Introduction to Natural Language Semantics

Lecture 11: presupposition projection

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1 Presupposition triggers

- In class 1 we discussed the notion of a *presupposition*.
- Intuitively, a sentence ϕ presupposes ψ ($\phi \prec \psi$) when a speaker must take for granted that ψ is true in order to properly use ϕ.

  (1) Alice will play her guitar tonight.
  $\prec$ Alice has a guitar.

- Presuppositions arise systematically from certain items and constructions. These are called *presupposition triggers*.
- The list of presupposition triggers includes, among others:
  - Definite descriptions and possessives: *the king of France*, *her guitar*.
  - Factive verbs: *know*, *realize*, *regret*, *discover*.

    (2) John regrets that he voted for Trump.
    $\prec$ John voted for Trump.

  - Aspectual verbs: *stop*, *continue*, *start*.

    (3) John stopped smoking.
    $\prec$ John used to smoke.

  - Aspectual adverbs: *still*, *yet*, *anymore*.

    (4) John doesn't smoke anymore.
    $\prec$ John used to smoke.

  - Iterative adverbs: *too*, *also*, *as well*, *again*.

    (5) John is clever too.
    $\prec$ Some other individual is clever.

2 The projection problem

- The projection problem for presuppositions is the problem of determining the presupposition of a complex sentence, given the presuppositions of its components (how presuppositions "project" from the components to the compound).
- E.g., consider the sentence in (6), containing a presupposition trigger, and the conditionals in (7) which embed it.

(6) Alice will play her guitar tonight. $\prec$ Alice has a guitar

(7) a. If Alice plays her guitar tonight, we will be delighted.
b. If Alice has a guitar, then she will play her guitar tonight.
c. If Alice is a guitarist, then she will play her guitar tonight.

- In (7-a), the presupposition seems to be inherited.
- In (7-b), the presupposition is *canceled*, i.e., not inherited at all.
- Notice that this would be problematic for the naïve account based on the following assumptions:
  - semantics assigns sentences with partial truth-function;
  - ϕ lacks a truth-value when its presuppositions are not satisfied;
  - whenever a component is undefined, the compound is undefined.
- In (7-c), the situation is more subtle. What is presupposed is not that Alice has a guitar, but only that *if she is a guitarist, she has a guitar.*
- In this case, the presupposition of the conditional is not a presupposition of either constituent: so, in complex sentences presuppositions may not only be inherited or canceled: they may also be modified.
- This is not specific to conditionals: similar patterns seem to occur with conjunction and disjunction as well.
- How should we deal with the projection problem?
- Recursively compute the set of presuppositions of a sentence?
- This was tried (Karttunen, 1973), but the results are quite cumbersome.

3 Karttunen's admittance rules

- Karttunen's 1974 paper tackles the problem from a different perspective.
- Instead of recursively defining presuppositions, he defines presupposition satisfaction conditions, called **admittance conditions**.
- These take the form of a relation $\lhd$ between contexts c and sentences A:

$$c \lhd A : \text{ context } c \text{ admits sentence } A$$

- For our purposes, the relevant feature of a context is the information available in it: the information which is publicly shared by the participants.
- This information can be modeled as a set of worlds σ_c—the *context set*: it consists of those worlds which are live possibilities in the conversation.
- For simplicity, we will simply identify the context c with the context set σ_c.
- We say that a context c entails a sentence A if A is true in all worlds in c:

$$c \models A \overset{def}{\iff} \forall w \in c : [\![A]\!]^w = 1$$

- Then, from the admittance conditions we can recover a presupposition relation $\prec$ between sentences as follows:

$$A \prec B \overset{def}{\iff} \text{ for all } c: \text{ if } c \lhd A \text{ then } c \models B$$

- That is, A presupposes B if A is only admitted in contexts that entail B.
- We can say that P expresses the presupposition of A if A is admitted in exactly those contexts which entail P, i.e., if: $c \lhd A \iff c \models P$
- Now the projection problem reduces to the problem of giving a recursive definition of admittance.
- Start from prop. connectives: given the admittance conditions of A and B, what are the admittance conditions of $\neg A$, $A \land B$, $A \to B$, $A \lor B$?
- An important notion: update of a context c with a sentence A:

$$c[A] := c \cap [\![A]\!] = \{w \in c \mid [\![A]\!]^w = 1\}$$

- This plays a key role the standard account of assertion (Stalnaker, 1978): an assertion of A in context c is a proposal to change the context to $c[A]$.
- Notice that what a context entails can be written in terms of update:

$$c \models A \iff c[A] = c$$

Conditional

- Karttunen's admittance clause for conditionals:

$$c \lhd A \rightarrow B \iff c \lhd A \text{ and } c[A] \lhd B$$

- Let us look at the predictions which are made.
- Antecedent presuppositions are inherited: $A \prec P$ implies $(A \rightarrow B) \prec P$.

(8) If Alice plays her guitar tonight, we will be delighted.
$\prec$ Alice has a guitar.

- Consequent presuppositions are filtered: if $B \prec P$ then $A \rightarrow B \prec A \rightarrow P$.[1]
- Thus, it is predicted that (9) does not presuppose that Alice has a guitar, but only that if she is a guitarist, then she has a guitar.

(9) If Alice is a guitarist, she will play her guitar tonight.

- Finally, consider (10):

(10) If Alice has a guitar, she will play her guitar tonight.

- Let this sentence be $A \rightarrow B$. In this case, the antecedent presupposes nothing, while what the consequent presupposes is just the antecedent A:

$$c \lhd B \iff c \models A$$

- For all c we have $c[A] \models A$. Therefore, $c[A] \lhd B$, and thus $c \lhd A \rightarrow B$. So $A \rightarrow B$ is admitted by every c, and has no (non-trivial) presuppositions.
- Thus it is predicted that (10) presupposes nothing.
- These seem to be the predictions that we want.

Negation

- Admittance clause for negation:

$$c \lhd \neg A \iff c \lhd A$$

- Prediction: presuppositions are preserved under negation.

(11) Alice won't play her guitar tonight.
$\prec$ Alice has a guitar

- This fits well with the fact that presuppositions are sometimes characterized, empirically, as implications which persist under negation.

[1] This way of writing the prediction assumes that $\rightarrow$ is the material conditional. If not, we can still write the prediction in a different way, e.g., $A \rightarrow B \prec \neg A \vee P$.

Conjunction

- Atmittance clause:

$$c \ \lhd \ A \wedge B \iff c \lhd A \text{ and } c[A] \lhd B$$

- This is the same clause as for implication; so the predictions are the same:
  - presuppositions of the first conjunct are inherited;
  - presuppositions of the second conjunct are conditionalized by the first conjunct (which may result in cancellation).

(12) Alice will play her guitar tonight, and we will be delighted.
$\prec$ Alice has a guitar

(13) Alice is a guitarist and she will play her guitar tonight.
$\prec$ If Alice is a guitarist she has a guitar.

(14) Alice has a guitar and she will play her guitar tonight.
$\prec$ If Alice has a guitar, she has a guitar $\equiv \top$

Disjunction

- Karttunen's admittance clause:

$$c \ \lhd \ A \vee B \iff c \lhd A \text{ and } c[\neg A] \lhd B$$

- Predictions:
  - presuppositions of the first disjunct are inherited;
  - presuppositions of the second disjunct are conditionalized by the negation of the first disjunct (which may result in cancellation).
- These predictions are not entirely satisfactory, since presuppositions of the first disjunct may also be filtered or canceled by the second disjunct:

(15) a. Either Alice has no guitar, or she will play her guitar tonight.
b. Either Alice will play her guitar tonight, or she has no guitar.

- The clause correctly predicts that (15-a) presupposes nothing.
- But it also predicts that (15-b) presupposes that Alice has a guitar, but this seems wrong.
- Here is an alternative symmetric admittance clause:

$$c \ \lhd \ A \vee B \iff c[\neg B] \lhd A \text{ and } c[\neg A] \lhd B$$

- Predictions:
  - presuppositions of each disjunct are conditionalized by the negation of the other disjunct.

4 Accommodation

- What if a speaker utters a sentence which is not admitted by the context of the conversation? Does the information exchange come to a halt?
- No! Typically, other participants will "accommodate" some information needed to make sense of the utterance, insofar as this is unproblematic, and "quietly and without fuss" reach a new context that admits the sentence.
- For instance, I could say to you:

  (16) I have to go, I have an appointment with my sister.

- Even if you don't already know I have a sister, I expect you to infer that from my use of the definite description, and then to process my statement.
- This phenomenon is known as **presupposition accommodation**.
- The flexibility provided by this repair mechanism can be exploited by speakers to communicate efficiently, taking for granted information which is not yet shared but is considered unproblematic and easy to figure out.
- There is no requirement that accommodation happens by adding the *minimal* piece of information leading to a state where the sentence is admitted.
- Rather, it seems that what is typically accommodated is the most "natural" assumption that allows us to reach a state which admits the sentence.
- Consider (17):

  (17) If it rains, Alice will play her guitar tonight.

- According to Karttunen's rules, (17) does not presuppose that Alice has a guitar, but only that *if it rains*, Alice has a guitar.
- But certainly, upon hearing (17), we take the speaker to think that Alice has a guitar, not that she has a guitar if it rains!
- Is Karttunen's account inadequate in this case?
- No! Karttunen's account predicts what is the *minimal* information needed for a formula to be admitted in a context.
- Karttunen's prediction is that (17) is felicitous without accommodation in a context that does not entail that Alice has a guitar, but only that *if it rains then Alice has a guitar*.
- Is this right?
- Suppose we know the following: Alice made a bet about the weather, and she stands to gain a guitar in case it rains.

- In this case, an utterance of (17) is felicitous without accommodation. Karttunen's predictions are borne out.
- However, if (17) is uttered, and we have to accommodate some information that will make (17) felicitous, one would normally accommodate the stronger piece of information that Alice has a guitar.
- Presumably, this is because by far the most plausible way in which the speaker might know that if it rains then Alice has a guitar is just if they know that Alice has a guitar.

5 Explaining the projection facts

- Karttunen's admittance conditions give a *description* of how presuppositions project under connectives.
- But *why* do they project in that way?
- Does a child need to learn the admittance clauses associated with each connective independently of the rest of its meaning? Seems implausible...
- What we would like to have is an *explanation* of the projection behavior of the connectives in terms of their meaning.
- Consider again the clause for conjunction:

$$c \lhd A \wedge B \iff c \lhd A \text{ and } c[A] \lhd B$$

- We check the presupposition of B not in the context of utterance, c, but in a context $c[A]$ which already incorporates the information that A.
- Why?
- Idea: by the time when we process the second conjunct, the information conveyed by the first conjunct has already been integrated into the context.
- If right, this means that a conjunction $A \wedge B$ is processed in two steps:

$$c \xrightarrow{A} c[A] \xrightarrow{B} c[A][B] = c[A \wedge B]$$

- This is not what we expect in truth-conditional semantics!
- There, the relation between semantics and pragmatics would be as follows:
  1. we compute the semantics of the conjunction, a proposition $[\![A \wedge B]\!]$
  2. we add this proposition to the context: $c \xrightarrow{A \wedge B} c[A \wedge B] = c \cap [\![A \wedge B]\!]$
- The projection data suggest that this is not how a conjunction is processed.
- A conjunction is processed as a sequence of two updates.
- This points to a dynamic view, where meanings are recipes for updating the context in certain ways.

Context-change potentials

- We give a semantics that assigns to a sentence a *context change potential* (CCP): a partial function $[\phi]$ from contexts to contexts.
- With respect to dynamic predicate logic, we have two differences:
  - the input and output are not assignments but sets of worlds (requires resources of intensional semantics);
  - given an input, there is at most one output: $[\phi]$ is a partial function.
- We write $c[\phi]$ for the result of applying $[\phi]$ to c.
- We write $c \models \phi$ (read: c incorporates ϕ) if $c[\phi] = c$.
- We construe presuppositions as definedness conditions on the CCP: sentences presuppose that their input contexts are of a certain kind.
- For instance:

  (18) Alice quit smoking

  $$c[(18)] = \begin{cases} \{w \in c \mid \text{A. doesn't smoke in } w\} & \text{if } c \models \text{A. used to smoke} \\ \text{undefined} & \text{otherwise} \end{cases}$$

- Idea: sentences are tools for updating contexts, but *specialized* tools; they are designed to operate on contexts of a particular type.
- For instance, (18) is a specialized tool to update a context where Bob is represented as someone who has a habit of smoking.
- Let us implement the proposal for the language of propositional logic, expanded with a presupposition operator:

  $$\phi_{\partial\psi} : \phi \text{ with the presupposition that } \psi$$

- Here is the inductive definition of the semantics (Heim 1983):
  - $c[p] = \{w \in c \mid w(p) = 1\}$
  - $c[\phi_{\partial\psi}] = \begin{cases} c[\phi] & \text{if } c \models \psi \\ \text{undefined} & \text{otherwise} \end{cases}$
  - $c[\phi \wedge \psi] = c[\phi][\psi]$
  - $c[\neg\phi] = c - c[\phi]$
  - $c[\phi \rightarrow \psi] = c[\phi][\psi] \cup (c - c[\phi])$
  - $c[\phi \vee \psi] = c[\phi] \cup (c - c[\phi])[\psi]$
- Crucial point: from the semantics of a sentence, given in terms of CCPs, we can recover both its truth-conditions and its admittance conditions.

Accounting for admittance conditions

- There's a natural way to construe admittance in dynamic semantics:

$$c \lhd \phi \iff c[\phi] \text{ is defined}$$

- Now we can check that the admittance conditions that we get from the semantics are precisely the Karttunen clauses.
- But now these admittance conditions are not stipulated, but derived from the meaning of the connectives.
- Thus, in dynamic semantics we can give a deeper explanation of why presuppositions project in the way described by Karttunen.

Accounting for truth-conditions

- The standard truth-conditional contribution of the connectives can also be derived from their dynamic semantic clauses.
- Suppose c is a context with $w \in c$, and $c \lhd \phi$.
- We say that ϕ is **true** at w wrt c, notation $w \models_c \phi$, in case $w \in c[\phi]$.
- We can check that, whenever $w \in c$ and c admits all the relevant formulas, we have the following facts:
  - $w \models_c \neg\phi \iff w \not\models_c \phi$
  - $w \models_c \phi \wedge \psi \iff w \models_c \phi$ and $w \models_c \psi$
  - $w \models_c \phi \vee \psi \iff w \models_c \phi$ or $w \models_c \psi$
  - $w \models_c \phi \rightarrow \psi \iff w \not\models_c \phi$ or $w \models \psi$
- Thus, truth-conditions and admittance conditions are not two unrelated aspects of the meaning of a sentence; both can be derived from its CCP.

Local accommodation

- Besides standard accommodation, which Heim calls *global*, she discusses another form of accommodation, that she calls *local*.
- Suppose (19) is uttered in a context c in which it is not admitted.

(19) Alice will not play her guitar tonight.

- The operation that we have to perform to obtain $c[\neg A]$ is $c - c[A]$. We have two options:
- **Global option**: we can enhance c into c' that admits A, and then compute $c'[\neg A] = c' - c'[A]$. In this way the accommodated information becomes part of the new context.

- **Local option**: we can only enhance c "locally" to c' when strictly needed, that is, when evaluating $c[A]$. In this way we get $c - c'[A]$, and the accommodated information does not become part of the new context.
- Global accommodation is the default.
- Local accommodation only occurs if needed, e.g. in case local accommodation would result in inconsistency: for instance, if the speaker goes on to say: "because she has no guitar".

6 Summary

- Besides predicting the truth-conditions of sentences, one task of natural language semantics is to predict what a sentences presuppose.
- Certain items systematically generate presuppositions.
- The projection problem is the problem of predicting how these are inherited.
- We looked at this problem in a specific case: propositional connectives.
- We described the projection behavior of connectives, which is non-trivial: the presupposition of a constituent can be inherited, not be inherited, or be inherited in a modified form.
- We asked whether this behavior can be explained in terms of something more fundamental.
- We saw that it can, provided we make the following assumptions:
  - meanings of sentences are recipes for updating information states;
  - connectives are associated with certain ways to combine such functions (conjunction is sequencing, etc.);
  - presuppositions are definedness conditions on updates.
- Thus, the phenomenon of presupposition projection provides additional motivation (beyond the motivation coming from anaphora) for a dynamic view on sentence meaning.