Whiting and Watts (2024): "A framework for quantifying individual and collective common sense."

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Overview

- Motivation the ambiguity of traditional common sense
- Analytical framework individual level
- Analytical framework collective level
- Conclusion

Motivation

- What makes something commonsensical?
- How "common" is it really?

Background

Common Sense Project at Penn CSSL

- Watts, D. J. (2011). Everything is obvious:* Once you know the answer. Crown Currency.
- Watts, D. J. (2014). Common sense and sociological explanations. American Journal of Sociology, 120(2), 313-351.
- Watts, D. J. (2017). Response to Turco and Zuckerman's "Verstehen for Sociology." American Journal of Sociology, 122(4), 1292–1299.
- Whiting, M. E., Watts, D. J. (2024). A framework for quantifying individual and collective common sense. PNAS, 121(4).

Traditional notion of common sense

A common sense belief list, compiled by James Beattie

- I exist. I am the same being today that I was yesterday – or even 20y ago.
- Things qual to one and the same thing are equal to one another.
- Ingratitude ought to be blamed and punished.
- ...

Traditional notion of common sense

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  ambiguity? different categories, different epistemology...

Traditional notion of common sense

Definition

- traditional definition: "truths that are self-evident and therefore requiring no particular justification." We simply "know" that it is common sense without knowing why.

Traditional notion of common sense

Nature

- traditional definition: “truths that are self-evident and therefore requiring no particular justification.” We simply ”know” that it is common sense without knowing why.
- This also assume what is self-evident to us is also self-evident to others.

Traditional notion of common sense

Problem

- Logical circularity: Common sense is what all sensible people would agree with, but sensible people are those who exhibit common sense.
- No way to measure or quantify.

Analytical Framework

Framework for measuring common sense at two levels:

- Individual level: "Commonsensicality"
  - For claims: Consensus and awareness
  - For people: Their alignment with majority views
- Collective level: "pq common sense"
  - p: fraction of people who share beliefs
  - q: fraction of claims they agree on

Commonsensicality

Define Commonsensicality

What makes a claim commonsensical?

- 1. A claim $i \in S$ can be considered common sense to the extent that members of some population P are in agreement with one another about the claim.
- 2. i can be considered common sense to the extent that members of P accurately perceive the agreement (or disagreement) of other members of P with i.
  Two defining quantities: consensus and awareness

Commonsensicality

Define Commonsensicality

What makes a claim commonsensical?

- Consensus c_i regarding claim i is given by

$$c_i = 2|p_i - \frac{1}{2}|$$

  where $p_i = P[\text{agreement with claim } i]$ is the average agreement with the claim over the population in question.
- absolute value is used because the consensus may be in disagreement with the claim.
- Then, rescale this value to lie between 0 and 1.
  Two defining quantities: consensus and awareness

Commonsensicality

Define Commonsensicality

What makes a claim commonsensical?

- Awareness a_i is the average accuracy with which individuals in the population predict the majority position (agree or disagree) regarding claim i.

  Two defining quantities: consensus and awareness

Commonsensicality

Define Commonsensicality

What makes a claim commonsensical?

- Consensus
- Awareness

Commonsensicality is defined as m_i of claim i as $m_i = \sqrt{a_i c_i}$, where the geometric mean is used in order to emphasize that both consensus and awareness should be in high in order for a claim to be considered common sense.

Commonsensicality

- Common Knowledge in Rational Choice Theory:
  - First-order: I know X
  - Second-order: I know that you know X
  - Third-order: I know that you know that I know X
  - And so on infinitely...
- limited in the first order
- reflexivity: break this circulation by:
  - measure consensus and awareness independently
  - making no assumption about who is "sensible".

Commonsensicality

Data

- two sources of human-generated claims: one elicited directly based on a given domain of knowledge (N=832) and one in which a human was prompted to complete a sentence (N=630).
- two collections derived from the popular AI corpora: ConceptNet (N=581) and Atomic (N=697).
- claims from three sources of common sense "in the wild": news media article (N=290); political campaign emails (N=668); and popular aphorisms (N=709).

  In total, 4,407 candidate claims were collected in the corpus

  These claims are only candidates for common sense, meaning that each claim was judged by someone to be self-evidently true, or at least sufficiently plausible that they hoped to persuade others of its self-evident truth

Commonsensicality

design

Participants and Data Collection

- 2,046 MTurk participants recruited.
- rate 50 randomly chosen claims from corpus.

Assessment

- participants answered if they agreed with a claim, and if they thought most others would agree with it.
- they also indicated their reasoning for each of these responses in a forced-choice question, and were finally asked if they thought the claim was common sense.

Data

4,407 claims in total, each claim is rated by an average of 23.44 distinct individuals, leading to 102,300 ratings total.

Commonsensicality

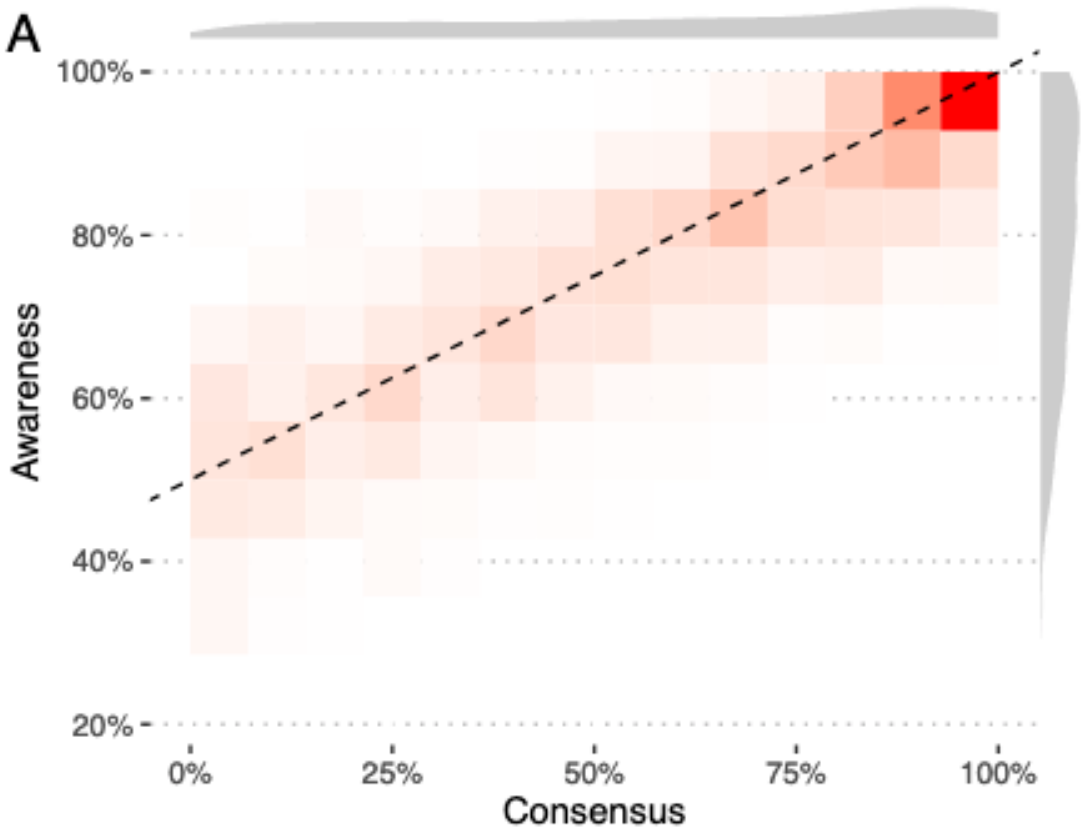

Figure: A density plot showing consensus and awareness for all claims with marginals, with a diagonal dashed line indicating calibration of consensus and awareness At the low end lie claims that are effectively rated at chance due to disagreement across population, and at the high end, lie claims that are fully common sense.

Commonsensicality

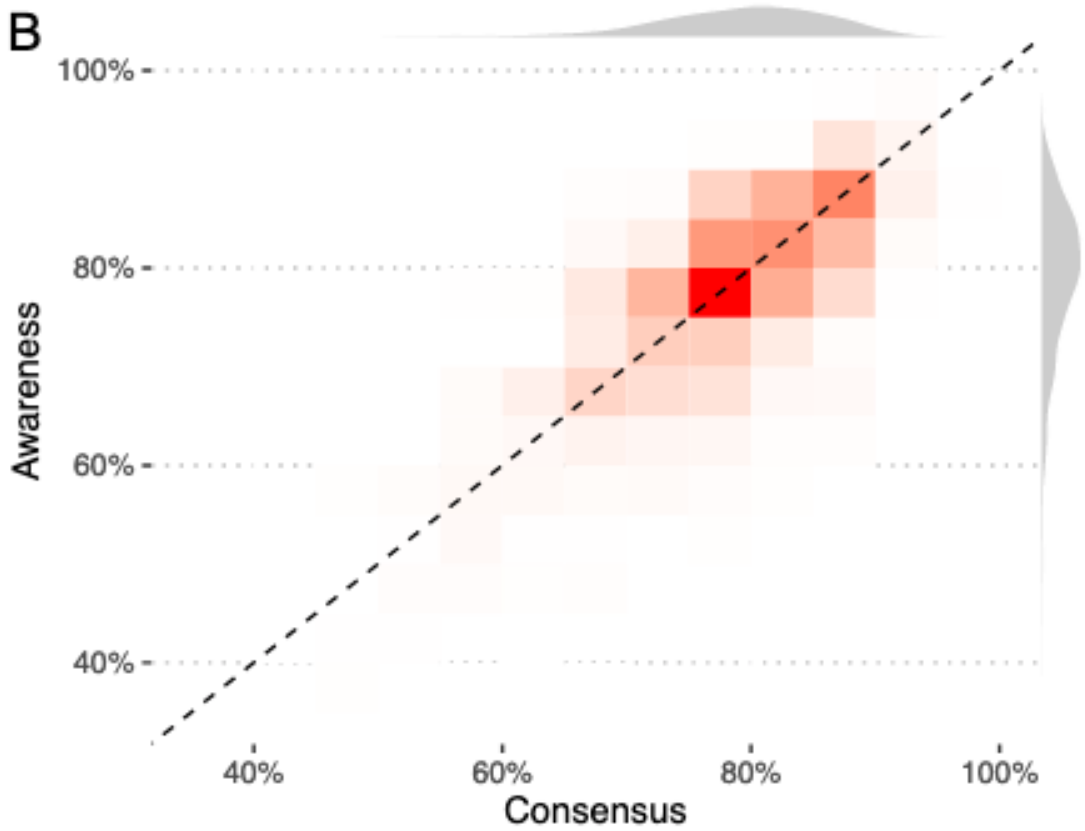

Figure: Comparable equivalent for all individuals.

Commonsensicality

Next: what types of knowledge and people are more or less commonsensical?

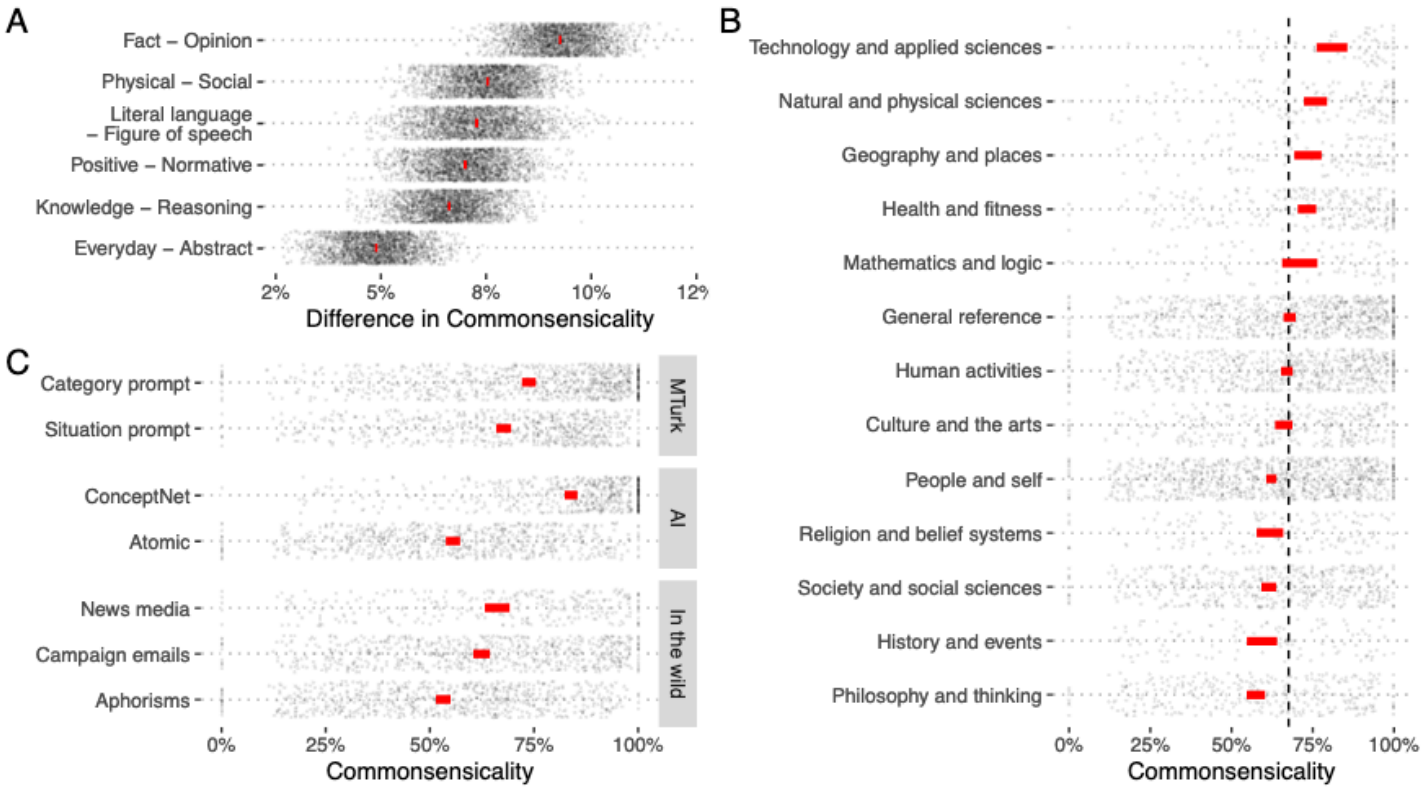

Figure: Commonsensicality based on properties. A.knowledge types(epistemology) B. Knowledge domains C.Sources

Key Findings

A: Commonsensicality was higher for concrete, everyday, natural phenomena than for subjective or abstract views of people and society.

C: what people say is common sense when asked about it directly is systematically different from when they invoke common sense to support an argument or point of view.

Commonsensicality

what types of people (demographic attributes and cognitive scores)

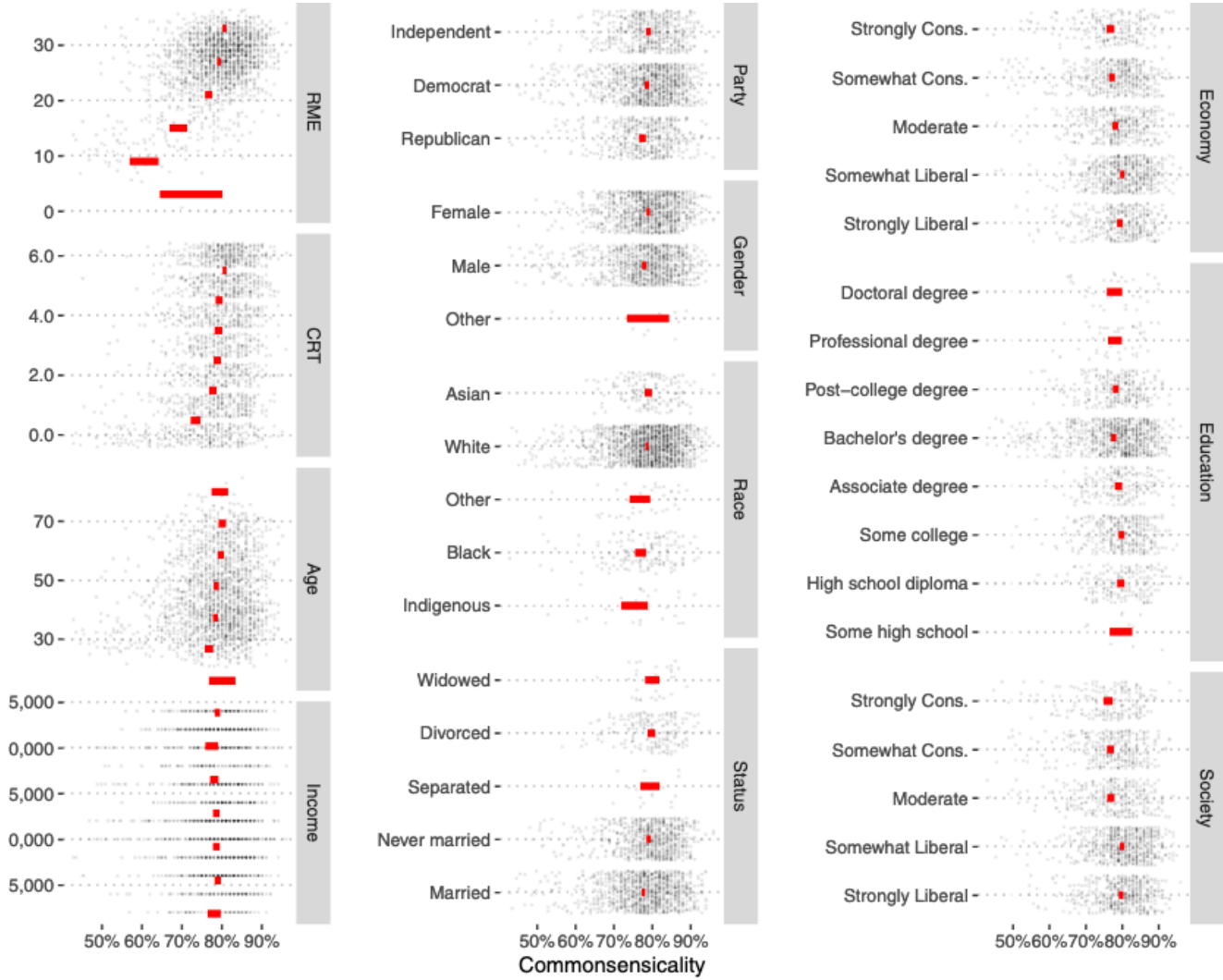

Figure: Commonsensicality based on individual-level properties.

Extension to Collective

- Assumption: a large fraction of claims attracted universal or near-universal consensus.
- $f(\tau)$: the fraction of claims that exhibit commonsensicality greater than some threshold τ.

Extension to Collective

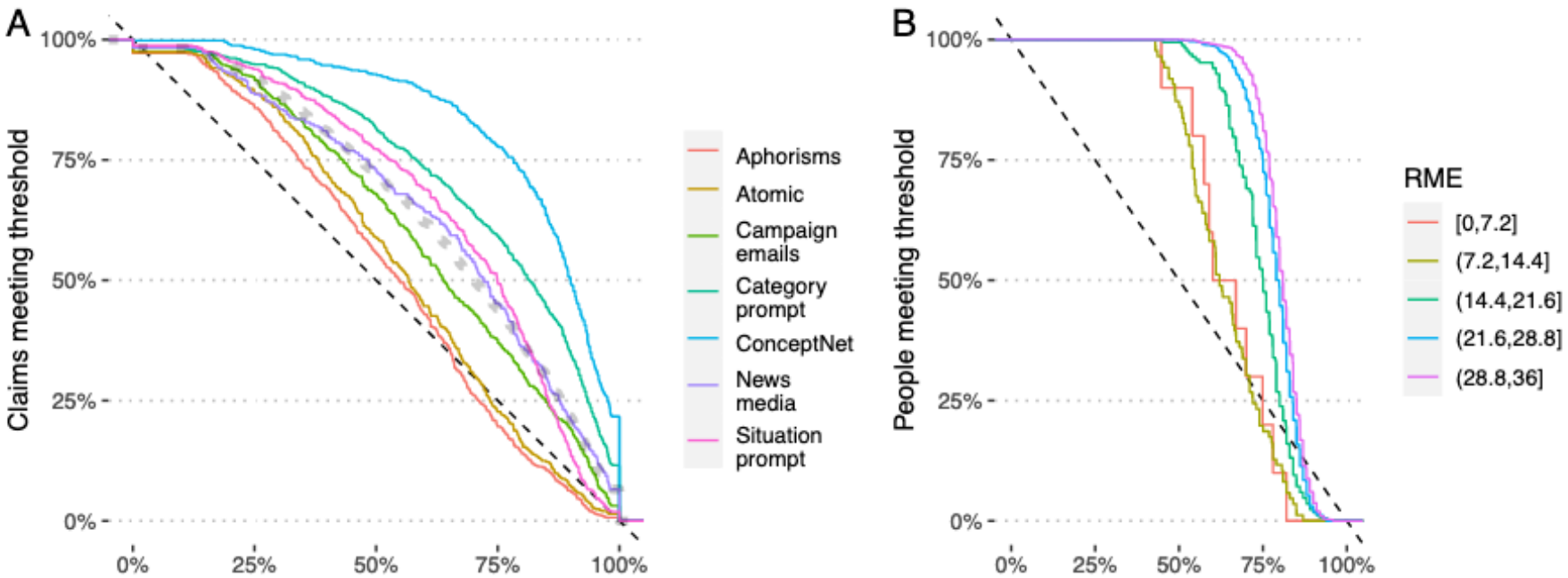

Figure: Commonsensicality thresholds. in ECCDF.A. Claims B. Population

Interpretation

- As the threshold for commonsensicality decreases from 1, it becomes increasingly unclear how to interpret it as a claim about shared beliefs.
- Random select problem: when the threshold is low, there could be more easily to have a random selection problem.

pq common sense

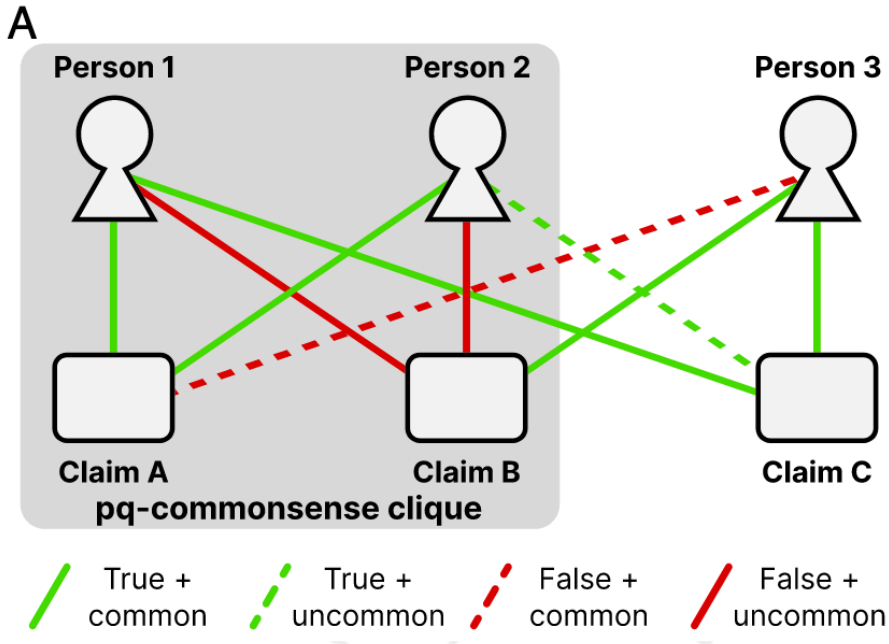

Figure: A belief graph for 3 people and 3 claims indicating each individual's belief profile for each claim, and an associated matrix showing the formalization of this graph with the largest clique in marked in gray. Person 1 and Person 2 have a common belief profile including the same beliefs around Claims A and B.

we say that a belief graph exhibits *pq* common sense when at least a fraction *p* members indicate the samme response for at least a fraction of *q* claims.

pq common sense

- Human raters (2,046) $\times$ claims (4,407) = 9,016,722 ratings $\rightarrow$ infeasible
- Approximate the belief graph:
  - Train a multinomial logistic regression-based classifier on 102,300 ratings to predict how any participant would respond to any claim.
  - Use the model to predict all 9,016,722 possible ratings.
- compute cliques using algorithm.
- 50 claims selected across the spectrum of commonsensicality

pq common sense

Extreme cases

- Perfect common sense: p and q both near 1 (everyone agrees on most things)
- No common sense: p approaches 0 for any non-zero q (no substantial agreement)

pq common sense

- *pq* common sense as a functional relationship $p(q)$

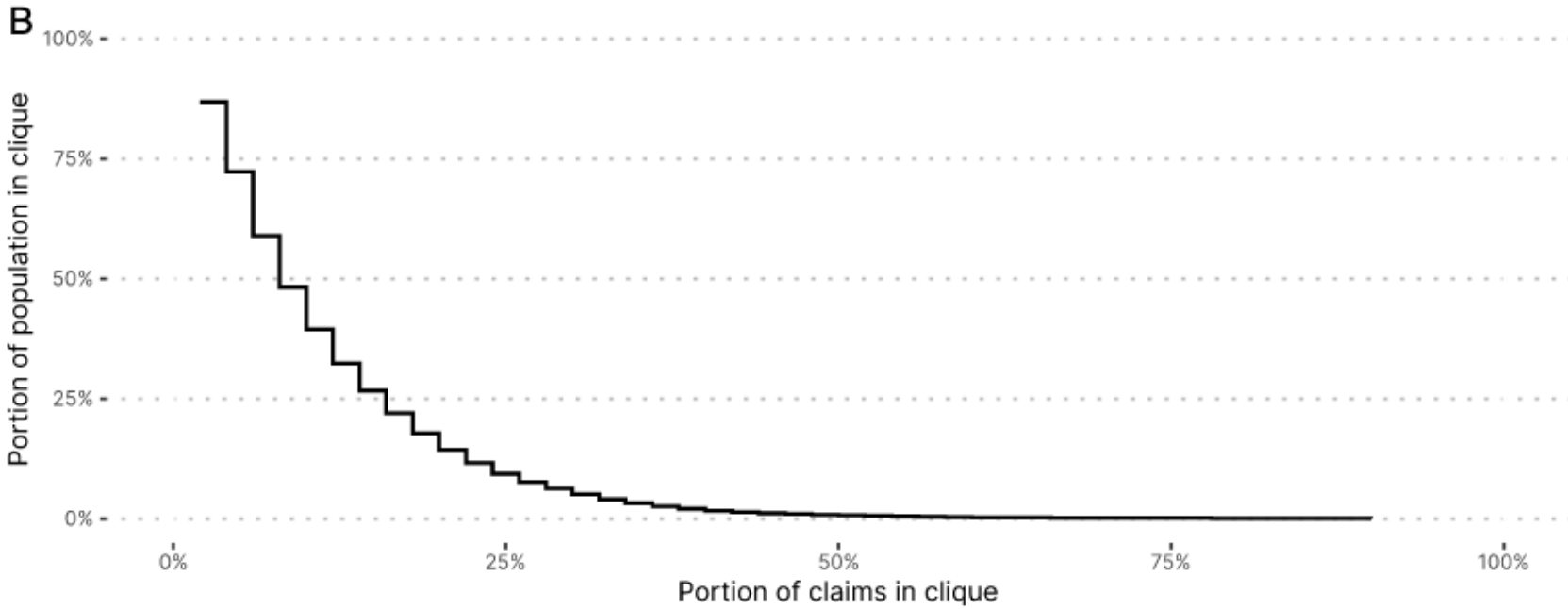

Figure: Sample of 50 claims

shows the tradeoff between breadth of agreement (p) and number of claims (q) they agreed upon

pq common sense

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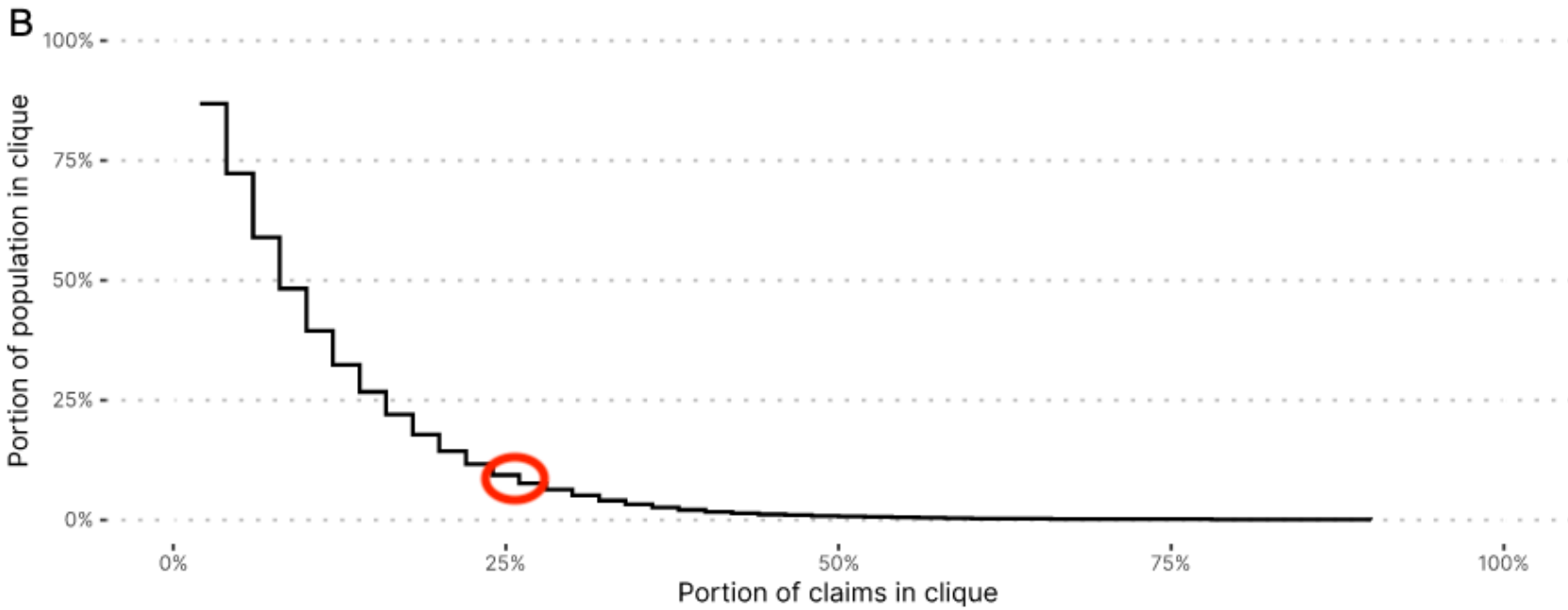

Figure: Sample of 50 claims

At q = 25%, p drops to about 8%

pq common sense

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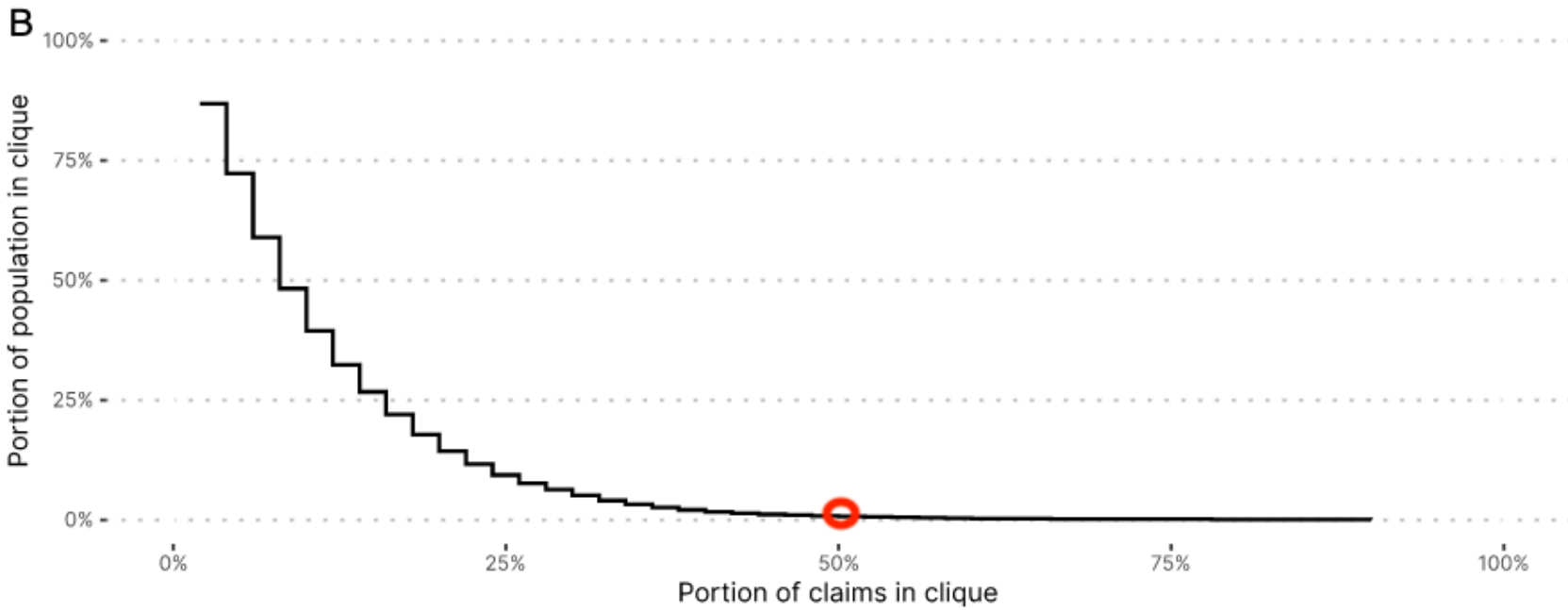

Figure: Sample of 50 claims

At q = 50%, p approaches 0%

pq common sense

The authors mention this is likely an overestimate because:

- They used imputed data (predicted responses) due to computational constraints
- Their models tended to overestimate agreement
- They only used 50 carefully selected claims instead of all 4,407

pq common sense

The Theoretical Extreme Cases would be:

- Perfect Common Sense:
  - Line would start at p 1 when q 0
  - Would stay high even as q increases
  - Would look more like a gentle slope
- No Common Sense:
  - Line would start at low p even when q 0
  - Would drop to zero very quickly
  - Would look even steeper than what's shown

The actual results fall somewhere in between but lean more toward the "no common sense" extreme, suggesting that truly common beliefs are quite rare, even rarer than what's shown in the graph.

Key Takeaway Messages Learned (1/2)

Methodological Contribution

- First quantitative framework for common sense
- Breaks traditional circular logic
- Separates individual and collective analysis

About Claims

- Most commonsensical: plain, fact-like statements about physical reality
- Knowledge domains matter:
  - Higher: technology, natural science, geography
  - Lower: philosophy, social science, religion
- Source matters:
  - Directly elicited claims more commonsensical

Key Takeaway Messages Learned (2/2)

About People

- Demographics have minimal impact:
  - Age, gender, education, income
  - Political leaning, cultural background
- What matters:
  - Social perceptiveness
  - Critical reasoning ability
- Less variation across people than across claims

The "Commonness" of Common Sense

- True common sense (universal agreement) is rare
- Agreement drops dramatically with more claims:
  - At 25% claims: only 8% agree
  - At 50% claims: nearly 0% agree
- What's "common sense" to one person may be unique to them