Tutorial ‘Introduction to Semantic Theory’ (No. 4)

Lecture 5

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Session 4

November 22, 2019

Our agenda today

- Assignment 3

  Remaining questions from previous assignments

- Also something new:

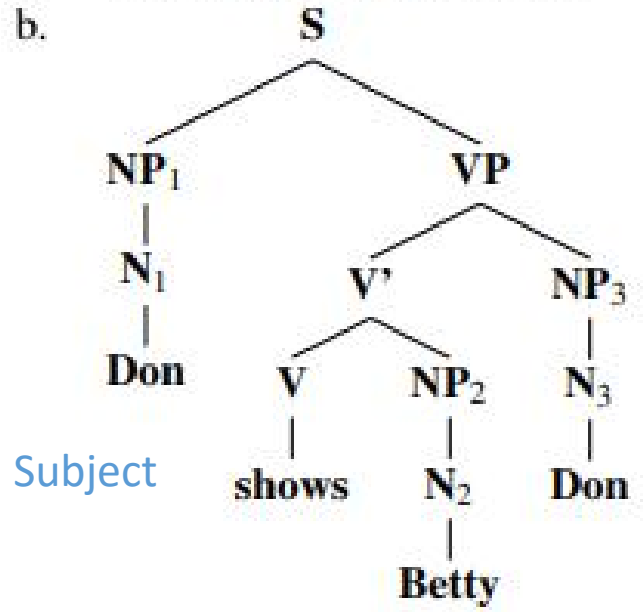
  Empty expressions, non-verbal predicates, **modification**, **presuppositions**

- Some exercise to help you with assignment 5

Assignment 3: Exercise 1

(1) a. **Don shows Betty himself.**

b.



Subject

Direct oject

Indirect oject

[[show]]=[λx ∈ D_e . [λy ∈ D_e . [λz ∈ D_e . z introduced y to x]]]

Subject

Direct oject

Indirect oject

Assignment 3: Exercise 2(i)

Exercise 2 Assume $D = \{\text{Don, Betty}\}$. The ternary relation R_{shows} is defined as in (2). The first ordered triple in (2) says that Don shows himself to Betty, the second one that Don shows Betty to herself, the third one that Betty shows herself to Don.

(2) $R_{show} = \{\langle \text{Don, Betty, Don} \rangle, \langle \text{Don, Betty, Betty} \rangle, \langle \text{Betty, Don, Betty} \rangle\}$

[[S]]= [[Don shows Betty himself]]= 1 iff Don shows Betty Don

What about these two sentnces?

[[S']]= [[Don shows Betty Betty]]

[[S'']]=[[Betty shows Don herself]]

Assignment 3: Exercise 2(iii)

Exercise 2 Assume $D = \{\text{Don, Betty}\}$. The ternary relation R_{shows} is defined as in (2). The first ordered triple in (2) says that Don shows himself to Betty, the second one that Don shows Betty to herself, the third one that Betty shows herself to Don.

S IO DO

(2) $R_{show} = \{\langle \text{Don, Betty, Don}\rangle, \langle \text{Don, Betty, Betty}\rangle, \langle \text{Betty, Don, Betty}\rangle\}$

(iii) The characteristic function of R_{show} is:

$$f_{show} := \begin{bmatrix} \langle \text{Don, Don, Don}\rangle & \to & 0 \\ \langle \text{Don, Don, Betty}\rangle & \to & 0 \\ \langle \text{Don, Betty, Don}\rangle & \to & 1 \\ \langle \text{Don, Betty, Betty}\rangle & \to & 1 \\ \langle \text{Betty, Don, Don}\rangle & \to & 0 \\ \langle \text{Betty, Don, Betty}\rangle & \to & 1 \\ \langle \text{Betty, Betty, Don}\rangle & \to & 0 \\ \langle \text{Betty, Betty, Betty}\rangle & \to & 0 \end{bmatrix}$$

Subject

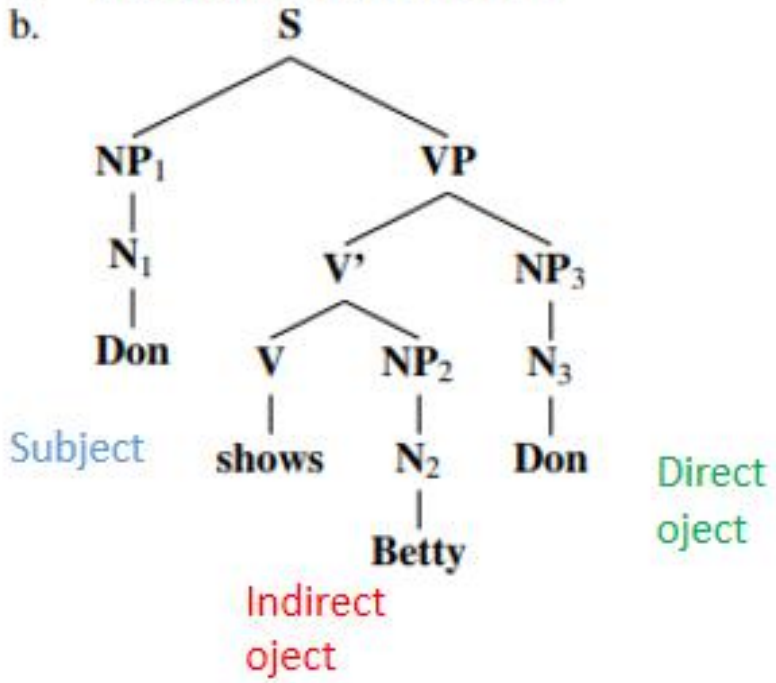
Indirect oject

Direct oject

Assignment 3: Exercise 2(ii)

(1) a. **Don shows Betty himself.**

b.



$$[\![\textbf{show}]\!] = \begin{bmatrix} \text{Don} \rightarrow \begin{bmatrix} \text{Don} \rightarrow \begin{bmatrix} \text{Don} \rightarrow 0 \\ \text{Betty} \rightarrow 0 \end{bmatrix} \\ \text{Betty} \rightarrow \begin{bmatrix} \text{Don} \rightarrow 0 \\ \text{Betty} \rightarrow 1 \end{bmatrix} \end{bmatrix} \\ \text{Betty} \rightarrow \begin{bmatrix} \text{Don} \rightarrow \begin{bmatrix} \text{Don} \rightarrow 1 \\ \text{Betty} \rightarrow 0 \end{bmatrix} \\ \text{Betty} \rightarrow \begin{bmatrix} \text{Don} \rightarrow 1 \\ \text{Betty} \rightarrow 0 \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Indirect oject

Direct oject

Subject

Assignment 3: Exercise 2(iii)

$$f_{show} := \begin{bmatrix} \langle \text{Don}, \text{Don}, \text{Don} \rangle & \to & 0 \\ \langle \text{Don}, \text{Don}, \text{Betty} \rangle & \to & 0 \\ \langle \text{Don}, \text{Betty}, \text{Don} \rangle & \to & 1 \\ \langle \text{Don}, \text{Betty}, \text{Betty} \rangle & \to & 1 \\ \langle \text{Betty}, \text{Don}, \text{Don} \rangle & \to & 0 \\ \langle \text{Betty}, \text{Don}, \text{Betty} \rangle & \to & 1 \\ \langle \text{Betty}, \text{Betty}, \text{Don} \rangle & \to & 0 \\ \langle \text{Betty}, \text{Betty}, \text{Betty} \rangle & \to & 0 \end{bmatrix}$$

Subject Indirect oject Direct oject

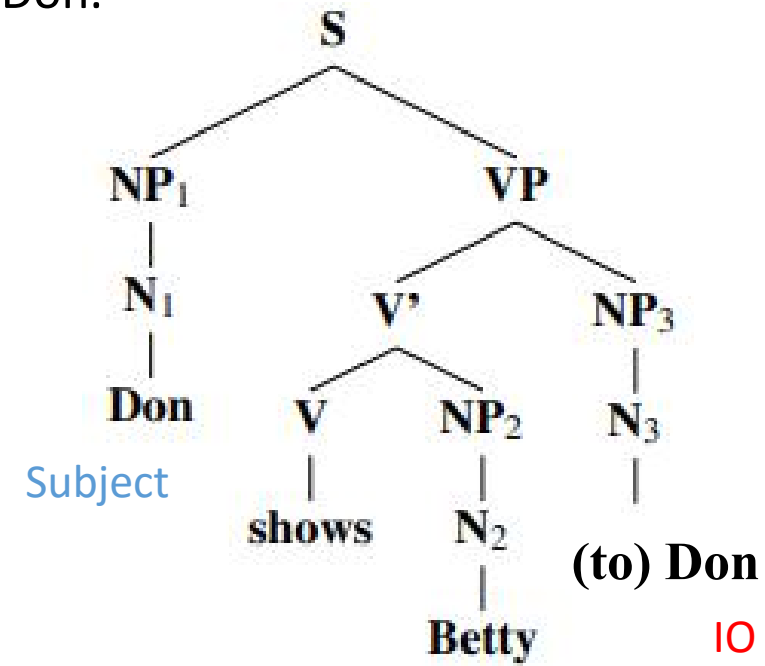
$$[\![\textbf{show}]\!] = \begin{bmatrix} \text{Don} \to \begin{bmatrix} \text{Don} \to \begin{bmatrix} \text{Don} \to 0 \\ \text{Betty} \to 0 \end{bmatrix} \\ \text{Betty} \to \begin{bmatrix} \text{Don} \to 0 \\ \text{Betty} \to 1 \end{bmatrix} \end{bmatrix} \\ \text{Betty} \to \begin{bmatrix} \text{Don} \to \begin{bmatrix} \text{Don} \to 1 \\ \text{Betty} \to 0 \end{bmatrix} \\ \text{Betty} \to \begin{bmatrix} \text{Don} \to 1 \\ \text{Betty} \to 0 \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Indirect oject Direct oject Subject

Left to right schönfinkelization: Subject ID DO
Right to left schönfinkelization: DO ID Subject

What about sentence (1')?

(1) Don shows Betty Don.
(1') Don shows Betty to Don.



Subject

IO

DO

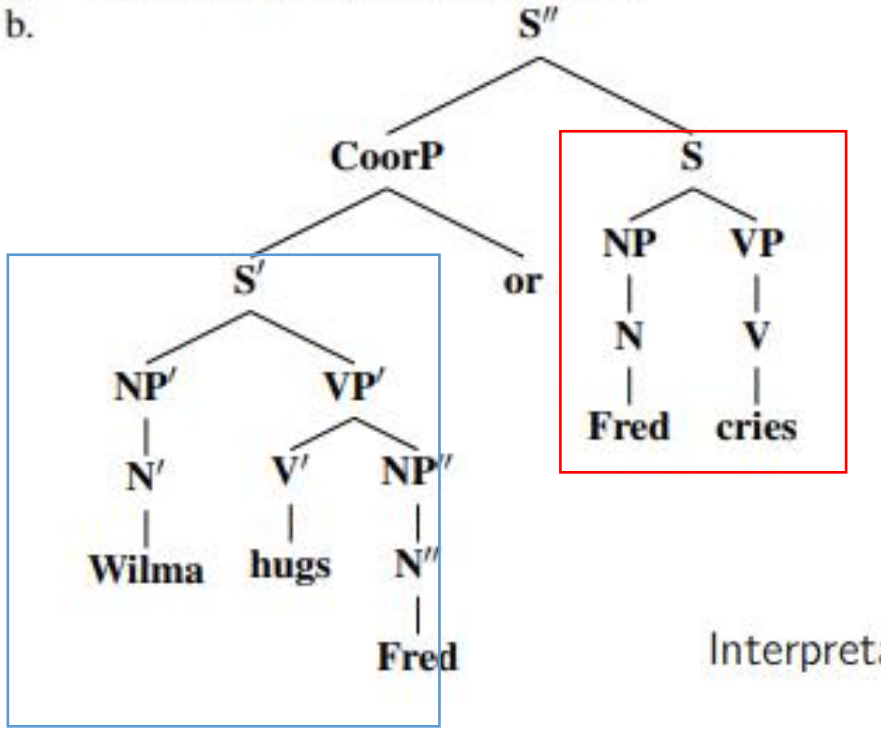
S IO DO

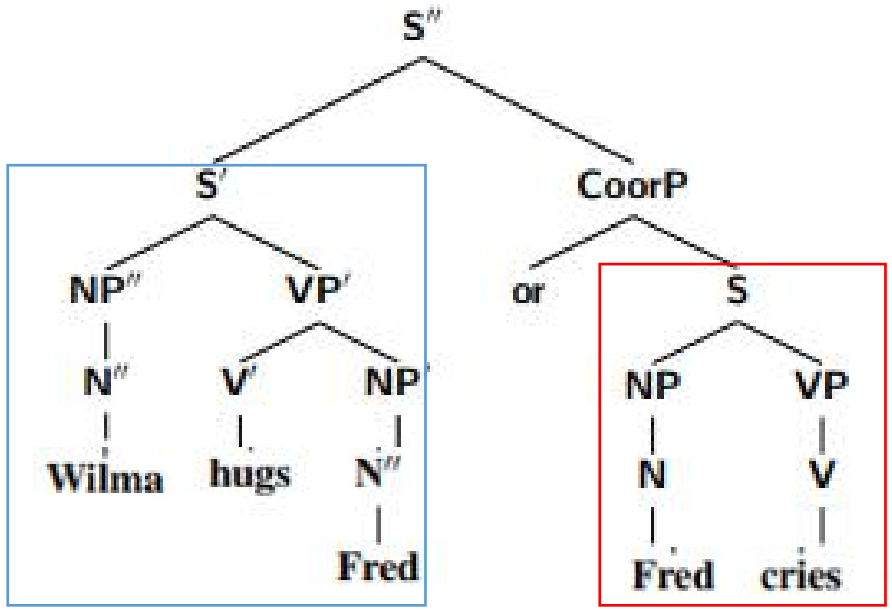
$$R_{show} = \{\langle \text{Don, Betty, Don}\rangle, \langle \text{Don, Betty, Betty}\rangle, \langle \text{Betty, Don, Betty}\rangle\}$$

Assignment 4: *CoorP* and connectives

(3) a. **Wilma hugs Fred or Fred cries.**

b.



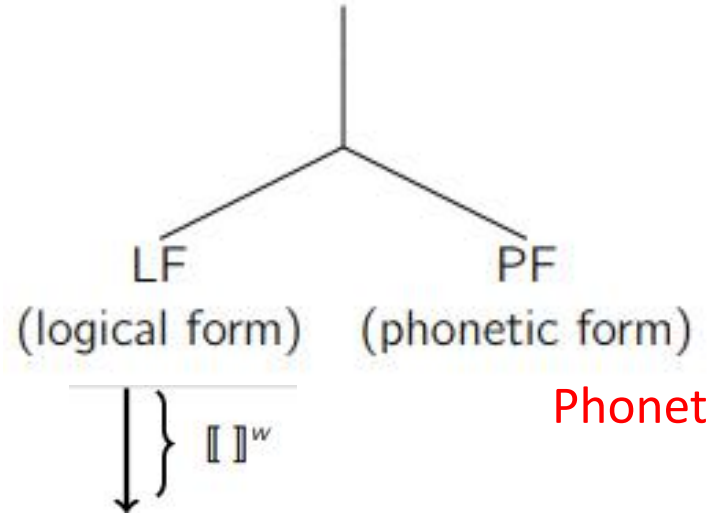


Interpretation is blind to linearity and phrase-structure categories.

Only lexical expressions and hierarchical structure are visible for interpretation.

Inverted Y-model (e.g. Chomsky 1995)

Syntactic derivation



Phonetic spell-out

Truth-condition

Semantic interpretation

Linear order only matters to the phonetic spell-out.

Semantically vacuous expressions

Interpretation is blind to linearity and phrase-structure categories.

Only lexical expressions and hierarchical structure are visible for interpretation.

Some expressions have only syntactic but no semantic contribution:

(4) a. John is the father of Tom.

b. Joan is Tom's father.

(5) a. Snowball is a cat.

b. [[Snowball is a cat]]

= [[cat]] ([[Snowball]])

= 1 iff Snowball is a cat

(6) a. John is rich.

b. (I consider) John rich.

Empty expressions: A list

Unary non-verbal predicates:

Common noun: [[~~is a~~ cat]]= $\lambda x : x \in D_e$. x is a cat

Predicative ADJ: [[~~is~~ rich]]= $\lambda x : x \in D_e$. x is rich

[[~~is~~ out]]= $\lambda x : x \in D_e$. x is not in x's home

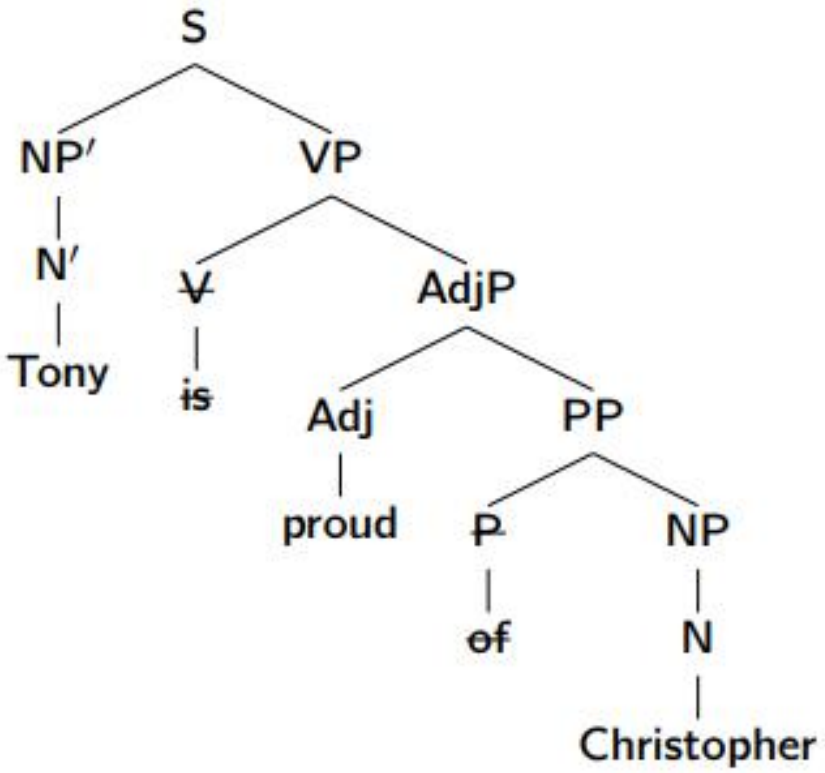
Binary non-verbal predicates:

[[~~is~~ part ~~of~~]]= $\lambda x \in D_e$. [$\lambda y \in D_e$. y is a part of x]

[[~~is~~ the father ~~of~~]]= $\lambda x \in D_e$. [$\lambda y \in D_e$. y is the father of x]

[[~~is located~~ in]]= $\lambda x \in D_e$. [$\lambda y \in D_e$. y is in x]

Semantic invisibility



In the exams, the empty expressions will be pointed out in the sytactic structure.

Modification as parts of set

(7) a. a part of Europe (argument)

b. a city in Texas (restrictive modifier)

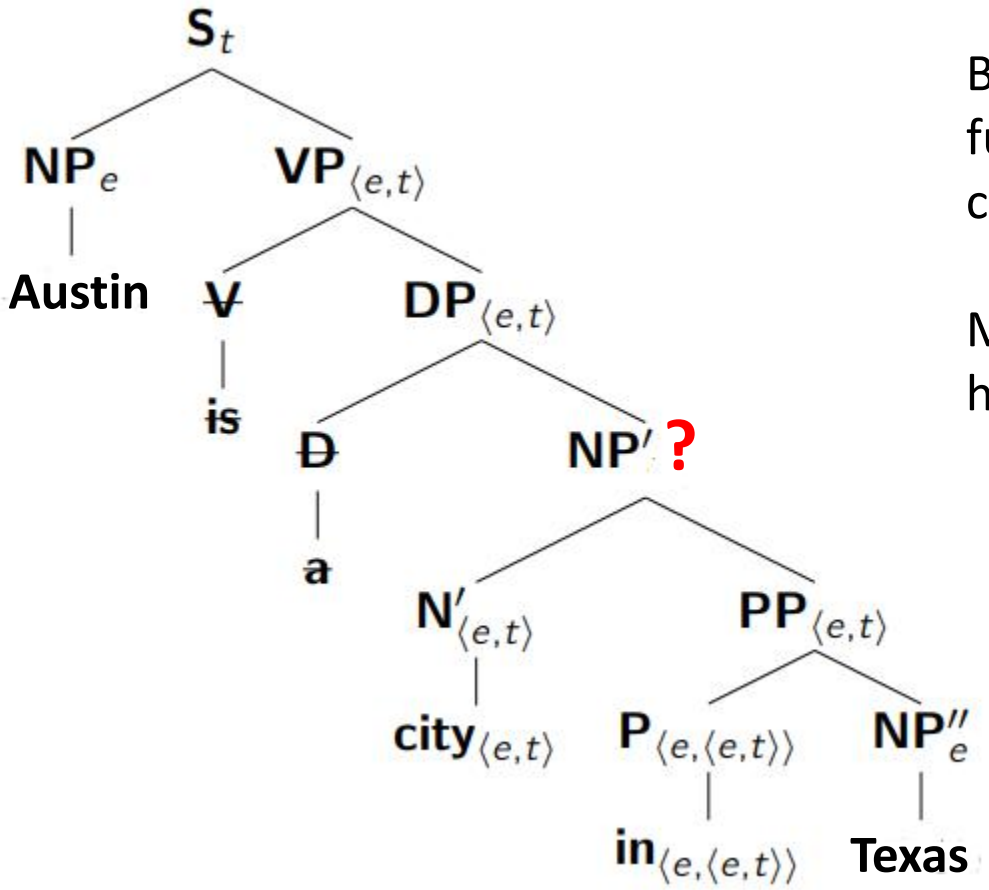
c. Pierre, from Quebec (modifier)

d. Snowball is a white cat. (modifier)

What kind of functions does the modifier in (7b), (7c), (7d) denote?

Characteristic functions of the type <e,t>.

New Rules or New Types?



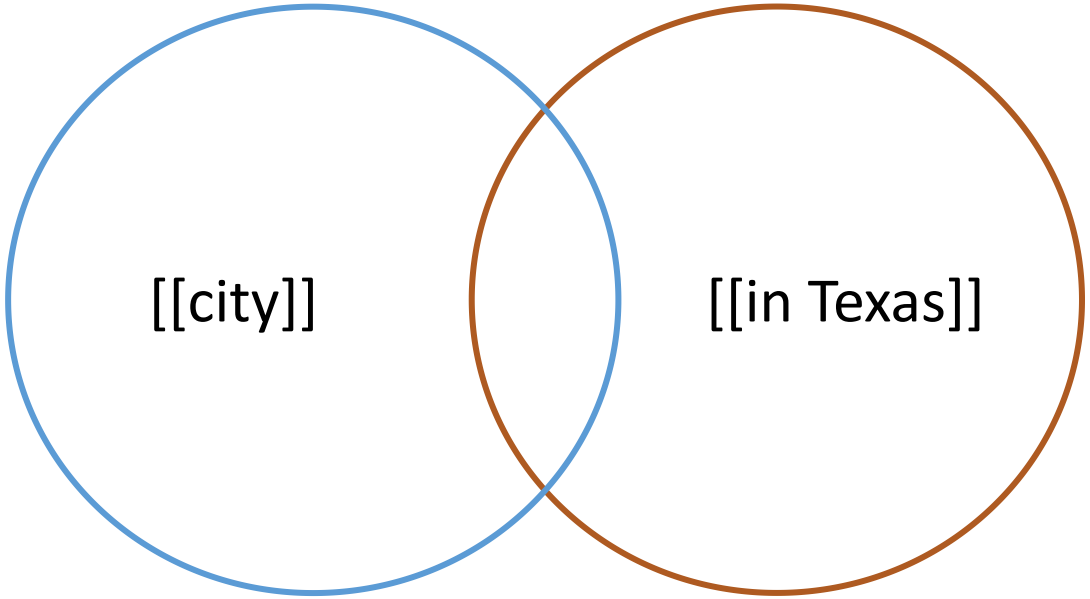
Both N' and PP denote functions, none of them can be the argument.

Maybe FA is not suitable here.

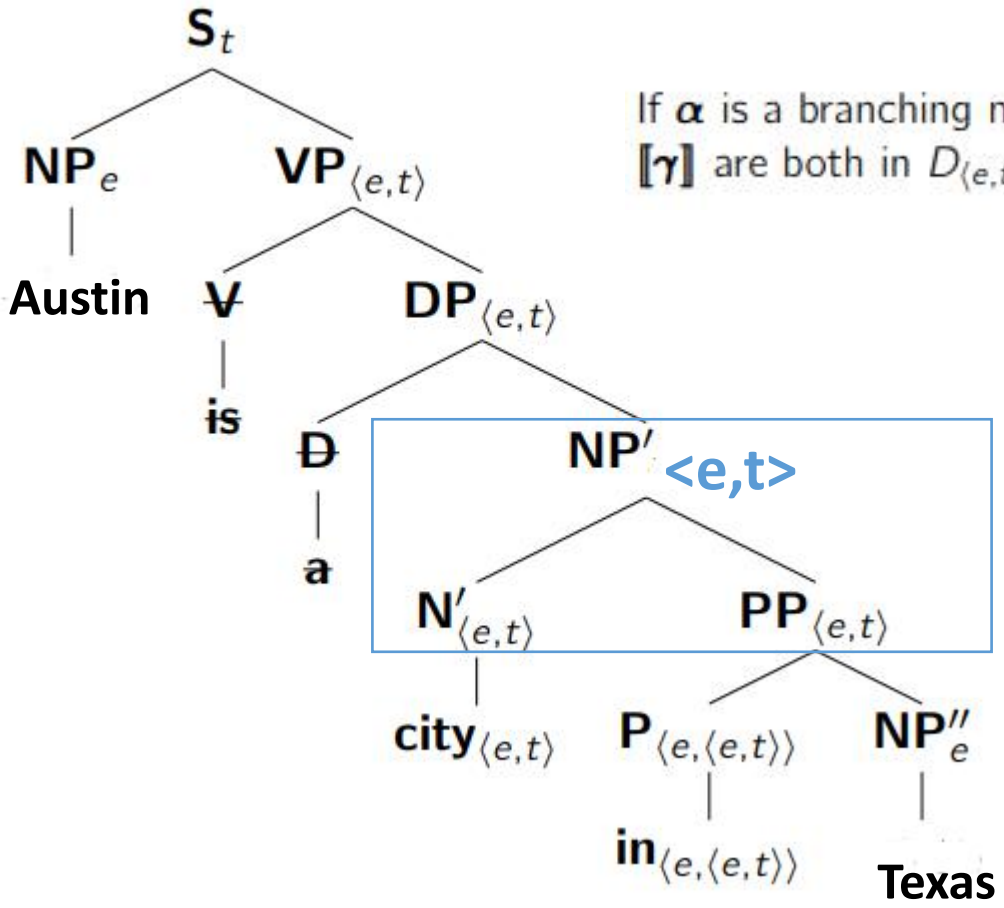
Restrictive modification and intersection

(7b) Austin is a city in Texas.

→ Austin is a city and Austin is in Texas.



Old types, new Rule: Predicate modification



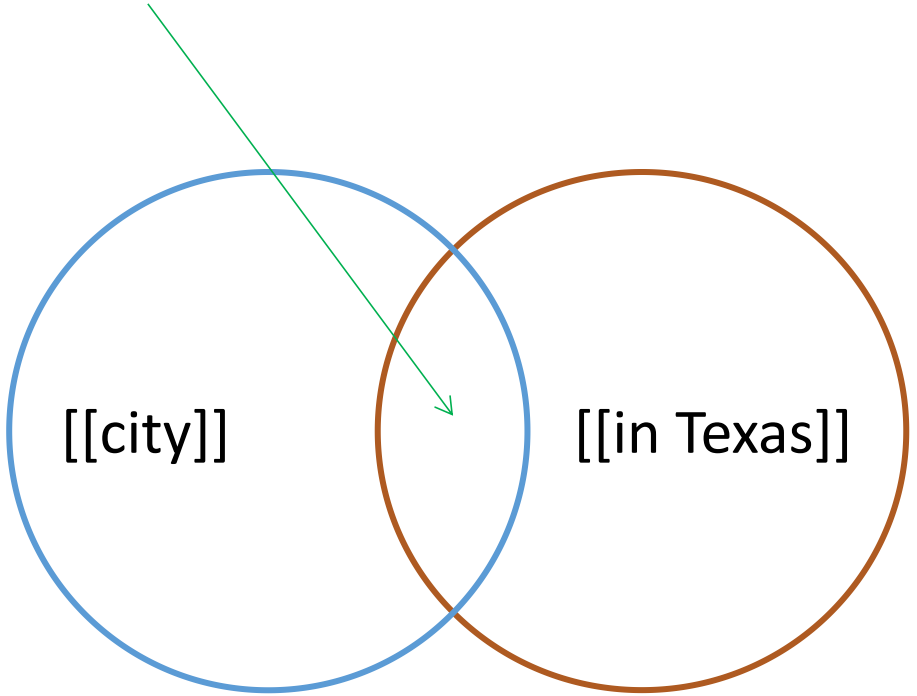
If α is a branching node, $\{\beta, \gamma\}$ is the set of α's daughters, and $[\![\beta]\!]$ and $[\![\gamma]\!]$ are both in $D_{\langle e,t\rangle}$, then $[\![\alpha]\!] = \lambda x \in D_e\ .\ [\![\beta]\!](x) = [\![\gamma]\!](x) = 1$.

Intersective modification and entailment

(7) b. Austin is a city in Texas. (**Intersective modification**)

b'. Austin is a city

b''. Austin is in Texas.



Is there any entailment relation in (7b)? Recall our tests.

(7b) eintails (7b') and (7b'').

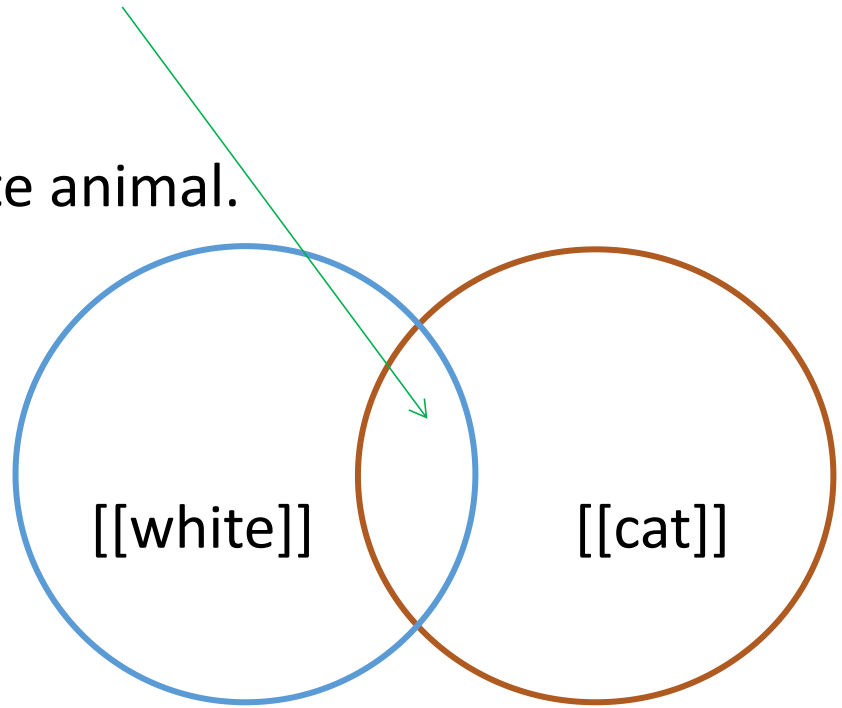
Intersective Adjectives

(7) d. Snowball is a white cat. (**Intersective modification**).

d'. Snowball is white.

d''. Snowball is a cat.

d'''. Snowball is a white animal.



Is there any entailment relation in (7d)? Recall our tests.

(7d) entails (7d'), (7d'') and (7d''').

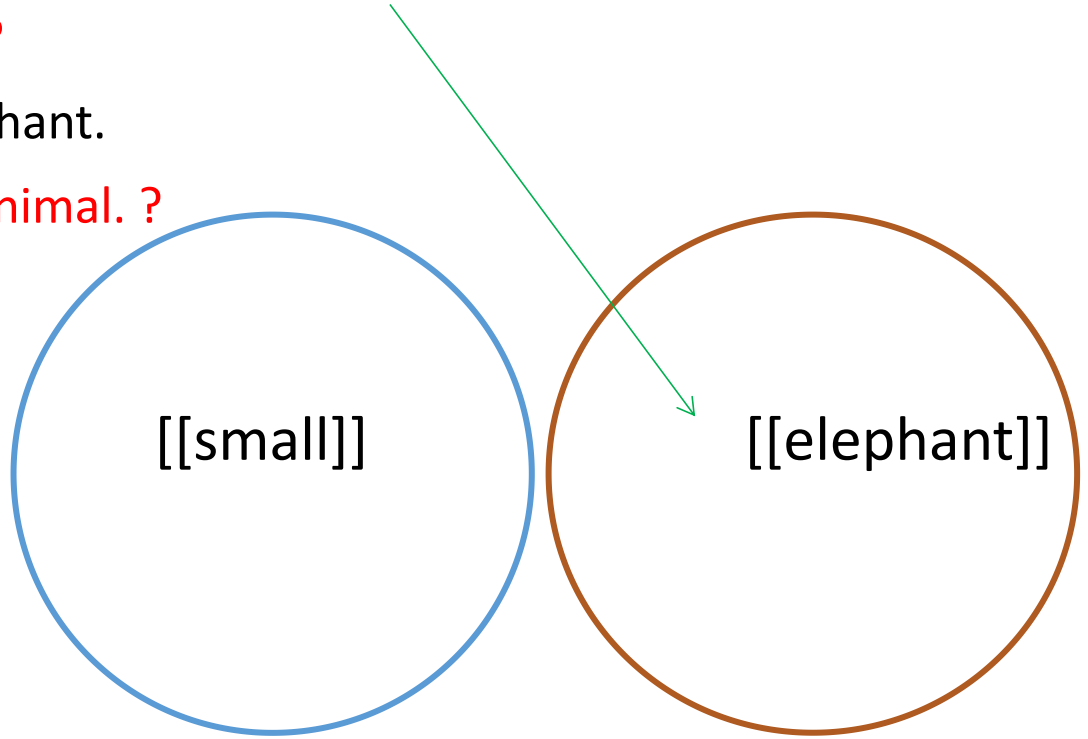
What about non-intersective Adjectives?

(8) a. Jumbo is a small elephant. (**non-Intersective**)

b. Jumbo is small. ?

c. Jumbo is an elephant.

d. Jumbo is small animal. ?



Is there any entailment relation in (8)? Recall our tests.

(8a) entails only (8c), not the other two sentences.

Context sensitivity:
Two ways to think about *small*

small ⟷ big

- Jumbo is a small elephant but Jumbo is not a small animal comparing to cats,dog ect. Type <<e,t>, <e,t>>

$[\![\textbf{small}]\!] =$
$\lambda f \in D_{et}.[\lambda x \in D_e.[f(x) = 1$ **and the size of** x **is below the average size of the elements of** $\{y : f(y) = 1\}]]$

- Adjectives like *small* contain a **context variable *c*** in their denotation. Type <e,t> (Heim and Kratzer 1998)

$[\![\textbf{small}]\!] = \lambda x \in D_e.[x$**'s size is below** c**, where** c **is the size standard made salient by the utterance context.]**

Semantic rules: A list

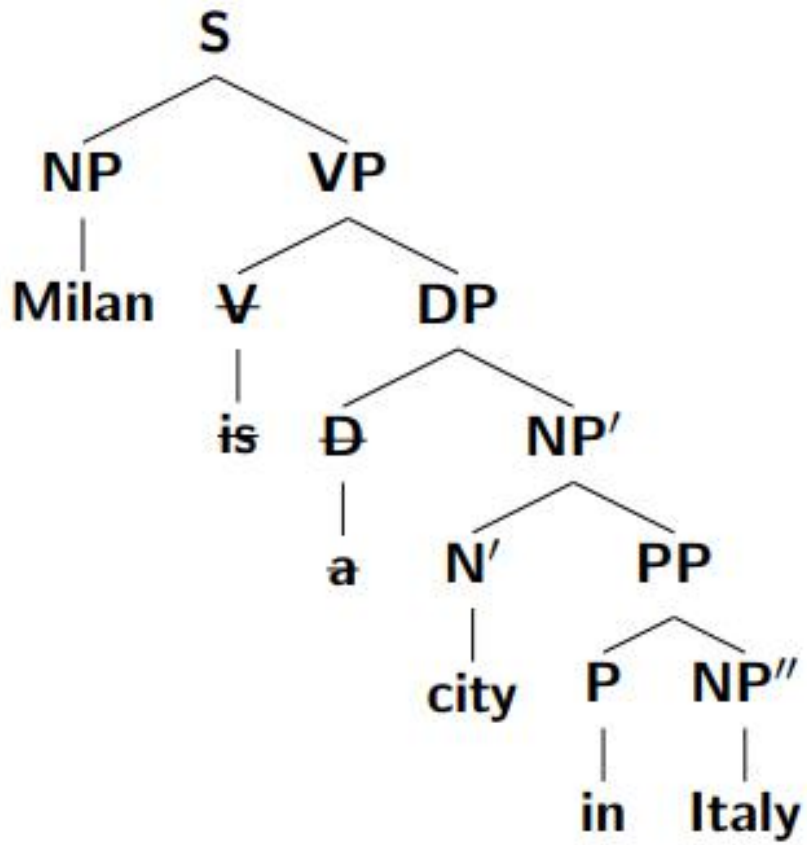
TN If $\boldsymbol{\alpha}$ is a terminal node, $[\![\boldsymbol{\alpha}]\!]$ is specified in the lexicon.

NN If $\boldsymbol{\alpha}$ is a non-branching node, and $\boldsymbol{\beta}$ is $\boldsymbol{\alpha}$'s daughter, then $[\![\boldsymbol{\alpha}]\!] = [\![\boldsymbol{\beta}]\!]$.

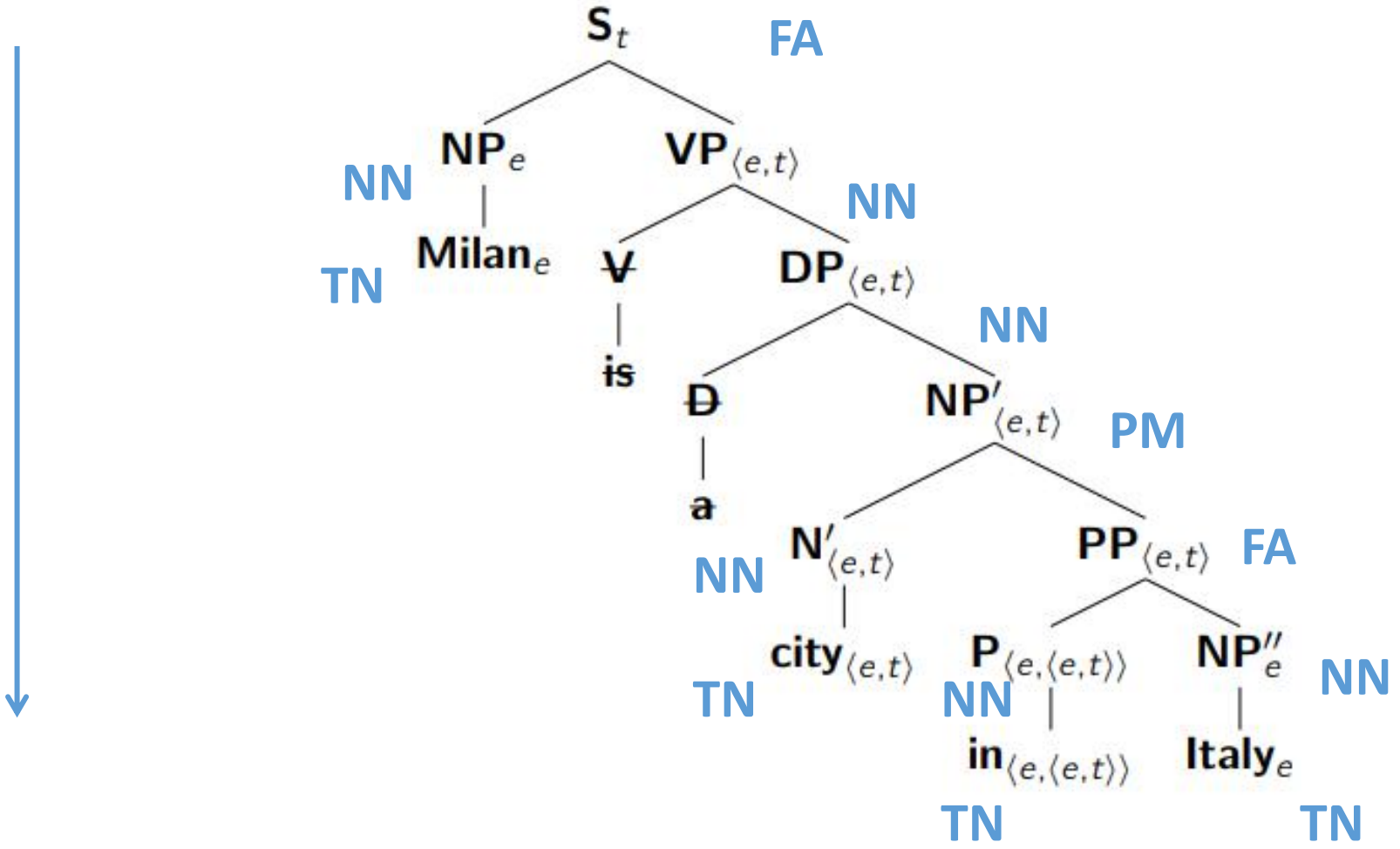
FA If $\boldsymbol{\alpha}$ is a branching node, $\{\boldsymbol{\beta}, \boldsymbol{\gamma}\}$ is the set of $\boldsymbol{\alpha}$'s daughters, and $[\![\boldsymbol{\beta}]\!]$ is a function whose domain contains $[\![\boldsymbol{\gamma}]\!]$, $[\![\boldsymbol{\alpha}]\!] = [\![\boldsymbol{\beta}]\!]([\![\boldsymbol{\gamma}]\!])$.

PM If $\boldsymbol{\alpha}$ is a branching node, $\{\boldsymbol{\beta}, \boldsymbol{\gamma}\}$ is the set of $\boldsymbol{\alpha}$'s daughters, and $[\![\boldsymbol{\beta}]\!]$ and $[\![\boldsymbol{\gamma}]\!]$ are both in $D_{\langle e,t\rangle}$, then
$[\![\boldsymbol{\alpha}]\!] = \lambda x \in D_e \,.\, [\![\boldsymbol{\beta}]\!](x) = [\![\boldsymbol{\gamma}]\!](x) = 1$.

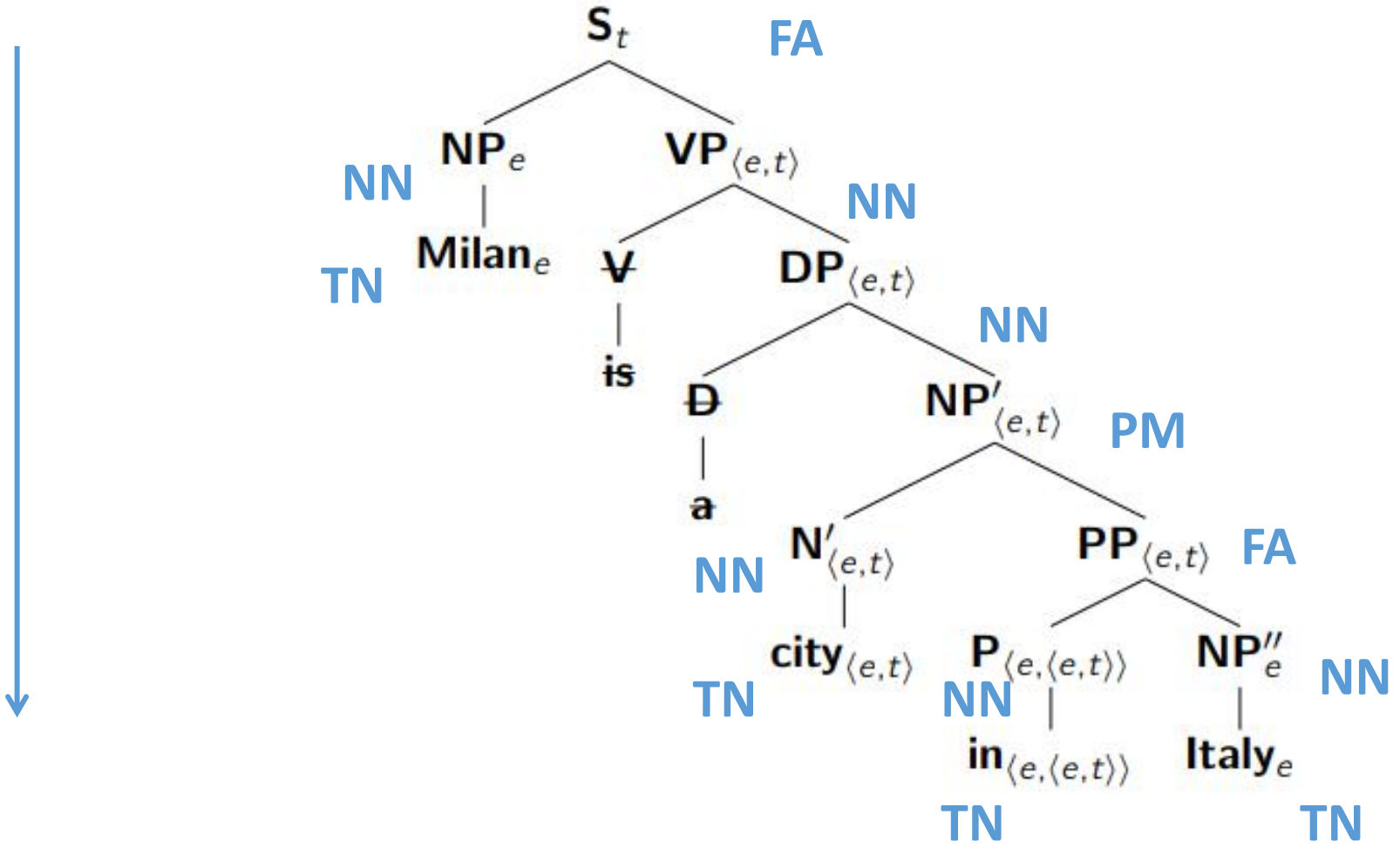
Which rule?



Step 1: Semantic types



Exercise 11: Compute the truth-conditions (Top-down)



Tip: Exercise 11

Top-down derivation dosen't mean you must do the whole structure without a pause.

(9) Tony is pround of Christopher.

$$
\begin{aligned}
[\![\mathbf{S}]\!] &= [\![\mathbf{VP}]\!]([\![\mathbf{NP'}]\!]) && \text{(FA)}\\
&= [\![\mathbf{AdjP}]\!]([\![\mathbf{NP'}]\!]) && \text{(NN)}\\
&= [\![\mathbf{Adj}]\!]([\![\mathbf{PP}]\!])([\![\mathbf{NP'}]\!]) && \text{(FA)}\\
&= [\![\mathbf{Adj}]\!]([\![\mathbf{NP}]\!])([\![\mathbf{NP'}]\!]) && \text{(NN)}\\
&= [\![\mathbf{proud}]\!]([\![\mathbf{Christopher}]\!])([\![\mathbf{Tony}]\!]) && \text{(5}\times\text{NN)}\\
&= [\lambda x \in D_e \,.\, [\lambda y \in D_e \,.\, y \text{ is proud of } x]](\text{Christopher})(\text{Tony}) && \text{(3}\times\text{TN)}\\
&= [\lambda y \in D_e \,.\, y \text{ is proud of Christopher}](\text{Tony})\\
&= 1 \text{ iff Tony is proud of Christopher}
\end{aligned}
$$

What if we have a longer sentence like (10)?

(10) Tony is not pround of Christopher or Jack give Jane a book about Italy.

Tip: Exercise 11

(10) Tony is not pround of Christopher or Jack give Jane a book about Italy.

$$
\begin{aligned}
[\![\mathbf{S}'']\!] &= [\![\mathbf{CoorP}]\!]([\![\mathbf{S}']\!]) && \text{(FA)}\\
&= [\![\mathbf{or}]\!]([\![\mathbf{S}]\!])([\![\mathbf{S}']\!]) && \text{(FA)}\\
&= [\lambda p \in D_t \,.\, [\lambda q \in D_t \,.\, \text{there is an } r \in \{p,q\} \text{ such that } r = 1]]([\![\mathbf{S}]\!])([\![\mathbf{S}']\!]) && \text{(TN)}\\
&= [\lambda q \in D_t \,.\, \text{there is an } r \in \{[\![\mathbf{S}]\!],q\} \text{ such that } r = 1]([\![\mathbf{S}']\!])\\
&= 1 \text{ iff there is an } r \in \{[\![\mathbf{S}]\!],[\![\mathbf{S}']\!]\} \text{ such that } r = 1
\end{aligned}
$$

$$[\![\mathbf{S}]\!] = [\![\mathbf{VP}]\!]([\![\mathbf{NP}]\!]) \qquad \text{(FA)}$$

.....

$$[\![\mathbf{S}']\!] = [\![\mathbf{VP}']\!]([\![\mathbf{NP}']\!]) \qquad \text{(FA)}$$

.....

Solution: Exercise 11

[[S]] = [[VP]]([[NP]]) (FA)
= [[VP]] ([[Milan]]) (NN)
= [[VP]] (Milan) (TN)

[[VP]] = [[DP]]= [[NP']] (2x NN)
= $\lambda x \in D_e$. [[N']](x) = [[PP]](x) = 1 (PM)
= $\lambda x \in D_e$. [[city]](x) = [[PP]](x) = 1 (NN)
= $\lambda x \in D_e$. [$\lambda y \in$ De . y is a city](x) = [[PP]](x) = 1 (TN)

[[PP]] = [[P]]([[NP'']]) (FA)
= [[in]] ([[Italy]]) (2x NN)
= [$\lambda y \in$ De . y is located in x] (Italy) (2x TN)
= [$\lambda y \in$ De . y is located in Italy]

Solution: Exercise 11

[[S]] = [[VP]] (Milan) ([[S]])

= [λx ∈ D_e . [λy ∈ De . y is a city](x) = [[PP]](x) = 1] (Milan) ([[VP]])

= [λx ∈ De . [λy ∈ De . y is a city](x) = [λy ∈ De . y is located in Italy](x) = 1]

([[PP]])

= [λx ∈ De . x is a city and x is in Italy] (Milan)

= 1 iff Milan is a city and Milan is in Italy

Recap: Entailment and literal meaning

(11) a. I have a cat *and* it is white.
b. I have a cat *but* it is white.

Same **truth-conditional meaning**, different **utterance meaning.**

The **literal meaning** of a sentence S = S's truth-conditions
S's truth-conditions are composed by lexical meanings of each part of S.
Entailments are derived from lexical meanings.

(12) a. I have a white cat.
b. A white cat is an animal
$\longrightarrow$ c. I have an animal.

Negation and truth-conditions

(13) a. I don't have a white cat.

$\xrightarrow{?}$ c. I have an animal.

Can entailments still be preserved under negation?

Note: Negation “reverses” the truth-conditions of a sentence.

What is happening here in (4)?

(14) a. I played with my white cat today.

$\rightarrow$ b. I have a cat.

c. I didn't play with my white cat today.

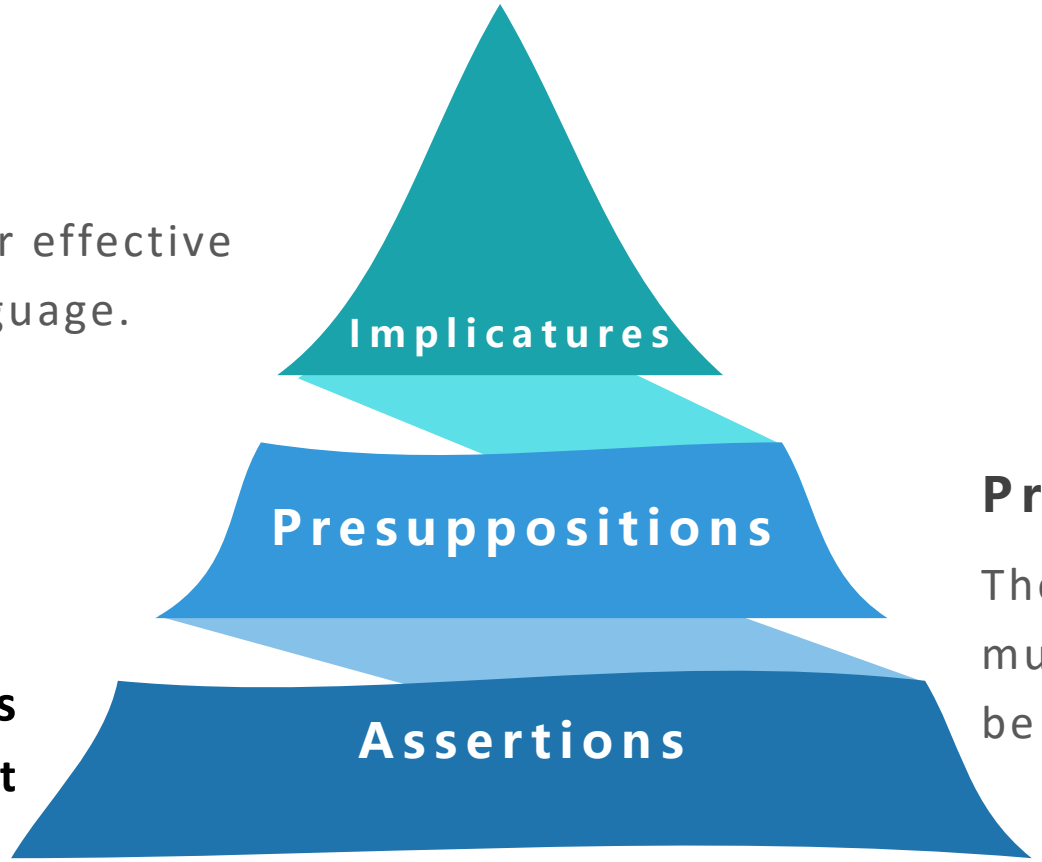
$\rightarrow$ b. I have a cat.

Three levels of meaning

Unlike entailments, **presuppositions** “survive” under negation.

Conversational

A set of “guidelines” for effective and rational use of language.



Truth-conditions
Entailment

Presuppositional

The requirements that the context must satisfy for the sentence to be interpretable at all.

Some presupposition triggers

In English, presuppositions are usually triggered by lexical items.

- **Definite noun phrases**

  Mary loves / doesn’t love her husband

  ≫ Mary has a husband.

- **Verbs like forget, win**

  I won/ didn't win the game.

  ≫ I took part in the game.

- **Aspect: Stop, quit, again**

  John has/ hasn't stopped smoking

  ≫ John used to smoke

Presupposition or entailment?

Presupposition	Entailment
Mutually shared belief of the **speakers** prior to making an utterance.	Encoded in the literal meaning of **what is uttered**.
Pragmatic-semantic	Semantic
Can be cancelled	Normally can not be cancelled
Can survive the change of truth-conditions	Can not survive the change of truth-conditions

Presupposition trigger tests

(15) a. Jane loves her husband.

b. Jane is married.

Entailment test: # Jane loves her husband and she is not married.

Presupposition tests:

Negation: Jane doesn't love her husband. (15b) still holds.

Conditional: If Jane loves her husband, then she will stay. (15b) still holds.

Question: - Does Jane love her husband? - No idea. (15b) still holds.

Conclusion: (15a) entails and presupposes (15b).

Exercise 12: Presuppose or entail?

Decide for all sentences whether (a) entails and/or presupposes (b).

(16) a. I danced all night at the party.
b. I went to the party.
(17) a. I know that you went to the party.
b. You went to the party.
(18) a. That fact that you went to the party shocked me.
b. I was shocked.
(19) a. It was John who stole my bike.
b. My bike was taken.
(20) a. It was John who stole my bike.
b. John took my bike.

Solution: Exercise 12

(16) Both.

Contradiction: # I danced all night at the party and I didn't go to the party.

Question: - Did you danced all night at the party?

- No, I left around 2.

(16b) still holds.

(17) Both.

Contradiction: # I know that you went to the party and you didn't go to the party.

Negation: I don't know that you went to the party.

(17b) still holds.

Solution: Exercise 12

(18a) entails (18b).

Contradiction: # That fact that you went to the party shocked me and I was not shocked.

Negation: That fact that you went to the party didn't shock me.

(18b) is not always true anymore.

(19) Contradiction: # It was John who stole my bike and my bike was not taken.

Negation: It was not John who stole my bike.

(19b) still holds.

Solution: Exercise 12

(20a) only entails (20b).

Contradiction: # It was John who stole my bike and John didn't take my bike.

Conditional: If it was John who stole my bike, I would call his dad.

(20a) does not suggest (20b).

Next time...

Textbooks (relevant chapters posted on StudIP)

C&MG 1.3.3, 3

H&K 4.4–4.5

Presupposition failure, (Un)definedness, definite article

Thanks and see you next week!