Presupposition, Provisos, and Probability

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Contribution

- New solution to the Proviso Problem.
- Derived from new work on the semantics of connectives and epistemic modals.
- Connects semantics/pragmatics of presupposition with recent Bayesian cognitive science.
- No stipulative strengthening mechanisms or syntactic conditions.

The Proviso Problem

- What is the presupposition of $\phi \to \psi_\chi$, with a presupposition in the consequent?
- Satisfaction theories after [H83]: $\phi \to \chi$. DRT: χ.

(1) If Bo is away, his dog will be sad.
  a. $\not\rightsquigarrow$ If Bo is away, he has a dog.
  b. $\rightsquigarrow$ Bo has a dog. [✓DRT, Ge96]

(2) If John is a diver, he'll bring his wetsuit.
  a. $\rightsquigarrow$ If John is a diver, he has a wetsuit.
  b. $\not\rightsquigarrow$ John has a wetsuit. [✓H83, B01]

Strengthening Accounts

- Satisfaction theorists have proposed various **strengthening** accounts, where an extra mechanism strengthens (1a) to (1b) (e.g., [Si07,Sc11]).
- [Ge96] argues that these accounts are *ad hoc* and empirically problematic.

Presuppositions of Factives

If (1) is strengthened, why not (3) as well? [G96]

(3) Sam knows that if Bo is away, he has a dog.
  a. $\rightsquigarrow$ If Bo is away, he has a dog.
  b. $\not\rightsquigarrow$ Bo has a dog.

Semi-Conditional Presuppositions

How do we get the partial strengthening in (4)?

(4) If John is a diver and wants to impress his girlfriend, he'll bring his wetsuit.
  a. $\not\rightsquigarrow$ If John is a diver and wants to impress his girlfriend, he has a wetsuit.
  b. $\rightsquigarrow$ If John is a diver, he has a wetsuit.
  c. $\not\rightsquigarrow$ John has a wetsuit.

Connectives and Information

- [KR10]: Static variant of [H83], where presuppositions and epistemic modals both rely on an **information state parameter** s [Y07].
- A presupposition must be entailed by the **local** information state. Connectives shift the value of s:

- $s_\alpha =_{df} \{w' \in s \mid [\![\alpha]\!]^{c,s,w'} = 1\}$, the α-subset of s.
  - $[\![\neg\phi]\!]^{c,s,w}$=1 iff $[\![\phi]\!]^{c,s,w} = 0$
  - $[\![\phi \wedge \psi]\!]^{c,s,w}$=1 iff $[\![\phi]\!]^{c,s,w}$=1 and $[\![\psi]\!]^{c,s_\phi,w}$=1
  - $[\![\phi \vee \psi]\!]^{c,s,w}$=1 iff $[\![\phi]\!]^{c,s,w}$=1 or $[\![\psi]\!]^{c,s_{\neg\phi},w}$=1
  - $[\![\phi \to \psi]\!]^{c,s,w} = 1$ iff $[\![\phi]\!]^{c,s,w}$=0 or $[\![\psi]\!]^{c,s_\phi,w}$=1

- $\phi \to \psi_\chi$ presupposes that $s_\phi \subseteq [\![\chi]\!]^{c,s_\phi,w}$.
- This is equivalent to global ps $\phi \to \chi$.

Realistic Information States

Converging evidence from semantics and cognitive science indicates that information states are not sets of worlds but **probability distributions**.

- Entailments and degree modification with epistemic modals implicates probability in information states [Y10,L10,L11].
- Learning, reasoning, and decision-making implicate probability in cognition [C06,G08].

An information state s is a **probability measure** on a set of worlds W if and only if $\Phi \subseteq \mathcal{P}(W)$ is an algebra of propositions (sets of worlds), and

- $s : \Phi \to [0,1]$, $W \in \Phi$, and $s(W) = 1$;
- For all A and $B \in \Phi$: if $A \cap B = \varnothing$, then $s(A \cup B) = s(A) + s(B)$.

Probabilistic Presuppositions

- We can construct a probabilistic variant of [KR10] by modifying the definition of local satisfaction:
- The **probabilistic presupposition** of α_β is

$$s(\beta) \geq \theta$$

where θ is a high probability threshold.
- In short: **high probability** instead of **certainty**.
- Also, redefine s_α as conditional probability:

$$s_\alpha(\beta) = \frac{s(\alpha \wedge \beta)}{s(\alpha)} = prob(\beta|\alpha)$$

Predictions

- **The predicted presupposition for $\phi \to \psi_\chi$ is that the conditional probability $s_\phi(\chi)$ is at least θ.**
- **Possible prior knowledge: either (1) $s_\phi(\chi) = s(\chi)$, (2) $s_\phi(\chi) < s(\chi)$, or (3) $s_\phi(\chi) > s(\chi)$.**
- **Which of these holds determines the appropriate sentential paraphrase of the probabilistic ps.**

Independence & Unconditional Pss

- Consider (1): intuitively, whether Bo is away does not affect the probability that he has a dog.
- So, ϕ = *Bo is away* and χ = *Bo has a dog* are **probabilistically independent**:

$$s(\chi) = s_\phi(\chi)$$

- If we are in an information state in which this holds, $s_\phi(\chi) \geq \theta$ is **equivalent** to $s(\chi) \geq \theta$.
- $s(\chi) \geq \theta$ is the same ps that *Bo's dog is sad* has, and is well-paraphrased by *Bo has a dog*.

Presupposition & Paraphrase

In context, (1) presupposes $s_\phi(\chi) \geq \theta$ **and** $s(\chi) \geq \theta$.
- Why is (1b) a good paraphrase, and (1a) not?
- Conditional sentences carry a strong **relevance** implicature: (1a) implies that whether Bo is away is relevant to whether he has a dog.
- But it's not — independence implies irrelevance!
- (1b) avoids this unwanted inference.

Genuine Conditional Pss

- True conditional pss arise when $s_\phi(\chi) > s(\chi)$.
- Knowing for sure that John is a diver makes it more likely that he owns a wetsuit.
- No unconditional inference in this info state:

$$s_\phi(\chi) \geq \theta, s_\phi(\chi) > s(\chi) \not\models s(\chi) \geq \theta.$$

- Relevance implicature of (2a) unproblematic.

Presuppositions of Factives

- (3) is not a problem unless $s_\phi(\chi) = s(\textit{if } \phi \textit{ then } \chi)$.
- [L76] proved that this equation cannot hold in general without trivializing probability measures.
- Differences between (1) and (3) are expected.

Semi-Conditional Presuppositions

(4) has the form $(\phi \wedge \psi) \to \chi_\eta$, with ϕ, ψ independent. John's diving and wetsuit ownership are related, but neither is relevant to his relationship. Formally, ϕ and η are **jointly independent** of ψ:

$$s(\phi \wedge \eta) = s_\psi(\phi \wedge \eta)$$

If this condition is met, the ps of (4) is provably equivalent to $s_\phi(\eta) \geq \theta$ — the same ps that (2) has.

Looking Beyond

More issues not dealt with here (see paper):

- Theoretical & empirical advantages over strengthening accounts of Singh & Schlenker which invoke probabilistic independence
- Extension to predicative presuppositions in the scope of a quantifier (expectation)

Conclusions and Future Directions

- The core data in (1-4) illustrate the effect of probabilistic prior knowledge on the perceived form of presuppositions.
- No *ad hoc* strengthening mechanisms are needed to account for the Proviso Problem — what we needed was a new conception of information.
- Potential for engagement with recent cognitive science, leading to a serious Bayesian pragmatics.

References

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