

Interesting Things We Haven't Covered

Pragmatics and the problem of inference

- Text coherence
- Scripts for text understanding
- Textual entailment

Slide CS474-1

Interpretation in Context

Jack took out a match. He lit a candle.

Jack took out a match. The sun set.

Useful to divide context into:

- **discourse context:** information from preceding sentences
- **situational context:** relevant world knowledge

Slide CS474-2

The Problem of Inference

When the balloon touched the light bulb, it broke. This made the baby cry. Mary gave John a dirty look and picked up the baby. John shrugged and picked up the balloon.

Slide CS474-3

NLU as Abduction

If $A \rightarrow B$ is true and B true, then A true.

X = *Fred desperately needed money for the mortgage payment.*

B = *Fred called his sister.*

Rule1 = If you need money then you can get it from a family member.

Rule2 = If you want to get something from someone, then you can ask them for it.

Rule3 = One way to ask someone for something is to call them.

Slide CS474-4

Framework for Using World Knowledge

Expectation-Based Processing

1. Assume setting of discourse is represented by content of previous sentences and any inferences made when interpreting those sentences.
2. Use this information to **generate a set of expectations** about plausible eventualities.
3. **Match** possible interpretations of new sentences against expectations generated from the previous discourse.

Slide CS474–5

Scripts [Schank & Abelson]

- Prepackaged chain of causal relations between events and states that encodes expectations.
- Don't have to generate expectations from first principles using causality reasoning.
- Knowledge structure that encodes stereotypical sequences of events.

John was hungry. He went into Schneider's and ordered a pastrami sandwich. It was served to him quickly. He left the server a large tip.

Slide CS474–6

\$RESTAURANT Script

Roles: Customer(S), Server(W), Cook(C), Cashier(M), Food(F)

Props: Table, Utensils, etc.

Constraints: HUMAN(S), HUMAN(W), etc.

Preconditions: HAS-MONEY(S)

Effects:

HAS-LESS-MONEY(S), HAS-MORE-MONEY(M),
-HUNGRY(S), -PLEASED(S)

Slide CS474–7

Decomposition (Conceptual Dependency form):

1. **Enter:** S PTRANS S into Restaurant; S ATTEND Eyes to Tables; S MBUILD where to sit; S PTRANS S to Table; S MOVE S to sitting position.
2. **Order:** S MTRANS food-order to W (main)
3. **Eat:** S INGEST X (main)
4. **Exit:** S ATRANS money to M (main)

Slide CS474–8

Using Scripts to Understand a Story

Assume: script \$S\$, consisting of events e_1, e_2, \dots

For each sentence, s in text:

1. Parse s into its propositional CD form.
2. While event, e , in list of script events:
 - (a) If s matches e ,
 - i. Instantiate e with current script roles.
 - ii. Instantiate all intervening events, i , with current script roles.
 - (b) Else move pointer to next event, saving e in i .

Output is instantiated script.

Slide CS474-9

Problems with Scripts

1. Script selection
2. Managing multiple scripts
3. Aborting scripts
John went to Schneider's. He left.
4. Allowing for optional paths through scripts
John was pick-pocketed on the way to restaurant.
5. Knowledge engineering requirements

Slide CS474-10

Novel Situations

John was hungry. He took out some ground beef.

John was hungry. He took out the Yellow Pages.

John needed money for the mortgage payment. He called his sister.

John needed money for the mortgage payment. He got a gun.

Slide CS474-11

Textual Entailment

Input: pairs of text units, termed T(ext) - the entailing text and H(ypothesis) - the entailed text.

Output: TRUE or FALSE to indicate whether T entails H.

T entails H if, typically, a human reading T would infer that H is most likely true.

Slide CS474-12

Examples

T: The flights begin at San Diego's Lindbergh Field in April, 2002 and follow the Lone Eagle's 1927 flight plan to St. Louis, New York, and Paris.

H: Lindbergh began his flight from Paris to New York in 2002.
(FALSE)

T: The world will never forget the epic flight of Charles Lindbergh across the Atlantic from New York to Paris in May 1927, a feat still regarded as one of the greatest in aviation history.

H: Lindbergh began his flight from New York to Paris in 1927.
(TRUE)

Slide CS474-13

Examples

T: Courtney Love became known primarily as Kurt Cobain's spotlight-stealing drug-sharing partner, girlfriend, and, later, wife, and the mother of their child, Frances Bean.

H: Courtney Love is the wife of Kurt Cobain.
(TRUE)

T: Attending the first showing of the film "Phantom of the Opera" was the main actor, Robert Englund, and his wife. Courtney Love and Kurt Cobain were also spotted at the premiere.

H: Courtney Love is the wife of Robert Englund.
(FALSE)

Slide CS474-14

Follow-on NLP/IR/ML Courses

CS674 graduate-level NLP
CS630 language technologies
CS472 AI
CS478 ML
CS578 ML
CS678 ML
CS775 NLP seminar
CS772 AI seminar

CS490!!!
CS790!!!

Slide CS474-15