

A Snapshot of Climate Change Arguments: Searching for Recurring Themes in Tweets on Climate Change

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1. Funding for a small collaboration project (from Vinnova)



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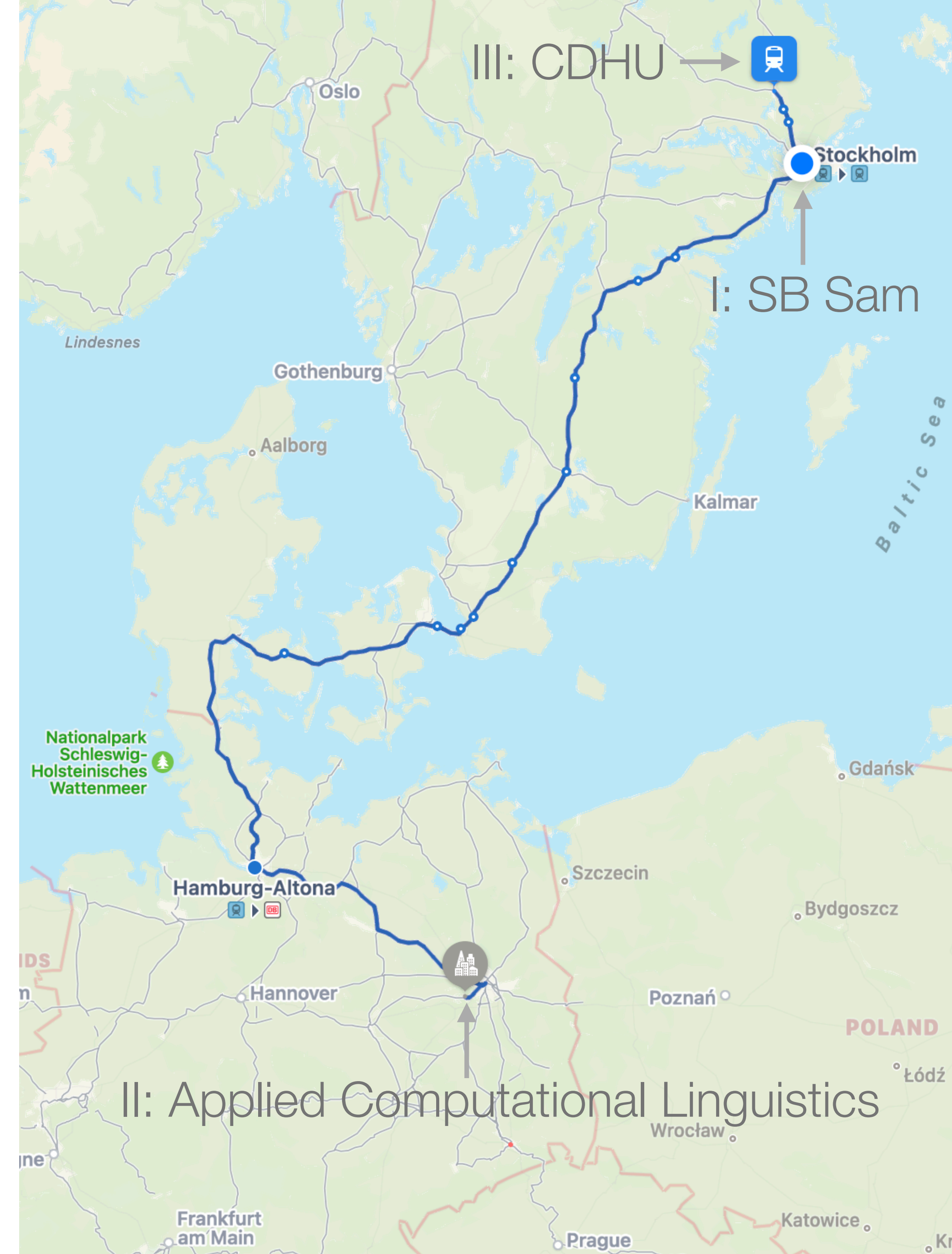
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Using the SB Sam NLP tools for manual and automatic annotation of climate change texts

Reference number	2021-03973
Coordinator	Institutet För Språk & Folkminnen
Funding from Vinnova	SEK 208 606
Project duration	November 2021 - December 2022
Status	Ongoing

2. Three organisations

- I: SB Sam at the Institute for Language and Folklore (Sweden)
- II: Applied Computational Linguistics at University of Potsdam (Germany)
- III CDHU, Centre for Digital Humanities Uppsala at Uppsala University (Sweden)



I: SB Sam (society)

At the Institute for Language and Folklore. A part of the research infrastructure: The National Language Bank of Sweden

- Tools/methods from NLP and digital humanities to support research on written and spoken material.
- Different types of written and spoken material is made more accessible to researchers.
- The institute is a CLARIN Knowledge Centre for the Languages of Sweden (SWELANG).

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II: Applied CL Discourse Research Lab

At University of Potsdam

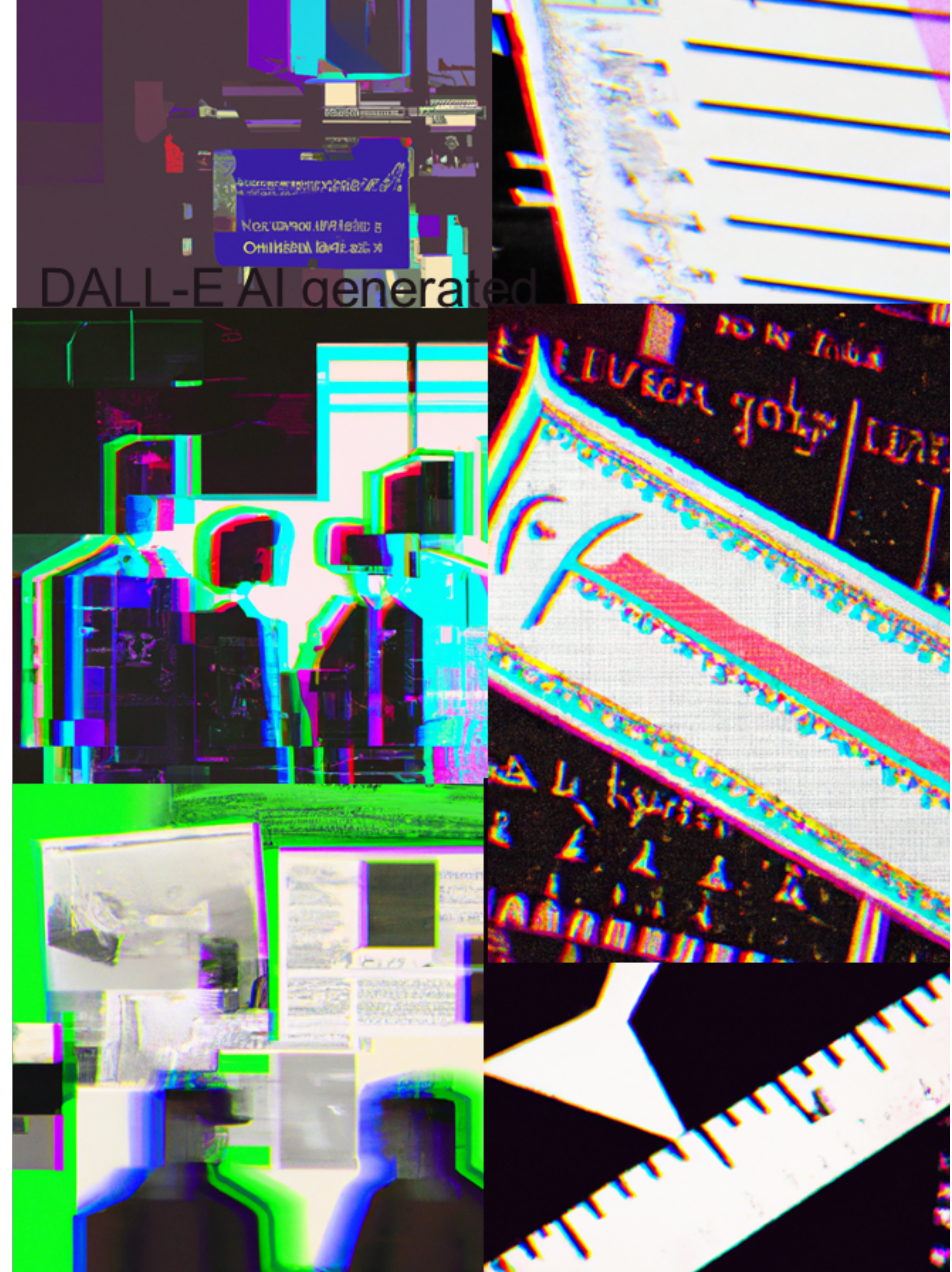
- Research on both theoretical and applied aspects of discourse processing.
- One of the current projects: “Probing the discourses of climate change. What can automatic text mining reveal about climate change communication?”
 - Annotate and classify corpora.
 - Study trends in climate change communication
 - Climate change discourse glossaries



III: CDHU, Centre for Digital Humanities Uppsala

At Department of ALM, Uppsala University

- Digital infrastructure to technically support research in the humanities and social sciences at Uppsala University.
- Research initiation and support, e.g., through application support and seminars.
- Skills training and education, e.g., through workshops and courses.



3. Background

The Intergovernmental Panel on Climate Change (IPCC) concludes that:

“It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred. [...]

Global surface temperature will continue to increase until at least mid-century under all emissions scenarios considered. Global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in CO₂ and other greenhouse gas emissions occur in the coming decades.” (IPCC, 2021)

4. Aim

“It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred. [...] Global surface temperature will continue to increase until at least mid-century under all emissions scenarios considered. Global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in CO₂ and other greenhouse gas emissions occur in the coming decades.” (IPCC, 2021)

- Given this information, wouldn't it be expected that most discussions on climate change evolve around the subject of climate change mitigation?
- If not, what themes are then instead discussed?

We studied this for one example corpus: A corpus on German tweets.

5. Materials (= corpus)

GerCCT: An annotated corpus with German tweets on climate change Tweets collected in 2019 with the following criteria:

1. They should consist of a pair of
 - an original context tweet and
 - a reply to this tweet.
2. They should be written in German
3. They should contain the string “Klima” (climate).

Around 12,000 tweet pairs were retrieved, and 1,200 of these were randomly selected for manual annotation.

Information annotated (not used here)

Only the reply tweet was annotated (context tweet shown to the annotator).

- claim
 - unverifiable
 - verifiable
- evidence
 - reason
 - external evidence
 - internal evidence
- sarcasm
- toxic language

(See: R. Schaefer & M. Stede. 2022. GerCCT: An annotated corpus for mining arguments in German tweets on climate change.)

6. Method

How to find examples of frequent themes among 1,200 climate tweets?

Did not have time to search for themes in 1,200 tweets, but in around 10%.

Strategy:

1. Used a topic modelling tool which automatically extracts recurring topics among the tweets, and then
2. Searched for themes in tweets most closely associated with automatically extracted topics.

7. The tool: We used the topic modelling tool Topics2Themes

The screenshot displays the Topics2Themes web application interface, which is used for topic modeling. The interface is organized into four main panels: Terms, Topics, Texts, and Themes.

- Terms Panel:** Lists various terms related to comorbidities and clinical conditions, such as "comorbid / comorbidities / comorbidity / comorbidome / co", "diabetes / mellitus", "age", "patients", "conditions", "mortalities / mortality", "chronic", "presence", "index", "clinical", "demographic / demographics / sociodemographic", "virus / viruses", "infected", "coinfections / coinfection / co", "influenza", "hf", "exist / preexisting / preexist", and "existing / pre".
- Topics Panel:** Shows several topics generated from the text, including "Results of studies of co-morbidities and other risk factors", "Causes of respiratory tract infections in children, and", "Mostly texts related to antibodies and immunity.", "Risk factors for influenza, symptoms for influenza, factors", "Over-arching health policies and programs", "The role of animal hosts for the emergence of viruses", "Descriptions of typical symptoms, and symptoms", and "Descriptions of drug treatments for different conditions, and the".
- Texts Panel:** Displays individual text snippets with their associated sentiment. For example, "severe cases and mortality associated with influenza and OrV As shown in table 2, 9/37 influenza-positive cases fell into the severe spectrum, and severe disease was significantly more frequent in patients with influenza infection than in those with ORV infection(30% vs 11%). In an adjusted analysis, only age was associated with this outcome(P=0.01), whereas the presence of comorbidities was not(P=0. [...]" is marked as "Me" (Meaningful). Other snippets are marked as "No" (Not Meaningful).
- Themes Panel:** Shows themes derived from the topics. For instance, "comorbidities is a factor" is associated with Theme #2, "age is a factor" is associated with Theme #1, "co-morbidities/risk factors/genetic variations reported, but no relation disease/symptom mentioned." is associated with Theme #8, and "comorbidities is NOT a factor" is associated with Theme #3. Each theme is accompanied by a grid of "Me" or "No" buttons, indicating the sentiment of the associated text snippets.

The interface also includes a search bar at the top, a dropdown menu for the dataset ("CORD-19-research-challeng"), and a dropdown menu for the analysis name ("analysis 1").

The interface is divided into four main panels:

- Terms:** A list of keywords such as "comorbid / comorbidities / comorbidity / comorbidome / co", "diabetes / mellitus", "age", "patients", "conditions", "mortalities / mortality", "chronic", "presence", "index", "clinical", "demographic / demographics / sociodemographic", "virus / viruses", "infected", "coinfections / coinfection / co", "influenza", "hf", "exist / preexisting / preexist", "existing / pre", and "respiratory".
- Topics:** A list of topic descriptions including "Results of studies of comorbidities and other risk factors", "Causes of respiratory tract infections in children, and", "Mostly texts related to antibodies and immunity.", "Risk factors for influenza, symptoms for influenza, factors", "Over-arching health policies and programs", "The role of animal hosts for the emergence of viruses", "Descriptions of typical symptoms, and symptoms", and "Descriptions of drug treatments for different conditions, and the".
- Texts:** A list of text snippets with sentiment indicators (Me, No). Examples include:
 - "severe cases and mortality associated with influenza and OrV As shown in table 2, 9/37 influenza-positive cases fell into the severe spectrum, and severe disease was significantly more frequent in patients with influenza infection than in those with ORV infection(30% vs 11%). In an adjusted analysis, only age was associated with this outcome(P=0.01), whereas the presence of comorbidities was not(P=0. [...]" (Me)
 - "A chi-squared test was used to assess the associations of comorbidities and clinical presentations, with p values < 0.05 considered significant. Pubmed" (No)
 - "A chi-squared test was used to assess the associations of comorbidities and clinical presentations, with p values < 0.05 considered significant. [...]" (No)
 - "Risk factors for more severe disease include older age, comorbidities (eg, chronic lung diseases, diabetes), and immunosuppression. The reported mortality is approximately 36%. [...]" (Me)
 - "[...] One additional study identified IMHA in 2 dogs with leishmaniasis without other comorbidities, yielding an IME value of 1.87. [...]" (No)
- Themes:** A list of user-defined themes with associated sentiment indicators (Me, No). Examples include:
 - "comorbidities is a factor" (Me)
 - "age is a factor" (Me)
 - "co-morbidities/risk factors/genetic variations reported, but no relation disease/symptom mentioned." (No)
 - "comorbidities is NOT a factor" (Me)
 - "factors affecting treatment response" (No)

The user can create elements in the Themes panel, representing potential themes found when analysing the texts.

8. Results

What recurring themes were found among the 1,200 climate tweets?



Terms

demonstranten / demonstrationen / demo / demos / demonstrieren / demonstriert / proteste / protesten / protestieren / klimademo / klimademos / klimastreik

linke / linken / linker

geschadet / schaden / schadet

gang / geh / gegangen / gehts / ging / gings / gehe / ginge

klimakrise / klimakriese / klimanotstand / klimanotstandes

gefährlich

radikale / radikalen / radikaler

ddr

aktiv / engagieren

null

klimahype / klimahysterie / klimahysteriker

heuchler

schutz

verdient

behandelt

erkennbar / erkennen / sichtbar

bedeuten / bedeutet

woche / wochen

blödsinn / irrsinn / quatsch / schwachsinn / stuss / unfug / unsinn

sozialismus

alte / alten

notstand

gefühl

bewusst

hoffentlich

weiß

extrem / extreme / extremer / extremen

anprangern / beleidigen / beschimpfen / diffamieren / diskreditieren

Topics

Greta Thunberg "greta - cool - politiker"

Demonstrations "demonstranten - linke - geschadet"

Debates on the existence of climate change and whether it is caused by human activity. "erderwärmung"

Different themes, e.g. Criticism against the climate movement "sekte - jugendliche - nächster"

Debates on the existence of climate change and whether it is caused by human activity. "co2 - preis -"

General. Different topics related to climate protection "klimaschutz - regeln - teil".

Climate protection in Germany, in relation to other places "deutsche - schuld - gerettet"

Relationship between weather and climate "wetter - schön - unterschied"

criticism again political parties and policies "grün - baum - rot"

Criticism against a climate package not being large/effective enough "klimapaket - fragen - groko"

No clear topic "ökonomien - politik - artikel"

About scientists "wissenschaft - erkennbar - einfluss"

About the party AfD "afd - flüchtling - abartig"

Fridays For Future "fff - bewegung - welt"

No clear topic "zeit - suv - tag"

Texts

Kommt doch vorher schon um 12 zum Friedensplatz und beteiligt euch an unserer(kurzen) Demo not sol. ↓

argument claim unverifiable_claim

Theme #17 ✕

Klimaheuchler u Demos schaden dem Klima! Schon die Anreise der Heuchler zur Klimademo schadet dem Klima viel mehr als die Demo dem Klima nutzen kann!! not sol. ↓

toxic_language

Theme #18 ✕

Jetzt darf man nicht mal mehr gegen Kriminalität Demonstrieren ohne das jemand mit der Rassisten Keule kommt... sind wir eigentlich in einer Diktatur? Erlaubt sind nur Demonstrationen zum Klima Schutz. Wie in der DDR! not sol. ↓

argument claim unverifiable_claim

Theme #18 ✕

Die Emcke-These wandte ich auf die Berichterstattung zur Berner Demo an.(Das ist DAS Klima-CH-Politikum drei Wochen vor den CH-Wahlen.)Die Demo wird von der NZZ auffällig stiefmütterlich behandelt. MfG JL not sol. ↓

argument claim unverifiable_claim verifiable_claim

Theme #51 ✕

Aso, das war eine linke Demo? Mea culpa, dachte es ging ums Klima... not sol. ↓

sarcasm

Theme #3 ✕

Junge Bärtige im Luxus Schlitten auf Harz 4. Wo ist die Steuerfahndung, wenn man sie braucht? Und was machen die Klima-Jacobiner? Im Kiez der Bärtigen demonstrieren sie jedenfalls nicht. Auch SUFFs werden dort eher selten beklebt. Zu gefährlich. not sol. ↓




argument claim evidence reason verifiable_claim


Denen geht es nicht ums Klima, sondern ums radikale demonstrieren! not sol. ↓


argument claim unverifiable_claim


Theme #18 ✕


15 stably occurring topics extracted


Topics   


Greta Thunberg "greta - cool - politiker" 


Demonstrations "demonstranten - linke - geschadet" 

Debates on the existence of climate change and whether it is caused by human activity. "erderwärmung" 

Different themes, e.g. Criticism against the climate movement "sekte - jugendliche - nächster" 

Debates on the existence of climate change and whether it is caused by human activity. "co2 - preis -" 

General. Different topics related to climate protection "klimaschutz - regeln - teil". 

Climate protection in Germany, in relation to other places "deutsche - schuld - gerettet" 

Relationship between weather and climate "wetter - schön - unterschied" 

criticism again political parties and policies "grün - baum - rot" 

Criticism against a climate package not being large/effective enough "klimapaket - fragen - groko" 





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Fridays For Future "fff - bewegung - welt" 

No clear topic "zeit - suv - tag" 


   

mehr als 

nd wir 

hen vor 

lima-efährlich. 

pen der sich 

The image displays a software interface for text analysis. On the left, a list of tweets is shown, each with associated metadata and classification tags. On the right, a list of themes is displayed, with lines connecting specific words or phrases from the tweets to their corresponding theme descriptions.

Texts Panel:

- Tweet 1:** "[...] Den **Klimawandel** gab es auch schon bevor es Menschen gab. [...] In der Bronzezeit hatten wir in unseren **Breiten** mediteranes Klima. [...]"
Tags: argument, claim, evidence, reason, unverifiable_claim, verifiable_claim
Theme: Theme #4
- Tweet 2:** "Wenn's eine **Mehrheit** ist. Dann aber glaubt die, das **Wetter** machen zu können. Auch ganz **schön** irre. [...]"
Tags: argument, claim, unverifiable_claim
Theme: Theme #4
- Tweet 3:** "Historisch **bewegen** wir uns nahe am CO₂-MINIMUM, damit **Leben** möglich bleibt. [...]"
Tags: argument, claim, evidence, external_evidence, unverifiable_claim, verifiable_claim
Theme: Theme #4
- Tweet 4:** "... das #Wetter(wahlweise das #Klima) Weder **Wetter** noch Klima können für das nächste Jahr, das übernächste Jahr noch in 100 **Jahren** [seriös] vorhergesagt werden. [...]"
Tags: argument, claim, evidence, external_evidence, reason, unverifiable_claim, verifiable_claim
Theme: Theme #4
- Tweet 5:** "Schon 1960 war klar, dass wir in 20 **Jahren** alle tot sind. [...]"
Tag: sarcasm

Themes Panel:

- Theme #3: Difficult to understand without context
- Theme #4: Argumentation claiming that it is not proven that human activity causes climate change, that climate change is not a problem, or that we cannot
- Theme #31: Criticism against a climate package not being large/effective enough, or demands for a better one.
- Theme #1: Argumentation stating that climate change exists, is caused by human activity and is a problem.
- Theme #10: Criticism against Greta Thunberg, e.g. claims that she is being forced by others to protest.
- Theme #11: Criticism against the climate movement, e.g. being a sect, searching for street conflicts, too fanatic
- Theme #18: Critique against climate demonstrations (e.g., claims that it is not allowed to demonstrate against anything, demonstrators more interested in radical
- Theme #22: Criticism against climate change receiving too much attention/that too much is done/that there is a climate hysteria.
- Theme #29: (Text partially obscured)

Theme candidates were manually identified and assigned in around 120 tweets

The 14 themes that occurred at least three times

Theme

- (a) Criticism against a climate package not being large/effective enough, or demands for a better one.
 - (b) Argumentation claiming that it is not proven that human activity causes climate change, that climate change is not a problem, or that we cannot know anything about future climate.
 - (c) Argumentation stating that climate change exists, is caused by human activity and is a problem.
 - (d) Criticism against Greta Thunberg, e.g. claims that she is being forced by others to protest.
 - (e) Criticism against the field and background of a scientist in relation to the subject of climate change.
 - (f) Criticism of that climate change receives too much attention/too much is done/there's a hysteria.
 - (g) Criticism of the climate movement, e.g., for being a sect, searching for street conflicts, too fanatic.
 - (h) Critique against climate demonstrations, e.g., claims that it is not allowed to demonstrate against anything else, more interest in radical demonstration than climate.
 - (i) Critique against party strategies in relation to climate change.
 - (j) Criticism against those working against climate change doing activities that emit a lot of CO₂.
 - (k) Discussions about the relation between weather and climate.
 - (l) Critique against that (or trying to find reasons why) someone does not worry about climate change.
 - (m) Criticism towards politicians for not doing enough for the climate.
 - (n) Discussions about different economic instruments for climate protection.
-

9. Next steps

- Run topic modelling also on the un-annotated set
- Include the context tweets
- Try other topic modelling algorithms

Thank you!

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- Topics2Themes:
<https://github.com/mariask2/topics2themes>
- SB Sam and The National Language Bank of Sweden:
<https://www.sprakbanken.se/sprakbankeninenglish.html>
- Probing the discourses of climate change. What can automatic text mining reveal about climate change communication?
<http://angcl.ling.uni-potsdam.de/research/climate.html>
- Centre for Digital Humanities Uppsala
<https://www.abm.uu.se/cdhu-eng>

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