Text Data in Business and Economics

Basel University – Autumn 2023

8. Linguistic Parsing

Beyond Word Order

► The models we have seen so far have counted words and phrases, or embedded sequences
  ► the only language structure we have used is local ordering of words.

Beyond Word Order

► The models we have seen so far have counted words and phrases, or embedded sequences
  ► the only language structure we have used is local ordering of words.

► Consider these examples:
  ► "The defendant was negligent"
  ► "The negligent defendant"
  ► "The defendant was not negligent"
  ► "The defendant, a driver of limousines, was negligent"

► How to reliably identify an attribute assignment between "negiglent" and "defendant"?

Beyond Word Order

▶ The models we have seen so far have counted words and phrases, or embedded sequences
  ▶ the only language structure we have used is local ordering of words.

▶ Consider these examples:
  ▶ "The defendant was negligent"
  ▶ "The negligent defendant"
  ▶ "The defendant was not negligent"
  ▶ "The defendant, a driver of limousines, was negligent"

▶ How to reliably identify an attribute assignment between "negiglent" and "defendant"?
  ▶ Previous methods using only word order fail. Dictionary methods would be complex and inaccurate.

Beyond Word Order

▶ The models we have seen so far have counted words and phrases, or embedded sequences
  ▶ the only language structure we have used is local ordering of words.

▶ Consider these examples:
  ▶ "The defendant was negligent"
  ▶ "The negligent defendant"
  ▶ "The defendant was not negligent"
  ▶ "The defendant, a driver of limousines, was negligent"

▶ How to reliably identify an attribute assignment between "negiglent" and "defendant"?
  ▶ Previous methods using only word order fail. Dictionary methods would be complex and inaccurate.
  ▶ A good solution requires information on sentence grammar → linguistic annotations

Using Grammar: Constituency

▶ The idea of constituency is that groups of words behave as singular functional units in a sentence.

▶ Some example noun phrases:

Harry the Horse	a high-class spot such as Mindy's
the Broadway coppers	the reason he comes into the Hot Box
they	three parties from Brooklyn

▶ these phrases consist of many POS's but function as nouns

Using Grammar: Constituency

▶ The idea of constituency is that groups of words behave as singular functional units in a sentence.

▶ Some example noun phrases:

Harry the Horse	a high-class spot such as Mindy's
the Broadway coppers	the reason he comes into the Hot Box
they	three parties from Brooklyn

  ▶ these phrases consist of many POS's but function as nouns

▶ In English, constituents can be moved around in a sentence (e.g. these prepositional phrases):
  ▶ John talked [to the children] [about drugs].
  ▶ John talked [about drugs] [to the children] .

Constructing "Memes" with Parts of Speech (e.g. Ash 2018)

- ▶ A: Adjective, N: Noun, V: Verb, P: Preposition, D: Determinant, C: Conjunction.
- ▶ 2-grams: AN, NN, VN, VV, NV, VP.
  - ▶ tax credit, magistrate judge
- ▶ 3-grams: NNN, AAN, ANN, NAN, NPN, VAN, VNN, AVN, VVN, VPN, ANV, NVV, VDN, VVV, NNV, VVP, VAV, VVN, NCN, VCV, ACA, PAN.
  - ▶ armed and dangerous, stating the obvious

Constructing "Memes" with Parts of Speech (e.g. Ash 2018)

▶ A: Adjective, N: Noun, V: Verb, P: Preposition, D: Determinant, C: Conjunction.
▶ 2-grams: AN, NN, VN, VV, NV, VP.
  ▶ tax credit, magistrate judge
▶ 3-grams: NNN, AAN, ANN, NAN, NPN, VAN, VNN, AVN, VVN, VPN, ANV, NVV, VDN, VVV, NNV, VVP, VAV, VVN, NCN, VCV, ACA, PAN.
  ▶ armed and dangerous, stating the obvious

▶ 4-grams: NCVN, ANNN, NNNN, NPNN, AANN, ANNN, ANPN, NNPN, NPAN, ACAN, NCNN, NNCN, ANCN, NCAN, PDAN, PNPN, VDNN, VDAN, VVDN.
  ▶ Beyond a reasonable doubt (preposition, article, adjective, noun)
  ▶ Earned income tax credit (adjective, noun, noun, noun)

Co-Reference Resolution

Finding all expressions that refer to the same entity in a text.

"My sister has a cat. Her name is Roberta."

↓

[Cat's] name is Roberta ⬌ [Sister's] name is Roberta

Co-Reference Resolution

Finding all expressions that refer to the same entity in a text.

"My sister has a cat. Her name is Roberta."

↓

[Cat's] name is Roberta 🔁 [Sister's] name is Roberta

https://demo.allennlp.org/coreference-resolution

The legal pressures facing [0 Michael Cohen] are growing in a wide - ranging investigation of [0 his] personal business affairs and [0 his] work on behalf of [1 [0 his] former client , President Trump] . In addition to [0 his] work for [1 Mr. Trump] , [0 he] pursued [0 his] own business interests , including ventures in real estate , personal loans and investments in taxi medallions .

Outline

Dependency Grammar

► The basic idea:
  ► Syntactic structure consists of words, linked by binary directed relations called dependencies.
  ► Dependencies identify the grammatical relations between words.

Dependencies: Binary Directed Relations Between Words (Head and Dependent)

Economic news had little effect on financial markets .
adj   noun verb adj   noun prep adj   noun .

▶ dependency trees are mostly determined by the ordering of POS tags.

Dependencies: Binary Directed Relations Between Words (Head and Dependent)

Economic news had little effect on financial markets .
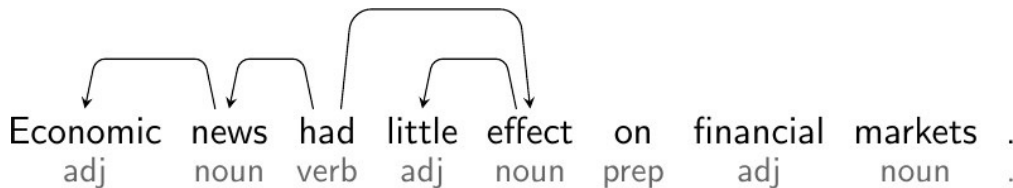adj   noun verb adj noun prep   adj   noun   .
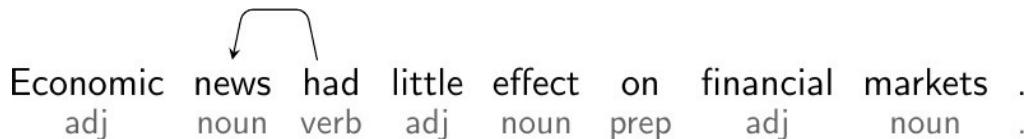
► the "root" of a sentence is the main verb (for compound sentences, the first verb).

Dependencies: Binary Directed Relations Between Words (Head and Dependent)

- directed arcs indicate dependencies: a one-way link from a "head" token to a "dependent" token.
- A word can be "head" multiple times, but "dependent" only one.

Dependencies: Binary Directed Relations Between Words (Head and Dependent)
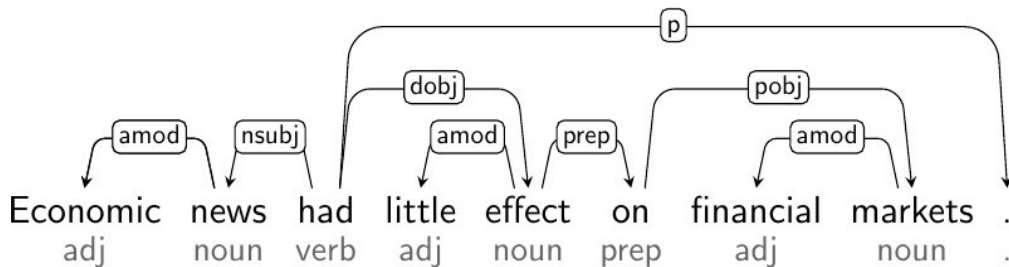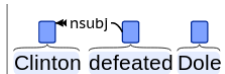

- ▶ arc labels indicate functional relations, e.g.:
  - ▶ nsubj: verb → subject doing the verb
  - ▶ dobj: verb → object targeted by the verb
  - ▶ amod: noun → attribute of the noun
- ▶ spaCy dependency visualizer: https://explosion.ai/demos/displacy

Subjects

- **nsubj: nominal subject**
  - non-clausal constituent in the subject position of an active verb.

- **nsubjpass: passive nominal subject**
  - non-clausal constituent in the subject position of a passive verb.

Objects

dobj: direct object

▶ noun phrase, the (accusative) object of the verb.

"She **gave** me a **raise**"

$gave \xrightarrow{dobj} raise$

dative: dative or indirect object

▶ noun phrase, the (dative) object of the verb.

"She **gave me** a raise"

$gave \xrightarrow{dative} me$

pobj: object of a preposition

▶ noun phrase following a preposition

"I sat **on the chair**"

$on \xrightarrow{obj} chair$

Adjectives/Attributes

acomp: adjectival complement

▶ adjectival phrase which functions as object of verb.

"Bill **is honest**": acomp(is → honest)

attr: attribute

▶ noun phrase that is a non-VP predicate usually following a copula verb.
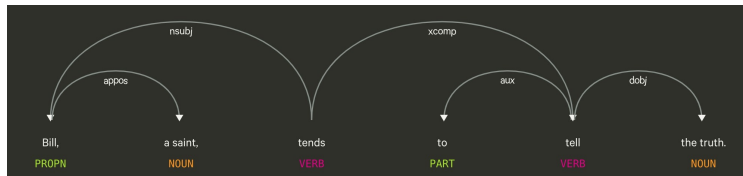
"Bill **is** a **saint**": attr(is → saint)

amod: adjectival modifier

▶ modifies the meaning of the noun phrase.

"Sam eats **red meat**": amod(meat → red)

appositional modifier (appos) is a noun phrase giving additional information of the preceding noun phrase.

Verb phrases

► **aux: auxiliary**
  ► links between a verb and helping verb, including modals.

  "Reagan **has died**": aux(died → has)

  "He **should leave**": aux(leave → should)

► **auxpass: passive auxiliary**
  ► links between a main verb and helping verb in passive constructions.

  "Laws have **been broken**": auxpass(broken → been)

► **prt: phrasal verb particle**
  ► identifies a phrasal verb: links verb with its particle.

  "They **shut down** the station": prt(shut → down)

Etc.

- **neg: negation modifier**
  - captures negation and the verb it modifies.
  - "Bill **is not** a scientist": neg(is → not)
  - "Bill **doesn't** drive": neg(drive → n't)

Etc.

- **neg: negation modifier**
  - captures negation and the verb it modifies.
  - "Bill **is not** a scientist": neg(is → not)
  - "Bill **doesn't** drive": neg(drive → n't)
- **poss: possession modifier**
  - holds between noun phrase and its possessive determiner, or genitive's complement
  - "**Bill's clothes**": poss(clothes → Bill)

Etc.

- **neg: negation modifier**
  - captures negation and the verb it modifies.
  - "Bill **is not** a scientist": neg(is → not)
  - "Bill **doesn't** drive": neg(drive → n't)
- **poss: possession modifier**
  - holds between noun phrase and its possessive determiner, or genitive's complement
  - "**Bill's clothes**": poss(clothes → Bill)
- **agent (agent)** is the complement of a passive verb that is the surface subject of its active form.
- **expletive (expl)** is an existential there in the subject position.
- and more...

Outline

Outline

Relation Extraction for Knowledge Graphs
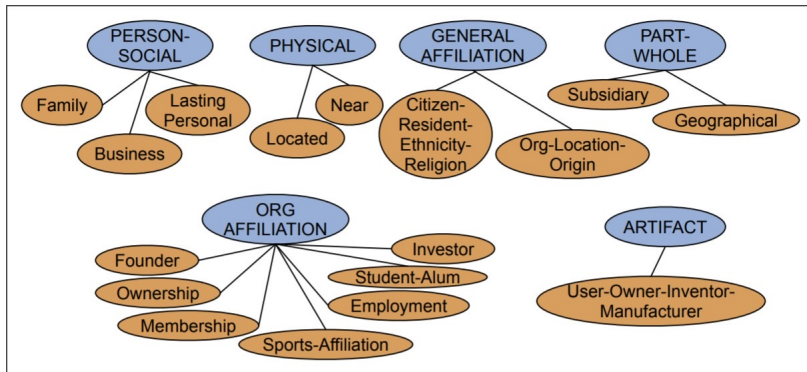
Figure 17.1 The 17 relations used in the ACE relation extraction task.

Relations	Types	Examples
Physical-Located	PER-GPE	**He** was in **Tennessee**
Part-Whole-Subsidiary	ORG-ORG	**XYZ**, the parent company of **ABC**
Person-Social-Family	PER-PER	**Yoko**'s husband **John**
Org-AFF-Founder	PER-ORG	**Steve Jobs**, co-founder of **Apple**...

Figure 17.2 Semantic relations with examples and the named entity types they involve.

Relation Extraction with Dependencies (e.g. Bank et al 2007, Fader et al 2011, Angeli et al 2015)
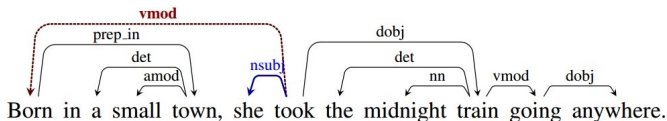
she took the midnight train going anywhere   she took the midnight train

Born in a small town, she took the midnight train   **she took midnight train**

Born in a town, she took the midnight train   . . .

↓

(she; took; midnight train)
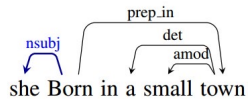
she Born in small town

she Born in a town

she Born in town

↓

(she; born in; small town)

(she; born in; town)

▶ filtering: relation must contain a predicate; subject and object must be noun phrases.

▶ thresholding: aggregate over large corpora and keep only frequent (therefore potentially reliable) relations.

Outline

New corpus: 30,000 collective bargaining agreements from Canada, 1986-2015

TABLE OF CONTENTS

2005 – 2006 calendar

AGREEMENT

This Agreement ratified December 16,2005 is made and entered into between ST. CLAIR TECHNOLOGIES INC., Wallaceburg, Ontario (hereinafter called "the Company"), and the International Union, united Automobile, Aerospace and Agricultural Implement Workers of America (UAW-CLC) and its Local No. 251, (hereinafter called "the Union").

ARTICLE 1
RECOGNITION

1. The provisions of this Agreement shall apply to all employees covered by this Agreement without discrimination on account of race, creed, colour, sex, marital status, nationality, ancestry or place of origin.

2. Wherever the male noun or pronoun is used, it shall also mean the female.

3. The Company recognizes the Union as the sole bargaining agent of all its employees at Wallaceburg, Ontario, save and except supervisor, those above the rank of supervisor, office and sales staff, students for not more than twenty-four hours per week and students employed during the school vacation period (May 1st-September 15th). In case of reduction in force, students would be laid off first. Students will be paid at a rate to be determined by the Company, but will not be less than the Employment Standards Act.

4. The word "employee" or "employees" wherever used in this Agreement shall mean only the employees in the bargaining unit defined above unless the context otherwise provides.

5. The Company will negotiate with the Union for the purpose of adjusting any disputes which may arise concerning sickness and accident, wages, hours and working conditions.

ARTICLE 2

2. Hire, promote, demote, classify, transfer, suspend and retire employees, and to discipline or discharge for just cause, any employee provided that a claim by an employee who has acquired seniority that he has been discharged or disciplined without just cause may be the subject of a grievance and dealt with as here in before provided.

3. Make, enforce, and alter, from time to time, rules and regulations to be observed by the employees, such rules not to be inconsistent with the provisions of this Agreement. The Company agrees to give a copy of any changes in plant rules to the Union Chairperson prior to posting of same on bulletin boards.

4. Determine the nature and kind of business conducted by the Company, the kinds and locations of plants, equipment and material to be used, the control of materials and parts, the use of incentive programs, the methods and techniques of work, the content of jobs, the schedules of production, the number of employees to be employed, the extension, limitations, curtailment or cessation of operations or any part thereof, and to determine and exercise all other function and prerogatives which shall remain solely with the Company except specifically limited by the express provisions of this Agreement.

ARTICLE 4
NO STRIKES - NO LOCKOUTS

1. The Union agrees that during the term of this agreement, there shall be no strikes, sit-downs, work stoppage, slowdowns, or suspension of work, either complete or partial, for any reason, by an employee or employees. There shall be no lockout of employees by the Company, for the duration of this Agreement.

ARTICLE 5
REPRESENTATION

1. The Union shall elect or appoint, and the Company shall recognize, from those employees who have completed at least one (1) year service with the Company a plant committee of four (4) people, one of whom will be the chairperson and one of whom will be vice-chairperson. The committee people shall be employed on the day shift.

2. The Company shall also recognize a steward who will be elected or

---

UNION SECURITY

1. All employees covered by this Agreement who are members of the Union at the signing date of this Agreement or who after become members thereof during the term of this Agreement, must retain their membership in the Union for the duration of the Agreement by paying the regular monthly dues levied against all members, as a condition of employment. All employees covered by this Agreement who are not members of the Union shall pay regular monthly dues, the same as the dues that are levied against those who are members of the union as a condition of employment.

2. All new employees, upon completion of thirty (30) days employment shall become members thereof in good standing in accordance with the constitution and bylaws of the Union for the life of this Agreement.

3. The Company will during the term of the Agreement, deduct initiation fees, monthly dues and assessments on a monthly basis from the pay cheque of all seniority employees, probationary employees and full-time students who have worked or been compensated for forty (40) hours in any one (1) month, or as required by the U.A.W. constitution, (full-time student being a student who works all or any time between May 1st and September 15th of the same year). Such deductions shall be credited to the Secretary-Treasurer of Local 251, not later than the tenth (10th) day of the calendar month next following the month in which such deductions are made. The Company and the Union will work out a mutually satisfactory arrangement by which the Company will furnish monthly records to the Financial Secretary of Local 251 of those from whom deductions were made, together with the amount of such deductions.

ARTICLE 3
MANAGEMENT RIGHTS

The Union recognizes and acknowledges that the management of the plant and direction of the working force are fixed exclusively in the Company and, without restricting the generality of the foregoing, the Union acknowledges that it is the exclusive function of the Company to:

1. Maintain order and efficiency

4

appointed by the Union and work on the afternoon or midnight shift during such periods as the Company schedules these shifts and is equal to or greater than five (5) employees. Stewards will have preferred seniority on their shift for lay off and recall purposes only.

3. The Union will inform the Company in writing of the names of the stewards and members of the Grievance Committee and of any subsequent changes in the names of any steward or members of the Grievance Committee. The Company shall not be asked to recognize any steward or member of the Grievance Committee until such notification from the Union has been received.

4. The Union acknowledges that committee persons and stewards have their regular duties as employees to perform and that such persons will not leave their regular duties without first obtaining permission from their supervisor. Such permission shall not be unreasonably withheld. In the application of representation language "such permission shall not be unreasonably withheld" it is understood that a supervisor will not detain a Union representative from performing legitimate representation and by the same token the Union representative will understand the occasional need to complete a job in the interest of continuing production before leaving for legitimate union business. In any event, no such Union representative shall be detained any longer than thirty (30) minutes to perform their union representation duties.

5. The Company shall schedule a meeting, date and time within the time limits prescribed for any grievance submitted to Step 2 and/or Step 3 of the grievance procedure. The grievance committee only shall be compensated at their job rate for any regular scheduled work hours lost during such meeting with Company representatives. Overtime shall be paid when the meeting has been requested by the Company or the meeting goes beyond the Union representatives scheduled shift.

6.

The plant committee referred to in Section 1, shall head the seniority list during their term of office for layoff and recall purposes only.

A committee person will be required where more than nine (9) employees on the day shift at any one plant are required to work on Saturdays, Sundays and Statutory Holidays.

Parse Information on Subjects and Verbs

► Subject categories, assigned with lexicons
  ► worker, union, owner, manager.
► In contracts, **modal verbs** impose legal requirements:
  ► strict (*shall*, *will*, *must*) modals express necessity.
  ► permissive (*may*, *can*) modals express possibility.

Parse Information on Subjects and Verbs

▶ Subject categories, assigned with lexicons
  ▶ worker, union, owner, manager.
▶ In contracts, **modal verbs** impose legal requirements:
  ▶ strict (*shall*, *will*, *must*) modals express necessity.
  ▶ permissive (*may*, *can*) modals express possibility.
▶ Negation ("shall **not**")
▶ Active/passive ("shall provide" vs "shall be provided").

Parse Information on Subjects and Verbs

- ▶ Subject categories, assigned with lexicons
  - ▶ worker, union, owner, manager.
- ▶ In contracts, **modal verbs** impose legal requirements:
  - ▶ strict (*shall*, *will*, *must*) modals express necessity.
  - ▶ permissive (*may*, *can*) modals express possibility.
- ▶ Negation ("shall **not**")
- ▶ Active/passive ("shall provide" vs "shall be provided").
- ▶ Special verbs:
  - ▶ *Obligation* Verbs (have to, ought to, be required, be expected, be compelled, be obliged, be obligated)
  - ▶ *Prohibition* Verbs (be prohibited, be forbidden, be banned, be barred, be restricted, be proscribed)
  - ▶ *Permission* Verbs (be allowed, be permitted, be authorized)
  - ▶ *Entitlement* Verbs (have, receive, retain).

Categorization Logic	Examples
<u>Obligations</u>	
Positive & Strict Modal & Active Verb	shall be, shall provide, shall include, shall notify, shall continue
Positive & Strict Modal & Obligation	shall be required, shall be expected, shall be obliged
Verb Positive & Non-Modal &	is required, is expected
Obligation Verb **<u>Prohibitions</u>**	
Negative & Any Modal & Active	shall not exceed, shall not use, shall not apply, shall not discriminate
Verb Negative & Permission Verb	shall not be allowed, is not permitted
Positive & Strict Modal & Constraint Verb	shall be prohibited, shal be restricted
<u>Permissions</u>	
Positive & Non-Modal & Permission Verb	is allowed, is permitted, is authorized
Positive & Strict Modal & Permission Verb	shall be allowed, shall be permitted
Positive & Permissive Modal & Active Verb	may be, may request, may use, may require, may apply
Negative & Any Modal & Constraint Verb	shall not be restricted, shall not be prohibited
<u>Entitlements</u>	
Strict Modal & Passive Verb	shall be paid, shall be given, shall not be discharged
Positive & Strict Modal & Entitlement	shall have, shall receive, shall retain
Verb Negative & Any Modal &	may not be required
Obligation Verb	

What do union contracts consist of?

Firm obligations, worker obligations, and worker entitlements

role	obligation	prohibition	permission	entitlement	total
worker	579K (16.2%)	83K (2.3%)	266K (7.4%)	1115K (31.2%)	2045 (57.1%)
firm	787K (22.0%)	46K (1.3%)	109K (3.1%)	90K (2.5%)	1033 (28.9%)
union	207K (5.8%)	17K (0.5%)	62K (1.8%)	130K (3.6%)	418 (11.7%)
manager	54K (1.5%)	3K (0.1%)	11K (0.3%)	16K (0.4%)	85 (2.4%)
total	1628 (45.5%)	151 (4.2%)	451 (12.6%)	1352 (37.7%)	3582K

▶ clauses are mostly about workers (57.1%), followed by the firm/employer (29.9%)

▶ single most important clause: worker entitlements, followed by firm obligations

▶ worker obligations: workers also make some long-term promises that the firm can rely on

Outline

Unsupervised Discovery of Gendered Language (Hoyle et al 2019)

▶ This paper builds on the "gender bias" NLP papers by adding in syntactic   information:
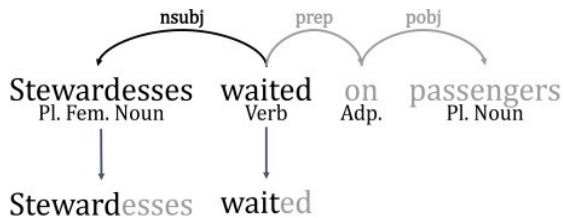

Figure 2: An example sentence with its labeled dependency parse (top) and lemmatized words (bottom).

▶ Corpus: dependency parse of 3.5 million books from Goldberg and Orwant (2013).

  ▶ 37 million noun-adjective pairs
  ▶ 41-million subject-verb pairs
  ▶ 14 million verb-object pairs

▶ Extract pairs that have high PMI with the gender of the noun.

Gendered Adjectives

$\tau_{\text{MASC-POS}}$		$\tau_{\text{MASC-NEG}}$		$\tau_{\text{MASC-NEU}}$		$\tau_{\text{FEM-POS}}$		$\tau_{\text{FEM-NEG}}$		$\tau_{\text{FEM-NEU}}$	
Adj.	Value	Adj.	Value	Adj.	Value	Adj.	Value	Adj.	Value	Adj.	Value
faithful	2.3	unjust	2.4	german	1.9	pretty	3.3	horrible	1.8	virgin	2.8
responsible	2.2	dumb	2.3	teutonic	0.8	fair	3.3	destructive	0.8	alleged	2.0
adventurous	1.9	violent	1.8	financial	2.6	beautiful	3.4	notorious	2.6	maiden	2.8
grand	2.6	weak	2.0	feudal	2.2	lovely	3.4	dreary	0.8	russian	1.9
worthy	2.2	evil	1.9	later	1.6	charming	3.1	ugly	3.2	fair	2.6
brave	2.1	stupid	1.6	austrian	1.2	sweet	2.7	weird	3.0	widowed	2.4
good	2.3	petty	2.4	feudatory	1.8	grand	2.6	harried	2.4	grand	2.1
normal	1.9	brutal	2.4	maternal	1.6	stately	3.8	diabetic	1.2	byzantine	2.6
ambitious	1.6	wicked	2.1	bavarian	1.5	attractive	3.3	discontented	0.5	fashionable	2.5
gallant	2.8	rebellious	2.1	negro	1.5	chaste	3.3	infected	2.8	aged	1.8
mighty	2.4	bad	1.9	paternal	1.4	virtuous	2.7	unmarried	2.8	topless	3.9
loyal	2.1	worthless	1.6	frankish	1.8	fertile	3.2	unequal	2.4	withered	2.9
valiant	2.8	hostile	1.9	welsh	1.7	delightful	2.9	widowed	2.4	colonial	2.8
courteous	2.6	careless	1.6	ecclesiastical	1.6	gentle	2.6	unhappy	2.4	diabetic	0.7
powerful	2.3	unsung	2.4	rural	1.4	privileged	1.4	horrid	2.2	burlesque	2.9
rational	2.1	abusive	1.5	persian	1.4	romantic	3.1	pitiful	0.8	blonde	2.9
supreme	1.9	financial	3.6	belted	1.4	enchanted	3.0	frightful	0.5	parisian	2.7
meritorious	1.5	feudal	2.5	swiss	1.3	kindly	3.2	artificial	3.2	clad	2.5
serene	1.4	false	2.3	finnish	1.1	elegant	2.8	sullen	3.1	female	2.3
godlike	2.3	feeble	1.9	national	2.2	dear	2.2	hysterical	2.8	oriental	2.2
noble	2.3	impotent	1.7	priestly	1.8	devoted	2.0	awful	2.6	ancient	1.7
rightful	1.9	dishonest	1.6	merovingian	1.6	beauteous	3.9	haughty	2.6	feminist	2.9
eager	1.9	ungrateful	1.5	capetian	1.4	sprightly	3.2	terrible	2.4	matronly	2.6
financial	3.3	unfaithful	2.6	prussian	1.4	beloved	2.5	damned	2.4	pretty	2.5
chivalrous	2.6	incompetent	1.7	racial	0.9	pleasant	1.8	topless	3.5	asiatic	2.0

Gendered Verbs (as subject)

$\tau_{\text{MASC-POS}}$		$\tau_{\text{MASC-NEG}}$		$\tau_{\text{MASC-NEU}}$		$\tau_{\text{FEM-POS}}$		$\tau_{\text{FEM-NEG}}$		$\tau_{\text{FEM-NEU}}$	
Verb	Value	Verb	Value	Verb	Value	Verb	Value	Verb	Value	Verb	Value
succeed	1.6	fight	1.2	extend	0.7	celebrate	2.4	persecute	2.1	faint	0.7
protect	1.4	fail	1.0	found	0.8	fascinate	0.8	faint	1.0	be	1.1
favor	1.3	fear	1.0	strike	1.3	facilitate	0.7	fly	1.0	go	0.4
flourish	1.3	murder	1.5	own	1.1	marry	1.8	weep	2.3	find	0.1
prosper	1.7	shock	1.6	collect	1.1	smile	1.8	harm	2.2	fly	0.4
support	1.5	blind	1.6	set	0.8	fan	0.8	wear	2.0	fall	0.1
promise	1.5	forbid	1.5	wag	1.0	kiss	1.8	mourn	1.7	wear	0.9
welcome	1.5	kill	1.3	present	0.9	champion	2.2	gasp	1.1	leave	0.7
favour	1.2	protest	1.3	pretend	1.1	adore	2.0	fatigue	0.7	fell	0.1
clear	1.9	cheat	1.3	prostrate	1.1	dance	1.7	scold	1.8	vanish	1.3
reward	1.8	fake	0.8	want	0.9	laugh	1.6	scream	2.1	come	0.7
appeal	1.6	deprive	1.5	create	0.9	have	1.4	confess	1.7	fertilize	0.6
encourage	1.5	threaten	1.3	pay	1.1	play	1.0	get	0.5	flush	0.5
allow	1.5	frustrate	0.9	prompt	1.0	give	0.8	gossip	2.0	spin	1.6
respect	1.5	fright	0.9	brazen	1.0	like	1.8	worry	1.8	dress	1.4
comfort	1.4	temper	1.4	tarry	0.7	giggle	1.4	be	1.3	fill	0.2
treat	1.3	horrify	1.4	front	0.5	extol	0.6	fail	0.4	fee	0.2
brave	1.7	neglect	1.4	flush	0.3	compassionate	1.9	fight	0.4	extend	0.1
rescue	1.5	argue	1.3	reach	0.9	live	1.4	fake	0.3	sniff	1.6
win	1.5	denounce	1.3	escape	0.8	free	0.9	overrun	2.4	celebrate	1.1
warm	1.5	concern	1.2	gi	0.7	felicitate	0.6	hurt	1.8	clap	1.1
praise	1.4	expel	1.7	rush	0.6	mature	2.2	complain	1.7	appear	0.9
fit	1.4	dispute	1.5	duplicate	0.5	exalt	1.7	lament	1.5	gi	0.8
wish	1.4	obscure	1.4	incarnate	0.5	surpass	1.7	fertilize	0.5	have	0.5
grant	1.3	damn	1.4	freeze	0.5	meet	1.1	feign	0.5	front	0.5

Gendered Verbs (as object)

$\tau_{\text{MASC-POS}}$ Verb	Value	$\tau_{\text{MASC-NEG}}$ Verb	Value	$\tau_{\text{MASC-NEU}}$ Verb	Value	$\tau_{\text{FEM-POS}}$ Verb	Value	$\tau_{\text{FEM-NEG}}$ Verb	Value	$\tau_{\text{FEM-NEU}}$ Verb	Value
praise	1.7	fight	1.8	set	1.5	marry	2.3	forbid	1.3	have	1.0
thank	1.7	expel	1.8	pay	1.2	assure	3.4	shame	2.5	expose	0.8
succeed	1.7	fear	1.6	escape	0.4	escort	1.2	escort	1.3	escort	1.4
exalt	1.2	defeat	2.4	use	2.1	exclaim	1.0	exploit	0.9	pour	2.1
reward	1.8	fail	1.3	expel	0.9	play	2.7	drag	2.1	marry	1.3
commend	1.7	bribe	1.8	summon	1.7	pour	2.6	suffer	2.2	take	1.1
fit	1.4	kill	1.6	speak	1.3	create	2.0	shock	2.1	assure	1.6
glorify	2.0	deny	1.5	shop	2.6	have	1.8	fright	2.4	fertilize	1.6
honor	1.6	murder	1.7	excommunicate	1.3	fertilize	1.8	steal	2.0	ask	1.0
welcome	1.9	depose	2.3	direct	1.1	eye	0.9	insult	1.8	exclaim	0.6
gentle	1.8	summon	2.0	await	0.9	woo	3.3	fertilize	1.6	strut	2.3
inspire	1.7	order	1.9	equal	0.4	strut	3.1	violate	2.4	burn	1.7
enrich	1.7	denounce	1.7	appoint	1.7	kiss	2.6	tease	2.3	rear	1.5
uphold	1.5	deprive	1.6	animate	1.1	protect	2.1	terrify	2.1	feature	0.9
appease	1.5	mock	1.6	follow	0.7	win	2.0	persecute	2.1	visit	1.3
join	1.4	destroy	1.5	depose	1.8	excel	1.6	cry	1.8	saw	1.3
congratulate	1.3	deceive	1.7	want	1.1	treat	2.3	expose	1.3	exchange	0.8
extol	1.1	bore	1.6	reach	0.9	like	2.2	burn	2.6	shame	1.6
respect	1.7	bully	1.5	found	0.8	entertain	2.0	scare	2.0	fade	1.2
brave	1.7	enrage	1.4	exempt	0.4	espouse	1.4	frighten	1.8	signal	1.2
greet	1.6	shop	2.7	tip	1.8	feature	1.2	distract	2.3	see	1.2
restore	1.5	elect	2.2	elect	1.7	meet	2.2	weep	2.3	present	1.0
clear	1.5	compel	2.1	unmake	1.5	wish	1.9	scream	2.3	leave	0.8
excite	1.2	offend	1.5	fight	1.2	fondle	1.9	drown	2.1	espouse	1.3
flatter	0.9	scold	1.4	prevent	1.1	saw	1.8	rape	2.0	want	1.1

Outline

Who did *what* to *whom* at *where?*

The police officer detained the suspect at the scene of the crime

Agent   Predicate   Theme   Location
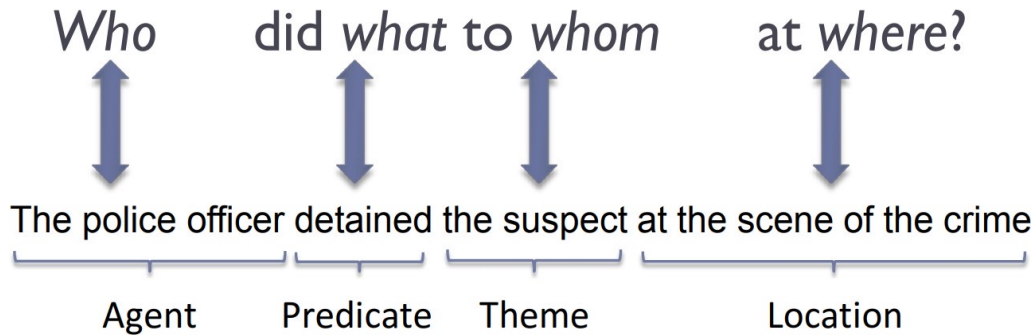
Source: Jurafsky-Martin slides.

Proposition Bank (PropBank)

Ex1: [$_{Arg0}$ The group] *agreed* [$_{Arg1}$ it wouldn't make an offer].

Ex2: [$_{ArgM\text{-}TMP}$ Usually] [$_{Arg0}$ John] *agrees* [$_{Arg2}$ with Mary] [$_{Arg1}$ on everything].

ARG0	agent	ARG3	starting point, benefactive, attribute
ARG1	patient	ARG4	ending point
ARG2	instrument, benefactive, attribute	ARGM	modifier

Table 1.1: List of arguments in PropBank

▶ Agent (ARG0)
  ▶ Volitional/sentient involvement in event or state
  ▶ Causes an event or change of state in another participant
▶ Patient (ARG1)
  ▶ Causally affected by an agent/action
  ▶ Undergoes change of state
▶ ARG2 has three functions:
  ▶ instrument for an action ("Pat opened the door <u>with a crowbar</u>.")
  ▶ attribute assigned to a patient ("Pat is <u>an agent</u>").
  ▶ benefactive: the dative/indirect object ("Sasha gave the crowbar <u>to Pat</u>.")

ARG-M: Modifiers

ArgM-TMP	when?	yesterday evening, now
LOC	where?	at the museum, in San Francisco
DIR	where to/from?	down, to Bangkok
MNR	how?	clearly, with much enthusiasm
PRP/CAU	why?	because ... , in response to the ruling
REC		themselves, each other
ADV	miscellaneous	
PRD	secondary predication	...ate the meat raw

► AllenNLP semantic role labeling demo:

   https://demo.allennlp.org/semantic-role-labeling

   ► also has models for constituency parsing, dependency parsing, and more.

Outline

Textual Entailment ⟷ Natural Language Inference

▶ TE is the task of predicting whether, for a pair of sentences, the facts in the first sentence necessarily imply the facts in the second.

Sentence A (Premise)	Sentence B (Hypothesis)	Label
A soccer game with multiple males playing.	Some men are playing a sport.	entailment
An older and younger man smiling.	Two men are smiling and laughing at the cats playing on the floor.	neutral
A man inspects the uniform of a figure in some East Asian country.	The man is sleeping.	contradiction

▶ The SNLI (Stanford Natural Language Inference) dataset contains 570k human-written English sentence pairs manually labeled (by Amazon Mechanical Turk Workers) for balanced classification with the labels: entailment, contradiction, neutral.
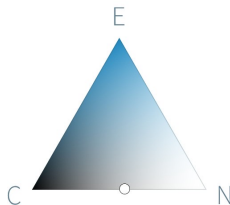
It is **somewhat likely** that there is **no correlation** between the premise and hypothesis.

Premise

A handmade djembe was on display at the Smithsonian.

Hypothesis

Visitors could not hear the djembe.

Judgement	Probability	
Entailment		0.7%
Contradiction		46.4%
Neutral		52.9%

Reading Comprehension ⟷ Local Question Answering

Answering questions about a passage of text to show that the system understands the passage.

Reading Comprehension ⬌ Local Question Answering

Answering questions about a passage of text to show that the system understands the passage.

https://demo.allennlp.org/reading-comprehension

Passage Context

The institutional framework of Navarre was preserved following the 1512 invasion. Once Ferdinand II of Aragon died in January, the Parliament of Navarre gathered in Pamplona, urging Charles V to attend a coronation ceremony in the town following tradition, but the envoys of the Parliament were met with the Emperor's utter indifference if not contempt. He refused to attend any ceremony and responded with a brief "let's say I am happy and pleases me." Eventually the Parliament met in 1517 without Charles V, represented instead by the **Duke of Najera** pronouncing an array of promises of little certitude, while the acting Parliament kept piling up grievances and demands for damages due to the Emperor, totalling 67—the 2nd Viceroy of Navarre Fadrique de Acuña was deposed in 1515 probably for acceding to send grievances. Contradictions inherent to the documents accounting for the Emperor's non-existent oath pledge in 1516 point to a contemporary manipulation of the records.

Question

Who represented the Charles V at Parliament?