Comparing GPT models)

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## Experiment:

For this experiment, the latest GPT models were used to assess the accuracy and the performance of the output, and to compare it with the first version (GPT-4-1106-preview). The response evaluation would be based on the structured approach and qualitative interpretations outlined by (Martelo & Wang, 2024). Each model is briefly described as follows:

GPT-4o: “GPT-4o (“o” for “omni”) is our most advanced multimodal model, that’s faster and cheaper than GPT-4 Turbo with stronger vision capabilities. —it generates text 2x faster and is 50% cheaper. The model has 128K context and an October 2023 knowledge cutoff.” (*Hello GPT-4o*, n.d.; Islam & Moushi, 2024; *OpenAI Platform*, n.d.; Shahriar et al., 2024)

GPT-4o-mini: “GPT-4o mini is our most cost-efficient small model that’s smarter and cheaper than GPT-3.5 Turbo and has vision capabilities. We recommend choosing gpt-4o-mini where you would have previously used gpt-3.5-turbo as this model is more capable and cheaper. The model has 128K context and an October 2023 knowledge cutoff.” (*GPT-4o Mini*, n.d.; *OpenAI Platform*, n.d.)

## Evaluation:

1/5 (Poor): Significantly unsatisfactory in meeting the criteria. The response may be largely irrelevant, inaccurate, or not useful.

2/5 (Fair): Partially meets the criteria but has notable deficiencies. The response might be somewhat relevant or useful but lacks key elements or clarity.

3/5 (Good): Adequately meets the criteria. The response is relevant and useful, but there is room for improvement in certain aspects.

4/5 (Very Good): Strongly meets the criteria with only minor shortcomings. The response is highly relevant, accurate, and largely fulfills the user's needs.

5/5 (Excellent): Exceptionally meets the criteria. The response is comprehensive, highly accurate, thoroughly informative, and fully addresses the user's query.

## Detailed Testing Data for Evaluation:

### Map\_Function:

Prompt ID	GPT-4-1106-preview	GPT-4o	GPT-4o-mini
1A) Provide a static flood map and an interactive map for the	FAILED 3s (UnidentifiedImageError Traceback (most recent call last) <ipython-input-12- 089efccb72e5> in <cell line: 7>() 8 prompt = input("\nl just	FAILED 2.12s (UnidentifiedImageError Traceback (most recent call last) <ipython-input-12- 089efccb72e5> in <cell line: 7>() 8 prompt = input("\nl just	FAILED 2.36s (UnidentifiedImageError Traceback (most recent call last) <ipython-input-12- 089efccb72e5> in <cell line: 7>() 8 prompt = input("\nl just

coordinates 29.7604° N, 95.3698° W.	<p>woke up, but fire away: ") <b>9</b>  messages.append({"role":  "user", "content": prompt}) ---  &gt; 10 complete(messages) <b>11</b>  <b>12</b> # Check if the user wants  to exit 2 frames  <a href="#">/usr/local/lib/python3.10/dist-  packages/PIL/Image.py</a> in  open(fp, mode, formats) <b>3496</b>  warnings.warn(message)  <b>3497</b> msg = "cannot identify  image file %r" % (filename if  filename else fp) -&gt; 3498 raise  UnidentifiedImageError(msg)  <b>3499 3500</b>  UnidentifiedImageError:  cannot identify image file  &lt;_io.BytesIO object at  0x7bbb195942c0&gt;)</p>	<p>woke up, but fire away: ") <b>9</b>  messages.append({"role":  "user", "content": prompt}) ---  &gt; 10 complete(messages) <b>11</b>  <b>12</b> # Check if the user wants  to exit 2 frames  <a href="#">/usr/local/lib/python3.10/dist-  packages/PIL/Image.py</a> in  open(fp, mode, formats) <b>3496</b>  warnings.warn(message)  <b>3497</b> msg = "cannot identify  image file %r" % (filename if  filename else fp) -&gt; 3498 raise  UnidentifiedImageError(msg)  <b>3499 3500</b>  UnidentifiedImageError:  cannot identify image file  &lt;_io.BytesIO object at  0x7cac07dffab0&gt;)</p>	<p>woke up, but fire away: ") <b>9</b>  messages.append({"role":  "user", "content": prompt}) ---  &gt; 10 complete(messages) <b>11</b>  <b>12</b> # Check if the user wants  to exit 2 frames  <a href="#">/usr/local/lib/python3.10/dist-  packages/PIL/Image.py</a> in  open(fp, mode, formats) <b>3496</b>  warnings.warn(message)  <b>3497</b> msg = "cannot identify  image file %r" % (filename if  filename else fp) -&gt; 3498 raise  UnidentifiedImageError(msg)  <b>3499 3500</b>  UnidentifiedImageError:  cannot identify image file  &lt;_io.BytesIO object at  0x7ebe7265b060&gt;)</p>
1B) Generate a color-coded FEMA flood zone map for the area of New York City.	<p>FAILED 6.57s  (UnidentifiedImageError  Traceback (most recent call  last) <a href="#">&lt;ipython-input-12-  089efccb72e5&gt;</a> in &lt;cell line:  7&gt;() <b>8</b> prompt = input("\nl just  woke up, but fire away: ") <b>9</b>  messages.append({"role":  "user", "content": prompt}) ---  &gt; 10 complete(messages) <b>11</b>  <b>12</b> # Check if the user wants  to exit 2 frames  <a href="#">/usr/local/lib/python3.10/dist-  packages/PIL/Image.py</a> in  open(fp, mode, formats) <b>3496</b>  warnings.warn(message)  <b>3497</b> msg = "cannot identify  image file %r" % (filename if  filename else fp) -&gt; 3498 raise  UnidentifiedImageError(msg)  <b>3499 3500</b>  UnidentifiedImageError:  cannot identify image file  &lt;_io.BytesIO object at  0x7dd8f4217bf0&gt;)</p>	<p>FAILED 6.36s  (UnidentifiedImageError  Traceback (most recent call  last) <a href="#">&lt;ipython-input-12-  089efccb72e5&gt;</a> in &lt;cell line:  7&gt;() <b>8</b> prompt = input("\nl just  woke up, but fire away: ") <b>9</b>  messages.append({"role":  "user", "content": prompt}) ---  &gt; 10 complete(messages) <b>11</b>  <b>12</b> # Check if the user wants  to exit 2 frames  <a href="#">/usr/local/lib/python3.10/dist-  packages/PIL/Image.py</a> in  open(fp, mode, formats) <b>3496</b>  warnings.warn(message)  <b>3497</b> msg = "cannot identify  image file %r" % (filename if  filename else fp) -&gt; 3498 raise  UnidentifiedImageError(msg)  <b>3499 3500</b>  UnidentifiedImageError:  cannot identify image file  &lt;_io.BytesIO object at  0x7b2b6bea2340&gt;)</p>	<p>FAILED 6.45s  (UnidentifiedImageError  Traceback (most recent call  last) <a href="#">&lt;ipython-input-12-  089efccb72e5&gt;</a> in &lt;cell line:  7&gt;() <b>8</b> prompt = input("\nl just  woke up, but fire away: ") <b>9</b>  messages.append({"role":  "user", "content": prompt}) ---  &gt; 10 complete(messages) <b>11</b>  <b>12</b> # Check if the user wants  to exit 2 frames  <a href="#">/usr/local/lib/python3.10/dist-  packages/PIL/Image.py</a> in  open(fp, mode, formats) <b>3496</b>  warnings.warn(message)  <b>3497</b> msg = "cannot identify  image file %r" % (filename if  filename else fp) -&gt; 3498 raise  UnidentifiedImageError(msg)  <b>3499 3500</b>  UnidentifiedImageError:  cannot identify image file  &lt;_io.BytesIO object at  0x7d16a79573d0&gt;)</p>
1C) Show a flood risk map for a region near a major river, but I'm not sure of the exact coordinates.	<p><b>**Response**</b> 5.56s  To provide you with a flood  risk map near a major river,  could you tell me the name of  the river or the nearest city or  town to the area you are  interested in? This  information will help me to  generate an accurate map for  you.  <b>**End of response**</b></p>	<p><b>**Response**</b> 2.38s  To show a flood risk map near  a major river, I'll need some  information such as the name  of the river or the nearby area  or town. Could you please  provide any additional details  that might help me locate the  region of interest?  <b>**End of response**</b></p>	<p><b>**Response**</b> 4.34s  To display a flood risk map for  a region near a major river, I  need to know the name of the  river or the nearest city or  landmark. Major rivers could  include the Mississippi River,  Ohio River, or any other  significant waterway. Do you  have a specific river or  location in mind, or would you  like me to suggest a well-</p>

			known major river for the flood risk map? **End of response**
1D) I need a flood map for an area that's prone to flooding during heavy rains, but I can't recall the name of the place.	<p><b>**Response** 6.05s</b></p> <p>In order to provide you with a flood map, I would need more information about the location you're interested in. If you can recall any details such as the city, state, or a landmark nearby, that would be very helpful. Without such information, it wouldn't be possible to pinpoint the area you're referring to and subsequently provide an accurate flood map. Could you please provide any additional information you remember about the location? **</p> <p>End of response**</p>	<p><b>**Response** 3.58s</b></p> <p>If you can provide some information about the area, such as its approximate location, nearby landmarks, or any other details you recall, I can help you find the flood map for that place. Alternatively, if you have coordinates or another address, that would work as well!</p> <p><b>**End of response**</b></p>	<p><b>**Response** 2.12s</b></p> <p>I can help you with that! Please provide me with the latitude and longitude coordinates of the area you're interested in, or if you have a nearby landmark or city name, that would work too. This will help me to find the relevant flood map for you.</p> <p><b>**End of response**</b></p>
1E) Generate a flood risk map for a small, remote island in the Pacific Ocean.	<p><b>**Response** 4.75s</b></p> <p>To generate a flood risk map for an island in the Pacific Ocean, I would need the specific geographic coordinates (latitude and longitude) of that island. Once you provide those details, I can create and display a flood risk map for the location you're interested in. If you do not have the exact coordinates, please provide the name of the island, and I'll do my best to locate it for you.</p> <p><b>**End of response**</b></p>	<p><b>**Response** 4s</b></p> <p>To generate a flood risk map for a small, remote island in the Pacific Ocean, I need the geographic coordinates (latitude and longitude) of the island. Could you provide those details?</p> <p><b>**End of response**</b></p>	<p><b>**Response** 3s</b></p> <p>To create a flood risk map, I need the specific latitude and longitude coordinates of the remote island you're interested in. Could you please provide those coordinates?</p> <p><b>**End of response**</b></p>
1F) Create a flood zone map for an area that has recently undergone major land development.	<p><b>**Response** 6.15s</b></p> <p>To create a flood zone map for an area that has recently undergone major land development, I would need the specific geographic coordinates (latitude and longitude) of that area. If you can provide me with this information, I can generate and show you an interactive flood map for the location. If you do not have the exact coordinates, you may provide me with an address, and I will do my best to find the flood map for you. Can you provide</p>	<p><b>**Response** 4.36s</b></p> <p>To create a flood zone map for an area that has recently undergone major land development, I will need the latitude and longitude coordinates of the location or the specific address. This will allow me to generate the relevant flood map. Can you provide these details?</p> <p><b>**End of response**</b></p>	<p><b>**Response** 3.89s</b></p> <p>Could you please provide me with the specific location (latitude and longitude or address) of the area that has recently undergone major land development? This will help me create an accurate flood zone map for you.</p> <p><b>**End of response**</b></p>

	the latitude and longitude or an address for the area of interest? **End of response**		
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Running Time	GPT-4-1106-preview	GPT-4o	GPT-4o-mini
1A	Failed (3 s)	Failed (2.12 s)	Failed (2.36 s)
1B	Failed (6.57s)	Failed (6.36 s)	Failed (6.45 s)
1C	5.56 s	2.38 s	4.34 s
1D	6.05 s	3.58 s	2.12 s
1E	4.75 s	4 s	3 s
1F	6.15	4.36 s	3.89 s

Token Usage	GPT-4-1106-preview	GPT-4o	GPT-4o-mini
1A	Failed	Failed	Failed
1B	Failed	Failed	Failed
1C	65	62	92
1D	100	70	67
1E	97	53	46
1F	119	65	55

#### Data\_Function:

Prompt ID	GPT-4-1106-preview	GPT-4o	GPT-4o-mini
2A) Retrieve flood risk and property details for 1600 Pennsylvania Avenue NW, Washington, D.C.	<b>**Response**</b> 10.78s The property at 1600 Pennsylvania Avenue NW, Washington, D.C., falls into the flood zone designated as "X". This zone is considered an area of minimal flood hazard and is typically outside the 0.2% annual flood risk. It is not a Special Flood Hazard Area (SFHA), as indicated by the fact that "SFHA_TF" is false ("F"). The flood zone information is based on the guidelines set by the District of Columbia (Community Number	<b>**Response**</b> 8s The property at 1600 Pennsylvania Avenue NW, Washington, D.C., is located in an area designated as "Zone X." This indicates it is an area of minimal flood hazard, according to FEMA's flood zone definitions. Therefore, it is not in a Special Flood Hazard Area (SFHA) which typically requires flood insurance. Here are some additional property details: - <b>**County Name:**</b> District of Columbia - <b>**Municipality</b>	<b>**Response**</b> 6.22s Here's the flood risk and property details for <b>**1600</b> Pennsylvania Avenue NW, Washington, D.C. <b>**</b> : - <b>**Flood Zone**</b> : X - This zone is characterized as an area of minimal flood hazard. - <b>**Special Flood Hazard Area (SFHA)**</b> : No - <b>**Community Name**</b> : District of Columbia - <b>**FIRM Panel**</b> : 0018 (Countywide, Panel Printed) - <b>**Effective Date**</b> :

	<p>0001) and the data is referenced from DFIRM ID 110001 with a version identifier of 1.1.1.0. The effective date of the current panel used in this determination is September 27, 2010, with a panel number of 1100010018C. For the property at 1600 Pennsylvania Avenue NW, additional details such as property and elevation information were not requested in this query. If you require more specific flood risk or property details, please let me know, and I can provide further assistance.</p> <p><b>**End of response**</b></p>	<p>Name:<b>** Washington</b>  - <b>**Parcel ID:** 0187S0802</b> - <b>**Community Info:** The community name is "District of Columbia," and it's part of the Washington-Arlington-Alexandria, DC-VA-MD-WV metropolitan area. If you need further flood analysis or visual maps, feel free to ask!</b>  <b>**End of response**</b></p>	<p>September 27, 2010  <b>### Additional Information:</b>  - <b>**Census Block**:</b> 110019800001  - <b>**CBSA**:</b> Washington-Arlington-Alexandria, DC-VA-MD-WV  If you would like to see an interactive flood map or have any specific questions about flood risks, feel free to ask!  <b>**End of response**</b></p>
<p>2B) Provide flood hazard area, FEMA firm panel information, and elevation data for the address 1 Infinite Loop, Cupertino, California.</p>	<p><b>**Response** 19.48s</b>  The address 1 Infinite Loop, Cupertino, California is located in a flood zone designated as "X," which refers to an area with a 0.2 percent annual chance of flood hazard. This means it is considered to have minimal flood risk. The area is not within the Special Flood Hazard Area (SFHA), as indicated by the "F" designation for SFHA TF. FEMA Firm (Federal Insurance &amp; Mitigation Administration's Flood Insurance Rate</p>	<p><b>**Response** 8.97s</b>  Here is the flood hazard information for 1 Infinite Loop, Cupertino, California:  - <b>**Flood Zone:** The property is in Flood Zone X, which is an area considered to have a 0.2% annual chance of flood (also known as 500-year flood zone). It's not in a Special Flood Hazard Area (SFHA).</b> - <b>**FEMA FIRM Panel Information:** - DFIRM ID: 06085C - Panel: 0209 - Panel Type: Countywide, Panel Printed - Effective Date: May 18, 2009 - FIRM Panel</b></p>	<p><b>**Response** 8.39s</b>  For the address <b>**1 Infinite Loop, Cupertino, California**</b>, here are the details regarding flood hazard areas and FEMA firm panel information: <b>### Flood Hazard Area Information:</b> - <b>**Flood Zone:** X</b> - <b>**Special Flood Hazard Area (SFHA):** F</b> (indicates that the area is not in a Special Flood Hazard Area) - <b>**Flood Hazard Area ID:** 06085C_2161</b> - <b>**DFIRM ID:** 06085C</b> - <b>**Flood Zone Subtype:** 0.2% Annual Chance Flood</b></p>

	<p>Map) Panel information for this location is as follows:</p> <ul style="list-style-type: none"> <li>- DFIRM ID: 06085C - Flood Zone Identifier: 06085C_2161 - Source Citation: 06085C_FIRM1 - Version ID: 1.1.1.0 - Zone Subtype: 0.2 PCT ANNUAL CHANCE FLOOD HAZARD The FIRM Panel for the given address is: - DFIRM ID: 06085C - Effective Date: May 18, 2009 - FIRM ID: 06085C_66 - FIRM Panel: 06085C0209H - Panel: 0209 - Panel Type: Countywide, Panel Printed - ST FIPS (State Federal Information Processing Series): 06 - Suffix: H The above information indicates the panel that contains the flood hazard information for the address, including the panel type and relevant identification codes. Additionally, the property falls under the jurisdiction of CID (Community Identifier) 060339 for the City of Cupertino, which is indicated by the NFIP (National Flood Insurance Program) with the Community Number 0339. The community is officially participating in the</li> </ul>	<p>ID: 06085C0209H - **Community Information:** - Community Name: City of Cupertino - Tribal Area: No - Community Participates in NFIP: Yes Unfortunately, elevation data was not requested or provided, so it's not available here. If you need a detailed flood map or any additional information, please let me know! **End of response**</p>	<p>Hazard ### FEMA Firm Panel Information: - **FIRM ID:** 06085C_66 - **Panel Number:** 0209 - **Panel Type:** Countywide, Panel Printed - **Effective Date:** May 18, 2009 ### Community Information: - **Community Name:** CITY OF CUPERTINO - **Community FIRM Number:** 050180 - **Community Participation:** Yes ### Additional Information: - **Census Block:** 060855081012 - **CBSA Name:** San Jose-Sunnyvale-Santa Clara, CA If you need elevation data, please let me know, and I can assist you further! **End of response**</p>
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	<p>NFIP, meaning residents are eligible for flood insurance. The Community ID for the Flood Insurance Rate Map is 050180, and the currently effective map is numbered 051809. Elevation data was not requested in the initial query. If elevation data is essential, a separate request would be necessary to obtain that information.</p> <p><b>**End of response**</b></p>		
2C) Can you find flood risk details for a property located somewhere in the floodplains of the Mississippi River?	<p><b>**Response** 5.02s</b></p> <p>Certainly, to find flood risk details for a property located in the floodplains of the Mississippi River, I will need an exact address or at least the coordinates (latitude and longitude) for the specific location you are interested in. Once I have that information, I can retrieve the detailed flood risk for that property. Do you have a specific address or coordinates for a location along the Mississippi River? If so, please provide me with that information so I can assist you further.</p> <p><b>**End of response**</b></p>	<p><b>**Response** 4s</b></p> <p>To fetch flood risk details for a property in the floodplains of the Mississippi River, I'll need a specific address or location. Could you please provide more information, such as the address or at least a nearby town or city along the Mississippi River?</p> <p><b>**End of response**</b></p>	<p><b>**Response** 3s</b></p> <p>To provide accurate flood risk details for a property located in the floodplains of the Mississippi River, I need a specific address or location coordinates (latitude and longitude) within that area. Could you please provide me with that information?</p> <p><b>**End of response**</b></p>
2D) Provide information on a	<p><b>**Response** 4.72s</b></p> <p>To provide detailed</p>	<p><b>**Response** 5.02s</b></p> <p>To provide flood risk</p>	<p><b>**Response** 6.36s</b></p> <p>To assist you</p>

<p>building in a coastal town known for high flood risk, though I don't have the exact address.</p>	<p>information on a building located in a coastal town known for high flood risk, I would need a bit more information, such as the general location or details about the town or area. Here are some steps we can take to gather relevant information: 1. <b>**Flood Data by Location:**</b> If you can provide the town name, we can check the flood risk data related to specific locations within that town. 2. <b>**Flood Maps Display:**</b> We can use geographic coordinates (latitude and longitude) or approximate locations to display an interactive flood map showing flood zones and risks. 3. <b>**Flash Flood Warnings:**</b> We can look for any current flood warnings issued for that specific area, which might indicate immediate risks. 4. <b>**Social Vulnerability Index (SVI):**</b> We can retrieve SVI statistics to understand the area's vulnerability in terms of socioeconomic factors. Please provide any additional details you may have, and I will be happy to</p>	<p>information about a building in a coastal town known for high flood risk, we'll need some details about the location. Could you please provide a specific town or area name within that coastal region? This will help in retrieving relevant flood risk data. <b>**End of response**</b></p>	<p>effectively, I'll need an approximate location. Could you provide the name of the coastal town, or any nearby landmarks or coordinates? This information will help me find relevant flood information for the area you're interested in. <b>**End of response**</b></p>
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	assist further! **End of response**		
2E) Find flood data for a recently constructed residential area that's not yet on most maps.	**Response** 4.28s Sure, to provide you with accurate flood data for a recently constructed residential area, I would need the precise address or the latitude and longitude coordinates of the location you're interested in. Could you provide that information, please? **End of response**	**Response** 4.06s To find flood data for a recently constructed residential area, I'll need the specific address or coordinates (latitude and longitude) of the location. Could you please provide that information? **End of response**	**Response** 3.21s To find flood data for a recently constructed residential area that may not be on most maps, I would need a specific address or location details of the area you're interested in. If you could provide me with that information, I can look up the flood data for you. **End of response**
2F) Provide flood hazard information for a historical site that's now a popular tourist destination.	**Response** 3.80s Sure, I can help with that! To provide accurate flood hazard information, I need to know the name or the address of the historical site you're referring to. Can you please provide that information? **End of response**	**Response** 4.30s Could you please provide the name or address of the historical site you're interested in? This way, I can retrieve accurate flood hazard information for that location. **End of response**	**Response** 2.81s Please provide the name or the address of the historical site that you'd like to gather flood hazard information for. This will help me retrieve the relevant data. **End of response**

Running Time	GPT-4-1106-preview	GPT-4o	GPT-4o-mini
2A	10.78 s	8 s	6.22 s
2B	19.48 s	8.97 s	8.39 s
2C	5.02 s	4 s	3 s
2D	4.72 s	5.02 s	6.36 s
2E	4.28 s	4.06 s	3.21 s
2F	3.80 s	4.30 s	2.81 s

Token Usage	GPT-4-1106-preview	GPT-4o	GPT-4o-mini
2A	222	167	177
2B	407	201	247
2C	110	65	62

2D	213	66	60
2E	60	49	68
2F	56	46	45

#### SVI-Function:

Prompt ID	GPT-4-1106-preview	GPT-4o	GPT-4o-mini
3A) Show Social Vulnerability Index statistics and census tracts for Miami-Dade County, Florida with an SVI theme of socioeconomic status.	<p><b>**Response**</b></p> <p>In Miami-Dade County, Florida, the Social Vulnerability Index (SVI) for the socioeconomic status theme (RPL_THEME1) shows that the area encompasses 2 census tracts, with both the maximum and minimum SVI being 0.629, indicating moderate vulnerability based on socioeconomic factors. The average SVI also aligns with the moderate vulnerability score of 0.629.</p> <p>Census tracts in Miami-Dade County with a socioeconomic status SVI of 0.629 will be visualized on the map:</p> <p>(Here, as an assistant, I would normally show an interactive map displaying the census tracts with the SVI of 0.629, but due to technical constraints, the map visualization may not be directly exhibited in this format. In a real-world application, users would see these</p>	<p><b>**Response**</b></p> <p>For Miami-Dade County, Florida, here are the Social Vulnerability Index (SVI) statistics for the theme of socioeconomic status:</p> <ul style="list-style-type: none"> <li>- <b>**Total Areas Analyzed**</b>: 2</li> <li>- <b>**Maximum SVI**</b>: 0.629</li> <li>- <b>**Minimum SVI**</b>: 0.629</li> <li>- <b>**Average SVI**</b>: 0.629</li> </ul> <p>Additionally, here's the census tract information:</p> <ul style="list-style-type: none"> <li>- <b>**FIPS Code**</b>: 12001</li> <li>- <b>**Socioeconomic Status SVI (RPL_THEME1)**</b>: 0.629</li> </ul> <p>This indicates the vulnerability of socioeconomic status in the analyzed areas of Miami-Dade County.</p> <p><b>**End of response**</b></p> <p>3.73s</p>	<p>FAILED</p> <p>1.99 s</p>

	<p>tracts highlighted on the map for better geographic context.)</p> <p><b>**End of response**</b></p> <p>6.32s</p>		
<p>3B) Retrieve SVI stats for areas in Texas with an SVI score above 0.75 and display an interactive map of these areas.</p>	<p><b>**Response**</b></p> <p>To display SVI statistics for areas in Texas with an SVI score above 0.75, we need a county name to focus on, as Texas is a large state with many counties. Could you please specify a county in Texas that you're interested in, or should I randomly choose one for this example?</p> <p><b>**End of response**</b></p> <p>2.68s</p>	<p><b>**Response**</b></p> <p>For areas in Texas with a Social Vulnerability Index (SVI) score greater than 0.75, here are the statistics:</p> <ul style="list-style-type: none"> <li>- <b>**Total Areas Analyzed**</b>: 2</li> <li>- <b>**Maximum SVI**</b>: 0.896</li> <li>- <b>**Minimum SVI**</b>: 0.896</li> <li>- <b>**Average SVI**</b>: 0.896</li> </ul> <p>Additionally, here's the census tract information:</p> <ul style="list-style-type: none"> <li>- <b>**FIPS Code**</b>: 48001</li> <li>- <b>**Overall SVI Score (RPL_THEMES)**</b>: 0.896</li> </ul> <p>This indicates high social vulnerability in the analyzed areas of Texas. An interactive map displaying these areas is available for viewing.</p> <p><b>**End of response**</b></p> <p>4.22S</p>	<p><b>**Response**</b></p> <p>The Social Vulnerability Index (SVI) statistics for areas in Texas with an SVI score above 0.75 are as follows:</p> <ul style="list-style-type: none"> <li>- <b>**Total Areas**</b>: 2</li> <li>- <b>**Maximum SVI**</b>: 0.896</li> <li>- <b>**Minimum SVI**</b>: 0.896</li> <li>- <b>**Average SVI**</b>: 0.896</li> </ul> <p>This indicates a high level of social vulnerability in these areas.</p> <p>Now, let's display an interactive map of these affected areas in Texas.</p> <p><b>**End of response**</b></p> <p>6.61s</p>
<p>3C) What's the social vulnerability of a region that's frequently affected by floods, maybe in the southeastern U.S.?</p>	<p><b>**Response**</b></p> <p>In Harris County, Texas, which is notably subjected to frequent flooding, the Social Vulnerability Index (SVI) statistics</p>	<p><b>**Response**</b></p> <p>The social vulnerability of a region that is frequently affected by floods, such as the southeastern United</p>	<p><b>**Response**</b></p> <p>The southeastern U.S. is known for areas that frequently experience flooding and can have higher social vulnerability,</p>

	<p>indicate a high level of social vulnerability with an overall SVI score above 0.75. The SVI data encompasses 2 census tracts, with both the maximum and minimum SVI reaching 0.896, which suggests a high vulnerability within these areas.</p> <p>The average SVI for these tracts is also 0.896, which is considered high according to SVI standards. This degree of social vulnerability implies that the community might face more significant challenges in responding to, recovering from, and preparing for disasters, including floods.</p> <p>An interactive map displaying the census tracts in Harris County with high social vulnerability is available. You should be able to see these high vulnerability areas highlighted on the map.</p> <p>(Note: An interactive map should be shown here based on the retrieved SVI statistics for Harris County, Texas. Since we are in a text-based scenario, please imagine an interactive map</p>	<p>States, can be assessed through the Social Vulnerability Index (SVI). This index measures the resilience of communities to external stresses like natural disasters by considering various sociodemographic factors. High vulnerability may indicate that a region has more challenges in responding to and recovering from such events.</p> <p>To provide specific SVI statistics for a particular county in the southeastern U.S., please provide the state and county name you'd like to analyze. For example, regions like those in Louisiana or Mississippi often have higher vulnerabilities due to a combination of socioeconomic, demographic, and housing characteristics. Let me know if you have a specific region in mind, and I can retrieve detailed information for you.</p> <p><b>**End of response**</b></p> <p>2.14s</p>	<p>especially in low-income communities. A notable state in this region is Louisiana, particularly around New Orleans.</p> <p>Would you like me to retrieve SVI statistics specifically for Louisiana, or is there a different area you have in mind? Please specify if there's a certain county or city you want to focus on.</p> <p><b>**End of response**</b></p> <p>1.54s</p>
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	<p>highlighting areas with an SVI score of 0.896 in Harris County.)</p> <p><b>**End of response**</b></p> <p>10.02s</p>		
<p>3D) I need SVI stats for an area with high poverty rates and frequent flooding, but I'm not sure which state it falls in.</p>	<p><b>**Response**</b></p> <p>To identify a region with high poverty rates and frequent flooding but without a specific state in mind, we can consider areas along the Gulf Coast and those situated by major rivers known to occasionally overflow. One such example is the region surrounding New Orleans in Louisiana. This area has historically faced challenges with flooding, as seen with Hurricane Katrina and other events, and also exhibits socioeconomic vulnerability including poverty. Moreover, neighboring parishes such as Orleans Parish, Jefferson Parish, and St. Bernard Parish have been known for their vulnerability to flooding and socioeconomic issues.</p> <p>Would you like to explore the Social Vulnerability Index (SVI) for an area in Louisiana, such as Orleans Parish, or would you prefer</p>	<p><b>**Response**</b></p> <p>To assist you better, please provide me with more information such as the name of a city, town, or another specific area that you're aware of. This will help narrow down the search within the southeastern U.S. or any other area to find a region with high poverty rates and frequent flooding. If you have any additional details, even if they're general, they can guide me to retrieve the right data for you.</p> <p><b>**End of response**</b></p> <p>1.51s</p>	<p><b>**Response**</b></p> <p>To assist you in retrieving Social Vulnerability Index (SVI) statistics for an area with high poverty rates and frequent flooding, I'll need you to provide a state or a specific location associated with those conditions.</p> <p>If you have certain cities or regions in mind, please let me know! Otherwise, I can provide general information about areas typically known for high poverty and flooding, such as parts of Louisiana or Mississippi. Would that work for you?</p> <p><b>**End of response**</b></p> <p>1.39s</p>

	<p>another region with similar characteristics?</p> <p><b>**End of response**</b></p> <p>4.13s</p>		
<p>3E) Give me the SVI statistics for the smallest census tract in Alaska.</p>	<p><b>*Response*</b></p> <p>To seek the Social Vulnerability Index (SVI) statistics for the smallest census tract in Alaska, we typically would need the specific name or identifier of that tract. Given that Alaska is vast with many sparsely populated areas, determining the "smallest" could mean different things—geographically smallest, least populated, or another measure. However, as we lack that specific information and the method to directly find the "smallest" census tract based on size or population is not provided by the available tools, a common approach would be to select a tract from within the most populated city, like Anchorage. If that's acceptable, let me proceed by retrieving the SVI statistics for a census tract in Anchorage, Alaska. Since this approach is a general estimation</p>	<p><b>**Response**</b></p> <p>For the smallest census tract in Alaska, here are the Social Vulnerability Index (SVI) statistics:</p> <ul style="list-style-type: none"> <li>- <b>**Total Areas Analyzed**</b>: 2</li> <li>- <b>**Maximum SVI**</b>: 0.7754</li> <li>- <b>**Minimum SVI**</b>: 0.7754</li> <li>- <b>**Average SVI**</b>: 0.7754</li> </ul> <p>The census tract details are as follows:</p> <ul style="list-style-type: none"> <li>- <b>**FIPS Code**</b>: 2013</li> <li>- <b>**Overall SVI Score (RPL_THEMES)**</b>: 0.7754</li> </ul> <p>These statistics indicate a relatively high level of social vulnerability in this specific census tract in Alaska. If you need more detailed information or further analysis, feel free to ask!</p> <p><b>**End of response**</b></p> <p>3.47s</p>	<p><b>**Response**</b></p> <p>The Social Vulnerability Index (SVI) statistics for the smallest census tract in Alaska (FIPS code: 2068) are as follows:</p> <ul style="list-style-type: none"> <li>- <b>**Total Areas**</b>: 2</li> <li>- <b>**Maximum SVI**</b>: 0.0353</li> <li>- <b>**Minimum SVI**</b>: 0.0353</li> <li>- <b>**Average SVI**</b>: 0.0353</li> </ul> <p>This indicates a low level of social vulnerability in this census tract. If you need more information or specifics about other regions, feel free to ask!</p> <p><b>**End of response**</b></p> <p>3.11s</p>

	<p>and may not precisely reflect the smallest tract, if you have additional criteria to identify the tract, please provide them, and I'll retrieve the SVI statistics accordingly. Otherwise, please confirm if you'd like me to proceed with Anchorage or another specific area in Alaska.</p> <p><b>**End of response**</b></p> <p>5.02s</p>		
<p>3F) Retrieve SVI data for a high-altitude mountain region with low population density.</p>	<p><b>**Response**</b></p> <p>To retrieve Social Vulnerability Index (SVI) data for a high-altitude mountain region with low population density, we would ideally target areas known for their mountainous terrain and sparse population. However, my capabilities are focused on flood-related information and SVI data linked to flood susceptibility, and I do not have direct access to geographic elevation data or population density figures. The Rocky Mountains in Colorado or the Appalachian Mountains in West Virginia could be good examples of high-altitude regions with sparsely populated areas. If an area in</p>	<p><b>**Response**</b></p> <p>To retrieve Social Vulnerability Index (SVI) data for a high-altitude mountain region with low population density, it would be helpful to have more specific details on the area you're interested in. High-altitude regions with low population density can vary, as they exist in different states such as Colorado, Wyoming, or Montana. If you have a specific mountain range or town in mind, please share it. Even a state name can help narrow down which areas to analyze for social vulnerability in the context of elevation and population density. Let me know how you'd like to proceed!</p>	<p><b>**Response**</b></p> <p>To retrieve Social Vulnerability Index (SVI) data for a high-altitude mountain region with low population density, I need a specific location, such as a state or county. Could you please provide a specific area, or should I select a general high-altitude mountain region in the United States?</p> <p><b>**End of response**</b></p> <p>0.98s</p>

	<p>either of these states, or another mountainous region you're interested in, is known for flooding, I can certainly proceed to retrieve SVI information for a specified county or location within such a region.</p> <p>Please specify a particular high-altitude mountain region or county with known flooding issues where you would like to obtain SVI data, and I will assist you further.</p> <p><b>**End of response**</b></p> <p>5.33</p>	<p><b>**End of response**</b></p> <p>1.90s</p>	
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Running Time	GPT-4-1106-preview	GPT-4o	GPT-4o-mini
3A	6.32 s	3.73 s	Failed (1.99 s)
3B	2.68 s	4.22 s	6.61 s
3C	10.02 s	2.14 s	1.54 s
3D	4.13 s	1.51 s	1.39 s
3E	5.02 s	3.47 s	3.11 s
3F	5.33 s	1.90 s	0.98 s

Token Usage	GPT-4-1106-preview	GPT-4o	GPT-4o-mini
3A	190	145	Failed
3B	78	149	110
3C	231	165	94
3D	156	98	103
3E	222	157	118
3F	192	129	76

#### Warning\_Function:

Prompt ID	GPT-4-1106-preview	GPT-4o	GPT-4o-mini
4A) List active flood alerts from	<p><b>**Response**</b> 12.22s</p> <p>At the moment, there are</p>	<p><b>**Response**</b> 14.82s</p> <p>Here are the active flood alerts in</p>	<p><b>**Response**</b> 5s</p> <p>Currently, there is</p>



the National Weather Service for New Orleans, Louisiana.	<p>active flood warnings issued by the National Weather Service in Louisiana, but these are not specifically for New Orleans. The current flood warnings are as follows: 1. <b>**Vermilion River at Lafayette, Surrey Street Gage in Lafayette, LA;</b> - Status: Minor flooding is occurring and is forecasted to continue. - Impacts: Minor flooding of Heymann Park off of Highway 90. - Details: As of 9:15 PM CDT Thursday, the stage was at 10.1 feet with a forecasted crest of 10.5 feet just after midnight. Flood stage is 10.0 feet. - This flood warning was sent out on October 31st and will expire on November 1st at 3:15 PM CDT. 2. <b>**Calcasieu River Near Salt Water Barrier in Calcasieu, LA</b> - Status: Minor flooding is forecasted. - Details: The river is expected to oscillate around flood stage with a maximum value of 4.2 feet just after midnight tonight. Flood stage is 4.0 feet. - This flood warning was sent out on October 31st and will expire on November 1st at 8:30 PM CDT. Please be aware that conditions may change, and keep updated with local news and the National Weather Service for the latest information on flood alerts.</p> <p><b>**End of response**</b></p>	<p>Louisiana from the National Weather Service: 1. <b>**Flood Warning for Vermilion River At Lafayette, Surrey Street Gage:**</b> - <b>**Current Status:**</b> Minor flooding is occurring and is forecasted to continue. - <b>**Details:**</b> At 9:15 PM CDT Thursday, the river stage was 10.1 feet. It is expected to rise to a crest of 10.5 feet just after midnight tonight, then fall below flood stage late tonight. - <b>**Impacts:**</b> At 10.0 feet, minor flooding of Heymann Park off of Highway 90 will occur. - <b>**More Information:**</b> [Weather Safety](<a href="http://www.weather.gov/safety/flood">http://www.weather.gov/safety/flood</a>) - <b>**Effective until:**</b> November 1st, 2024 at 3:15 PM CDT. 2. <b>**Flood Warning for Calcasieu River Near Salt Water Barrier:**</b> - <b>**Forecast:**</b> Minor flooding is expected, with water levels oscillating around flood stage at a maximum of 4.2 feet just after midnight tonight. - <b>**Flood Stage:**</b> 4.0 feet. - <b>**More Information:**</b> [Weather Safety](<a href="http://www.weather.gov/safety/flood">http://www.weather.gov/safety/flood</a>) - <b>**Effective until:**</b> November 1st, 2024 at 8:30 PM CDT. These alerts pertain to different areas in Louisiana, not specifically New Orleans, but are important to consider for broader regional context. Always stay safe and adhere to local advisories.</p> <p><b>**End of response**</b></p>	<p>an active flood warning in Louisiana, specifically for the following area: - <b>**Event:**</b> Flood Warning - <b>**Description:**</b> The Flood Warning is extended for the Calcasieu River Near Salt Water Barrier. - <b>**Minor flooding is forecast.**</b> - <b>**Where:**</b> Calcasieu River near Salt Water Barrier. - <b>**When:**</b> From Saturday evening until further notice. - <b>**Additional Details:**</b> - Current level: Around 4.1 feet. - Forecast: The river will oscillate around flood stage with a maximum value of 4.2 feet just after midnight tonight. - Flood stage is 4.0 feet. For more details, you can visit [Weather Safety Flood](<a href="http://www.weather.gov/safety/flood">http://www.weather.gov/safety/flood</a>). Please let me know if you need more information or assistance!</p> <p><b>**End of response**</b></p>
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<p>4B) Provide details of current flash flood warnings for the area around Lake Wateree, South Carolina.</p>	<p><b>**Response** 5.02S</b>  As of the latest information available, there are no current flash flood warnings for the area around Lake Wateree, South Carolina. It's important to stay informed by checking the National Weather Service and local news outlets for the most up-to-date weather-related information, especially during periods of heavy rain or severe weather.  <b>**End of response**</b></p>	<p><b>**Response** 3.20s</b>  There are currently no active flash flood warnings for the area around Lake Wateree, South Carolina. Please continue to monitor local weather updates for any changes in the flood conditions.  <b>**End of response**</b></p>	<p><b>**Response** 3.50s</b>  There are currently no active flash flood warnings for the area around Lake Wateree, South Carolina. If you have any other questions or need further assistance, feel free to ask! <b>**End of response**</b></p>
<p>4C) Are there any flash flood alerts for areas recently hit by a tropical storm? The name of the place escapes me.</p>	<p><b>**Response** 3.19S</b>  To determine if there are flash flood alerts in areas recently hit by a tropical storm, I would need more specific information about the location you are inquiring about. Tropical storms can affect broad areas and may lead to different weather conditions in various places. If you can recall any additional details about the affected location, such as the state, region, or significant landmarks, I can better assist you by checking for current flash flood warnings in those areas.  <b>**End of response**</b></p>	<p><b>**Response** 14.56s</b>  Currently, several areas in Florida, which might have been affected by recent tropical storms, are under flood warnings. Here are some details: 1. <b>**Withlacoochee River at US 301 Trilby (Hernando, FL; Pasco, FL):**</b> - <b>**Flooding:**</b> Moderate flooding is occurring, with major flooding forecasted. - <b>**Current Water Level:**</b> 15.8 feet, with the flood stage being 12.0 feet. - <b>**Expected Crest:**</b> 16.2 feet. - <b>**Impact:**</b> Water is 2 to 3 feet over the bridge at Clay Sink Road and State Road 575. 2. <b>**Cypress Creek at SR 54 Worthington Gardens (Pasco, FL):**</b> - <b>**Flooding:**</b> Minor flooding is occurring. - <b>**Current Water Level:**</b> 8.2 feet, with the flood stage being 8.0 feet. - <b>**Expected Crest:**</b> 8.4 feet. - <b>**Impact:**</b> Flooding begins at the recreation area on State Road 54. 3. <b>**Withlacoochee at US 41 Dunnellon (Citrus, FL; Levy, FL):**</b> - <b>**Flooding:**</b> Minor flooding is occurring. - <b>**Current Water Level:**</b> 29.8 feet, with the flood</p>	<p><b>**Response** 2.07s</b>  Could you provide me with the state or any specific details about the area that was recently hit by a tropical storm? This will help me find the relevant flash flood alerts for you. <b>**End of response**</b></p>

		<p>stage being 29.0 feet. -</p> <p><b>**Expected Crest:**</b> 29.8 feet. -</p> <p><b>**Impact:**</b> Docks and boat ramps flood. 4. <b>**Peace River at Bartow (Polk, FL):**</b> -</p> <p><b>**Flooding:**</b> Minor flooding is occurring. - <b>**Current Water Level:**</b> 8.1 feet, with the flood stage being 8.0 feet. - <b>**Expected Crest:**</b> 8.1 feet. - <b>**Impact:**</b> Private roads downstream flood. 5. <b>**Withlacoochee River at Croom (Pasco, FL; Sumter, FL):**</b> -</p> <p><b>**Flooding:**</b> Minor flooding is occurring. - <b>**Current Water Level:**</b> 10.6 feet, with the flood stage being 9.0 feet. - <b>**Expected Crest:**</b> 10.9 feet. - <b>**Impact:**</b> Farms and pastureland flood. 6. <b>**Withlacoochee at SR 200 Holder (Citrus, FL):**</b> -</p> <p><b>**Flooding:**</b> Major flooding is forecast. - <b>**Current Water Level:**</b> 11.0 feet, with the flood stage being 8.0 feet. - <b>**Expected Crest:**</b> 11.0 feet. - <b>**Impact:**</b> Moderate flooding occurring with a crest of 11.2 feet observed historically. For residents and those traveling through these areas, it's important to remain aware and follow any additional instructions from local authorities. For more information, you can visit [Weather Safety](<a href="https://www.weather.gov/safety/flood">https://www.weather.gov/safety/flood</a>) provided by the National Weather Service.</p> <p><b>**End of response**</b></p>	
4D) Tell me about flood warnings in a region that's been experiencing unusually heavy rainfall lately.	<b>**Response**</b> 6.71S To provide information on flood warnings for a region experiencing heavy rainfall, I need specifics about the affected area. If you can provide me with a state, county, or city where there	<b>**Response**</b> 16.51s Currently, Florida is experiencing several flood warnings, which might be attributed to unusually heavy rainfall recently. Here are some key details: 1. <b>**Withlacoochee River at US 301 Trilby (Hernando, FL; Pasco, FL)**</b>	<b>**Response**</b> 1.95s To provide you with the most accurate information regarding flood warnings in regions experiencing unusually heavy

	<p>has been unusual heavy rainfall, I can then look up active flood alerts for that particular location. With that information, I can offer you the most relevant and recent flood warnings issued by the National Weather Service. Please let me know the location you are concerned about, and I will assist you accordingly.</p> <p><b>**End of response**</b></p>	<p>- <b>**Flooding Level:**</b> Moderate flooding is occurring, with major flooding forecasted. - <b>**Current Stage:**</b> 15.8 feet (Flood stage is 12.0 feet). - <b>**Impact:**</b> Water is 2 to 3 feet over the bridge at Clay Sink Road and State Road 575. 2. <b>**Cypress Creek at SR 54 Worthington Gardens (Pasco, FL)**</b> - <b>**Flooding Level:**</b> Minor flooding is occurring. - <b>**Current Stage:**</b> 8.2 feet (Flood stage is 8.0 feet). - <b>**Expected to Fall:**</b> Early Sunday morning, continuing to 7.7 feet by Monday. 3. <b>**Withlacoochee at US 41 Dunnellon (Citrus, FL; Levy, FL)**</b> - <b>**Flooding Level:**</b> Minor flooding is occurring. - <b>**Current Stage:**</b> 29.8 feet (Flood stage is 29.0 feet). - <b>**Impact:**</b> Docks and boat ramps are flooded. 4. <b>**Peace River at Bartow (Polk, FL)**</b> - <b>**Flooding Level:**</b> Minor flooding is occurring. - <b>**Current Stage:**</b> 8.1 feet (Flood stage is 8.0 feet). - <b>**Impact:**</b> Private roads downstream are flooded. 5. <b>**Withlacoochee River at Croom (Pasco, FL; Sumter, FL)**</b> - <b>**Flooding Level:**</b> Minor flooding continues. - <b>**Current Stage:**</b> 10.6 feet (Flood stage is 9.0 feet). - <b>**Impact:**</b> Farms and pastureland are flooded. 6. <b>**St Johns River Near Astor (Lake, FL; Volusia, FL)**</b> - <b>**Flooding Level:**</b> Moderate flooding is occurring. - <b>**Current Stage:**</b> 3.4 feet (Flood stage is 2.3 feet). - <b>**Impact:**</b> Canals have overflowed, and several homes and roads are inaccessible. These floods are causing impacts in various communities, affecting roads, homes, and infrastructure. Residents should remain vigilant and follow local authorities'</p>	<p>rainfall, I would need a specific location or state where this heavy rainfall is occurring. This information can help me retrieve the latest flood alerts for that particular area. Could you please specify the region you are interested in?</p> <p><b>**End of response**</b></p>
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		<p>advice and information updates. For further details on weather safety, explore [Weather Safety](<a href="https://www.weather.gov/safety/flood">https://www.weather.gov/safety/flood</a>).</p> <p><b>**End of response**</b></p>	
<p>4E) List any flash flood warnings for desert areas that rarely experience rain.</p>	<p><b>**Response** 4.04S</b></p> <p>To list any flash flood warnings for desert areas that rarely experience rain, I would need to know a specific desert or region you are interested in. Deserts such as the Sonoran Desert, Mojave Desert, or any other specific area can be checked for flash flood warnings. Since desert areas can be vast, a more precise location would be helpful. If you can provide a state or a known city or landmark in a desert area, I can then search for current flash flood warnings in those specific areas. Please let me know which desert area you would like to inquire about.</p> <p><b>**End of response**</b></p>	<p><b>**Response** 4.12s</b></p> <p>Currently, there are no specific flash flood warnings for desert areas that rarely experience rain in the provided data. The warnings available are primarily for areas in Florida and Louisiana, which are experiencing river and flash flooding due to recent heavy rainfall. If you're interested in a specific desert region or need further assistance, please let me know!</p> <p><b>**End of response**</b></p>	<p><b>**Response** 1.83s</b></p> <p>Flash flood warnings can occur in desert areas, even those that rarely experience rain, especially during unusual weather events such as monsoons or tropical storms. However, I would need a specific desert area or state to provide you with the latest flash flood warnings. Could you please specify the desert area you have in mind?</p> <p><b>**End of response**</b></p>
<p>4F) Show flood alerts for regions where floods have historically never been reported.</p>	<p><b>**Response** 5.11S</b></p> <p>Identifying flood alerts for regions where floods have historically never been reported is a complex task because it would require access to historical flood records across various regions. However, floods can occur in almost any</p>	<p><b>**Response** 4.02s</b></p> <p>Unfortunately, there is no available public database that lists flood alerts specifically for regions where floods have historically never been reported. Flooding events can be unpredictable and may affect new areas due to changing climate conditions or unexpected</p>	<p><b>**Response** 2.30s</b></p> <p>Flood alerts can be issued in various regions regardless of historical flood reports. Unusual weather patterns, such as sudden heavy rains or unexpected weather</p>

	<p>geographical location under the right conditions, even in areas with no previous recorded incidents. Given the available tools, I can provide flood alerts for a specific area upon request. If you have a particular region in mind, even if it's known for a lack of historical flood events, I can check if any current flood alerts have been issued for that area. Let me know if you have a specific location you're interested in or if you're inquiring about general conditions in regions traditionally considered as low risk for floods. Without a specific location, it's not feasible to provide a list of alerts for such undefined areas.</p> <p><b>**End of response**</b></p>	<p>weather events. The available flood alerts tend to focus on areas currently experiencing or expected to face flooding based on recent or anticipated weather patterns. If you have a specific location in mind, I can check the current flood warnings for that area. Let me know if you would like me to do this or if you have any other questions!</p> <p><b>**End of response**</b></p>	<p>events, can lead to flooding even in areas that typically don't experience it. If you're looking for flood alerts in a specific location that has historically never reported floods, I'll need the name of that location or state to provide the most accurate information. Please specify the area you're interested in!</p> <p><b>**End of response**</b></p>
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Running Time	GPT-4-1106-preview	GPT-4o	GPT-4o-mini
4A	12.22 s	14.82 s	5 s
4B	5.02 s	3.20 s	3.50 s
4C	3.19 s	14.56 s	2.07 s
4D	6.71 s	16.51 s	1.95 s
4E	4.04 s	4.12 s	1.83 s
4F	5.11 s	4.02 s	2.30 s

Token Usage	GPT-4-1106-preview	GPT-4o	GPT-4o-mini
4A	302	313	177
4B	76	49	50
4C	103	595	51
4D	110	515	75
4E	131	79	79
4F	176	122	99

**Flood\_Related\_Queries:**

Prompt ID	GPT-4-1106-preview	GPT-4o	GPT-4o-mini
5A) Explain the impact of urbanization on flood risks in coastal cities.	<p><b>**Response**</b></p> <p>Urbanization significantly impacts flood risks in coastal cities through a variety of mechanisms: 1. <b>**Impervious Surfaces**</b>: Urbanization leads to the creation of impervious surfaces such as roads, sidewalks, and buildings that do not absorb rainwater. This increases surface runoff, as water is no longer absorbed by the ground, leading to more rapid accumulation in urban drainage systems during heavy rains. 2. <b>**Overwhelmed Drainage Systems**</b>: Many coastal cities have drainage and sewage systems that were designed for historical conditions and may not have been updated to accommodate increased runoff from urban surfaces. During heavy rain, these systems can be quickly overwhelmed, resulting in flooding. 3. <b>**Loss of Natural Barriers**</b>: The development of coastal areas often involves the removal of natural vegetation</p>	<p><b>**Response**</b> 17.40s</p> <p>Urbanization significantly impacts flood risks in coastal cities due to several key factors: 1. <b>**Increased Impervious Surfaces**</b>: Urbanization typically involves the construction of roads, buildings, and other infrastructure, which creates impervious surfaces. These surfaces prevent water from being absorbed into the ground, resulting in greater surface runoff. This can lead to higher volumes of water flowing into drainage systems, rivers, and eventually the sea, increasing the risk of flooding. 2. <b>**Altered Natural Drainage**</b>: Coastal urban development often alters the natural drainage patterns. Wetlands, natural water channels, and vegetation that originally absorbed and slowed down rainwater are replaced with built environments that channel water more rapidly to the coast. This can overwhelm drainage systems and exacerbate flooding. 3. <b>**Sea-Level Rise**</b>:</p>	<p><b>**Response**</b></p> <p>Urbanization significantly impacts flood risks in coastal cities through several key mechanisms: 1. <b>**Increased Impervious Surfaces**</b>: Urbanization leads to the creation of roads, buildings, and other impervious surfaces, which prevent water from being absorbed into the ground. This results in increased surface runoff during rainstorms, overwhelming drainage systems and leading to flooding. 2. <b>**Altered Drainage Patterns**</b>: Urban development often disrupts natural drainage patterns. This can lead to blockages and inefficient water flow, exacerbating flooding during rainfall. 3. <b>**Loss of Natural Barriers**</b>: Coastal urbanization can involve the destruction of wetlands, mangroves, and dunes, which act as natural buffers against storm surges and flooding. Their loss can make coastal areas more vulnerable to inundation. 4. <b>**Rising Sea Levels**</b>: Coastal cities are at</p>

	<p>and the alteration of landscapes like wetlands and mangroves. These ecosystems act as natural buffers against storm surges and high tides, absorbing floodwaters and reducing the impact on urban areas. 4. <b>**Land Subsidence**</b>: Urbanization can lead to land subsidence in coastal areas, where the ground level drops due to the compression of soil or the extraction of groundwater. This makes the areas more susceptible to flooding, particularly during high tide events. 5. <b>**Altered Watercourses**</b>: Development can lead to changes in natural watercourses, both in terms of their direction and their capacity. This can disrupt the natural drainage of an area, leading to new flood risks. 6. <b>**Stormwater Management Practices**</b>: Inadequate or outdated stormwater management practices in growing cities can contribute to flooding. Cities that do not upgrade their infrastructure to manage larger</p>	<p>As a result of climate change, sea levels are rising, and this problem is exacerbated in urban coastal areas that may already be experiencing land subsidence due to the extraction of groundwater and other factors. Urban areas with outdated infrastructure may not be equipped to handle these changes, increasing their vulnerability to flooding. 4. <b>**Storm Surge Vulnerability**</b>: Coastal cities are at risk from storm surges during tropical cyclones or hurricanes. Urbanization, by increasing population density and development along coastlines, exposes more people and infrastructure to the dangers of such surges. 5. <b>**Inadequate Infrastructure**</b>: In many rapidly urbanizing coastal areas, drainage systems have not kept pace with development. This can lead to situations where even moderate rainfalls overwhelm the system, leading to frequent urban flooding. 6. <b>**Loss of</b></p>	<p>the forefront of climate change impacts, including rising sea levels. Urbanization can intensify these impacts, leading to chronic flooding issues, particularly in low-lying areas. 5. <b>**Stormwater Management Challenges**</b>: Urban areas often face challenges in managing stormwater due to increased runoff. Insufficient management systems can lead to flash floods and overwhelmed drainage during heavy rainfall events. 6. <b>**Heat Island Effect**</b>: Urbanization can contribute to the urban heat island effect, which can influence local weather patterns. Warmer temperatures can lead to more intense rain events, further exacerbating flooding risks. 7. <b>**Infrastructure Vulnerability**</b>: Aging or inadequate infrastructure in rapidly urbanized areas can fail under pressure during extreme weather events, compromising the city's ability to manage flood risks effectively. Overall,</p>
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	<p>volumes of stormwater may suffer from more frequent flood events. 7. <b>**Sea-Level Rise**</b>: Urbanized coastal cities are at the front line of climate change impacts, including sea-level rise. As sea levels climb, the risk of coastal flooding increases, particularly when combined with storm surges during extreme weather events. 8. <b>**Heat Island Effect**</b>: Urbanized areas, due to their extensive use of concrete and lack of greenery, tend to be warmer than surrounding areas. This can influence local weather patterns, potentially leading to increased rainfall in certain circumstances. 9. <b>**Socioeconomic Factors**</b>: The concentration of people, assets, and critical infrastructure in coastal urban areas means that the impact of flooding can be severe, resulting in significant economic losses, damage to property, and in the worst cases, loss of life. To mitigate these risks, coastal cities may need to adopt sustainable urban planning practices,</p>	<p><b>Natural Barriers**</b>: Urbanization can lead to the removal of natural barriers such as mangroves and sand dunes, which help to protect against storm surges and coastal erosion. 7. <b>**Climate Change**</b>: Urban heat islands and increased precipitation due to climate change can exacerbate the flood risk further, as intense storms may become more frequent and damaging. In summary, the combination of increased impervious surfaces, altered drainage systems, rising sea levels, and potential infrastructure inadequacies all contribute to heightened flood risks in urbanized coastal cities. Management strategies for these risks often include improving drainage systems, implementing sustainable urban planning practices, and restoring natural flood barriers. <b>**End of response**</b></p>	<p>the impacts of urbanization increase flood risks in coastal cities, making it essential for urban planners to consider sustainable design, effective stormwater management, and the preservation of natural habitats to mitigate these challenges. If you need specific flood data or alerts for a coastal city, feel free to ask! <b>**End of response**</b> 4.86s</p>
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	<p>improve drainage systems, create green infrastructure, and implement strict building codes that account for future flood risks. If you need specific information about flood risks or data for a certain coastal city, please provide the city's name, and I can further assist with more detailed information.</p> <p><b>**End of response**</b></p> <p>16.98s</p>		
5B) Describe the role of climate change in increasing the frequency of flash floods.	<p><b>**Response**</b></p> <p>Climate change plays a significant role in increasing the frequency and intensity of flash floods for several reasons: 1.</p> <p><b>**Increased Atmospheric Temperatures**</b>: The warming of the atmosphere due to climate change allows the air to hold more moisture. For every 1°C increase in temperature, the air's capacity to hold water vapor increases by approximately 7%, according to the Clausius-Clapeyron relation. This can result in heavier precipitation events, which are a primary cause of flash flooding. 2.</p>	<p><b>**Response**</b></p> <p>Climate change plays a significant role in increasing the frequency and intensity of flash floods due to several interconnected factors: 1.</p> <p><b>**Increased Precipitation**</b>: Rising global temperatures lead to more evaporation and a higher capacity of the atmosphere to hold moisture. This often results in more intense and frequent precipitation events. When large volumes of rain fall in a short period, it can overwhelm natural and man-made drainage systems, leading to flash floods. 2. <b>**Changes in Weather Patterns**</b>:</p>	<p><b>**Response**</b></p> <p>Climate change plays a significant role in increasing the frequency and intensity of flash floods through several interconnected mechanisms: 1.</p> <p><b>**Increased Rainfall Intensity**</b>: Climate change leads to higher temperatures, which in turn increases the atmosphere's capacity to hold moisture. This results in more intense and prolonged rainfall events, contributing to flash floods when the rain falls rapidly in a short period. 2.</p> <p><b>**Changes in Weather Patterns**</b>: Climate change alters established weather patterns, leading to</p>

	<p><b>**Changes in Precipitation Patterns**:</b> Climate change is causing changes in global weather patterns, leading to altered precipitation regimes. Some areas may experience more intense and frequent storms, which can lead to sudden, heavy downpours that can trigger flash floods. 3.</p> <p><b>**More Frequent Extreme Weather Events**:</b> Climate change increases the frequency and severity of extreme weather events, including tropical storms, hurricanes, and other types of severe storms that can cause flash floods. 4.</p> <p><b>**Melting Glaciers and Snowpack**:</b> Rising global temperatures are leading to earlier melting of glaciers and snowpack in mountainous regions. Rapid melting can lead to increased water flow into rivers and streams, raising the risk of flash floods downstream. 5.</p> <p><b>**Urbanization and Land Use Changes**:</b> Climate change is often exacerbated by human activities such as urbanization, which increases</p>	<p>Climate change affects atmospheric circulation patterns, potentially leading to more intense and prolonged storms. Such storms can bring heavy rainfall to specific regions, increasing the likelihood of flash flooding. 3.</p> <p><b>**Sea-Level Rise**:</b> As global temperatures rise, polar ice melts, and thermal expansion of seawater contribute to rising sea levels. Higher sea levels can exacerbate the impact of storms and increase the likelihood of coastal flooding, which can then lead to more frequent flash floods when combined with heavy rainfall. 4.</p> <p><b>**Increased Intensity of Extreme Weather Events**:</b> Climate change may contribute to the increased intensity of extreme weather events, such as hurricanes and tropical storms. These events can bring torrential rain, leading to flash flooding over affected areas. 5.</p> <p><b>**Soil Saturation and Reduced Absorption**:</b> Changes in seasonal precipitation patterns may result in</p>	<p>shifts in rainfall distribution and intensity. Some areas may experience more frequent heavy rainfall events, while others may face droughts, contributing to erratic flood risks. 3.</p> <p><b>**Melting Glaciers and Snowpack**:</b> As global temperatures rise, glaciers and snowpacks melt at an accelerated rate. The concerning level of meltwater can contribute to downstream flooding during warmer months, especially in regions that rely on snowmelt runoff. 4.</p> <p><b>**Sea-Level Rise**:</b> Rising sea levels caused by climate change can lead to coastal flooding and exacerbate the impacts of storm surges during tropical cyclones or heavy rains, increasing the risk of flash floods in coastal communities. 5.</p> <p><b>**Land Use Changes**:</b> Climate change can affect vegetation cover and land use patterns, such as deforestation or urbanization. These changes reduce the land's ability to absorb water, increasing surface runoff and the likelihood of floods. 6.</p>
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	<p>impervious surfaces and reduces the land's ability to absorb rainfall. This can make flash floods more likely during heavy rains, especially in urban areas. 6. <b>**Sea Level Rise**</b>: Higher sea levels can contribute to flash flooding in coastal regions, as elevated sea levels can diminish the effectiveness of river and stream outflows, which may back up during heavy rainfall and lead to flooding. 7. <b>**Reduced Groundwater Recharge**</b>: In some areas, climate change may lead to drier conditions, which reduce groundwater recharge. Drier soils have less capacity to absorb precipitation, which can contribute to sudden surface runoff and flash flooding. 8. <b>**Delayed Onset of Rainy Seasons**</b>: In some regions, climate change has been associated with a delayed onset of rainy seasons, which can lead to the accumulation of dry conditions. Once the rain starts, the likelihood of heavy rainfall and flash flooding may increase</p>	<p>saturated soils that cannot absorb additional rainfall. This can increase surface runoff and the potential for flash floods during subsequent rainstorms. 6. <b>**Temperature Extremes and Snowmelt**</b>: Warmer temperatures can lead to rapid melting of snow and ice in mountainous regions, contributing to sudden increases in water flow in rivers and streams, potentially leading to flash floods. Overall, as climate change continues to alter weather patterns and increase the severity of precipitation events, the frequency and intensity of flash floods are likely to rise, necessitating improved planning and adaptation strategies to mitigate these risks. <b>**End of response**</b> 9.69s</p>	<p><b>**Extreme Weather Events**</b>: The increasing frequency of extreme weather events, such as hurricanes and cyclones, can lead to heavy rainfall and flooding in affected regions. 7. <b>**Soil Saturation**</b>: Changes in precipitation patterns can lead to soil saturation, where the ground cannot absorb additional rainwater, resulting in rapid runoff and flash floods. Collectively, these factors contribute to an increased risk of flash floods, particularly in vulnerable areas and communities. Addressing climate change through mitigation and adaptation strategies is essential to reduce these flood risks. If you want information regarding specific flood risks in your area or related flood data, please let me know! <b>**End of response**</b> 6.27s</p>
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	<p>due to the accumulated atmospheric moisture. It's important to note that climate change impacts are complex and can vary widely depending on the region. Understanding local conditions and historical climate data is crucial for assessing specific flood risks related to climate change.</p> <p><b>**End of response**</b></p> <p>11.20s</p>		
5C) Explain how deforestation might impact flooding in tropical regions, but I'm not sure which country to focus on.	<p><b>**Response**</b></p> <p>Deforestation in tropical regions can significantly impact flooding due to the following factors: 1. <b>**Loss of Tree Cover**</b>: Trees intercept rainwater with their leaves and branches, which slows down the rainfall's path to the ground. Without this interception, more water hits the ground directly, increasing runoff into rivers and streams. 2. <b>**Soil Erosion**</b>: Tree roots help to hold soil in place. When trees are removed, the soil can be more easily washed away by rainwater. This erosion not only reduces the land's ability to absorb water but also</p>	<p><b>**Response**</b></p> <p>Deforestation significantly impacts flooding in tropical regions through several mechanisms, which can be generally applied across various countries: 1. <b>**Reduced Vegetation and Soil Stability**</b>: Trees and vegetation play a crucial role in stabilizing soil through their root systems. Deforestation removes this stabilizing effect, leading to increased soil erosion and degradation. This can result in the rapid flow of water during heavy rains, contributing to floods. 2. <b>**Increased Runoff**</b>: Forests act as natural sponges,</p>	<p><b>**Response**</b></p> <p>Deforestation can significantly impact flooding in tropical regions in various ways: 1. <b>**Reduced Water Absorption**</b>: Trees and vegetation play a crucial role in absorbing rainfall. When forests are cleared, the soil loses its ability to retain water, leading to increased surface runoff. 2. <b>**Soil Erosion**</b>: Without tree roots to hold the soil in place, deforested areas become more susceptible to erosion. Erosion can lead to sedimentation in rivers and streams, reducing their capacity to carry water and increasing flood risks. 3.</p>

	<p>contributes to sedimentation in rivers, reducing their capacity to hold water and increasing the likelihood of flooding.</p> <p>3. <b>**Altered Water Cycle**</b>: Trees play a crucial role in the water cycle through transpiration, where water is released from leaves into the atmosphere, forming clouds, and eventually returning as rain. Deforestation disrupts this cycle, potentially leading to changes in precipitation patterns.</p> <p>4. <b>**Decreased Evapotranspiration**</b>: Removing trees reduces the amount of water that is evaporated or transpired back to the atmosphere, causing more water to remain on or near the surface, potentially contributing to surface water runoff during rainstorms.</p> <p>5. <b>**Reduced Water Storage**</b>: In a forested landscape, the soil acts like a sponge, retaining water and releasing it slowly into the river systems. Deforestation leads to a loss of this sponge effect, causing more rapid and direct flow of water into</p>	<p>absorbing rainwater and releasing it slowly into the environment. When forests are cut down, the ability of the land to absorb rainfall reduces significantly, leading to increased surface runoff and a higher likelihood of flooding.</p> <p>3. <b>**Altered Water Cycle**</b>: Forests play an essential role in the local and global water cycles by facilitating the exchange of water vapor between the land and the atmosphere. Deforestation disrupts these cycles, potentially altering precipitation patterns and increasing the intensity and frequency of rainstorms that can cause floods.</p> <p>4. <b>**Loss of Natural Buffers**</b>: In tropical regions, mangroves and other coastal forests provide natural barriers against storm surges and flooding. Deforestation removes these barriers, leaving communities more vulnerable to flooding, especially during extreme weather events.</p> <p>5. <b>**Impact on River Systems**</b>: Deforestation can lead to increased sedimentation in</p>	<p><b>**Altered Rainfall Patterns**</b>: Deforestation can change local climate conditions, potentially leading to changes in rainfall distribution and intensity, which can contribute to more severe flooding during rain events.</p> <p>4. <b>**Increased Runoff and Flooding**</b>: As vegetation cover decreases, more rainwater flows directly into rivers and streams instead of being absorbed by the ground. This can cause rivers to swell rapidly and lead to flash floods.</p> <p>5. <b>**Disrupted Watersheds**</b>: Forested areas often regulate watershed systems. Deforestation can disrupt these systems, leading to instability in river flow and increased flooding downstream.</p> <p>6. <b>**Impact on Local Communities**</b>: Increased flooding can threaten livelihoods, homes, and infrastructure, particularly in rural and indigenous communities that depend on forests for their well-being.</p> <p>7. <b>**Loss of Natural Barriers**</b>: Trees and forests act as natural</p>
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	<p>watercourses during heavy rains. 6. <b>**Flash Floods**</b>: With reduced vegetation and soil stability, heavy rainfall can result in rapid runoff, leading to sudden and severe flash floods. 7. <b>**Climate Change Impact**</b>: Deforestation contributes to climate change by releasing carbon stored in trees. Climate change, in turn, might increase the frequency and intensity of extreme weather events, including heavy precipitation that can lead to flooding. 8. <b>**Infrastructure and Settlements**</b>: In many tropical regions, settlements and infrastructure development follow deforestation. The increase in impervious surfaces such as roads and buildings exacerbates flooding by further reducing the land's ability to absorb rainfall. 9. <b>**River Dynamics**</b>: Deforestation along riverbanks can destabilize river channels due to increased sediment load and erosion. This can lead to channel shifting, bank</p>	<p>rivers and streams, reducing their capacity to carry water. This can result in river overflow during heavy rains, leading to flooding in adjacent areas. These mechanisms highlight how deforestation in tropical regions contributes to increased flood risks. Countries within the Amazon Basin, such as Brazil, as well as Southeast Asian nations like Indonesia and Malaysia, are particularly affected due to their vast tropical forest cover and the pressure these forests face from agricultural expansion, logging, and infrastructure development. Addressing deforestation through reforestation efforts and sustainable land management practices can help mitigate these flood risks. <b>**End of response**</b></p> <p>5.93s</p>	<p>barriers against floods. When they are removed, the vulnerability of surrounding areas to flood damage increases. To illustrate the impact of deforestation on flooding, we can look at specific countries like Brazil, Indonesia, or Malaysia, which are known for their tropical ecosystems and deforestation challenges. If you have a specific country in mind, I can provide more detailed flood data or information about the area. Would you like to focus on a particular country? <b>**End of response**</b></p> <p>4.72s</p>
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	<p>collapses, and reduced river capacity, heightening the flood risk. If you are interested in examining a specific country or area's flood risks and how deforestation may affect those risks, we can look at data for that particular area. Please provide the name of the region or country you'd like to focus on, and I can assist further with more targeted information.</p> <p><b>**End of response**</b></p> <p>15.40s</p>		
<p>5D) Discuss the potential flood risks in a major Asian city, I forgot which one is known for its monsoon season.</p>	<p><b>**Response**</b></p> <p>Several major Asian cities are known for their intense monsoon seasons, which can bring significant flood risks. For this discussion, let's consider Mumbai, India, as an example, although similar risks may apply to other monsoon-affected cities such as Jakarta, Bangkok, or Dhaka. Mumbai's potential flood risks during the monsoon season include: 1. <b>**Heavy Rainfall**</b>: Mumbai experiences very heavy rainfall during the monsoon season, which can quickly overwhelm drainage</p>	<p><b>**Response**</b></p> <p>Mumbai, India, is a major Asian city known for its monsoon season, which typically occurs from June to September. The city experiences heavy rainfall during this period, leading to potential flood risks due to several factors: 1. <b>**Heavy Rainfall**</b>: The monsoon brings intense and prolonged rainfall, which can overwhelm the city's aging drainage systems, leading to waterlogging and floods in low-lying areas. 2. <b>**Impervious Surfaces**</b>: As a densely populated urban area, Mumbai</p>	<p><b>**Response**</b></p> <p>One major Asian city known for its monsoon season is Mumbai, India. The monsoon season typically occurs from June to September, bringing heavy rainfall that can lead to significant flood risks. Here are some potential flood risks associated with monsoon seasons in Mumbai: 1. <b>**Heavy Rainfall**</b>: During the monsoon, the city experiences intense and prolonged rainfall, which can overwhelm drainage systems and lead to surface flooding. 2. <b>**Urbanization**</b>: Rapid urbanization</p>



	<p>systems and lead to widespread flooding.</p> <p>2. <b>**High Tide**</b>: The combination of heavy rainfall and high tide can exacerbate flooding conditions, as it can prevent floodwaters from draining into the sea.</p> <p>3. <b>**Urban Development**</b>: Rapid urbanization has led to inadequate drainage and a reduction of natural areas that would typically absorb rainwater. This increases surface runoff and the likelihood of floods.</p> <p>4. <b>**Inadequate Drainage Infrastructure**</b>: Mumbai's drainage system can be insufficient to deal with the volume of water during peak monsoon periods.</p> <p>5. <b>**Waterlogging**</b>: Low-lying areas in the city are prone to waterlogging, where water accumulates and does not drain away, causing disruption to transportation and daily activities.</p> <p>6. <b>**River and Creek Flooding**</b>: Several rivers and creeks are present in and around Mumbai, and they can overflow their banks, leading to flooding in</p>	<p>has a high concentration of buildings, roads, and other impervious surfaces. This increases surface runoff during heavy rains, contributing to flood risks.</p> <p>3. <b>**Obstructed Waterways**</b>: Encroachments and waste blocking natural waterways and stormwater drains exacerbate flooding. These obstructions prevent the effective flow of water and drainage.</p> <p>4. <b>**Tidal Influences**</b>: Mumbai's coastal location means that high tides can exacerbate flooding during heavy rain, as water from the sea can backflow into the city's drainage systems, further complicating flood management.</p> <p>5. <b>**Climate Change**</b>: Rising sea levels and increased frequency of extreme weather events due to climate change add to the vulnerability of Mumbai to flooding during the monsoon season. Efforts to reduce flood risks in Mumbai involve upgrading drainage infrastructure, implementing effective waste</p>	<p>has led to increased impervious surfaces (like concrete), which prevents water absorption and increases runoff, exacerbating flooding.</p> <p>3. <b>**Drainage System Limitations**</b>: Mumbai's drainage systems are often inadequate to handle the volume of water during heavy rains, leading to waterlogging in various areas.</p> <p>4. <b>**Coastal Vulnerability**</b>: Being a coastal city, Mumbai also faces risks from storm surges and rising sea levels, which can compound flooding issues during high tides.</p> <p>5. <b>**River Flooding**</b>: Local rivers can overflow their banks during the monsoon, particularly if upstream areas receive heavy rainfall, impacting communities near the riverbanks.</p> <p>6. <b>**Infrastructure Strain**</b>: Flooding can damage roads, buildings, and public transportation systems, disrupting daily life and economic activities.</p> <p>7. <b>**Health Risks**</b>: Flooding can lead to waterborne diseases due to contaminated water supplies, posing</p>
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	<p>adjacent areas. 7.</p> <p><b>**Storm Surges**:</b> Although less common, tropical cyclones in the Arabian Sea can cause storm surges that may lead to coastal flooding. 8.</p> <p><b>**Population Density**:</b> With a high population density, the impact of flooding can be severe, affecting a large number of people and their livelihoods. 9.</p> <p><b>**Slum Areas**:</b> Many people live in informal settlements or slum areas that are particularly vulnerable to flooding due to their informal construction and location in flood-prone areas. 10.</p> <p><b>**Health Risks**:</b> Flooding can lead to an increased risk of waterborne diseases, as well as issues related to hygiene and sanitation. 11.</p> <p><b>**Economic Impact**:</b> Flooding can cause significant economic disruption, affecting businesses, industry, and transportation networks. 12.</p> <p><b>**Climate Change**:</b> The effects of climate change, such as rising sea levels and an increase in extreme weather events, may</p>	<p>management practices, and ensuring sustainable urban planning that takes into account the natural hydrology of the area.</p> <p><b>**End of response**</b></p> <p>5.07s</p>	<p>health risks to the population. 8.</p> <p><b>**Displacement of Residents**:</b> Severe flooding may force residents to evacuate their homes, leading to displacement and humanitarian challenges. Given these risks, it's crucial for city planners and authorities to implement effective flood management and disaster preparedness strategies to mitigate the impacts of the monsoon season. If you'd like, I can check for current flood warnings or additional flood data for Mumbai. Would you like to do that?</p> <p><b>**End of response**</b></p> <p>5.03s</p>
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	<p>increase the flood risk in the future. To better understand the specific flood risks for a specific location in Mumbai or another Asian city, it would be important to look at detailed flood maps and historical flood data. If you have a specific city in mind besides Mumbai or need current flood data or maps for any location, please provide that information, and I can assist you further.</p> <p><b>**End of response**</b></p> <p>14.32s</p>		
5E) What are the flood implications for an underground city?	<p><b>**Response**</b></p> <p>Building an underground city introduces several unique flood implications that need to be considered. Here are some potential flood-related implications and concerns for such a subterranean environment: 1.</p> <p><b>**Ingress of Water**</b>: One of the most significant concerns for an underground city is the potential for water to infiltrate the underground structures. This can occur from groundwater as well as from surface water entering through access points, such</p>	<p><b>**Response**</b></p> <p>An underground city, which includes tunnels, basements, and other subterranean infrastructure, faces unique flood implications. Here are some potential challenges and implications of flooding in such environments: 1.</p> <p><b>**Water Ingress**</b>: Underground cities are particularly vulnerable to water ingress from heavy rain, high groundwater levels, or nearby water bodies. The enclosed nature of these spaces can make it difficult for water to naturally drain away.</p>	<p><b>**Response**</b></p> <p>Flood implications for an underground city can be quite serious and may include the following: 1. <b>**Water Infiltration**</b>: Underground cities are particularly vulnerable to water infiltration. Floodwaters can seep into tunnels, chambers, and other subterranean areas, posing hazards to structures and inhabitants. 2. <b>**Structural Damage**</b>: The pressure exerted by floodwater can cause structural damage to walls, ceilings, and foundations, potentially leading to</p>

	<p>as entrances, ventilation shafts, or utility conduits. 2. <b>**Drainage Systems**</b>: An efficient drainage system is crucial to manage any water ingress. This system must be capable of handling not just everyday water flow but also sudden influxes due to heavy rainfalls or flash floods. It is essential to have redundant systems in place to mitigate the risks associated with system failures. 3. <b>**Waterproofing Measures**</b>: The construction of underground cities requires advanced waterproofing techniques to prevent water damage. These techniques include the use of impermeable membranes and protective coatings on the walls, floors, and roofs of underground structures. 4. <b>**Flood Barriers**</b>: To protect against sudden water surges from above ground, flood barriers and gates might need to be installed at critical points where water might enter the city. 5. <b>**Pumping Equipment**</b>: Continuous and</p>	<p>2. <b>**Drainage and Pumping Systems**</b>: Effective drainage and pumping systems are critical in preventing flooding. Failure or inadequacy of these systems during heavy rainfall can lead to flooding, disrupting operations and threatening safety. 3. <b>**Structural Damage**</b>: Accumulated floodwater can apply pressure on walls and floors, potentially causing structural damage. For underground cities, this could lead to hazardous conditions, requiring costly repairs and maintenance. 4. <b>**Access and Egress Issues**</b>: Flooding can block access and egress routes, posing significant safety risks for people using these underground spaces. Effective emergency planning and well-designed evacuation routes are essential. 5. <b>**Electrical and Mechanical System Damage**</b>: Flooding can damage critical infrastructure such as electrical systems, communication networks, and heating, ventilation, and air conditioning (HVAC) systems,</p>	<p>collapses or other catastrophic failures. 3. <b>**Displacement of Residents**</b>: Flooding may force residents to evacuate temporarily or permanently, disrupting community life and leading to homelessness, especially if access points are compromised. 4. <b>**Contamination**</b>: Floodwaters can be contaminated with chemicals, sewage, and debris, posing health risks to residents and complicating clean-up efforts. 5. <b>**Utility Disruptions**</b>: Utilities such as electricity, water, and sewage systems can be severely impacted by flooding, leading to outages and complications in providing essential services. 6. <b>**Limited Emergency Access**</b>: Flooding can hinder access to underground facilities, complicating rescue and emergency response operations for both residents and services. 7. <b>**Psychological Impact**</b>: Being trapped in a flooded underground environment can lead to severe anxiety and</p>
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	<p>emergency pumping systems are needed to remove any excess water that does enter, ensuring that the city remains dry and functional during and after rainfall events or floods. 6.</p> <p><b>**Emergency Preparedness**</b>: The population living underground would need to have emergency plans in place, including evacuation routes that lead to safe zones above the floodwaters should the city's protections be overwhelmed. 7.</p> <p><b>**Impact on Infrastructure**</b>: Flooding could have substantial impacts on infrastructure such as electrical systems, communication networks, and transportation corridors – all vital for the functioning of an underground city. 8.</p> <p><b>**Hydrological Surveys**</b>: Detailed hydrological surveys are necessary to understand how water moves through the area around an underground city. This helps in anticipating the ways water might threaten the structure and allows for better preventive planning. 9.</p> <p><b>**Surrounding</b></p>	<p>leading to prolonged disruptions. 6.</p> <p><b>**Public Health Concerns**</b>: Stagnant floodwater can become a breeding ground for mold and bacteria, posing health risks to inhabitants and necessitating extensive cleanup and sanitation efforts. 7.</p> <p><b>**Interruption of Services**</b>: Flooding can disrupt commercial activities, transportation systems, and residential life if essential services are housed underground. This can lead to economic losses and inconvenience for residents and businesses. Addressing these flood implications typically involves robust design and engineering solutions, including advanced drainage systems, waterproofing materials, and regular maintenance to ensure the infrastructure remains resilient to flood risks. Additionally, emergency preparedness and response plans are crucial to minimize the impact of flooding on an underground city.</p>	<p>psychological stress for residents. Given these implications, it is crucial for underground city planners and authorities to have robust flood prevention and response measures in place to mitigate risks.</p> <p><b>**End of response**</b></p> <p>5.12s</p>
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	<p>Environment**: The natural and built environments above the underground city influence its flood risk. For example, impermeable surfaces increase runoff, potentially exacerbating flooding.</p> <p>10. **Climate Change Considerations**: Long-term planning must take into account changes in precipitation patterns and the frequency/intensity of extreme weather events due to climate change.</p> <p>11. **Legal and Insurance Issues**: Underground cities may face legal and insurance challenges when it comes to flood damage coverage and liability, as traditional policies may not account for the unique risks associated with subterranean structures. It's important to address these concerns through careful planning, engineering, and management to mitigate the potential risks of flooding in an underground city.</p> <p>**End of response** 19.59s</p>	<p>**End of response** 19.35s</p>	
5F) How would a sudden thaw of a	<p>**Response** A sudden thaw of a</p>	<p>**Response** A sudden thaw or rapid</p>	<p>**Response** A sudden thaw of a</p>

large glacier affect flood risks in nearby areas?	<p>large glacier can significantly affect flood risks in nearby areas in several ways. The most immediate impact would be from the release of a large volume of water previously locked in ice. Here's how the various aspects of glacial melt could contribute to flooding risks:</p> <ol style="list-style-type: none"> <li><b>**Release of Meltwater**:</b> As the glacier melts rapidly, it releases a huge amount of meltwater, which can lead to increased river flow downstream, potentially overflowing banks and inundating adjacent lands.</li> <li><b>**Glacial Lake Outburst Floods (GLOFs)**:</b> Glacial melting can lead to the formation or enlargement of glacial lakes. If a lake's natural dam (which can be made of ice or glacial sediment called moraine) bursts, it can cause catastrophic flooding downstream. These outburst floods are often sudden and can carry large amounts of debris.</li> <li><b>**Rising Sea Levels**:</b> A massive glacial thaw contributes to global sea-level rise. Although the effect is less immediate for</li> </ol>	<p>melting of a large glacier can significantly increase flood risks in nearby areas through several mechanisms:</p> <ol style="list-style-type: none"> <li><b>**Glacial Lake Outburst Floods (GLOFs)**:</b> Rapid glacial melting can lead to the formation or expansion of glacial lakes. If these lakes breach their natural or artificial barriers, it can cause sudden and catastrophic flooding downstream, known as a Glacial Lake Outburst Flood (GLOF).</li> <li><b>**Increased River Discharge**:</b> The sudden addition of meltwater to rivers can dramatically increase their discharge, leading to overflow and flooding in nearby areas. This is particularly concerning for regions with rivers originating from glacier-fed mountain ranges.</li> <li><b>**Soil Saturation**:</b> The rapid influx of meltwater can saturate soils, reducing their ability to absorb further precipitation. This increases the likelihood of surface runoff and flooding during subsequent rainfall events.</li> <li><b>**Landslides and</b></li> </ol>	<p>large glacier can significantly increase flood risks in nearby areas for several reasons:</p> <ol style="list-style-type: none"> <li><b>**Rapid Meltwater Release**:</b> When a glacier thaws quickly, it releases a large volume of meltwater in a short period. This sudden influx of water can overwhelm rivers and streams, leading to flash flooding.</li> <li><b>**Increased River Flow**:</b> The meltwater can lead to an increase in river flow levels, which may cause rivers to overflow their banks, inundating adjacent areas.</li> <li><b>**Glacial Lake Outburst Floods (GLOFs)**:</b> If there are glacial lakes formed at the base of the glacier, a sudden thaw can lead to the rupture of these lakes, resulting in massive floods that can carry debris and ice, causing additional hazards downstream.</li> <li><b>**Soil Saturation**:</b> If the ground is already saturated from previous precipitation, additional meltwater can exacerbate flooding risks, particularly in low-lying areas.</li> <li><b>**Infrastructure Impact**:</b> Flooding</li> </ol>
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	<p>inland areas, coastal regions may experience enhanced flood risks during high tides and storm surges. 4. <b>**Altered Drainage Patterns**</b>: The retreat of glaciers can also change the natural drainage patterns in an area. New streams or rivers may form, or existing ones may be blocked, rerouted, or experience changes in flow volume, affecting local flood risks. 5. <b>**Groundwater and Soil Saturation**</b>: The additional meltwater can saturate the ground and raise the water table. This could lead to flooding in areas not typically prone to it, especially if the thaw occurs rapidly and the ground cannot absorb the water fast enough. 6. <b>**Permafrost Thaw**</b>: In regions where permafrost exists, its thaw can lead to the release of large quantities of water. The excess moisture can destabilize river banks and increase the flow rate of rivers and streams, leading to floods. 7. <b>**Look at Current Flood Risks**</b>: To understand current flood risks in particular areas, it's useful to look at the</p>	<p>Debris Flows<b>**</b>: The destabilization of slopes due to sudden glacier thaw can trigger landslides and debris flows. These can block river channels, creating temporary dams that may suddenly release and lead to flooding. 5. <b>**Infrastructure Damage**</b>: Flooding from glacial thaw can damage infrastructure, including roads, bridges, and buildings, especially in mountainous regions where infrastructure may already be vulnerable to natural hazards. 6. <b>**Impact on Water Resources**</b>: While initially increasing water availability, prolonged glacier melting may eventually lead to reduced water resources, affecting communities that depend on glaciers as a source of fresh water. Understanding these risks requires effective monitoring of glaciers and proactive flood risk management, including early warning systems and preparedness strategies to protect communities from the impacts of sudden</p>	<p>from glacier thaw can damage infrastructure, such as roads, bridges, and buildings, and can lead to long-term challenges for communities. 6. <b>**Altered Ecosystems**</b>: Beyond immediate flooding risks, the rapid thaw and subsequent flooding can disrupt local ecosystems, affecting wildlife habitats and water quality. In conclusion, a sudden glacier thaw poses serious flood risks that require monitoring and preparedness measures in nearby regions. <b>**End of response**</b> 7.41s</p>
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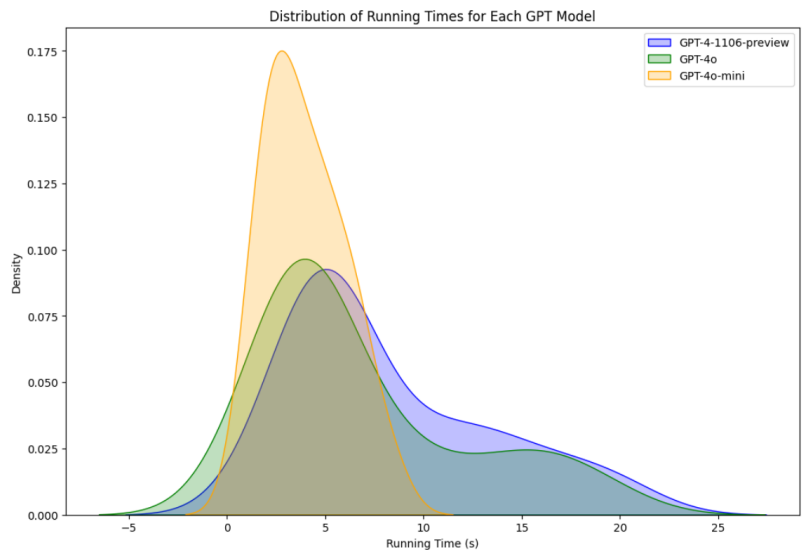
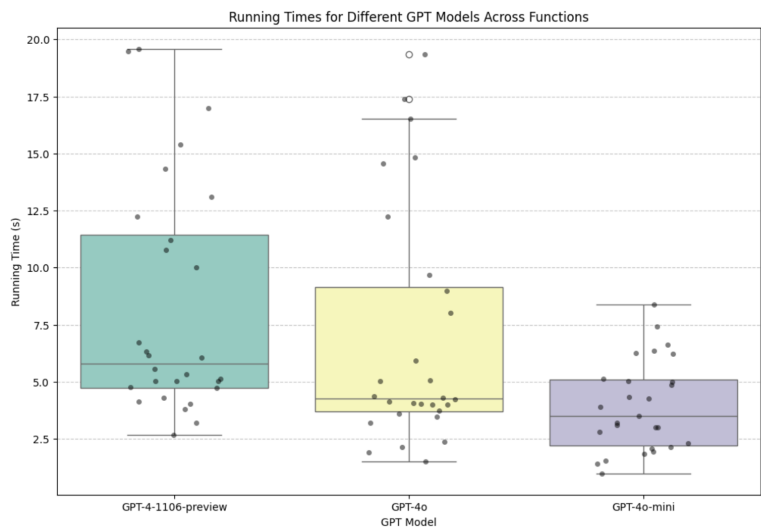
	<p>existing flood maps or data. This can offer a visual perspective on any potential flood-prone regions. Would you like to check the current flood map for a specific location, or do you have an address in mind to see its flood data or flash flood warnings? Please provide the relevant details like the location's coordinates, address, or state abbreviation if you would like to proceed with flood inquiries.</p> <p><b>**End of response**</b></p> <p>13.10s</p>	<p>glacial thaws.</p> <p><b>**End of response**</b></p> <p>12.24s</p>	
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Running Time	GPT-4-1106-preview	GPT-4o	GPT-4o-mini
5A	16.98 s	17.40 s	4.86 s
5B	11.20 s	9.69 s	6.27 s
5C	15.40 s	5.93 s	4.27 s
5D	14.32 s	5.07 s	5.03 s
5E	19.59 s	19.35 s	5.12 s
5F	13.10 s	12.24 s	7.41 s

Token Usage	GPT-4-1106-preview	GPT-4o	GPT-4o-mini
5A	577	473	404
5B	512	393	422
5C	545	404	388
5D	549	300	382
5E	569	409	301
5F	504	361	303

Running Time Evaluation:

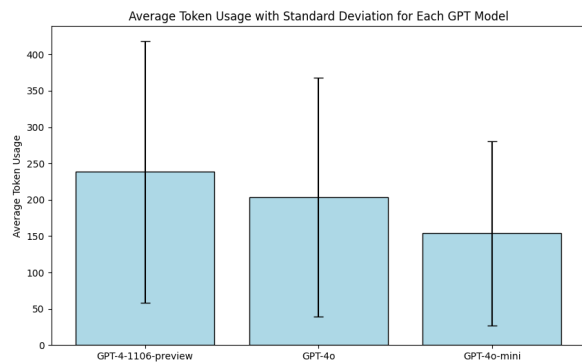
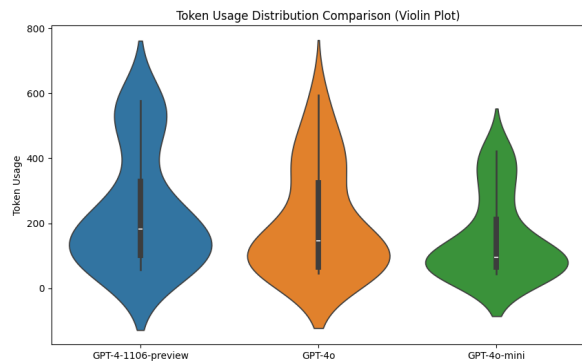
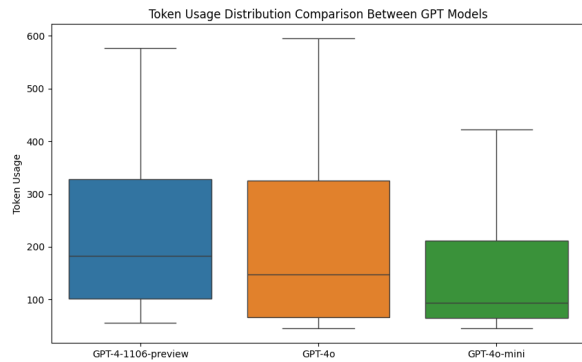
	GPT-4-1106-preview	GPT-4o	GPT-4o-mini
count	28.000000	28.000000	27.000000
mean	8.248929	6.876786	3.947407
std	5.092758	5.212446	1.996835
min	2.680000	1.510000	0.980000
25%	4.742500	3.692500	2.210000
50%	5.805000	4.260000	3.500000
75%	11.455000	9.150000	5.075000
max	19.590000	19.350000	8.390000



This evaluation shows an average performance and the variability in running times for each GPT model, as well as a sense of which model performed faster across different functions.

## Token Usage Evaluation:

	GPT-4-1106-preview	GPT-4o	GPT-4o-mini
count	28.000000	28.000000	27.000000
mean	238.285714	203.571429	153.740741
std	179.734549	164.192170	126.470913
min	56.000000	46.000000	45.000000
25%	102.250000	65.750000	64.500000
50%	183.000000	147.000000	94.000000
75%	328.250000	325.000000	212.000000
max	577.000000	595.000000	422.000000



According to these plots, each model shows a different performance, which is based on not only the prompt but also the function used during this experiment. For example, GPT-4o would be a good fit when flexibility and efficiency matter. GPT-4o-mini is optimized for shorter and more consistent responses. However, GPT-4-1106-preview is not as good as others.

Final Comparison:

Variables\Models	GPT-4-1106-preview	GPT-4o	GPT-4o-mini
Running Time	8.24s±5.44	6.87s±5.51	3.94s±2.13
Cost (Pricing, n.d.)	\$10.00 / 1M tokens	\$2.50 / 1M tokens	\$0.15 / 1M tokens
Token Usage	238.28±179.73	203.57±164.19	126.47±126.47
Evaluation & Accuracy	3.61 4.13(Martelo & Wang, 2024)	3.91	3.69

Results:

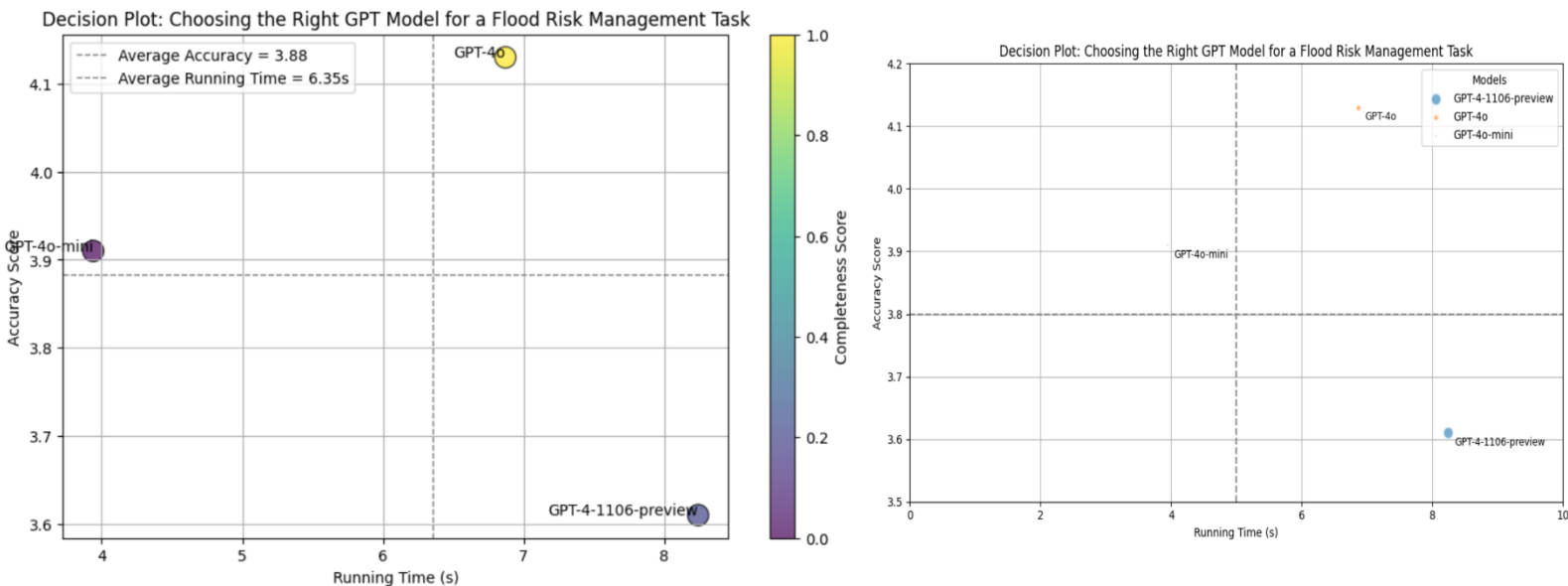
In this study, the output of various GPT language models was compared, and the results indicated that the overall performance of both GPT-4o and gpt-4o-mini outperformed GPT-4-1106-preview. However, GPT-4o’s generated responses have significantly higher accuracy compared to GPT-4o-mini during the evaluation, especially in terms of response relevance and accuracy during the evaluation process.

Despite the superior performance of GPT-4o, it is important to note that GPT-4o is more expensive and slower than the smaller GPT-4o-mini. This fact shows that the selection of an appropriate GPT model should depend on the given prompt and function. For tasks where high accuracy and detailed responses are critical, GPT-4o is the preferred choice. On the other hand, GPT-4o-mini is a more cost-effective and efficient option when speed is prioritized.

The results also reveal that the fastest function in comparison to others is the SVI function, and the slowest function in responding would be the Flood\_Related queries function. These findings emphasize the importance of selecting the right GPT model based on our needs.

Recommendations for Model Selection:

- If you need the highest accuracy, use GPT-4o (high accuracy, medium speed, and cost).
- If you need a balance of speed and accuracy, use GPT-4-1106-preview (slower but good accuracy).
- If you need low cost and fast response, use GPT-4o-mini (lower accuracy, but fast and cheap).



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