

Saarland University WS 15/16
Selected Topics in Semantics and Discourse
Lecturer: Manfred Pinkal

Unsupervised Learning of Narrative Event Chains

based on the article of Chambes & Jurafsky: 2008

Damyana Gateva
18.11.2015

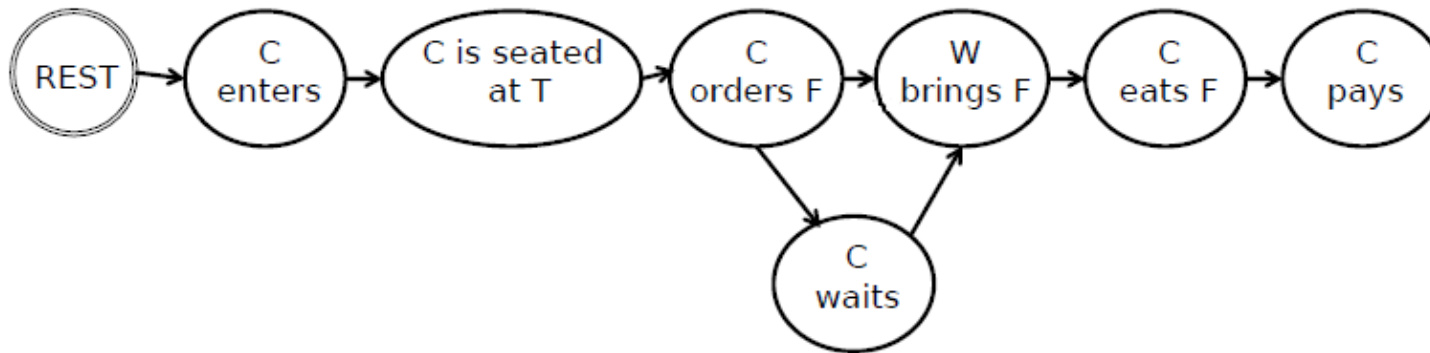
Overview

- The Narrative Chain Model
- Constructing narrative event chains:
 - Learning narrative relations
 - Temporal ordering of narrative events
- Experiments and Evaluation
 - Narrative cloze
 - Order coherence
- Discrete Narrative Event Chains

The Narrative Chain Model

- Narrative event chains:
 - partially ordered sets of events centered around a common protagonist
 - related to scripts

the restaurant-script



The Narrative Chain Model

- Goal: build a narrative event schain
 - extract events that occur with the same protagonist
 - assign a temporal order for these events

The Narrative Chain Model

- Narrative induction: learning narrative relations by following a protagonist
 - its grammatical role
 - its connection to surrounding events
 - temporal ordering

The Narrative Chain Model

- Protagonist and narrative coherence:
 - Verbs sharing coreferring arguments are semantically connected
 - Narrative learning: not only find a relation between two events but also additional facts about the participants.

Tom pushed Jerry. Jerry fell.

Protagonist Tom: (push, Subj)

Protagonist Jerry: (push, Obj), (fall, Subj)

The Narrative Chain Model

- Narrative event: a tuple of event and its participants:
(event, dependency)

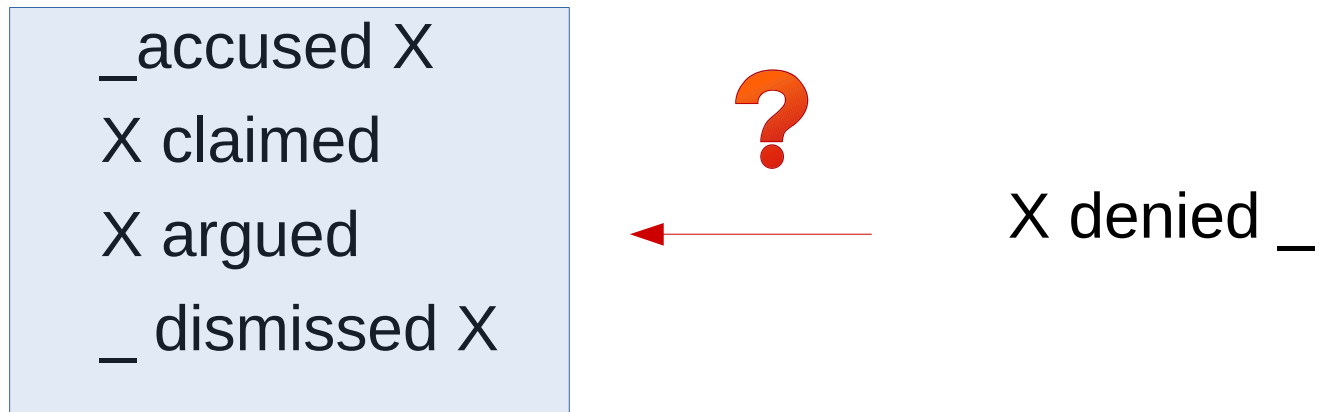
Tom denied pushing Jerry. (protagonist: Tom)

(deny, Subj)

- Narrative chain:
 - a set of narrative events: $\{e_1, e_2, \dots, e_n\}$
 - partial ordering through a temporal relation *before*:
 $B(e_i, e_j)$

The Narrative Chain Model

- Goal: build a narrative chain
 - extract events that occur with the same protagonist



Learning narrative relations

- pairwise relation score: how often two events share grammatical arguments
- global narrative score: all events in the chain provide feedback on the event in question

Learning narrative relations

- Pairwise relation score

Protagonist: Tom

*pmi((plead, **Subj**), (deny, **Subj**))*

$$pmi(e(w, d), e(v, g)) = \log \frac{P(e(w, d), e(v, g))}{P(e(w, d))P(e(v, g))}$$

$$P(e(w, d), e(v, g)) = \frac{C(e(w, d), e(v, g))}{\sum_{x,y} \sum_{d,f} C(e(x, d), e(y, f))}$$

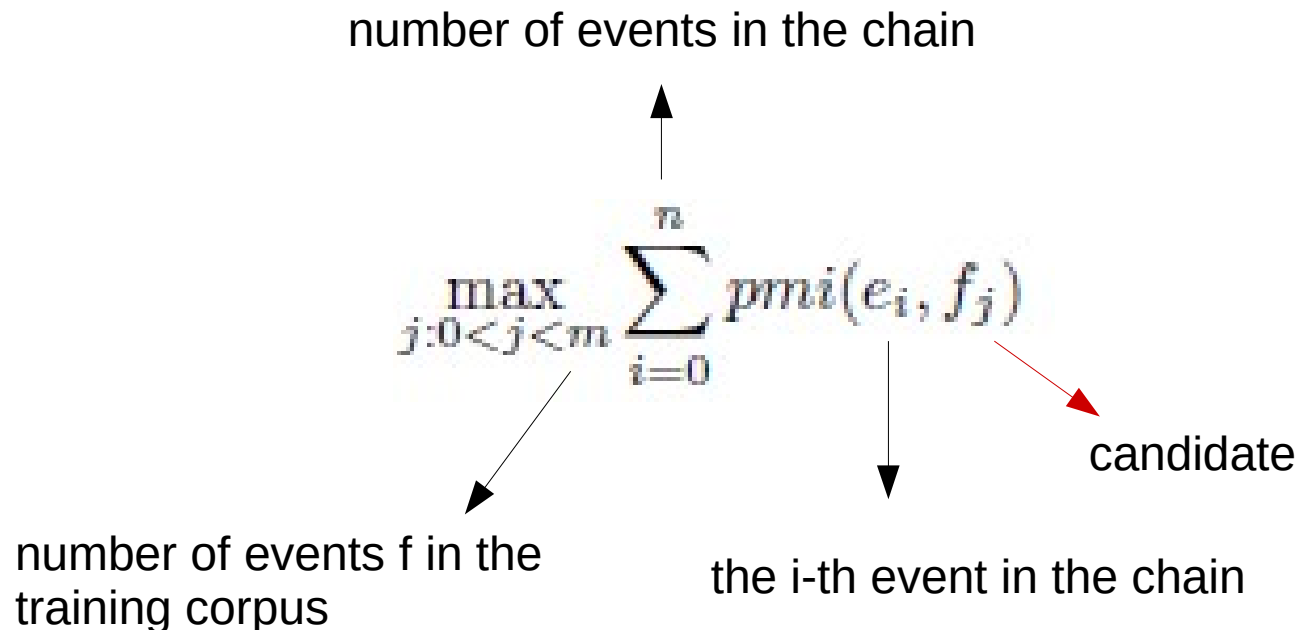
coreferring entity filling d and f

Learning narrative relations

- Global narrative score:

Narrative event chain: $\{(plead, Obj), (admits, Subj), (convicted, Obj)\}$

Event candidate from the training corpus $(f_j, Dependency)$



Learning narrative relations

- Global narrative score:

number of events in the chain

$$\max_{j:0 < j < m} \sum_{i=0}^n pmi(e_i, f_j)$$

the i-th event

number of events f in the training corpus

candidate

Output: ranked guess list

Known events:

(pleaded subj), (admits subj), (convicted obj)

Likely Events:

sentenced obj	0.89	indicted obj	0.74
paroled obj	0.76	fined obj	0.73
fired obj	0.75	denied subj	0.73

Narrative cloze task: example

1. The police arrested Tom yesterday.
2. The judge accused him of pushing Jerry.
3. Tom admitted having seen Jerry yesterday. He denied attacking him and pleaded innocent.

Protagonist: Tom

Events: (arrest, Obj), (accuse, Obj), (admit, Subj), (deny, Subj), (plead, Subj)

Narrative cloze task: example

1. The police arrested Tom yesterday.
2. The judge accused him of pushing Jerry.
3. Tom admitted having seen Jerry yesterday. He denied attacking him and pleaded innocent.

Protagonist: Tom

Events: (arrest, Obj), (accuse, Obj), (admit, Subj),
~~(deny, Subj)~~, (plead, Subj)

Narrative cloze experiment

- Training: news texts (1 007 277 documents)
 - parsed into dependency graphs
 - entity mentions resolved with coreference engine
- Test: 69 randomly chosen documents, for each:
 - narrative chain: at least 5 events
 - protagonist: the entity involved in the most events

Narrative cloze experiment

One of the 69 test documents, containing 10 narrative events.
The protagonist is president Bush

occupied subj

projects subj

offerred subj

thinks subj

brought subj

met subj

voted pp_for

rejecting subj

appeared subj

offer subj

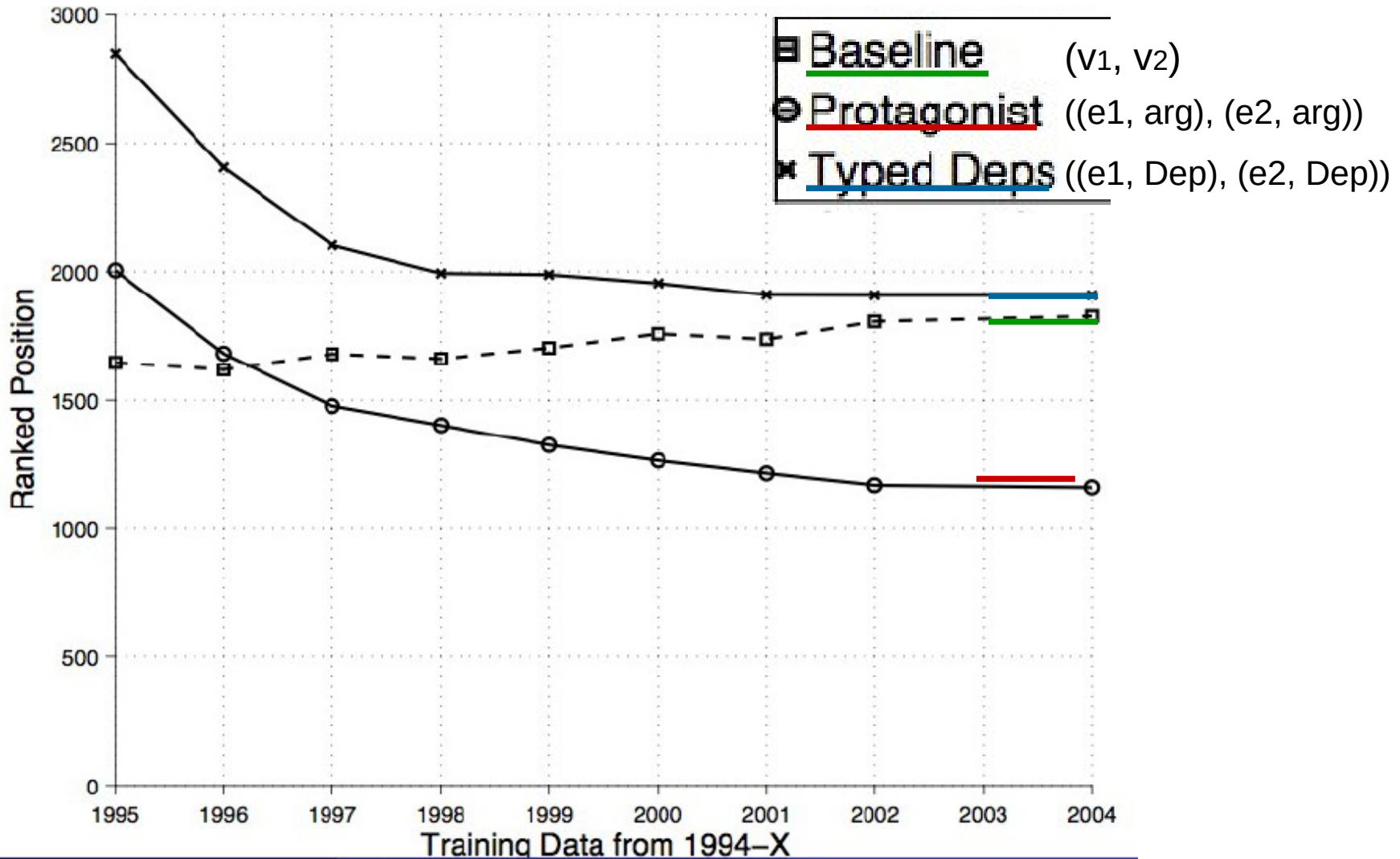
Narrative cloze experiment

- Experiment:
 - Leave-one-out cross validation
 - 69 narratives with 740 events: 740 cloze tests

Narrative cloze experiment

- Methods of comparison:
 - Baseline: verb only, pmi (v_1, v_2), verb pairs cooccurring more than 10 times
 - Protagonist: modified narrative model, ignoring typed dependencies: $((e_1, \text{arg}), (e_2, \text{arg}))$
 - Typed Deps: full narrative model including the grammatical dependencies: $((e_1, \text{Dep}), (e_2, \text{Dep}))$

Narrative cloze experiment



subsequently added

Ordering narrative events

- Temporal classifier: Training on TimeBank Corpus
- Temporal classes: *before* and *other*

Ordering narrative events

- Stages:
 - Labeling temporal attributes of events: tense, grammatical aspect, aspectual class (a. o.)
 - Classifying the temporal relationship between two events that share arguments

count *before*(A, B) vs. count *before*(B, A)

A: {(a, x₁), (a, y₁), ...}

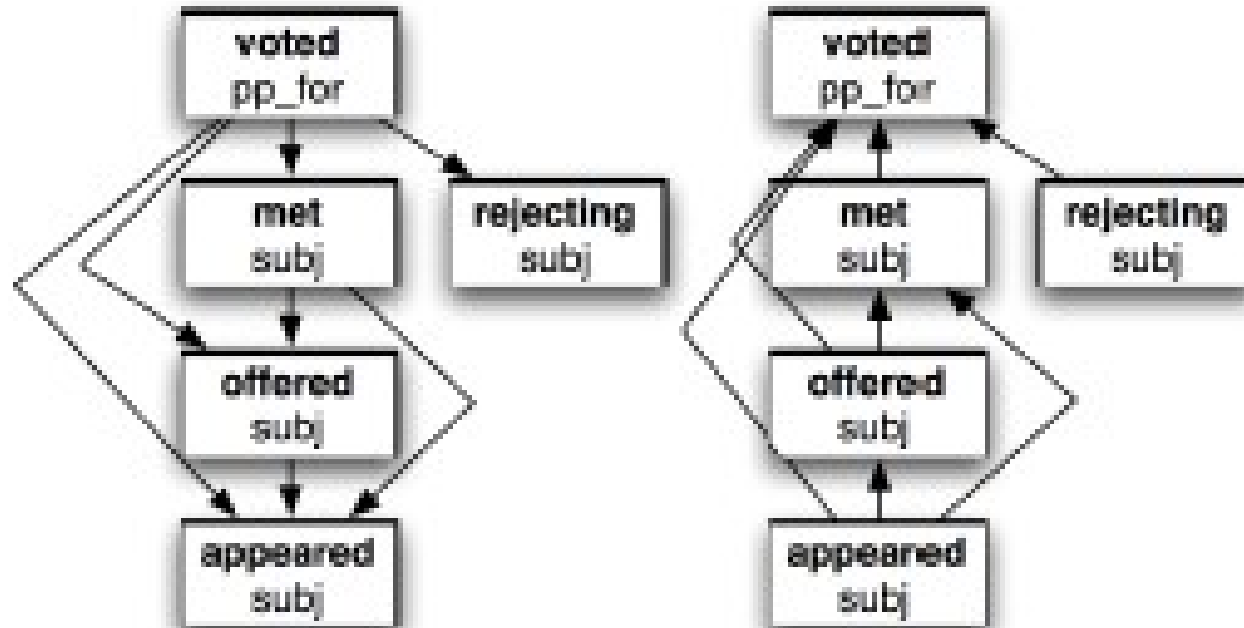
B: {(b, x₂), (b, y₃), ...}

x₁ → Mary ← x₂

Ordering narrative events: Evaluation

- Task: evaluating coherence of properly ordered narrative chains against random ordered ones
- Data: the same 69 documents
 - each document ordered with the *before* relation
 - for each document up to 300 random orderings

Ordering narrative events: Evaluation



A narrative chain and its reverse order

Ordering narrative events: Evaluation

- Coherence score for a narrative chain:
 - + : relations that agree
 - - : relations that disagree

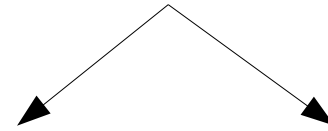
$C_sc = \log(|\text{count } before(A, B) - \text{count } before(B, A)|)$

+ C_sc : if A before B correctly classified

- C_sc : else

Ordering narrative events: Evaluation

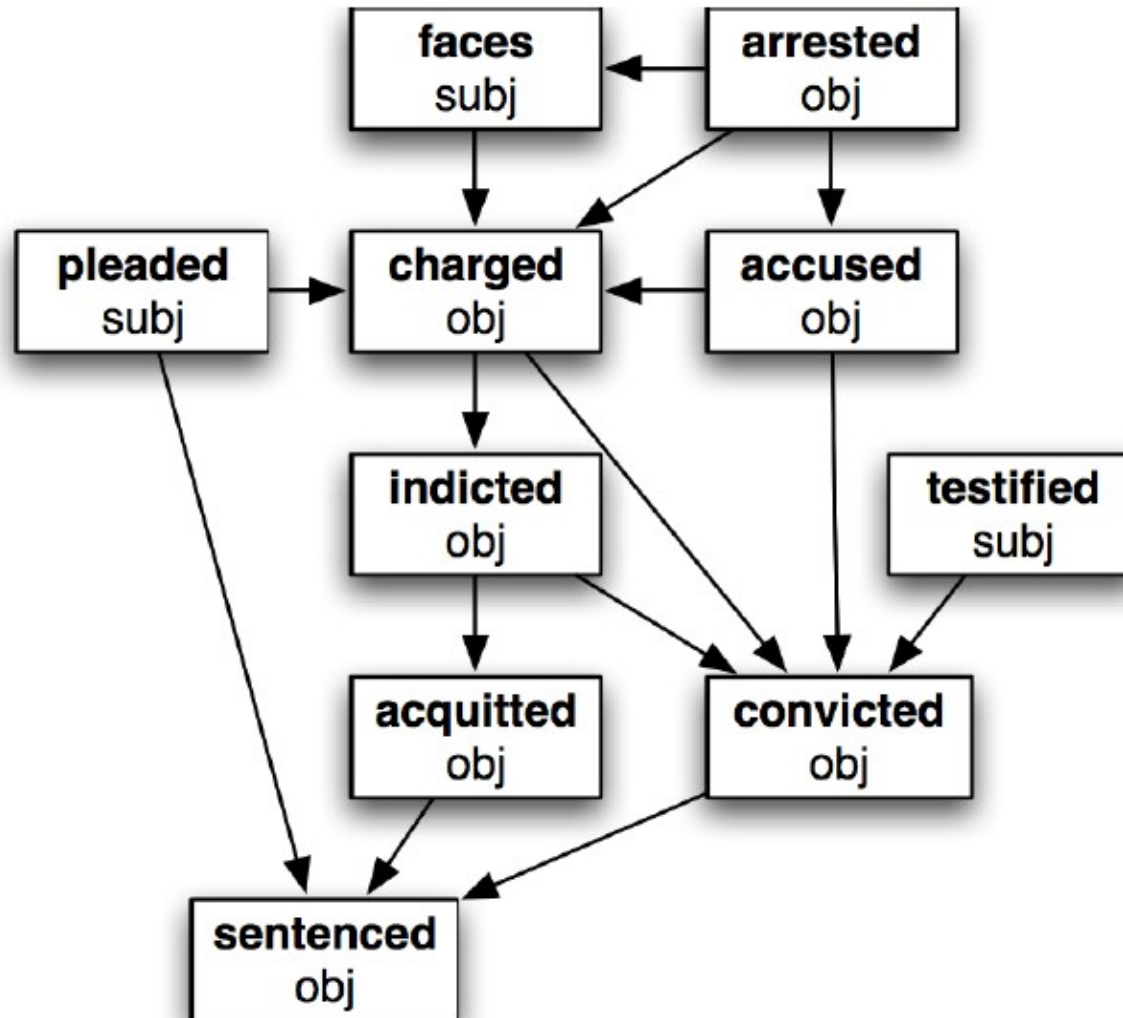
Chain length



	All	≥ 6	≥ 10
correct	8086 75%	7603 78%	6307 89%
incorrect	1738	1493	619
tie	931	627	160

Results for choosing the correct ordered chain.

Discrete Narrative Event Chains



An automatically learned Prosecution chain.
Arrows indicate the *before* relation.

Summary

- Achievements:
 - extracting list of related events using shared argument (protagonist)
 - unsupervised learning of narrative chains
 - temporal classification of narrative events
- Limitations:
 - represents only one participant
 - does not express any concrete information (ex. type/role) about the protagonist

Thank you!

Questions and Discussion:

...