Common Sense Entailment and Shared Place

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Four Related Activities

- Communication
  - Interpersonal transmission of information in language
- Argumentation
  - Persuading another person of something (rationally)
- Explanation
  - Stating the causes or mechanisms that produce a given result
- Problem solving
  - Figuring out means that will achieve a given end

Communication

- Someone tells us something in a language we know
  - We understand what the speaker means/is trying to communicate
- "Our train is running very late"
  - ➢ We may miss our connection and perhaps be late for our meeting

I return to this activity, which is central to common sense entailment, after briefly discussing the others

Argumentation

- Someone tries to convince us of something C (through reason, not by deceptive tricks)
  - They try to find other things $A_1,\ldots,A_n$ that, if accepted by us, will compel us to believe C (on pain of being unreasonable)
- People in Dealey Plaza heard three shots when John F. Kennedy was killed, in too quick a succession to all have been fired from the same rifle
  - ➢ Lee Harvey Oswald can't have been a lone assassin

Explanation

- We try to puzzle out how or why something happened
- If the cat scooped the fish out of the tank, its paws would have got wet and cat paw prints would lead from the tank to the fish bones
  - ➢ It's highly likely the cat took and ate the fish
- Explanation ranges from the mundane (this one hardly needs verbalizing) to extremely deep (Gravitation is the warping of space by masses)

Problem solving

- We try to puzzle out how to make something happen
- If we go by way of Ginza at this time of day, we'll encounter crowds and may be delayed. If we go by Nihombashi, there'll be little traffic and our trip will probably be easy
  - We'll go by Nihombashi and have a more peaceful trip with a better chance of arriving on time
- Involves choosing a (probably) successful course of action, in addition to figuring out which ones are likely to be successful

Features shared by these activities

- Situated activities
  - communication situation
  - described situation
  - jointly accepted facts of a situation
  - situational givens, affordances, and a goal
- ✦ All involve BA – shared ‘place’
- Involve inference
  - Infer things the speaker meant to communicate that she didn’t say
  - Infer the object C of persuasion from beliefs $A_1,\ldots,A_n$
  - Infer effects or results from causes or reasons
  - Infer that the goal will (probably) be achieved if chosen actions are performed
- When premises and conclusions are expressed in language, reasonable inferences are the ones whose premises entail their conclusion in the shared situation(s) — Common Sense Entailment
- What kind of **logic** is it that all these activities involve?

Common Sense Entailment

- It is a species of implication, relating utterances to propositions which are reasonably inferred from them.
- It is ubiquitous. In fact, speakers expect, and frequently intend, listeners to draw conclusions that are not strictly deducible from what they say. (As was pointed out by Grice among others.)
  - Language interpretation processes such as bridging anaphora depend on it.
  - Having a non-pedantic conversation depends on it.
- It is **not** deductive inference (like *logical implication* and *analytic entailment*) nor *semantic presupposition* or *conventional implicature*.
- You know it when you see it.
- In this respect, it's not so different from many other linguistic attributes, e.g., grammaticality, presence of specific grammatical relations, possible word of *L*, …

Well-Known Varieties of Entailment

- Deductive inference
  - Logical implication
  - Analytic entailment
  - Logical consequence of premises together with meaning postulates and factual assumptions
- Defeasible inferences
  - Inductive
  - Abductive

  } Highly probable conclusions
  - Conversational implicature
- Probabilistic inferences

Examples (Pascal Recognizing Textual Entailment Challenge style)

1.
   - T: Several airlines polled saw costs grow more than expected, even after adjusting for inflation.
   - H: Some of the companies in the poll reported cost increases.
2.
   - T: The memorandum noted the United Nations estimated that 2.5 million to 3.5 million people died of AIDS last year.
   - H: Over 2 million people died of AIDS last year.
3.
   - T: The doctor didn't hesitate to recommend Prozac.
   - H: The doctor recommended medication.
4.
   - T: Jimmy Dean refused to move without blue jeans.
   - H: James Dean didn't dance without pants.
5.
   - T: As leaders gather in Argentina ahead of this weekend's regional talks, Hugo Chávez, Venezuela's populist president is using an energy windfall to win friends and promote his vision of 21st-century socialism.
   - H: Hugo Chávez acts as Venezuela's president.
6.
   - T: Officials said Michael Hamilton was killed when gunmen opened fire and exchanged shots with Saudi security forces yesterday
   - H: Michael Hamilton died yesterday.

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More Examples

7.
   - T: The First Family's flight to Paris left Washington at 11am and lasted six hours.
   - H: The First Lady was not in France at 2pm.

8.
   - T: Cavern Club sessions paid the Beatles £15 evenings and £5 lunchtime.
   - H: The Beatles performed at Cavern Club at lunchtime.

9.
   - T: The two suspects belong to the 30th Street gang, which became embroiled in one of the most notorious recent crimes in Mexico: a shootout at the Guadalajara airport in May, 1993, that killed Cardinal Juan Jesus Posadas Ocampo and six others.
   - H: Cardinal Juan Jesus Posadas Ocampo died in 1993.

10.
   - T: A 30-year-old man has been killed in a shark attack at a surfing beach near Perth in West Australia where he was surfing with four other people.
   - H: A 30-year-old man was killed in a shark attack while surfing.

11.
   - T: A male gorilla escaped from his cage in the Berlin zoo and sent terrified visitors running for cover, the zoo said yesterday.
   - **H:** A gorilla escaped from his cage in a zoo in Germany.

12.
   - T: Microsoft was established in Italy in 1985.
   - H: Microsoft was established in 1985.

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Divergence of Common Sense Entailment from Deductive Entailment Matters to Semantic & Pragmatic Theory

- Competent language users have intuitions about what other such users' utterances mean.
  - These judgments are primary data for the semantic and pragmatic study of meaning.
  - Theories about linguistic meaning, conversational implicature, speaker meaning, etc. interact to explain these data.
- Theoretical disagreements in linguistics and the philosophy of language (sometimes disguised as disagreements about data) are often connected with points of divergence between common sense entailment and deductive inference.
  - Existence presupposition of universal quantifier, … other examples

Tradition: Deductive Entailment

- Everyday reasoning doesn't need the ironclad guarantee that deductive inference provides
- Ancient Greek argumentation contests
  - Aristotle admitted his analysis of reasonableness (truth of conclusion guaranteed by truth of premises) was not completely satisfactory: "This man has fever, since he breathes rapidly." is a reasonable non-deductive argument
- Being a transitive relation, deductive entailment is a monotonic kind of inference

Common Sense Entailments

- arise from:
  - logical implication
  - analytic entailment
  - semantic presupposition
  - conventional implicature
  - sincerity conditions on speech acts
  - ancillary non-linguistic knowledge
  - conversational common ground
  - impact of conversational purpose (v. conversational implicature)
  - influence of genre (e.g., news reporting, logic puzzles, …)

Fixed for language or for a language

Highly dependent on context of use

- Some of these contributors are fallible
  - Speech acts can be insincere
  - Non-linguistic knowledge may not be held by speaker as well as hearer.
  - Common ground is no more accurate than communicating parties' interpretations of each other's communicative intent.
  - An utterance may serve current conversational purpose in one of several different ways.
  - Some conventions of some genres are not fully fixed.
- The fallible contributors make common sense entailment defeasible and non-monotonic.

- Empirically, rather good intersubjective agreement exists about what does reasonably follow from speech acts.
    - Better than 90% agreement in many tests. (Comparable with agreement on deductive inferences.)
    - Strongly dependent on adequate listener access to context of utterance (and on speakers making themselves clear enough).
- Although people know common sense entailment when they see it, a characterization of the concept is strongly desirable. An analysis of it is also needed.
- Underpinnings: Common Sense Entailment, being found in interactions in language among agents, seems to rest on three foundations:
  - Congruences between agents' information states
  - Resources of the language in use
  - Purpose of the communicative interaction

Some Characteristics of CSE

- Reasonable
  - Common sense entailments can be explained post hoc with a plausible justification.
  - Judgments that an utterance does not common sense entail some proposition can be justified post hoc by providing plausible counterexamples to plausible construals under which there would be a common sense entailment.
  - Judgments that common sense fails to determine whether or not an utterance entails some proposition can be justified by giving
    - a plausible justification for a plausible construal, and
    - plausible counterexamples to another plausible construal
- Non-transitive
  - Common sense entailments are ‘local’. They are seldom strung together except in short chains.

Sketch of a Candidate Analysis

- Premises T *common sense entail* conclusion H if there are a context *c* and assumptions *A* such that $P(c,A) > \theta$ and $T_c, A \Rightarrow H_c$, where $\Rightarrow$ is logical implication.
- Premises T *fail to common sense entail* conclusion H if for all contexts *c* and assumptions *A* such that $T_c, A \Rightarrow H_c$, $P(c,A) < \theta$.

- Note: the probability distribution *P*, the mapping $c \rightarrow T_c$, $c \rightarrow H_c$, and the threshold θ are parameters of this sketchy definition. These must be 'reasonably' chosen.
- Further Note:
  - Ancillary premises *A* include 'meaning postulates' warranted by the lexical meaning of non-logical expressions occurring in T and H, background 'factual knowledge' shared by speaker and hearer, and propositions in the conversational common ground.
  - Context *c* reflects the purpose and genre of communication.

An Approach to Justifying Judgments

- To answer the question whether T *common sense entails* conclusion H with **yes/no/not clear**, one should provide:
  - yes:
    - a context *c* and assumptions *A* for which $P(c,A) > \theta$ and $T_c, A \Rightarrow H_c$.
  - no:
    - a convincing argument that for all contexts *c* and assumptions *A* such that $T_c, A \Rightarrow H_c$, $P(c,A) < \theta$.
  - not clear:
    - both a context *c* and assumptions *A* for which $P(c,A) > \theta$ and $T_c, A \Rightarrow H_c$,
    - and a context *c* and assumptions *A* for which $P(c,A) > \theta$ but not $T_c, A \not\Rightarrow H_c$.

Ba

- What listeners can reasonably take to follow from a speaker's utterances depends in part on assumptions it is reasonable to take the speaker to be making.
- The speaker making these assumptions, if she is, is part of the context of utterance.
- Context is not fully patent (transparent). Many aspects of context cannot be observed perceptually.
- Soundness of common sense entailment preserves some aspects of context (in the main, the ones that are crucial to the common sense entailment going through), as well as truth under the speaker's assumptions.
- Misapprehensions about context or shifts in context underlie defeasibility of common sense entailment.