A Dataset of Sustainable Diet Arguments on Twitter

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Workshop on NLP for Positive Impact 2022

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https://danielhers.github.io/sustainabletweets.pdf

Some avenues for positive climate impact

Analyzing public discourse

Understanding consumer behavior

Facilitating behavior change

Smart cities

Sustainable diets

"Transformation to healthy diets by 2050 will require substantial dietary shifts. Global consumption of fruits, vegetables, nuts and legumes will have to double, and consumption of foods such as red meat and sugar will have to be reduced by more than 50%. A diet rich in **plant-based** foods and with fewer animal source foods confers both improved health and **environmental** benefits."

https://eatforum.org/

Transforming dietary habits

Hard to change
- Perceptions of taste
- Knowledge and skills
- Cultural and social norms

Existing interventions
- Communication campaigns
- Nudging and convenience
- Supporting producers and retail

Argumentation

Can AI convince consumers of diverse backgrounds to change their habitual behavior?

What characterizes successful arguments for behavior change in public discourse?

Arguments mining

Given topic, extract relevant arguments from large text corpus

Topic: *We should abandon Valentine's day*

The Canadian polling firm Insights West **surveyed** a representative sample of Canadians who are in a relationship and found that **62 percent** agreed that **Valentine's Day** is a waste of time and **money**.

A recent **survey** by Virgin Mobile USA found that **59 percent** of people said that if they were going to break up with someone, they would do so just before **Valentine's Day** to save **money**.

Advances in Debating Technologies: Building AI That Can Debate Humans (Bar-Haim et al., ACL 2021)

A dataset of sustainable diet arguments on Twitter

1

Corpus of 32840 English tweets

2

600 arguments annotated for 5 topics

3

Trained and evaluated argument mining models

Topics:

We should reduce the consumption of meat

Plant based food should be encouraged

Meat alternatives should be encouraged

Vegan and vegetarian diets should be encouraged

We should pursue policies that promote sustainable foods

Topics for annotation

Topic – a short, usually controversial statement that defines the subject of interest; it is **clear** and **dividing** where claim and evidence have a **clear stance** towards it.

Topics for annotation

We should reduce the consumption of meat

Plant based food should be encouraged

Meat alternatives should be encouraged

Vegan and vegetarian diets should be encouraged

We should pursue policies that promote sustainable foods

Obtaining tweets for annotation

Scraping:

1	**2**	**3**	**4**
Manual list of patterns for each topic	Retrieve a set of English tweets	Remove non-language tweets	Total corpus of 32840 tweets

Obtaining tweets for annotation

Filtering:

Informational retrieval model scores tweets on topics

Randomly sample 250 tweets and combine them with 347 IR tweets

Condensed set of 597 English tweets for crowd annotation

Annotation methodology

Labels:

Argumentative - text contains argumentative structures such as claims or evidence while having a clear stance towards a topic

Claim – a standpoint towards the discussed topic implicitly or explicitly

Evidence - statement used to support or attack a topic or claim

Pro/con - the stance of a claim or the evidence towards the discussed topic

Types of evidence

Anecdotal: A description of an episode(s), centered on individual(s) or clearly located in place and/or in time.

Expert: Testimony by a person, group, committee, an organization with some known expertise/authority on the topic

Study: Results of a quantitative analysis of data, given as numbers, or as conclusions.

Fact: A known piece of information without a clear source, regardless of whether it is a *true* fact or not.

Normative: Description of a belief or value the author holds.

Examples: evidence types

Anecdotal	*We are on the green bean diet here, too! I love them. Mom hasn't tried broccoli* 😱
Expert	*Many fruit & veg (which contain natural acid) don't trigger flare ups- The list is long and varied (obs this may not apply to you) but after a little digging I found some doctors do reccomend a plant based diet to ease the inflammation. Going meatless is even recommended by ICA*
Study	*According to a 2022 study, eating an optimal #diet of whole grains, legumes, fish, fruits, vegetables and nuts can improve life expectancy by how many years?*
Fact	*Hey eco-friendlies! The well known high-carbon company McDonalds produces 1.5 MILLION tonnes of food packaging alone* 🤢 *! Fun fact carbon footprints are important! Tune in for more behind closed door stats!*
Normative	*The dangerous of this thing is that our vegan extremists will start interfering in this..*
Unrelated/no evidence	*Give your children healthy food to avoid the dad bod haha*

Examples

Lol - and the wash post is the PR firm and Whole Foods is the official food supplier

Not argumentative

Topic: T5 (We should pursue policies that promote sustainable foods). Tweet: It would also be nice if our government could begin subsidizing more sustainable options (like plant based meat) vs things like beef but... i digress

Pro claim + normative evidence

Topic: T2 (Plant based food should be encouraged). Tweet: Green taxes go into subsidizing development and production of green energy solutions. If we were on 100% renewables, our electricity prices would not have needed to go up. We need to move into self-sufficient green energy as soon as possible

Argumentative but unrelated

Topic: T1 (We should reduce the consumption of meat). Tweet: Yes but to be fair: we can expect a massive increase in meat and dairy consumption in emerging countries that will severely limit the impact of whatever we do.

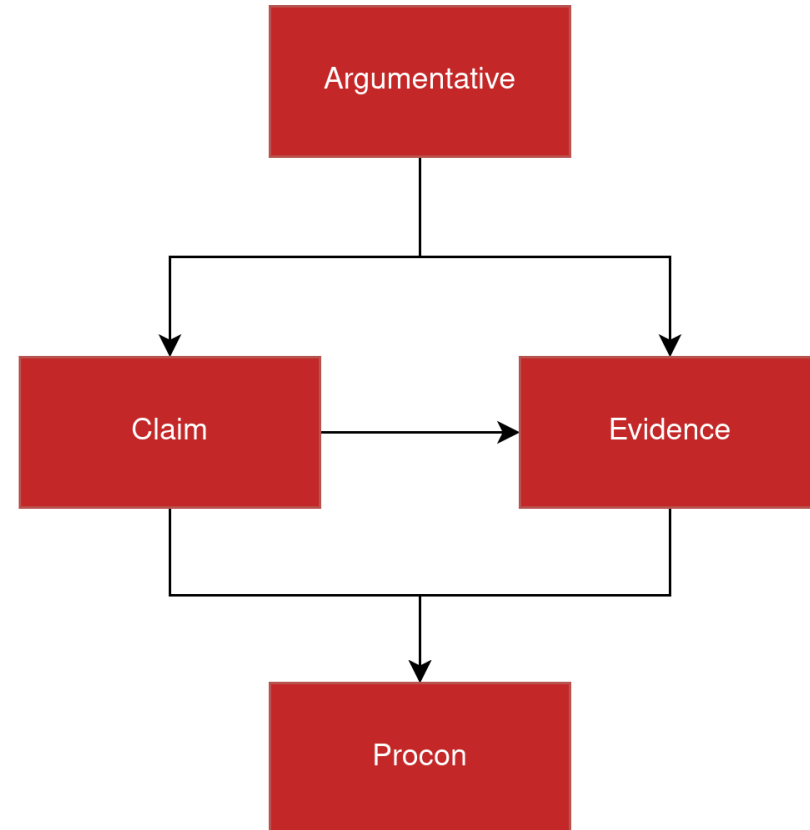**Con claim + normative evidence**

Annotation methodology

597 tweets for 5 topics

Amazon Mechanical Turk

5 workers per instance

Completed in 4 rounds

Dataset statistics

Tweets	Arg
597	387

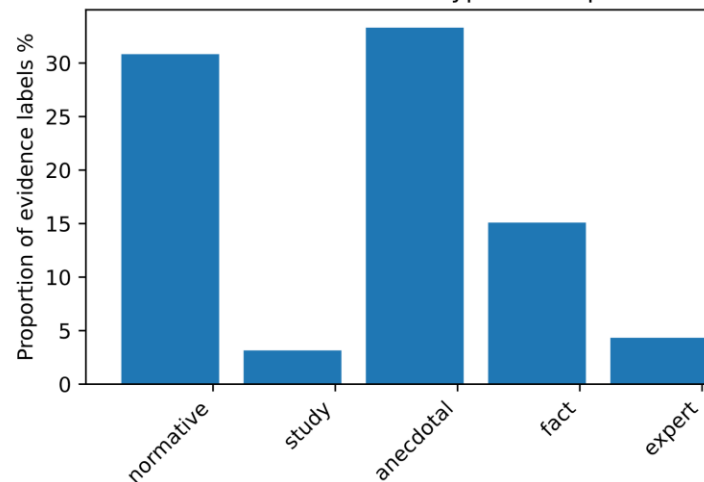|	ADUs	Claims	Evidence	Claims with evidence	Pro	Con
We should reduce the consumption of meat	118	63	89	34	77	37
Plant based food should be encouraged	130	92	85	47	89	38
Meat alternatives should be encouraged	85	42	63	20	58	27
Vegan and vegetarian diets should be encouraged	156	106	112	62	99	54
We should pursue policies that promote sustainable foods	140	60	113	33	96	37

Evidence types in corpus

Argument mining experiments: baselines

Majority Class

Random Class

BM-25

multi-qa-MiniLM-L6-cos-v1

IBM Debater API

Argument mining experiments: models

RoBERTa + XGBoost

RoBERTa+ XGBoost [SEP]

Fine-tuned RoBERTa model

Results summary

XGBoost is a strong starting point for argument mining

IBM Debater API a robust zero-shot model for argumentation tasks

Potential applications

Surveying public attitudes and exposing misinformation

Generation of convincing arguments for communication campaigns

Understanding public knowledge of sustainable diets

Summary

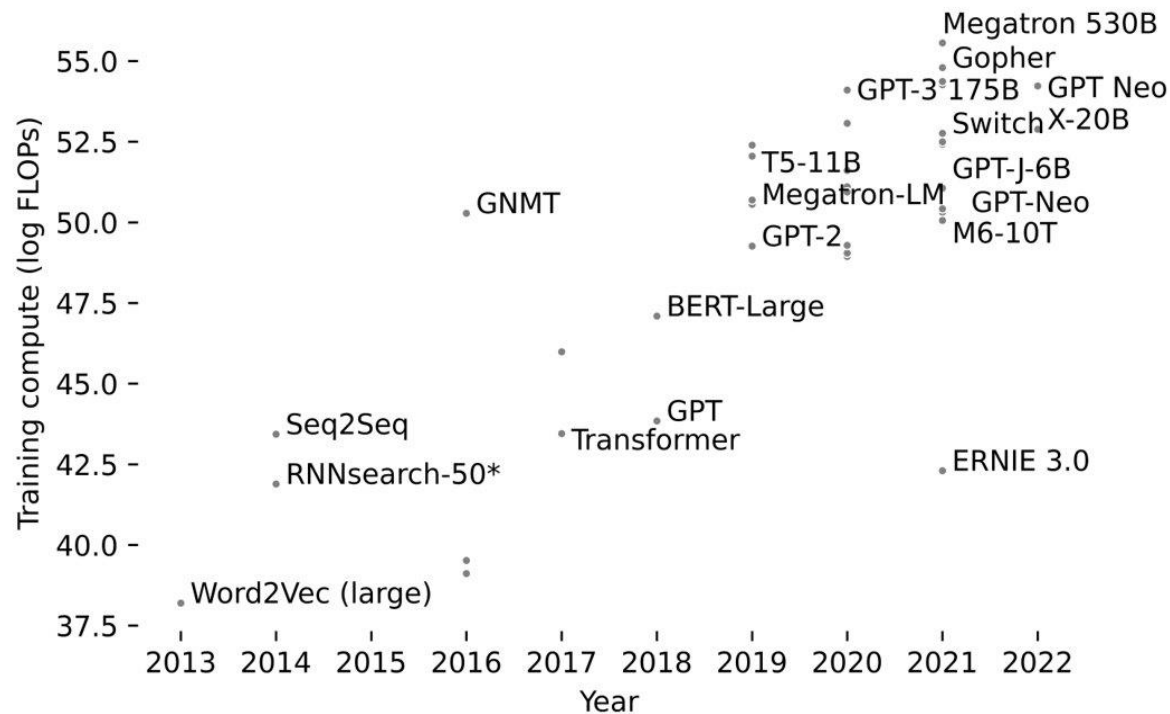Dataset and models for mining sustainable diet arguments on Twitter

Code and data:
https://github.com/danielhers/sustainable-diet-arguments-twitter

Contact:
danielhers.github.io
dh@di.ku.dk

Climate impact of NLP

Models grow exponentially and take longer to train
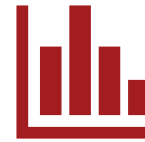
What can we do?

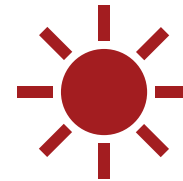Release trained models
to the public

Report duration of model
training

Report energy
consumption of model
training

Report location of
computations

Report calculated GHG
emissions

Positive climate impact

Towards Climate Awareness in NLP Research (Hershcovich et al., EMNLP 2022)

Diverse perspectives

Tweet	Aspects	Stance
(1) Many fruit & veg (which contain natural acid) don't trigger flare ups- The list is long and varied (obs this may not apply to you) but after a little digging I found some doctors do recommend a plant based diet to ease the inflammation. Going meatless is even recommended by ICA	Health	Positive
(2) People have been making meat alternatives for centuries for various reasons. If people want to eat a meat analogue that causes much less death and environmental destruction, what's your problem?	Culture, ethics	Positive
(3) Fair enough tbh, I can't become vegan or vegetarian due to personal reasons but the way animals are treated in the food industry is absolutely disgusting	Lifestyle, ethics	Positive
(4) Switch to plant based diets to reduce food costs and benefit climate	Economy, climate	Positive
(5) More people employed in plant based food production	Economy	Positive
(6) Yes but to be fair: we can expect a massive increase in meat and dairy consumption in emerging countries that will severely limit the impact of whatever we do	Economy	Negative

Climate performance model card

Fine-tuned RoBERTa

Information	Unit
1. Is the resulting model publicly available?	No
2. How much time does the training of the final model take?	105 Seconds
3. How much time did all model experiments take (incl. hyperparameter search)?	4228 seconds
4. What was the energy consumption (GPU/CPU)?	333 Watt
5. At which geo location were the computations performed?	Denmark
6. How much CO2eq was emitted to train the final model?	0.975g
7. How much CO2eq was emitted for all experiments?	39g

Towards Climate Awareness in NLP Research (Hershcovich et al., EMNLP 2022)

Climate performance model card

RoBERTa embeddings + XGBoost

Information	Unit
1. Is the resulting model publicly available?	No
2. How much time does the training of the final model take?	57 Seconds
3. How much time did all model experiments take (incl. hyperparameter search)?	456 seconds
4. What was the energy consumption (GPU/CPU)?	28 Watt
5. At which geo location were the computations performed?	Denmark
6. How much CO2eq was emitted to train the final model?	0.08g
7. How much CO2eq was emitted for all experiments?	3.5g

Towards Climate Awareness in NLP Research (Hershcovich et al., EMNLP 2022)

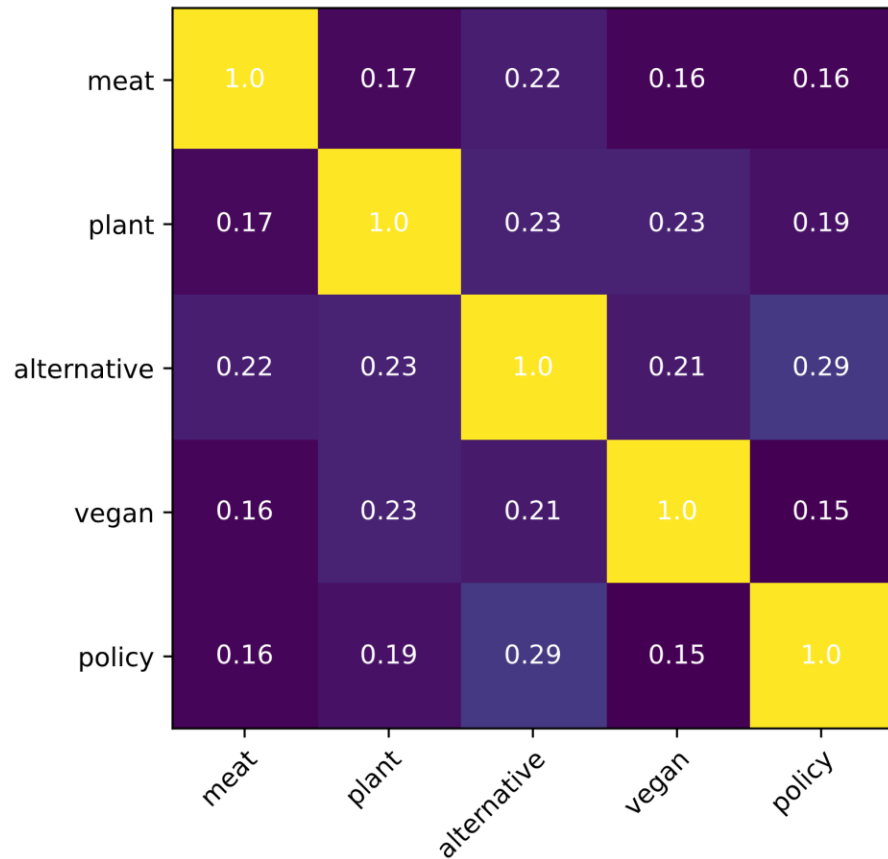# Inter-annotator agreement

Argumentative: 0.49

Claim: 0.47

Evidence: 0.15

Pro/con: 0.63
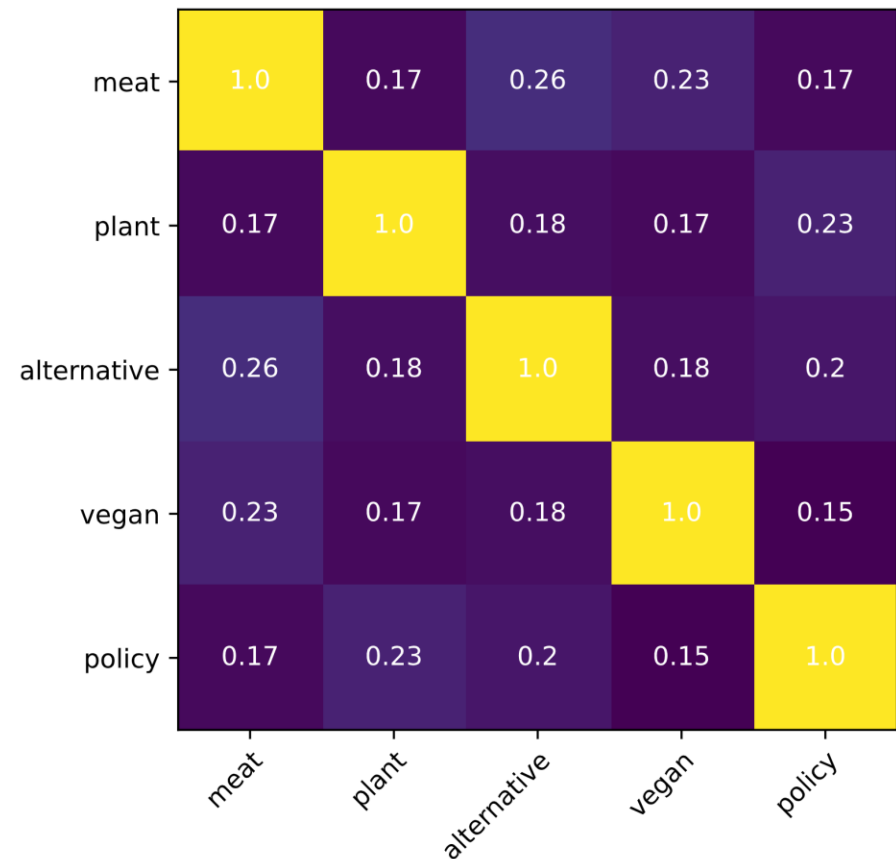
(Cohen's kappa)

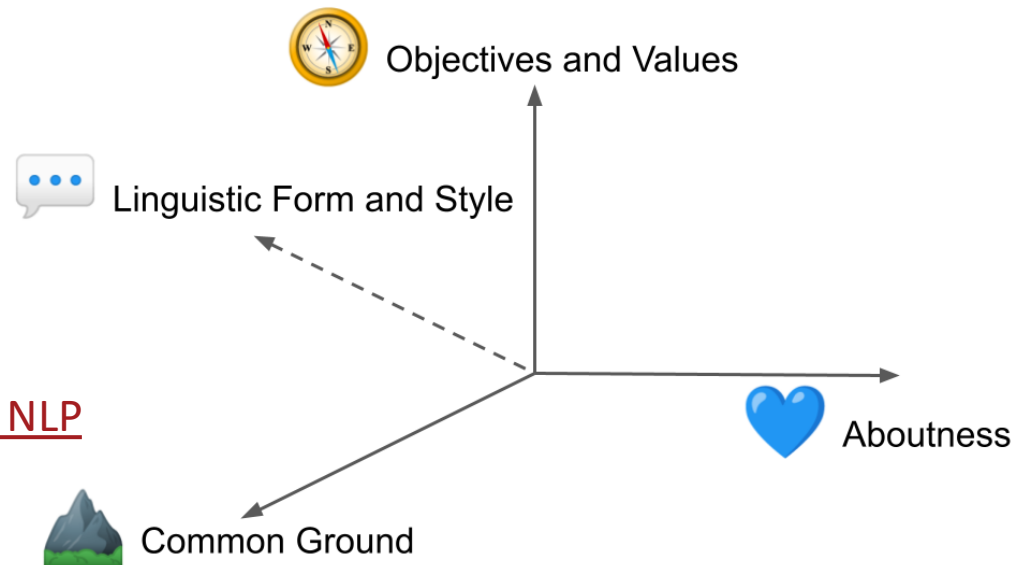# Topic overlap

Claims

Evidence

Facilitate systematic understanding

Mapping out consumer opinions

- Social media
- Local groups

Different arguments are convincing for different social groups

Challenges and Strategies in Cross-Cultural NLP
(Hershcovich et al., ACL 2022)

Objectives and Values

Linguistic Form and Style

Aboutness

Common Ground