

Language Generation 4: Discourse

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Words You'll Hear Today

- pragmatics
- coherence
- coreference
- discourse structure

Exhibit A

Absurdity like that I can deal with.

I just want someone to fix my sh*t if I'm in a car accident.

It's not always going to make sense or depict a situation that a normal person could relate to.

Television is television, be it a sitcom or an ad for Popeye's Chicken.

It's a given that nobody watches television commercials expecting to receive a heaping dose of reality.

I really don't care if the Geico Caveman gets to suit up with the Washington Redskins or not.

www.cracked.com

Exhibit B

It's a given that nobody watches television commercials expecting to receive a heaping dose of reality.

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I just want someone to fix my sh*t if I'm in a car accident.

Absurdity like that I can deal with.

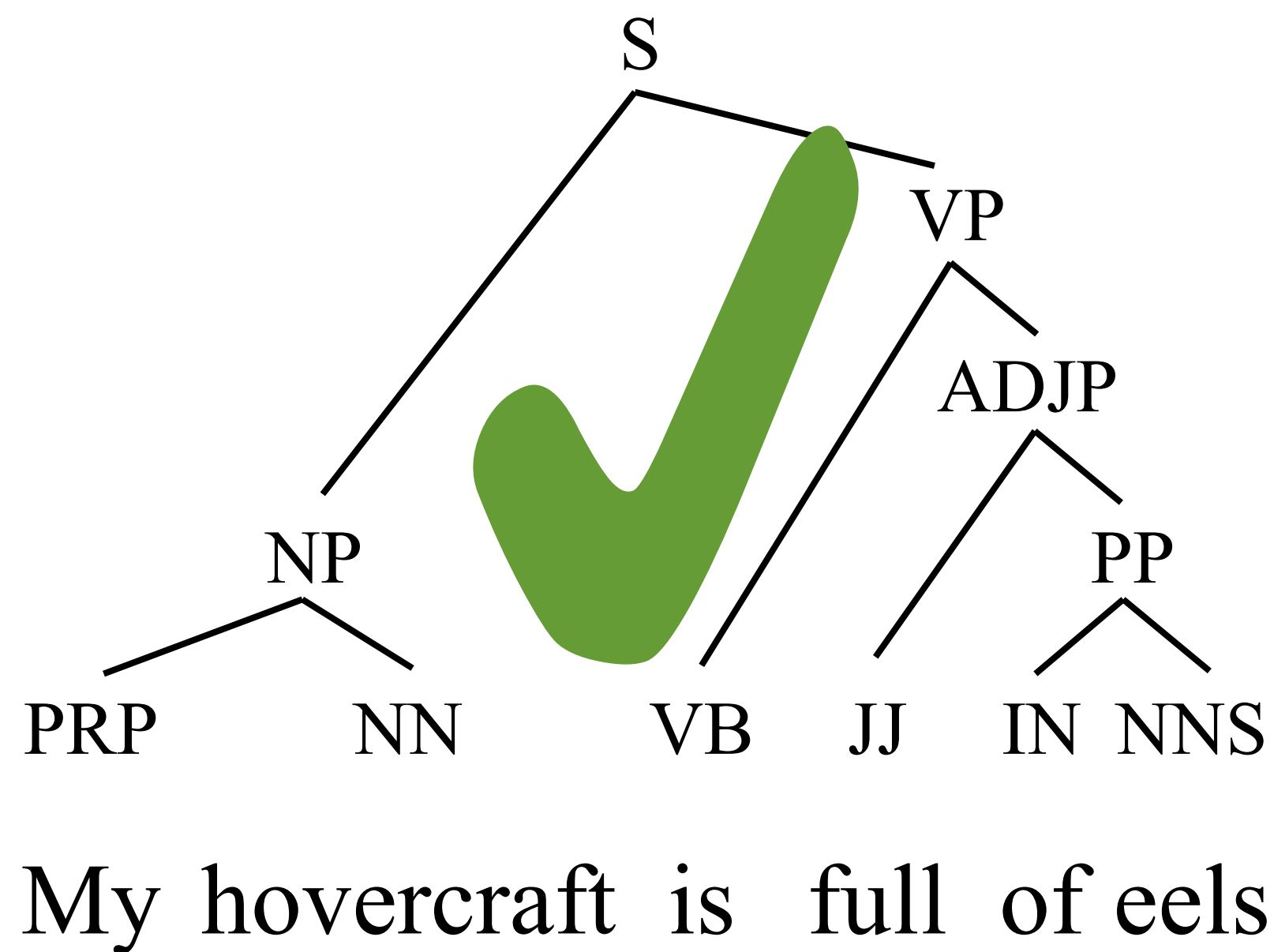
www.cracked.com

What's All This Then?

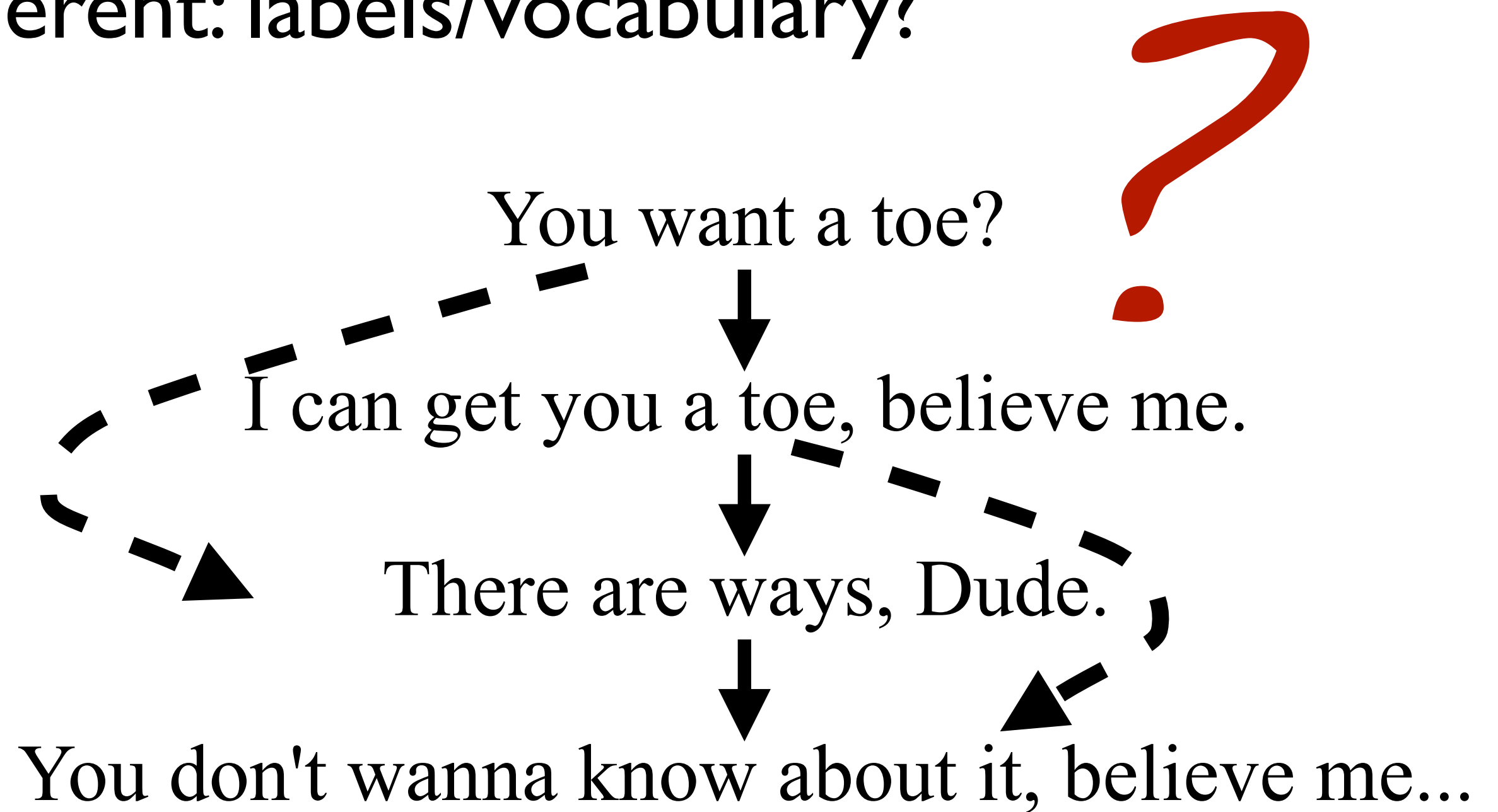
- sentence \neq random word order \rightarrow syntax
- text \neq random sentence order \rightarrow pragmatics
- criterion: coherence
- coherent set of sentences = discourse

The Problem

- how to make texts coherent: labels/vocabulary?



syntax



pragmatics

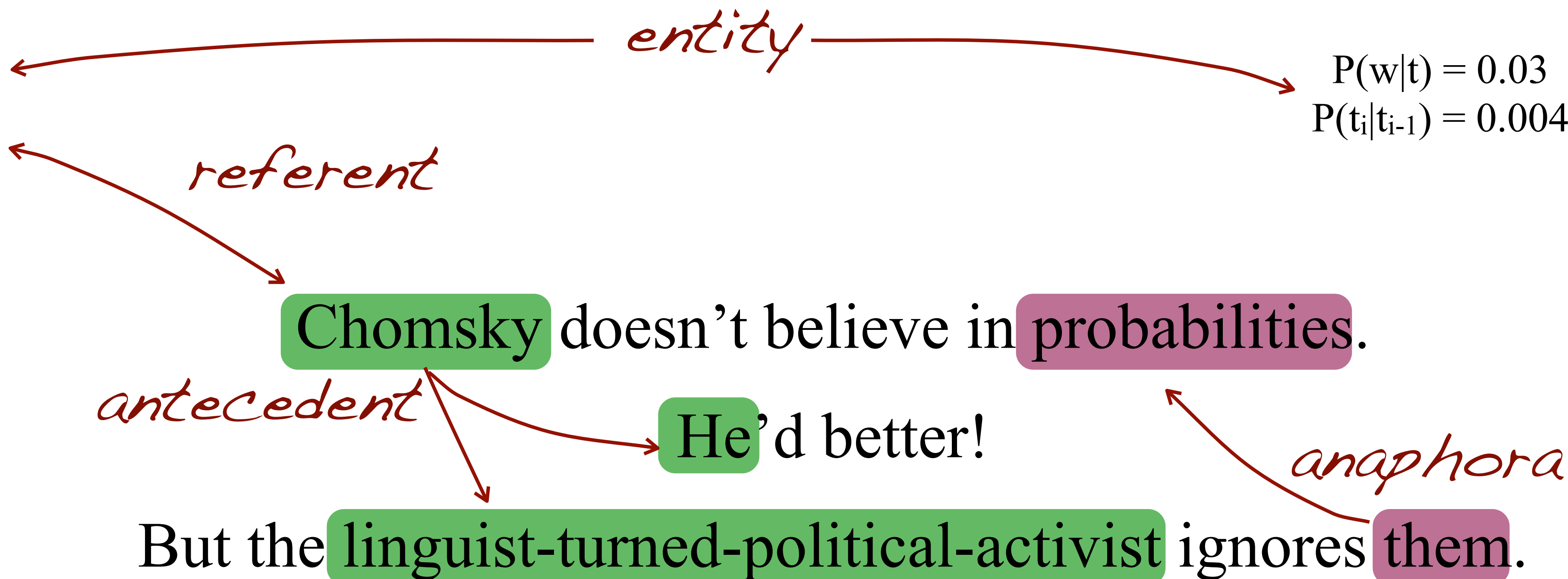
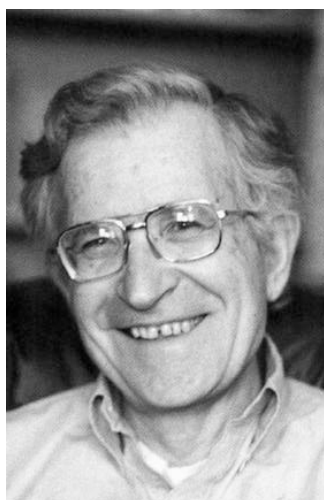
Coherence

- meaningful combination of sentences
- means to “link” sentences:
 - **coreference**
 - **discourse relations**

Coreference

- referring to one thing with multiple expressions
- crucial for all NLP tasks!
- intensive psycholinguistic research

Coreference Example



coreference chain {**Chomsky, He, linguist-turned-political-activist**}
{**probabilities, them**}

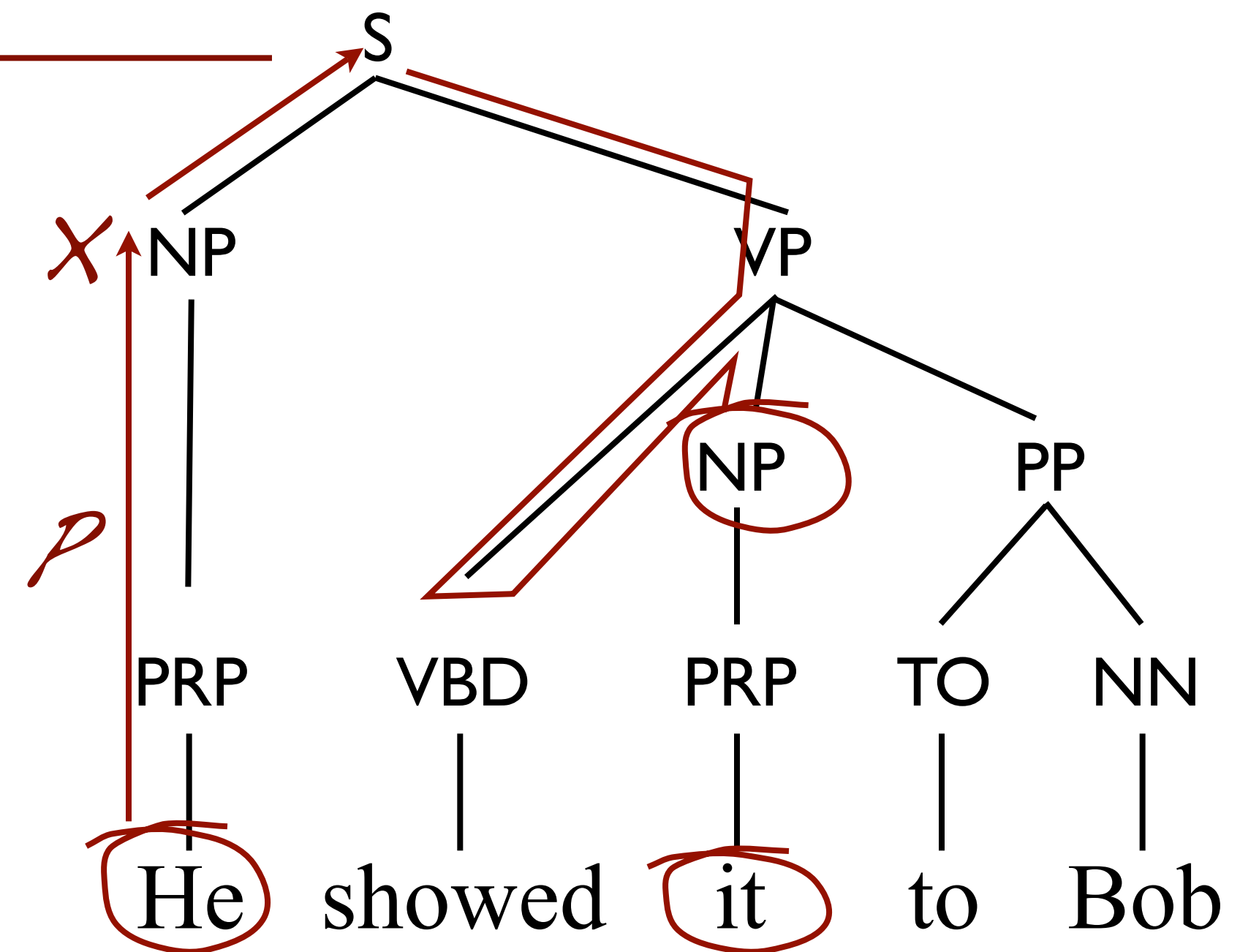
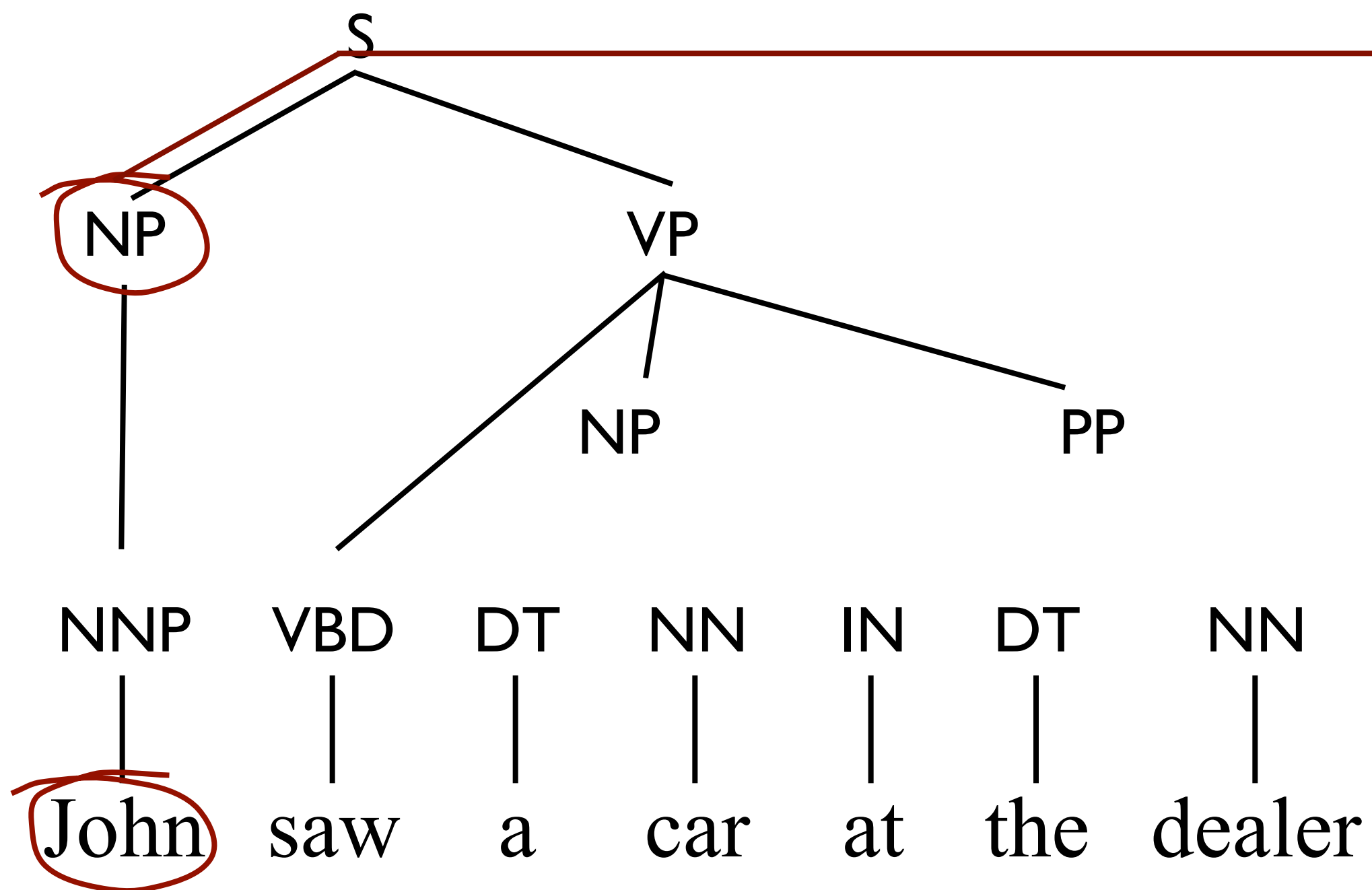
Coreference Problems

Peter gave Bob a piece of his mind.

? He seemed to enjoy it.

It rained all day. \neq

Coreference Algorithm I: tree search for pronouns



Proposed antecedents: ~~it~~ John

Coreference Algorithm 2: supervised ML

- identify all NPs

{Chomsky, probabilities, He, linguist-turned-political-activist, them}

- pairwise match NPs and extract features

features: gender, number, entity type, distance, ...

pairs: (Chomsky, probabilities)
(Chomsky, He
...

- check for coreference w/ classifier
- sort into coreference chains

Coreference Overview

- performance: precision & recall of coref chains
- best models: supervised ML, ~70–90 F-score
- depends on data set, evaluation, etc.

Coreference Comparison

(<http://www.minvolai.com/blog/2010/09/coreference-resolution-tools-a-first-look/>)

Queen Elizabeth set about transforming her husband, King George VI, into a viable monarch. Lionel Logue, a renowned speech therapist, was summoned to help the King overcome his speech impediment.

Illinois Coreference Package	{Lionel Logue, a renowned speech therapist, his} {Queen Elizabeth} {the King, King} {King George VI, transforming her husband, her} {a viable monarch}
CherryPicker	{Queen, her} {Elizabeth} {Husband} {King, George VI, King, his} {Lionel Logue} {therapist}
Reconcile	{Queen Elizabeth, her} {her husband, King George VI} {a Viable monarch} {Lionel Logue, a renowned speech therapist, the king, his}
ArkRef	{Queen Elizabeth, her} {her husband , King George VI} {Lionel Logue , a renowned speech therapist} {the King, his}

false entity

wrong chain

Coherence

- meaningful combination of sentences
- means to “link” sentences:
 - **coreference** ✓
 - **discourse relations**

Discourse Relations

I will not buy this record because it is scratched

- what is their relation?
- how to name it?
- which sentence is independent?
- which order makes more sense?
- what if there are no markers?

Endless Possibilities

- no agreed-upon set of sentence-sentence relations:
 - McKeown: schemas (4)
 - Hobbs: inference-based (13)
 - Mann & Thomas: RST (23)
- Survey by Hovy & Maier: 350+

RST

- Rhetorical Structure Theory (Mann & Thompson 1987)
- quasi-standard by now
- **nucleus**: sentence that can be interpreted on its own
- **satellite**: needs a nucleus to make sense

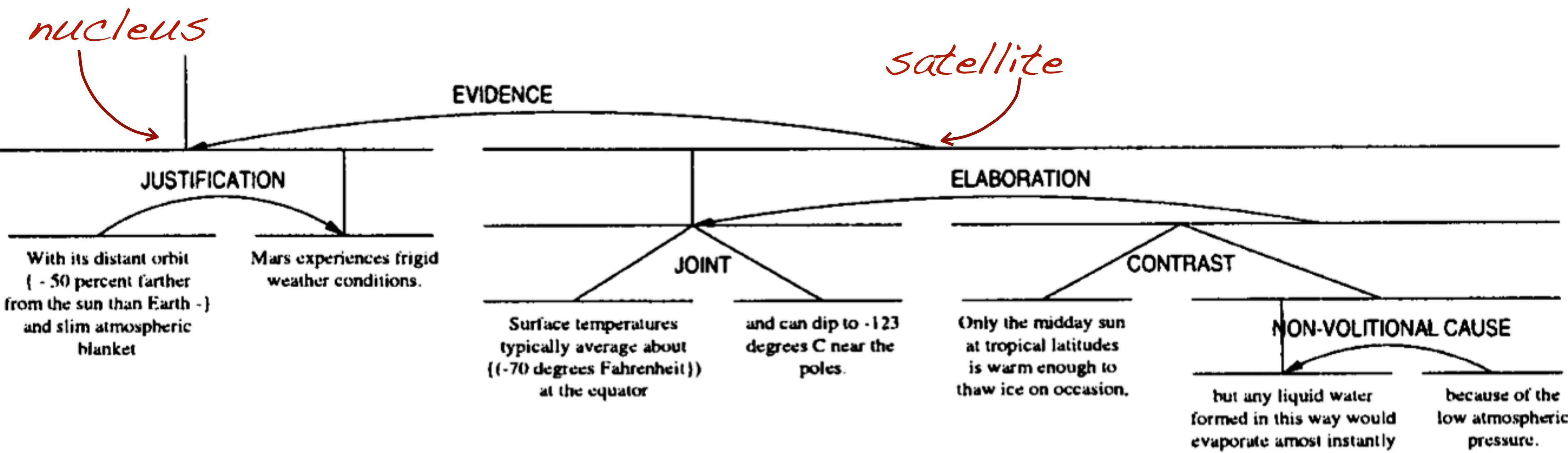
I will not buy this record

It is scratched

Parsing Discourse

- use RST to parse documents, similar to syntactic parsers
- Marcu 1997
- performance: P=47.0, R=78.4, F1=58.8
- difficulties: circular dependencies, graph instead of tree

Parsing Discourse



Marcu 2000

Parsing Discourse Algorithm

- determine cues in text
- find sections, paragraphs, sentences, clauses, etc.
- for all sections, paragraphs, sentences:
 - hypothesize rels b/w all units at that level based on markers and cohesion
 - use proof theory to infer trees below level
 - assign weights and find tree w/ max. weight
- merge best trees at each level

Marcu 2000



Discourse Structure in Language Generation

- McKeown: use 4 schemas (Identification, Constituency, Attributive, Compare&Contrast)
- each schema: various sub-labels for each clause
- realize via ATNs (recursive FSAs)

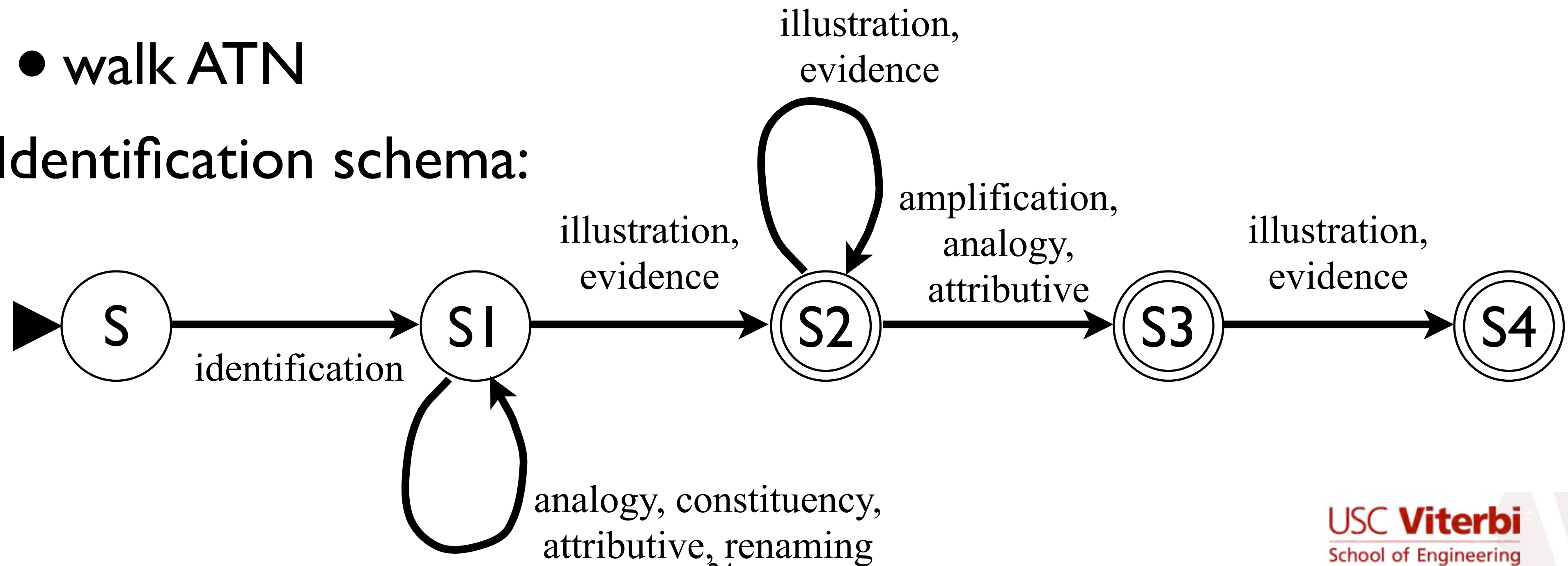
Clause Functions

- = labels: {adversative, amplification, analogy, answer, attributive, cause-effect, comparison, constituency, contrast, evidence, explanation, generalization, identification, inference, particular-illustration, positing question, problem, renaming, representative, restriction}

Discourse Structure in Language Generation

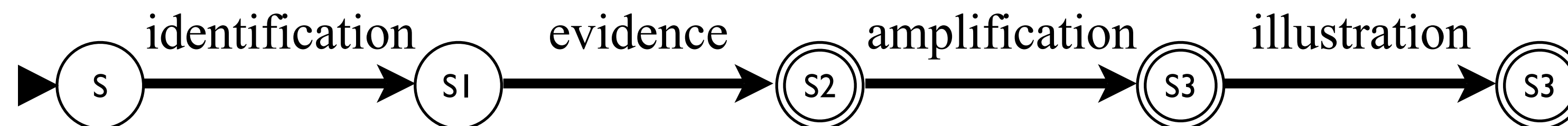
- choose schema
- extract KB info
- walk ATN

Identification schema:



Schema Example

Schema	Functions	Sentences
IDENTIFICATION	identification	Eltville, (Germany): an important wine village of the Rheingau region.
	evidence	The vineyards make wines that are emphatically of the Rheingau style,
	amplification	with a considerable weight for a white wine.
	particular illustration	Taubenberg, Sonnenberg, and Langenstück are among vineyards of note.



Works Both Ways

- like FSA for grammar:
 - can recognize sentence as some schema S if it can apply functions and reach end state S
 - can generate sentences starting from S and following arcs in ATN (\sim Markov chain)

Don't jump around!

- A hobie is a brand of catamaran,
- which is a kind of sailboat.
- Large hobbies have a jib, smaller ones don't.
- Hobies have a cockpit connecting the pontoons.
- Catamarans have sail and mast like other sailboats,
- but they have two hulls instead of one.
- That's a catamaran there!

} sailboats & parts
} catamarans & hobbies
} sailboats & parts
} catamarans & hobbies

Focus, Please!

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- Hobies have a cockpit connecting the pontoons.
- Large hobies have a jib, smaller ones don't.

specificity

sailboats & parts

catamarans & hobies

Pragmatics: In Theory

- using other sentences as context
 - could help resolve ambiguities
 - provides more information
 - produces better text (summarization, MT)

Pragmatics: In (NLP) Practice

- across-sentence/document processing
 - increases complexity
 - introduces noise
- ➡ still infrequently used by NLP systems

If You Remember Nothing Else...

- **pragmatics**: study of text structure
- **coherence**: sentence order sensibility measure
- **coreference**: refer to one entity w/ multiple expressions. Important but hard!
- **discourse relations**: rules & labels for sentence order. Parsing and generation approaches

Thanks for listening!