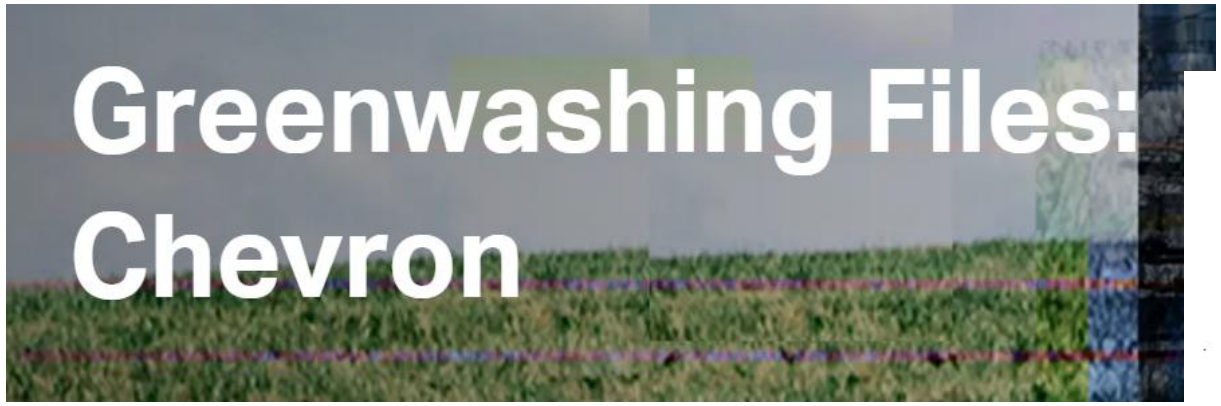
Climate Disinformation Tracker

6.1.1. De Nationale Politie - Cesar Hernando, Kasper Trouwee, Maria Paula Jimenez Moreno, Manya Atul Narkar, Shirley Li, Vincent van Vliet

Context



Reduce your carbon footprint. But first, find out what it is.

Call it your mark on the world. It's the amount of carbon dioxide emitted due to your daily activities—from mowing your lawn to vacuuming your home. Find out the size of your household's carbon footprint, learn how you can reduce it, and see how we're reducing ours at bp.com/carbonfootprint. It's a start.

bp

beyond petroleum

Real climate solutions won't happen without natural gas and oil

By **Mike Sommers, President and CEO, American Petroleum Institute**
December 14, 2020

Energy from U.S. natural gas and oil is fundamental to economic recovery and addressing climate change goals.

Any student of U.S. history knows that America met the greatest challenges of our past — the Great Depression,

Content From

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Important to note that what happens on Earth's surface (eg farming) has no meaningful impact on climate change.

Overwhelmingly, the risk of climate change is due to moving billions of tons of carbon from deep underground into the atmosphere.

Over time, if we keep doing this, the chemical makeup of our atmosphere will change enough to induce meaningful climate change.

4:28 AM · Jun 25, 2023 · **10.5M** Views

Relevance

Discrimination

New Technologies

Environmental Safety

Relevance

Discrimination

New Technologies

Environmental Safety

How can we help?

- Disinformation is not illegal.
- Organisations partaking in climate disinformation campaigns are often involved in other prosecutable crimes.
- By providing investigative journalists with a means to find the source of disinformation online, they are able to use their resources to find the actors behind such narratives.
- Once identified, the Dutch National Police can investigate these organisations for prosecutable offenses – giving them a lawful entry into stopping the spread of climate disinformation.

How can we help?

What is it?

A tool that – with multiple optional advanced-search parameter – identifies the earliest traceable source of a disinformation claim alongside a visualisation of its spread.

Who are our direct end users?

- Investigative journalists, researchers and analysts that need traceability.
- General public

Sustainability Goals

- People: Awareness and restoration of trust
- Planet: Successful climate action
- Profit: Fosters integrity and allows companies committed to sustainability to thrive

Business Aspect

- Non-profit
- Open source
- Ideal situation
- Pain
- Gain

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  - Hosted
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  - Reduces time
  - High social value
  - Scalable framework

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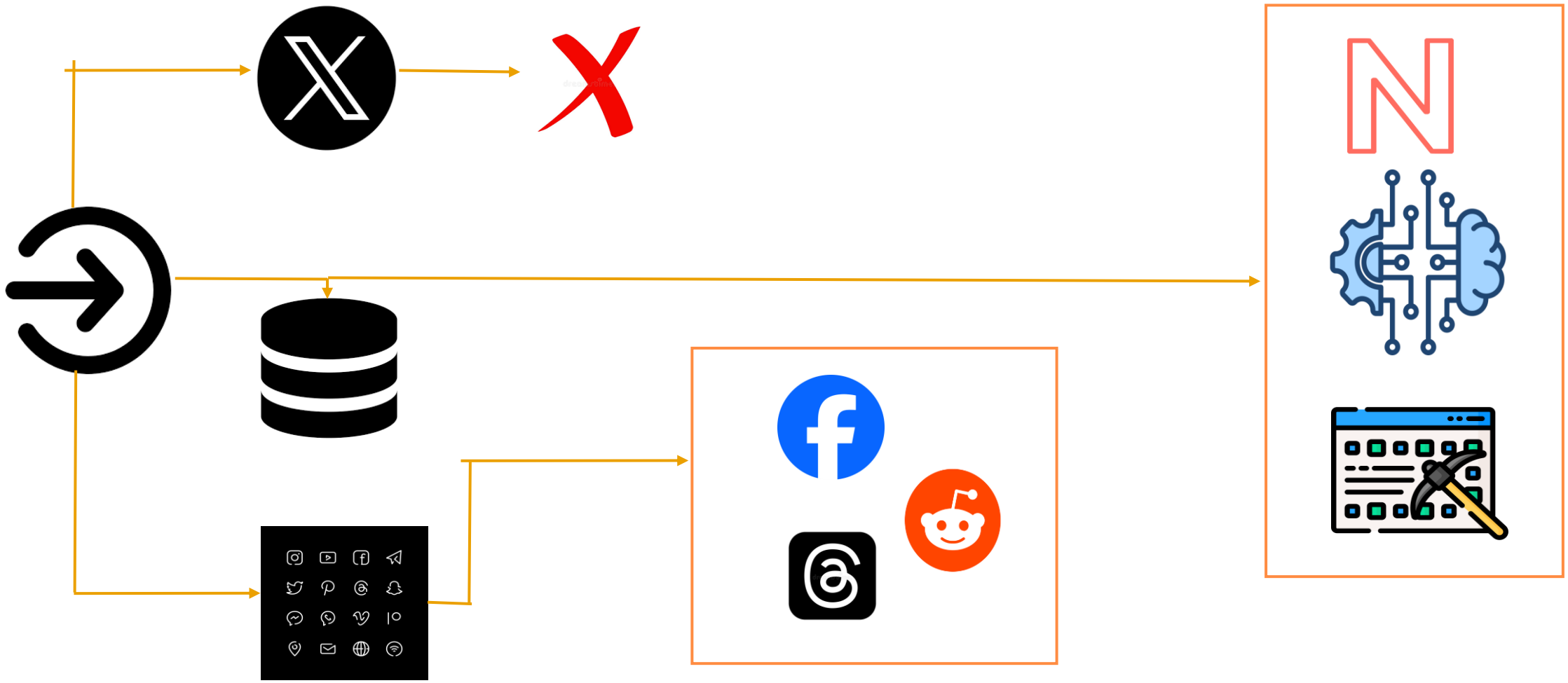
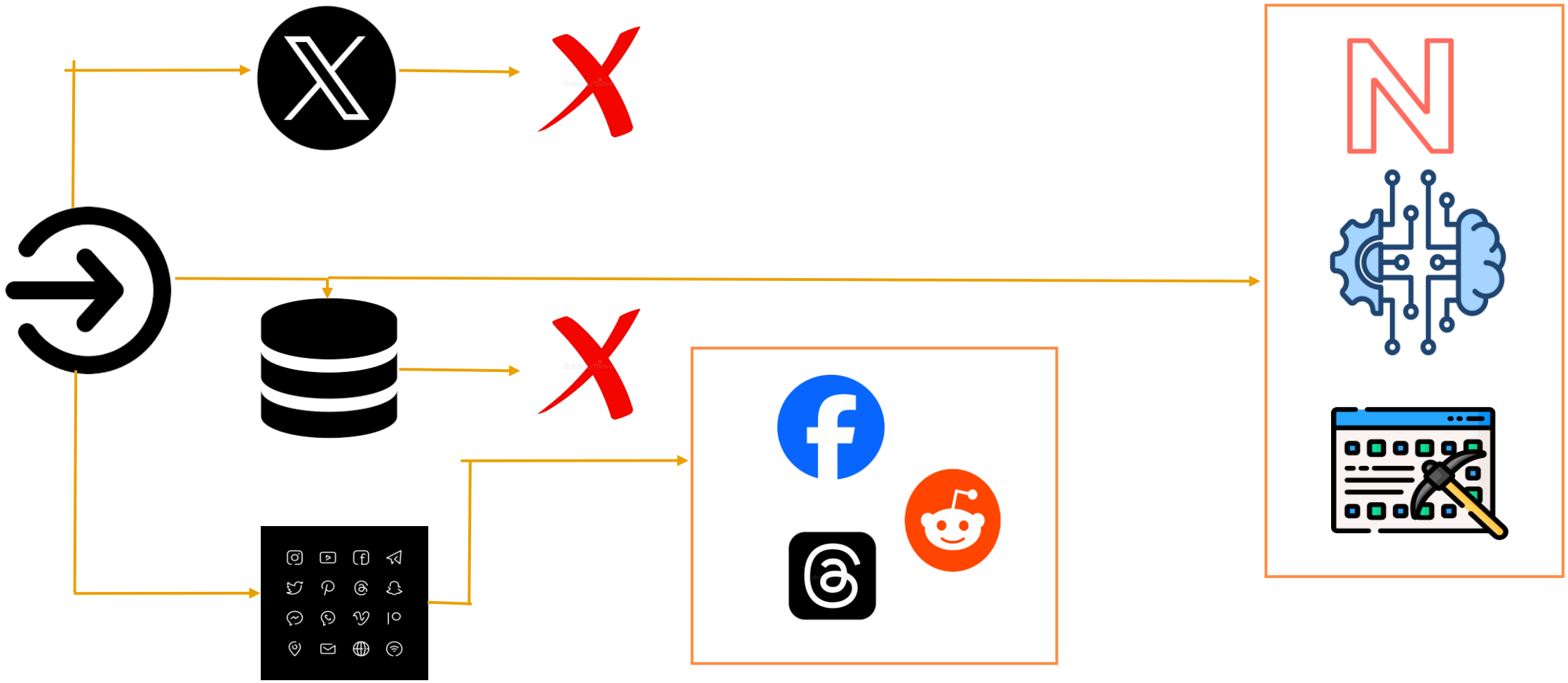
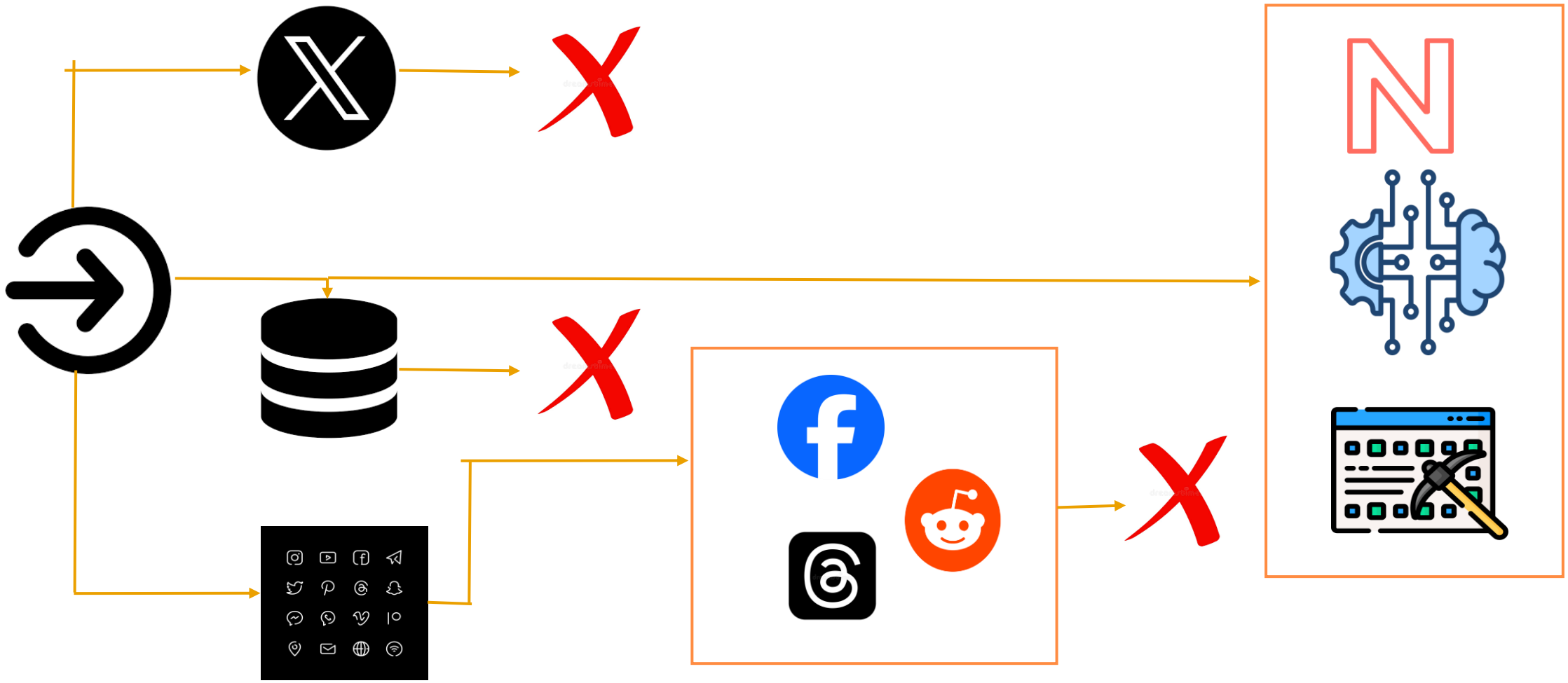
System Motivation & Explored Solutions



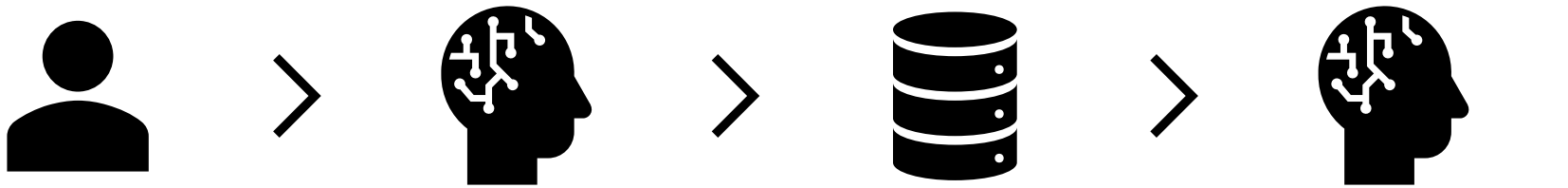
System Motivation & Explored Solutions



System Motivation & Explored Solutions



System design & functionalities



User input claim

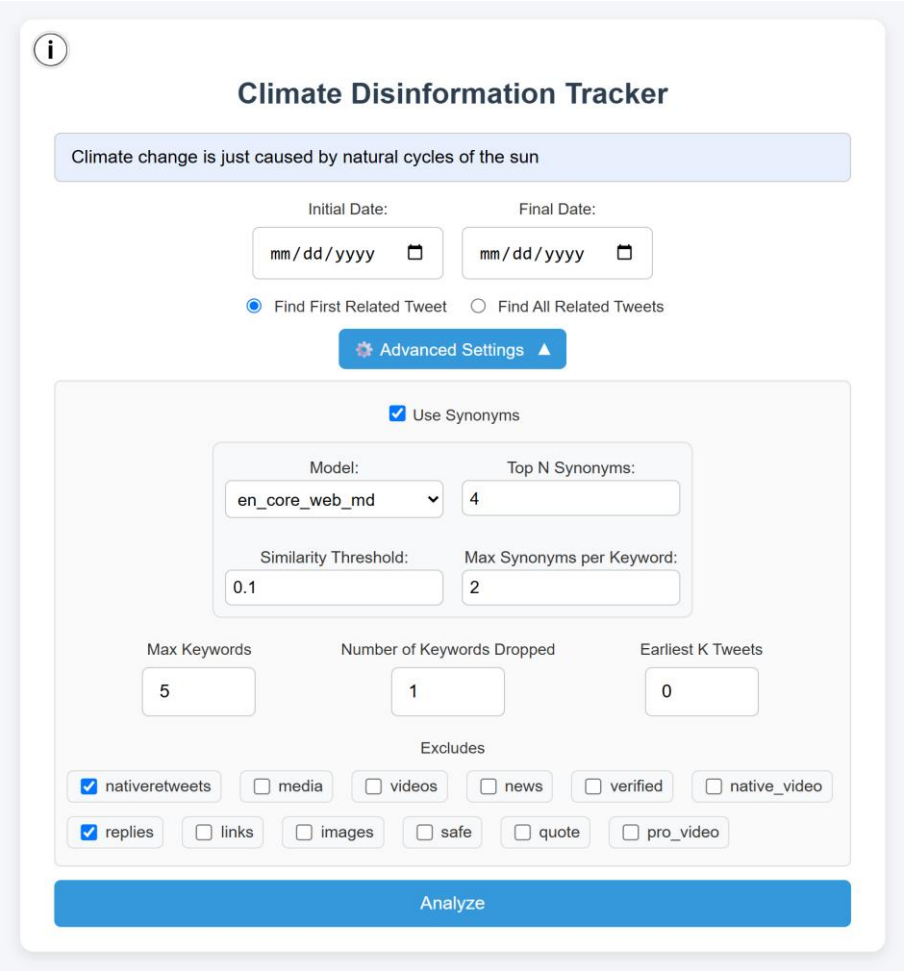
Extract keywords

Get tweets

Checks Alignment

System design & functionalities

Interactive interface where users can find the source tweet(s)aligning with an input claim



Visualize the spread of information about the topic

Keyword extraction and query generation

- Nitter uses keyword-based search and supports Boolean queries.
- To make the user experience smoother, the tool extracts the keywords from the input claim using *KeyBERT*.
- *KeyBERT* is a transformer-based model that leverages contextual embeddings generated by BERT – or any of its derivatives ⇨ *mstsb-paraphrase-multilingual mpnet-base-v2*

"Electric vehicles are actually worse for the environment than gas cars" ⇨ *["electric", "gas", "worse", "environment", "cars"]*

max_keywords = 5

- Then, we generate the Boolean query:

n_keywords_dropped = 1 ⇨ *(electric AND gas AND worse AND environment) OR (electric AND gas AND worse AND cars) OR ...*

⇧ **Flexibility**

Synonym-enhanced search

- Problem: Keyword search does not retrieve tweets phrased with different words
- Solution: Including synonyms in the Boolean query
- How:
    1. *Wordnet* suggests synonyms
    2. *Spacy* filters them based on their suitability in the context of the claim.
    3. The user can select from the suggested synonyms or add custom ones
    4. Add chosen synonyms in between ORs

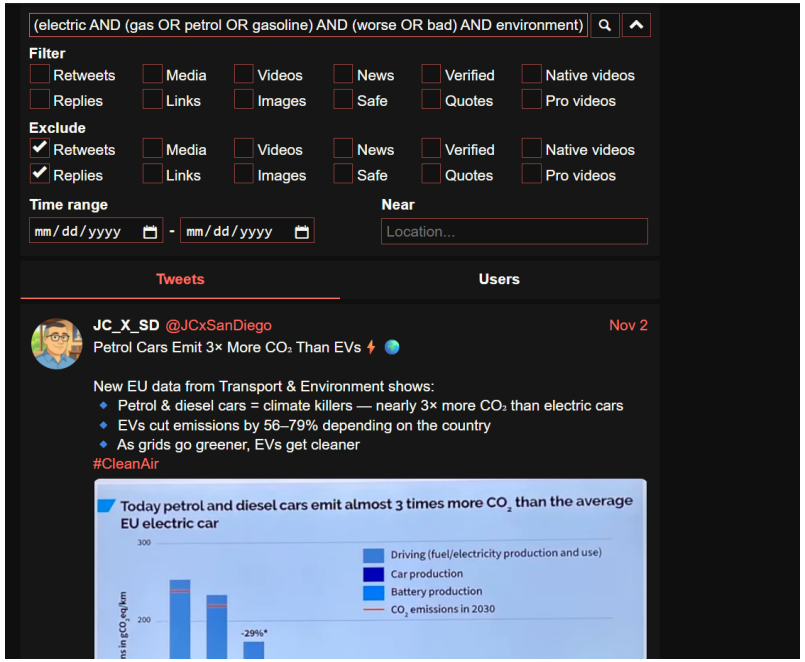
Balance of speed, accuracy and customizability

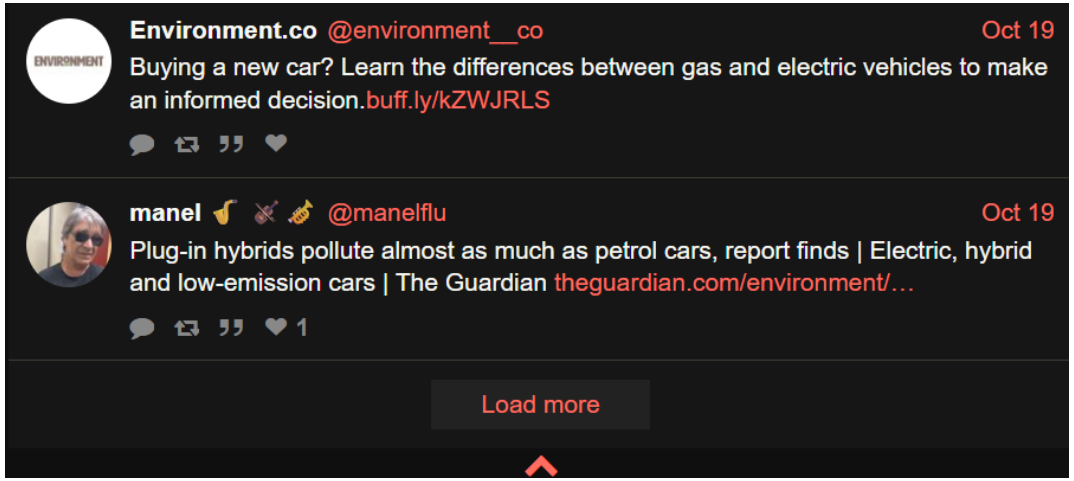
(*electric AND (gas OR petrol OR gasoline) AND (worse OR bad) AND environment****)*** *OR*

(*electric AND (gas OR petrol OR gasoline) AND (worse OR bad) AND (cars OR vehicles)****)*** *OR …*

Tweet retrieval

- We retrieve tweets by crawling and scraping Nitter ⟹ *Playwright async API* and *BeautifulSoup*
- Inputs: query, date range and filters
- Nitter shows the latest tweets first — inverse chronological order





How can we efficiently find the earliest tweet?

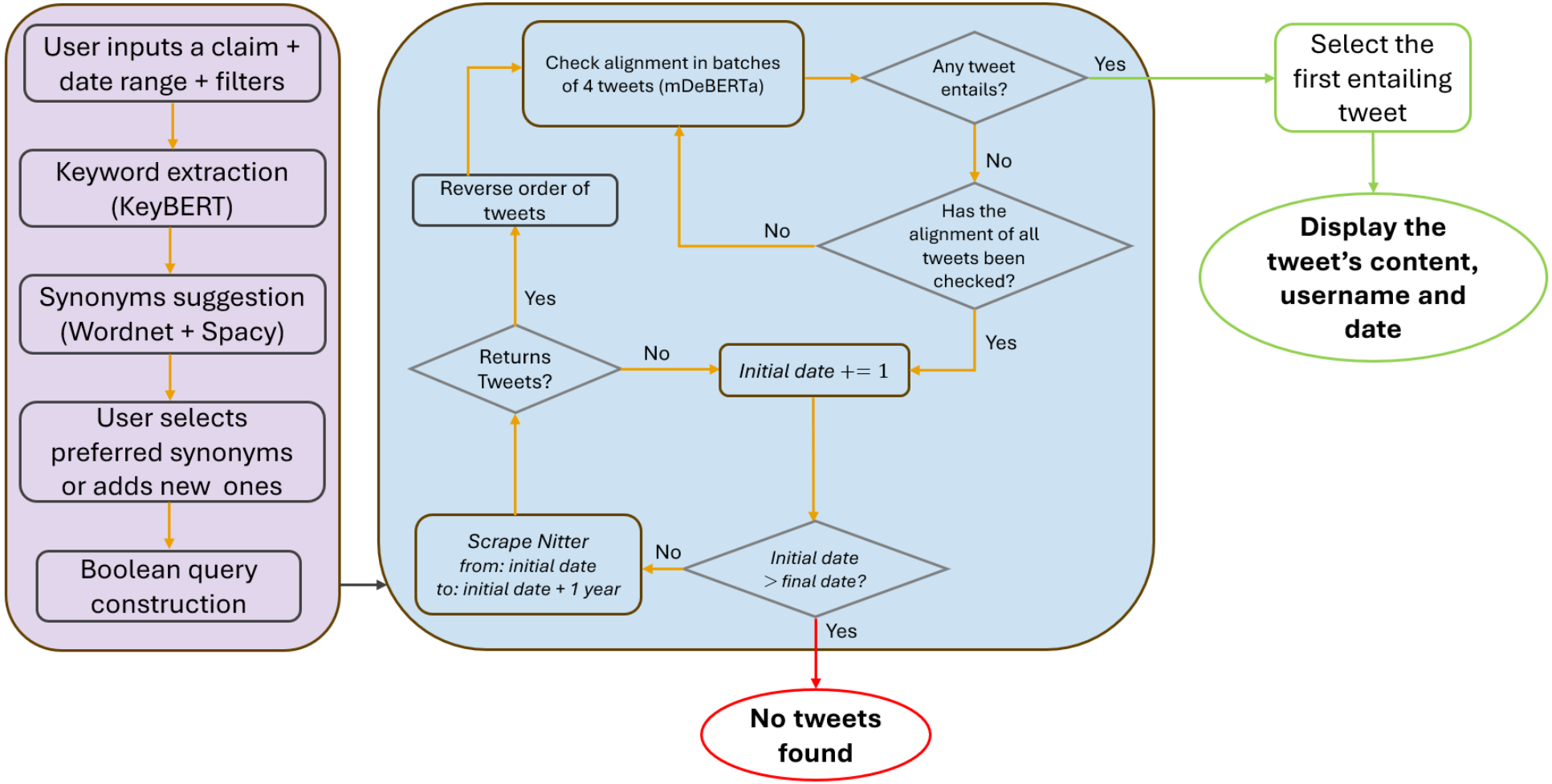
Predicting tweet alignment

- The retrieved tweets can fall in three different categories:
  - Entailing/aligned
  - Contradicting
  - Neutral

Since the input is a false claim about climate change, we are mostly interested in the entailing tweets

- To determine the alignment, or *natural language inference* (NLI), we employ the model: *mDeBERTa v3-base-mnli-xnli*.
- Multilingual large language model available on Hugging Face.
- This model was evaluated on the XNLI test set, and it is reported to have almost 90% accuracy on English.

Finding the earliest entailing tweet



Visualization

- Overview page
- Network analysis page

Overview | Network Analysis

Climate Disinformation Tracker

Climate change is just caused by natural cycles of the sun

Show tweets:
- Entailment
- Neutral
- Contradiction

First Found Entailing Tweet

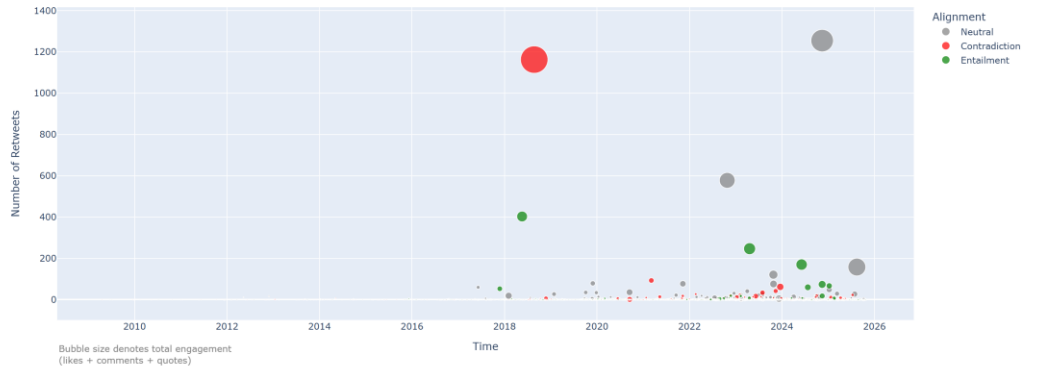
@DonPeppers Jun 18, 2009 11:18

Climate change largely caused by the sun's natural cycles - new study by NASA http://tinyurl.com/n8ezqh

0 0 0 0

Posts Bubble Chart

Linear Y-axis | Log Y-axis

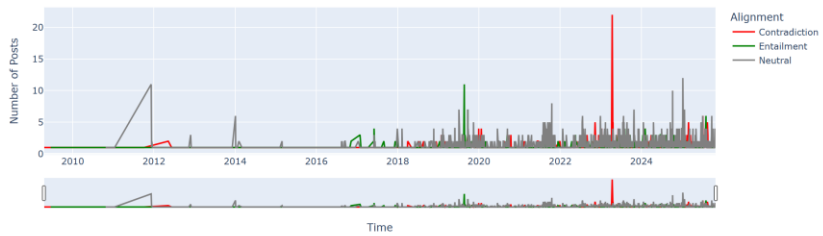


@PeterDClack Nov 13, 2024 22:46

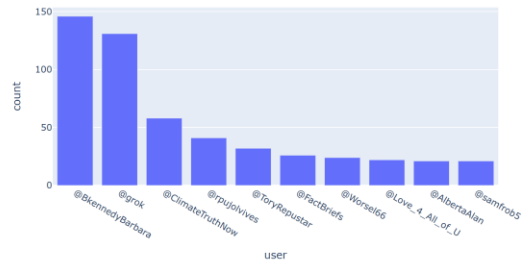
Weather patterns & cycles of warming or cooling are not caused by carbon dioxide. They come from the sun, which is 99.85 the mass of the solar system & controls all light & energy. The climate campaign exploits fear & falsified data to create an environmental crisis.

89 1255 2603 68

Post Frequency Over Time by Alignment



Top 10 Posters



2019-08-23

Remove Date Filter | Remove User Filter

@Love_4_All_of_U Aug 23, 2019 21:18

It's not CO2, it's not you, it's the Sun.Climate change is all about the natural cycles of the Sun & the Grand Solar Minimum cycle it is currently in. invidious.tiekoetter.com/watch?v=G2c_GIqY…

0 0 1 0

@Love_4_All_of_U Aug 23, 2019 20:34

Quoting: @ClimateChangeUS

They can manipulate their data all they want but there's no denying the facts. It's not CO2, it's not you, it's the Sun. Climate change is all about the natural cycles of the Sun & the Grand Solar Minimum cycle it is currently in.

0 0 0 0

@Love_4_All_of_U Aug 23, 2019 20:34

Replying to: @ClimateChangeUS

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0 0 0 0

@Love_4_All_of_U Aug 23, 2019 20:33

Replying to: @tancopsey

They can manipulate their data all they want but there's no denying the facts. It's not CO2, it's not you, it's the Sun. Climate change is all about the natural cycles of the Sun & the Grand Solar Minimum cycle it is currently in.

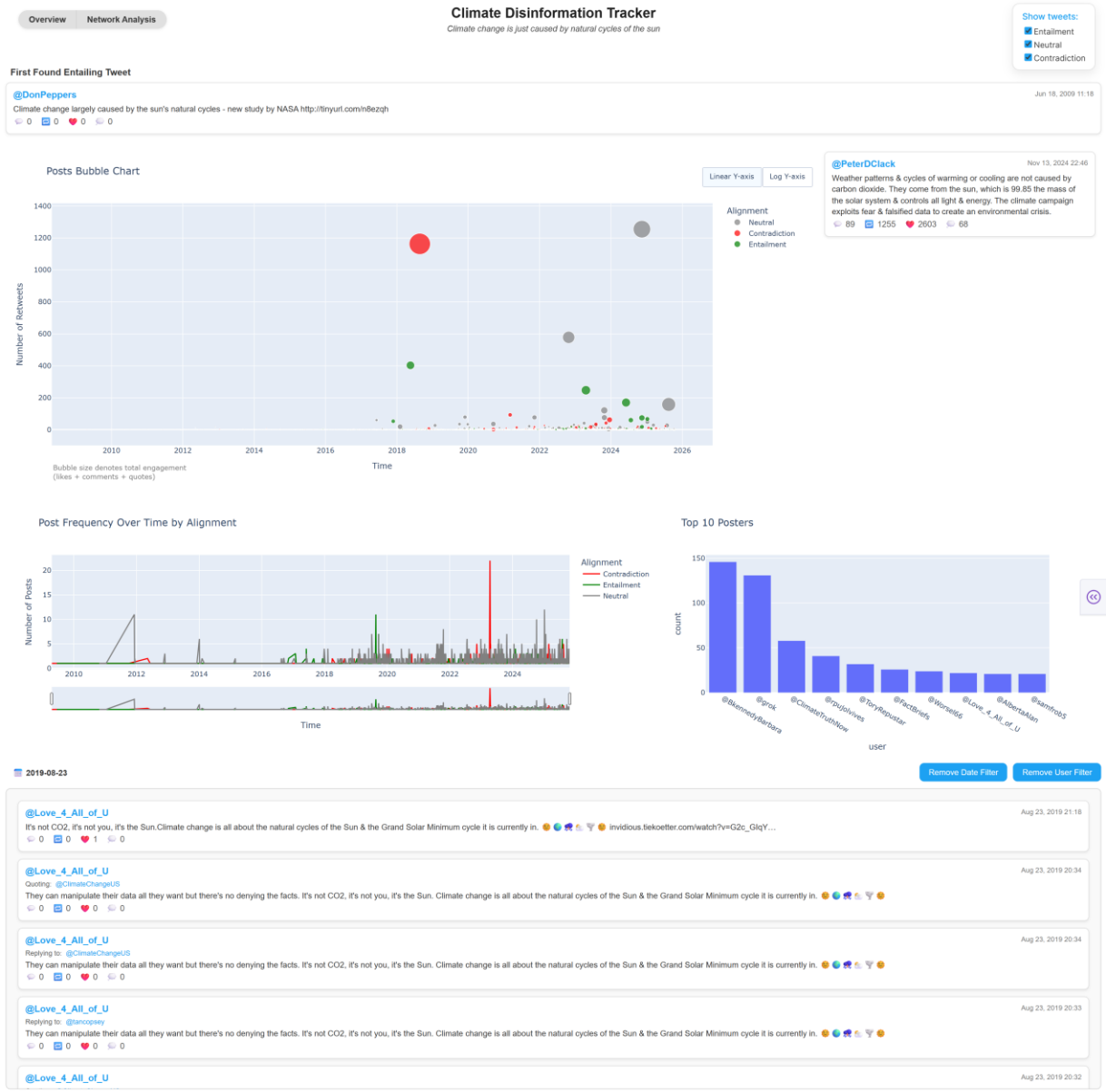
0 0 0 0

@Love_4_All_of_U Aug 23, 2019 20:32

Overview

- Bubble chart: time vs engagement
- Line chart: tweet frequency over time
- Bar chart: top 10 posters

- Filter by date and/or user
- Filter by alignment



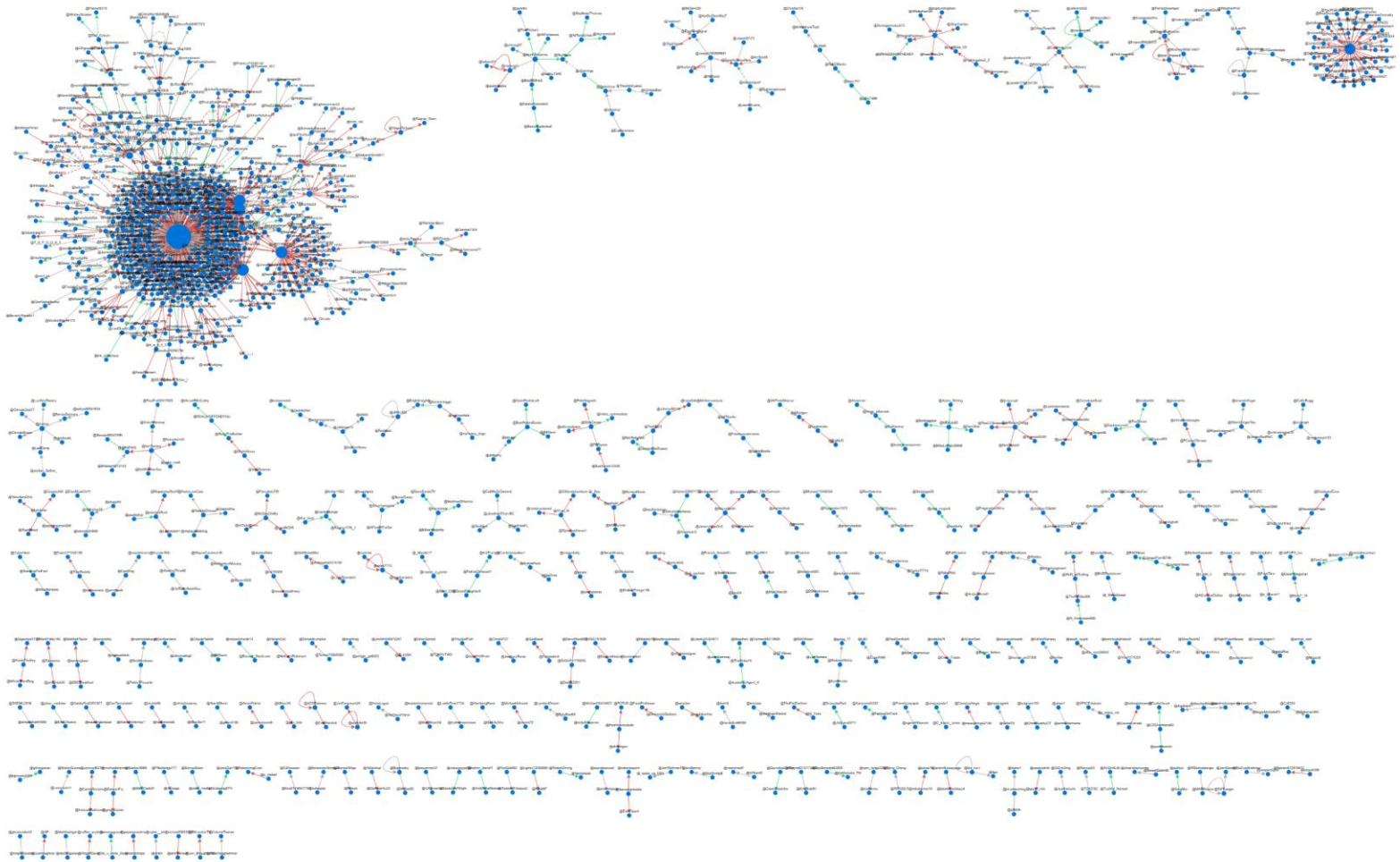
Overview | Network Analysis

Climate Disinformation Tracker

Climate change is just caused by natural cycles of the sun

Show tweets:
- ☑ Entailment
- ☑ Neutral
- ☑ Contradiction

Date Range: 2025-01-01 → 2025-10-29 ☑ Replies — ☑ Quotes ---



User: @Joe_Public2018 | Tweets: 4

@Joe_Public2018 Mar 17, 2025 16:30

Replying to: @jimdtweet @grok @Michael_D_Crow @FreeSpeech4U_Me @dafalgoutDennis @Frnc_prep @MLeiter42 @craigthomler @patfrank830 @evenminded512 @sjsimmons @ChrisBBacon3 @TrixX306 @DaleGribble_666 @priscian @Kenneth72712993 @WHPAAD @ammocrypta @Mark_A_Lunn @WayneAllanH @ladyspat1 @BubbasRanch @JJ9621073059835 @BobPartridge16 @LexWaters7 @Devonian1342 @JamesAbbott2013 @jgorman2424 @jgatta06 @TypicalDeviant @isaacscradle @CDCollins5269 @phlannelphysics @BenKoby1911 @ClimateRetorts @RobertWager1 @hannon_renee @RixAutomatedMat @GeorgeJeff9804 @roger_clague @GillesnFio @ClimatePoet @EthonRaptor @dantrimont @Quentin__France @PoeBrianL @ilovekiirth @IBergwiesel

Ah ha! So solar increase drove 1910-1940 warming, but CO_2 supposedly took over in 1980? That's cherry-picking. If the Sun warmed us then, why ignore it now? Climate isn't a switch—it's natural cycles, not CO_2 control.

1 0 2 0

@Joe_Public2018 Mar 17, 2025 16:05

Replying to: @jimdtweet @sjsimmons @grok @Michael_D_Crow @FreeSpeech4U_Me @dafalgoutDennis @Frnc_prep @MLeiter42 @craigthomler @patfrank830 @evenminded512 @ChrisBBacon3 @TrixX306 @DaleGribble_666 @priscian @Kenneth72712993 @WHPAAD @ammocrypta @Mark_A_Lunn @WayneAllanH @ladyspat1 @BubbasRanch @JJ9621073059835 @BobPartridge16 @LexWaters7 @Devonian1342 @JamesAbbott2013 @jgorman2424 @jgatta06 @TypicalDeviant @isaacscradle @CDCollins5269 @phlannelphysics @BenKoby1911 @ClimateRetorts @RobertWager1 @hannon_renee @RixAutomatedMat @GeorgeJeff9804 @roger_clague @GillesnFio @ClimatePoet @EthonRaptor @dantrimont @Quentin__France @PoeBrianL @ilovekiirth @IBergwiesel

So now the Sun matters? Exactly my point—natural cycles control climate far more than CO_2. If solar variation explains 1910-1940 warming, why ignore it for 1980-2000? CO_2 is just a minor player in a much bigger system. 🌞

3 0 1 0

@Joe_Public2018 Mar 17, 2025 15:51

Replying to: @sjsimmons @grok @Michael_D_Crow @FreeSpeech4U_Me @dafalgoutDennis @Frnc_prep @MLeiter42 @jimdtweet @craigthomler @patfrank830 @evenminded512 @ChrisBBacon3 @TrixX306 @DaleGribble_666 @priscian @Kenneth72712993 @WHPAAD

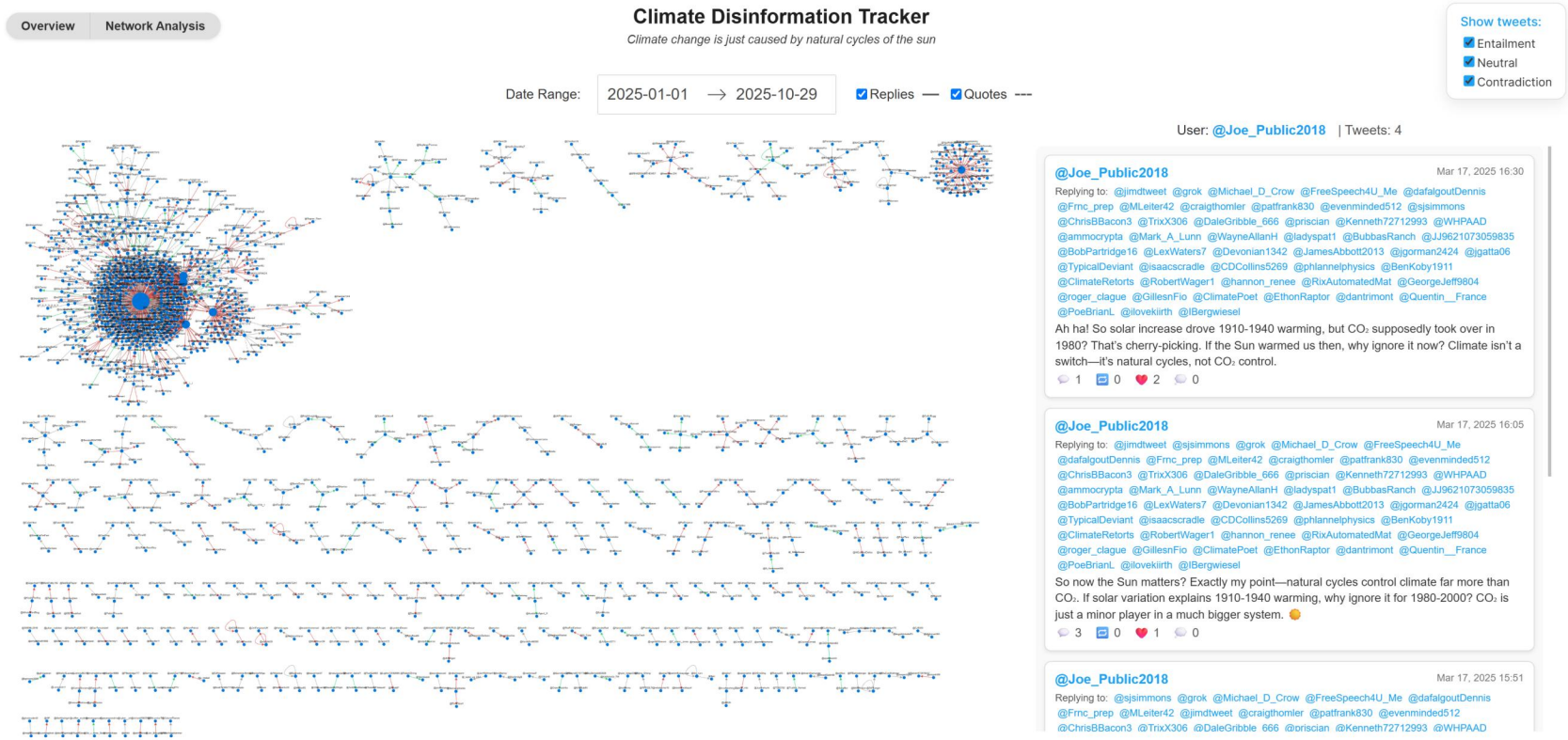
Network Analysis

- Reply/quote interaction between users

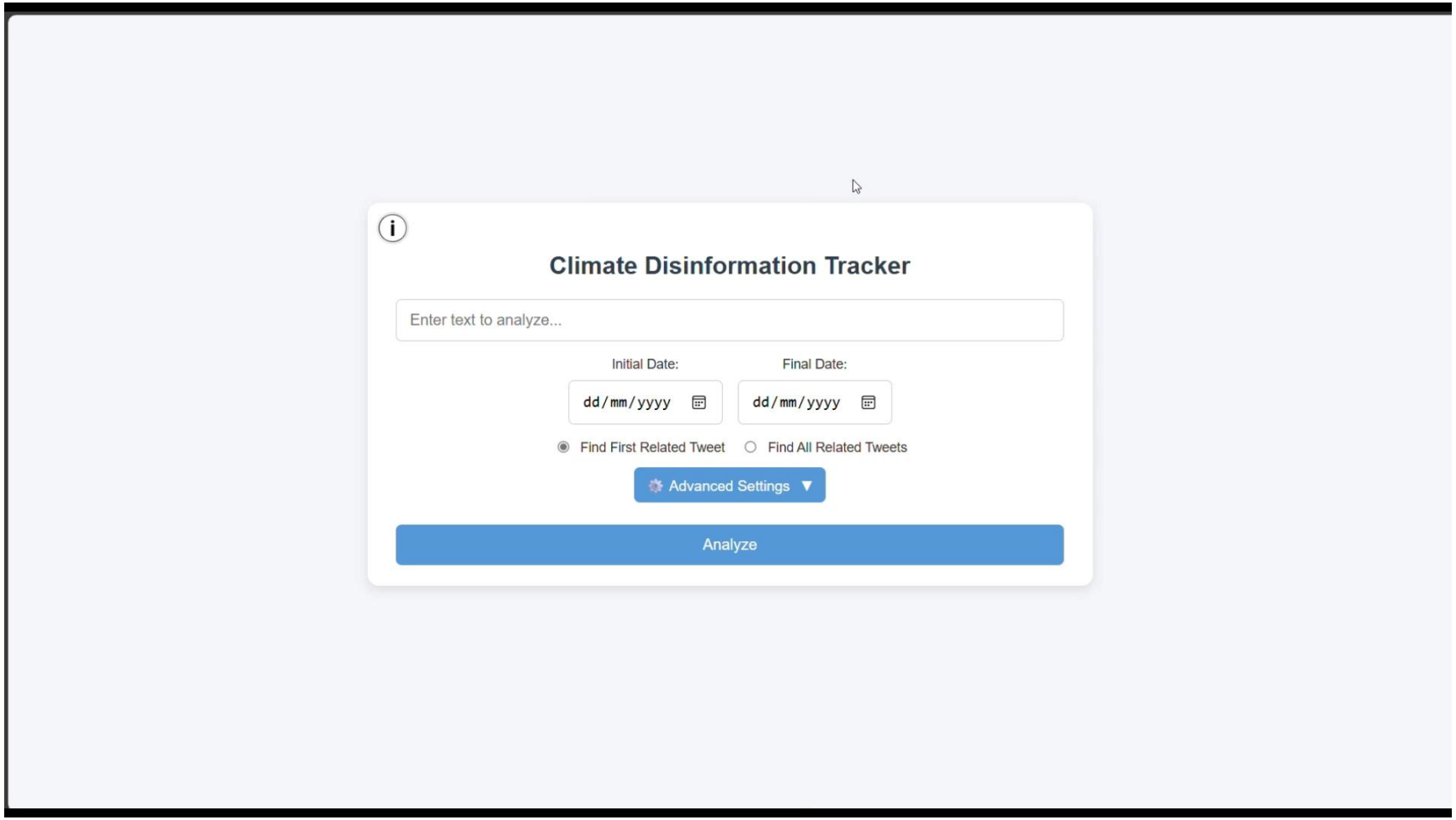
  $A \rightarrow B$:

  - A replied to/quoted B

- Filter by alignment, date range and interaction type



Demo


Climate Disinformation Tracker
Enter text to analyze...
Initial Date:
Final Date:
dd/mm/yyyy
dd/mm/yyyy
Find First Related Tweet
Find All Related Tweets
Advanced Settings
Analyze

Testing and Results

- Goal: validate the tool tracks the source of false information
- Testing setup
  - Created custom test cases (since real sources aren’t public).
  - Used tweets as known sources within defined time ranges.
  - Tested tool performance with and without synonym functionality.
- Test parameters
  - Input: new claim (modified tweet).
  - Search start date = original tweet date.
  - Up to 5 extracted keywords; 1 dropped in query.

Testing and Results

Testing round	# of claims	Accuracy	Notes
Without synonyms	31	68%	• Failures mainly due to synonym mismatch (no retrieval)
With synonyms	25	72%	• Improved retrieval thanks to synonym support. • Remaining errors due to misclassification by alignment model.

- Observations from testing
  - Non-deterministic outputs due to Nitter domain variability.
  - Sensitive to:
    - Contractions (e.g., don’t → don)
    - Hyphens (e.g., low-meat ≠ low meat)
    - Word forms/inflections
    - Time zone mismatches in tweet timestamps

Testing and Results

Testing round	# of claims	Accuracy	Notes
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- Conclusions from testing
  - Synonym integration enhanced retrieval accuracy (+4%).
  - Tool performs reliably (~72% accuracy) within scope.
  - Main improvement area: alignment model accuracy and keyword sensitivity.
  - Demonstrates strong potential for tracing misinformation sources with further refinement.

Risks and Ethics

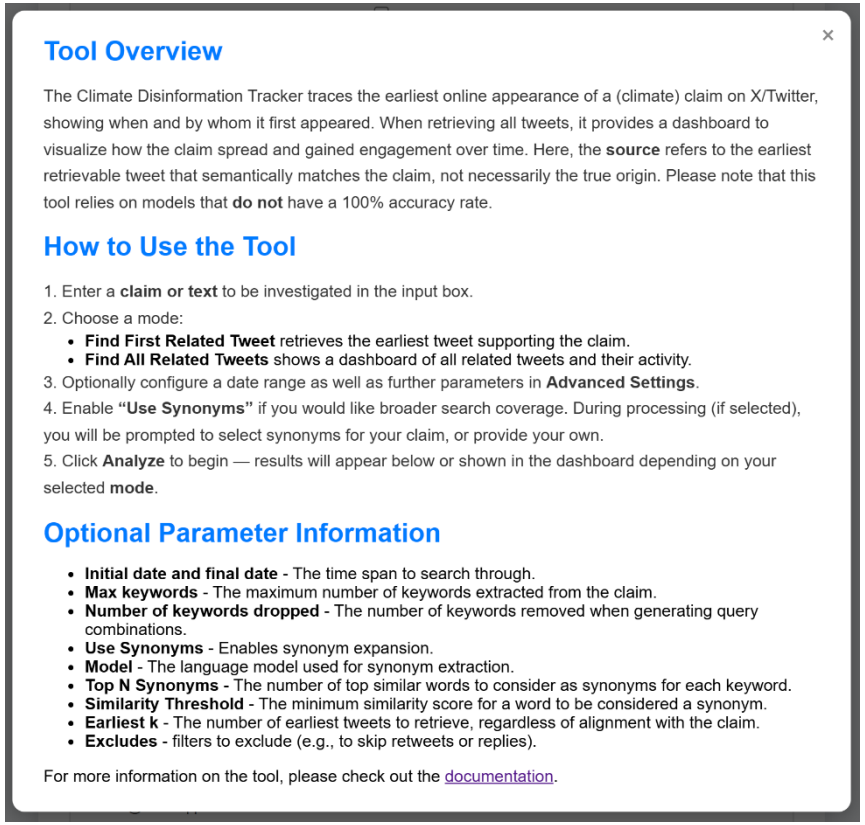
Risks

- Incorrectly identifying 'source’
- Misuse of tool

Risks and Ethics

Risks

- Incorrectly identifying 'source'
  - Return earliest *k* tweets
  - Visualization
  - Disclaimers in tool instruction
- Misuse of tool
  - Disclaimers in tool instruction
  - Open-source allows users to understand limitations/risks



Tool Overview

The Climate Disinformation Tracker traces the earliest online appearance of a (climate) claim on X/Twitter, showing when and by whom it first appeared. When retrieving all tweets, it provides a dashboard to visualize how the claim spread and gained engagement over time. Here, the **source** refers to the earliest retrievable tweet that semantically matches the claim, not necessarily the true origin. Please note that this tool relies on models that **do not** have a 100% accuracy rate.

How to Use the Tool

1. Enter a **claim or text** to be investigated in the input box.
2. Choose a mode:
   - **Find First Related Tweet** retrieves the earliest tweet supporting the claim.
   - **Find All Related Tweets** shows a dashboard of all related tweets and their activity.
3. Optionally configure a date range as well as further parameters in **Advanced Settings**.
4. Enable **"Use Synonyms"** if you would like broader search coverage. During processing (if selected), you will be prompted to select synonyms for your claim, or provide your own.
5. Click **Analyze** to begin — results will appear below or shown in the dashboard depending on your selected **mode**.

Optional Parameter Information

- **Initial date and final date** - The time span to search through.
- **Max keywords** - The maximum number of keywords extracted from the claim.
- **Number of keywords dropped** - The number of keywords removed when generating query combinations.
- **Use Synonyms** - Enables synonym expansion.
- **Model** - The language model used for synonym extraction.
- **Top N Synonyms** - The number of top similar words to consider as synonyms for each keyword.
- **Similarity Threshold** - The minimum similarity score for a word to be considered a synonym.
- **Earliest k** - The number of earliest tweets to retrieve, regardless of alignment with the claim.
- **Excludes** - filters to exclude (e.g., to skip retweets or replies).

For more information on the tool, please check out the documentation.

Risks and Ethics

Ethical considerations

- Privacy vs. transparency
  - Only use necessary publicly available data
- Freedom of speech
  - Neutral tool to encourage research and investigation
- Usage of Nitter
  - Most viable option given cost constraints, despite ethical concerns

Limitations

- Dependence on Nitter for Scraping
- Accuracy Bottlenecks of Core Models
- Query and Character Limits

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Future Work: Technical Extensions

- Extend beyond X/Twitter
- Improve synonym generation and alignment with stronger LLMs
- Explore adaptive search strategies
- Expand visualization metrics

Future Work: Organisational Steps

- Hosting and public access
- Sustainable funding and maintenance
- Pilot workshops with journalists and police

Conclusion

- PoC: Climate Disinformation Tracker
- 72% accuracy with synonym expansion
- Starting point for support for investigative journalists
- A step toward restoring trust and accountability

Thank You very much!

Questions?