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

Getting ready for the mid term

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Session 6

December 6, 2019

Our agenda today

- Something new:

  Pronouns, assignments, and features (important!)

- Some exercise to help you with assignment 7 and the mid-term exam

- Solutions for exercise 15 for mid-term (uploaded)

- Ask questions

Context dependence of pronouns

(1) What is the truth-conditions?

a. Mary likes John.

b. Mary likes **him**. ?

c. John likes Mary and Mary also likes **him**.

d. Bill is Mary's neighbour. Mary likes **him**.

The interpretation of pronouns **varies** relative to the context.

Context dependence of pronouns

Unlike proper names, pronouns are variables. They receive their denotation **via an assignment from the context**.

(1) c. John likes Mary and Mary also likes **him**.
d. Bill is Mary's neighbour. Mary likes **him**.

In (1c), under assignment John, *him* denotes John.
In (1d), under assignment Bill, *him* denotes Bill.

We use $[[\alpha]]^a = a$ for "α under assignment a denotes a".

Interpretation rules with assignments

FA If $\boldsymbol{\alpha}$ is a branching node, $\{\boldsymbol{\beta}, \boldsymbol{\gamma}\}$ is the set of $\boldsymbol{\alpha}$'s daughters, then for any assignment a $\boldsymbol{\alpha}$ is in the domain of $[\![\ ]\!]^a$ if $\boldsymbol{\beta}$ and $\boldsymbol{\gamma}$ are in the domain of $[\![\ ]\!]^a$ and $[\![\boldsymbol{\gamma}]\!]^a$ is in the domain of $[\![\boldsymbol{\beta}]\!]^a$. Then $[\![\boldsymbol{\alpha}]\!]^a = [\![\boldsymbol{\beta}]\!]^a([\![\boldsymbol{\gamma}]\!]^a)$.

NN If $\boldsymbol{\alpha}$ is a non-branching node, and $\boldsymbol{\beta}$ is $\boldsymbol{\alpha}$'s daughter, then for any assignment a, $\boldsymbol{\alpha}$ is in the domain of $[\![\ ]\!]^a$ if $\boldsymbol{\beta}$ is in the domain of $[\![\ ]\!]^a$. Then $[\![\boldsymbol{\alpha}]\!]^a = [\![\boldsymbol{\beta}]\!]^a$.

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

Assignment independent denotations (AID)

(2) Bill is a teacher. Mary likes John.

$[[\text{Mary}]]^{\text{Bill}} = \text{Mary}$
$[[\text{John}]]^{\text{Bill}} = \text{John}$
$[[\text{likes}]]^{\text{Bill}} = [[\text{likes}]]$

Proper names and verbs ect. don't receive their denotation via an assignment.

In other words, some lexical elements receive **Assignment independent denotations (AID)**.

New rule: AID

For every α, α is in the domain of $[\![\ ]\!]$ iff for all assignments a and b, $[\![\alpha]\!]^a = [\![\alpha]\!]^b$.

If α is in the domain of $[\![\ ]\!]$, then for every assignment a, $[\![\alpha]\!] = [\![\alpha]\!]^a$.

(3) (John likes Mary.) Mary likes him.

$[[S]]^{John} = [[VP]]^{John}([[Mary]]^{John})$ (FA)

$= [[kissed]]^{John}([[him]]^{John})([[Mary]]^{John})$ (FA)

$= [[\text{kissed}]]^{John}([[him]]^{John})([[\text{Mary}]]^{John})$ **(2x AID)**

Terminal nodes with assignments: Two rules

- For **assignment independent items**, we apply **TN1** to specified their denotations in the **lexicon:**

$[[\text{Mary}]]^{\text{Bill}} = \text{Mary}$ (TN1)

$[[\text{likes}]]^{\text{Bill}} = \lambda x \in D_e\,.\,[\lambda y \in De\,.\, y \text{ is located in } x]$ (TN1)

- For **pronous**, we apply **TN2** to specified their denotations via **assignment**.

$[[\text{she}]]^{\text{Mary}} = \text{Mary}$ (TN2)

$[[\text{him}]]^{\text{Bill}} = \text{Bill}$ (TN2)

Gender features and undefinedness

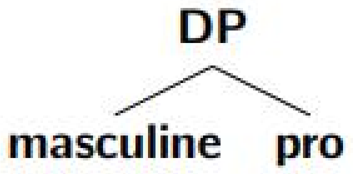
Pronouns bear features for grammatical gender.

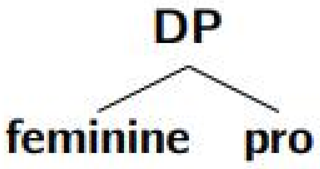
[±feminine] [± masculine]

(4) # Sue is a freind of Mary. Mary likes him.

$[[\text{him}]]^{Sue}$ is undefined. Where do the definedness conditions come from?

Encoding (un)definedness: Type <e,e>





Gender features denote restricted identity functions.

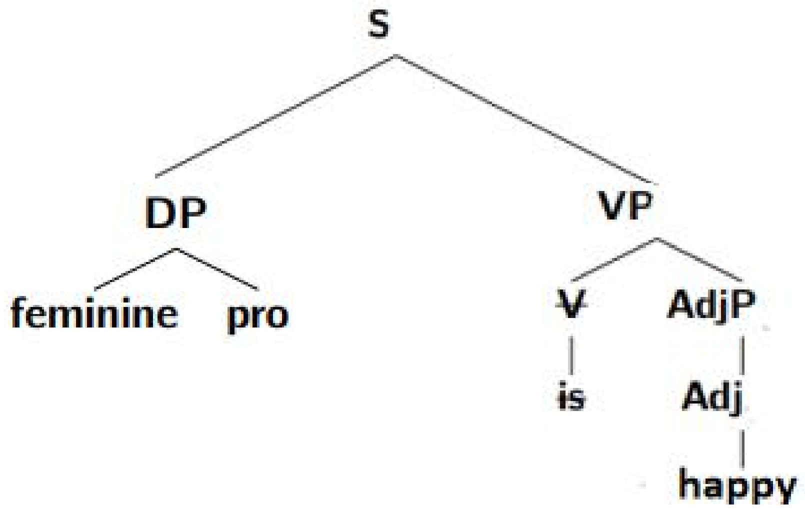
$[\![\textbf{masculine}]\!] = \lambda x : x \in D_e \text{ and } x \text{ is male} \,.\, x$

$[\![\textbf{feminine}]\!] = \lambda x : x \in D_e \text{ and } x \text{ is female} \,.\, x$

Interpretation of pronouns

(5) (Mary is a teacher.) She is happy.

$$
\begin{aligned}
[\![\mathbf{DP}]\!]^{Mary} &= [\![\mathbf{feminine}]\!]^{Mary}([\![\mathbf{pro}]\!]^{Mary}) && \text{(FA)}\\
&= [\![\mathbf{feminine}]\!]([\![\mathbf{pro}]\!]^{Mary}) && \text{(AID)}\\
&= [\![\mathbf{feminine}]\!](\text{Mary}) && \text{(TN2)}\\
&= [\lambda x : x \in D_e \text{ and } x \text{ is female} .\ x](\text{Mary}) && \text{(TN1)}\\
&= \text{Mary}\\
&\quad \text{defined only if Mary is female}
\end{aligned}
$$



[[S]]^{Mary} = 1 iff Mary smokes

defined only if Mary is female

More than one pronoun

(5) (Mary is a teacher.) She is happy.
Sentence (5) is under assignment *Mary*.

(6) John likes Bill. He introduced his teacher to him.

What do *he* and *him* denote?

Our intuitions tell us, different pronouns need different assignments.

$[[\text{he}]]^{\text{John}} = {}^{\text{John}}$ $[[\text{him}]]^{\text{Bill}} = {}^{\text{Bill}}$

Indices and assignment function

(6) John_1 likes Bill_2. He_1 introduced his teacher to him_2.

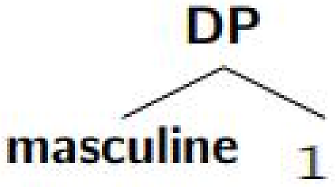
A (variable-) assignment is a partial function from **N** to De.

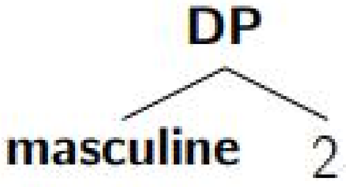
$$\begin{bmatrix} 1 & \rightarrow & \text{John} \\ 2 & \rightarrow & \text{Bill} \end{bmatrix}$$

Indices and assignment function

(6) John$_1$ likes Bill$_2$. He$_1$ introduced his teacher to him$_2$.

$$\begin{bmatrix} 1 & \rightarrow & \text{John} \\ 2 & \rightarrow & \text{Bill} \end{bmatrix}$$

he$_1$= 

him$_2$ = 

A new TN2

If $\boldsymbol{\alpha}$ is an index $\mathbf{i}$ then for any assignment a such that $\mathbf{i}$ is in the domain of a, $[\![\mathbf{i}]\!]^a = a(\mathbf{i})$.

$[[1]]^{\begin{bmatrix} 1 & \rightarrow & \text{John} \\ 2 & \rightarrow & \text{Bill} \end{bmatrix}} = \begin{bmatrix} 1 & \rightarrow & \text{John} \\ 2 & \rightarrow & \text{Bill} \end{bmatrix}(1) = \text{John}$

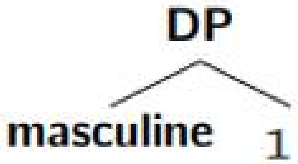
$[[2]]^{\begin{bmatrix} 1 & \rightarrow & \text{John} \\ 2 & \rightarrow & \text{Bill} \end{bmatrix}} = \begin{bmatrix} 1 & \rightarrow & \text{John} \\ 2 & \rightarrow & \text{Bill} \end{bmatrix}(2) = \text{Bill}$

$[[3]]^{\begin{bmatrix} 1 & \rightarrow & \text{John} \\ 2 & \rightarrow & \text{Bill} \end{bmatrix}} = \text{undefined}$

Interpretation of pronouns with assignment functions

(6) John_1 likes Bill_2. He_1 introduced his teacher to him_2.

$[[\text{DP}]]^{\begin{bmatrix} 1 & \to & \text{John} \\ 2 & \to & \text{Bill} \end{bmatrix}}$ $[[\text{masculine}]]^{\begin{bmatrix} 1 & \to & \text{John} \\ 2 & \to & \text{Bill} \end{bmatrix}}$ $([[1]])^{\begin{bmatrix} 1 & \to & \text{John} \\ 2 & \to & \text{Bill} \end{bmatrix}}$ (FA)



$= [[\text{masculine}]]\ ([[1]])^{\begin{bmatrix} 1 & \to & \text{John} \\ 2 & \to & \text{Bill} \end{bmatrix}}$ (AID)

$= [[\text{masculine}]]\ \begin{bmatrix} 1 & \to & \text{John} \\ 2 & \to & \text{Bill} \end{bmatrix}(1)$ (TN2)

$= [[\text{masculine}]]\ (\text{John})$

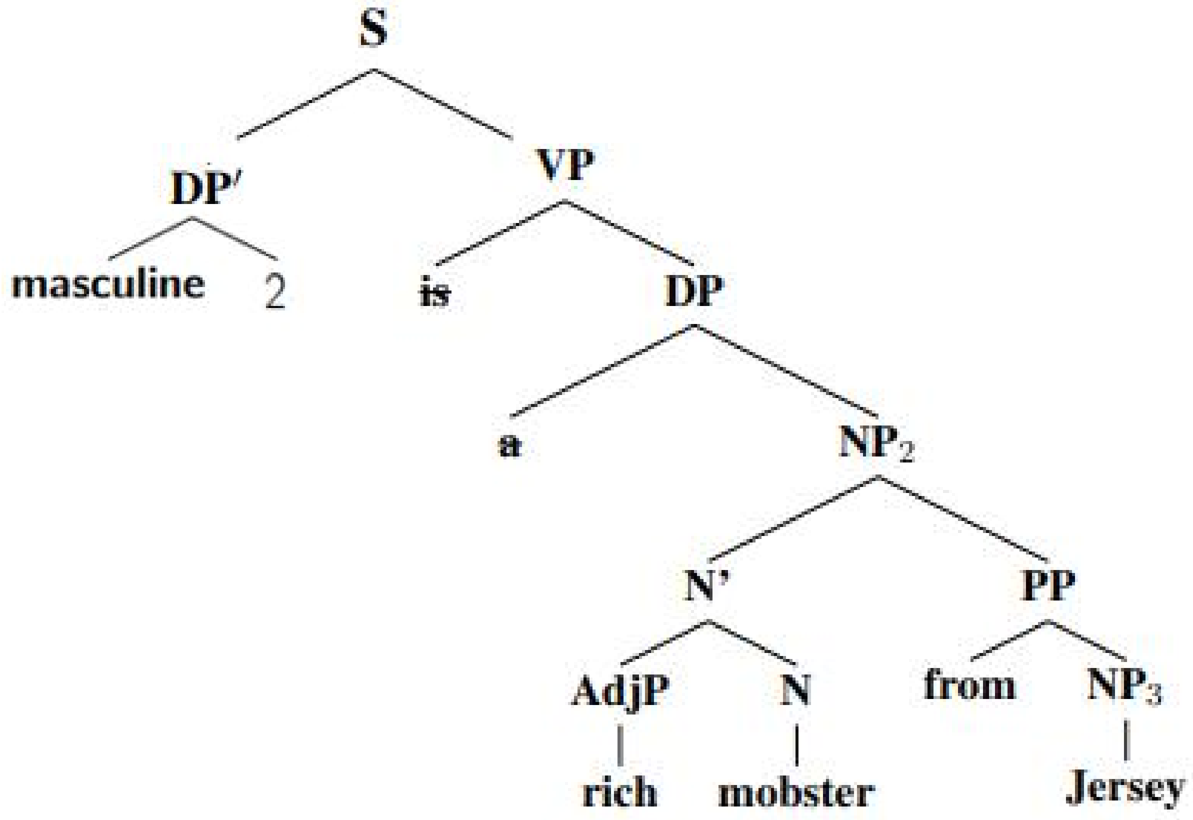
$= [x : x \in D_e \text{ and } x \text{ is male. } x](\text{John})$ (TN1)

= John

defined only if John is male

Exercise 16: To assume an appropriate assignment function

(7) He is a poor mobster from Jersey.



Solutions: Exercise 16

Appropriate assignment function: As long as we can map 2 to a male individual.

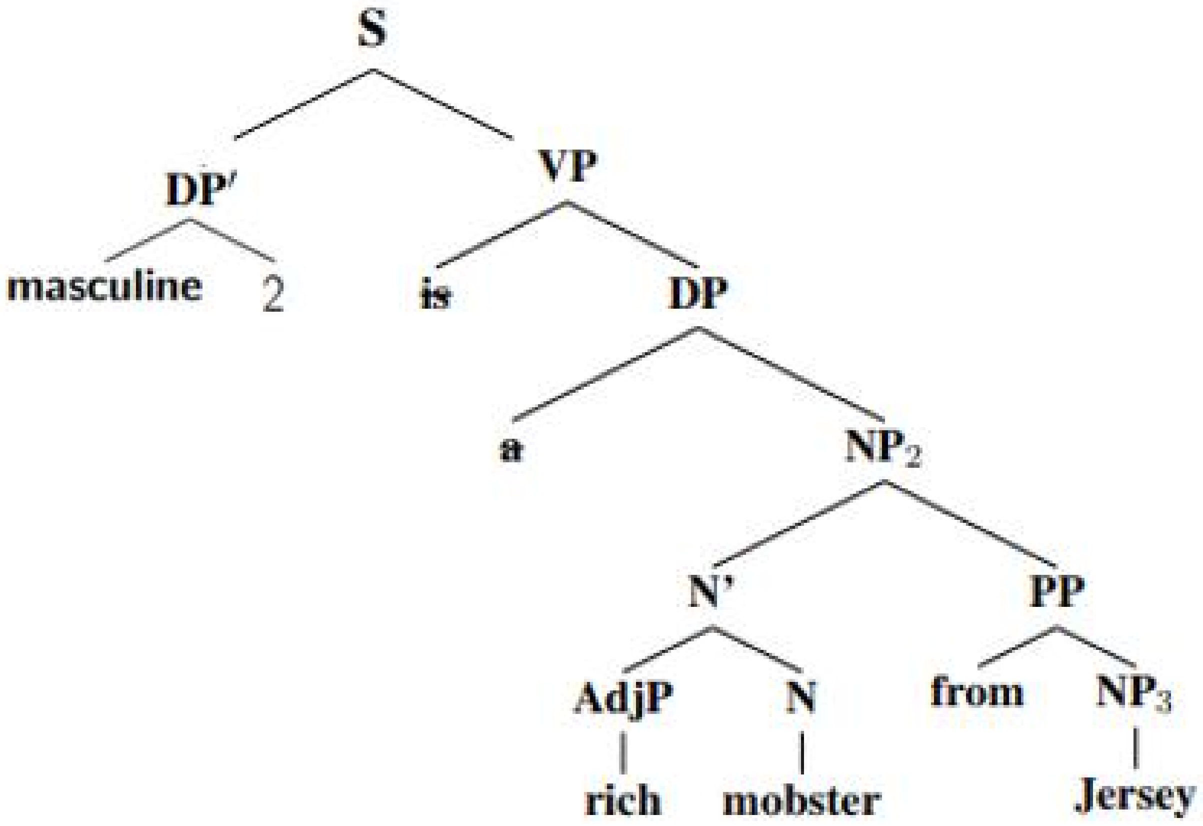
$$\begin{bmatrix} 1 & \rightarrow & \text{John} \\ 2 & \rightarrow & \text{Bill} \end{bmatrix} \quad \begin{bmatrix} 1 & \rightarrow & \text{John} \\ 2 & \rightarrow & \text{John} \end{bmatrix} \quad \begin{bmatrix} 2 & \rightarrow & \text{John} \\ 5 & \rightarrow & \text{Mary} \end{bmatrix}$$

Undefined:

$$\begin{bmatrix} 1 & \rightarrow & \text{John} \\ 5 & \rightarrow & \text{Mary} \\ 9 & \rightarrow & \text{Ann} \end{bmatrix} \quad \begin{bmatrix} 1 & \rightarrow & \text{John} \\ 2 & \rightarrow & \text{Mary} \\ 3 & \rightarrow & \text{John} \end{bmatrix}$$

Exercise 17: Compute the truth-conditions and definedness

$$\begin{bmatrix} 1 & \rightarrow & \text{John} \\ 2 & \rightarrow & \text{Bill} \end{bmatrix}$$



Solutions: Exercise 17

I won't repeat the computation of VP here. See assignment 5 for details.

$$[[S]]^{\begin{bmatrix} 1 & \rightarrow & \text{John} \\ 2 & \rightarrow & \text{Bill} \end{bmatrix}} = [[VP]]^{\begin{bmatrix} 1 & \rightarrow & \text{John} \\ 2 & \rightarrow & \text{Bill} \end{bmatrix}} \; [[DP']])^{\begin{bmatrix} 1 & \rightarrow & \text{John} \\ 2 & \rightarrow & \text{Bill} \end{bmatrix}} \qquad \text{(FA)}$$

$$[[VP]]^{\begin{bmatrix} 1 & \rightarrow & \text{John} \\ 2 & \rightarrow & \text{Bill} \end{bmatrix}} = [[VP]] = \lambda x \in D_e \,.\, x \text{ is rich and } x \text{ is a mobster and } x \text{ is from Jersey} \qquad \text{(4x AID)}$$

$$[[DP']]^{\begin{bmatrix} 1 & \rightarrow & \text{John} \\ 2 & \rightarrow & \text{Bill} \end{bmatrix}} \; [[masculine]]^{\begin{bmatrix} 1 & \rightarrow & \text{John} \\ 2 & \rightarrow & \text{Bill} \end{bmatrix}} \; ([[2]])^{\begin{bmatrix} 1 & \rightarrow & \text{John} \\ 2 & \rightarrow & \text{Bill} \end{bmatrix}} \qquad \text{(FA)}$$

$$= [[masculine]] \; ([[2]])^{\begin{bmatrix} 1 & \rightarrow & \text{John} \\ 2 & \rightarrow & \text{Bill} \end{bmatrix}} \qquad \text{(AID)}$$

$$= [[masculine]]^{\begin{bmatrix} 1 & \rightarrow & \text{John} \\ 2 & \rightarrow & \text{Bill} \end{bmatrix}} \; (2) \qquad \text{(TN2)}$$

$$= [[masculine]] \, (\text{Bill})$$

$$= [x : x \in D_e \text{ and } x \text{ is male. } x](\text{Bill}) \qquad \text{(TN1)}$$

$$= \text{Bill}$$

defined only if Bill is male

Solutions

[[S]]= [[VP]] ([[DP']])

= $[\lambda x \in D_e$. x is rich and x is a mobster and x is from Jersey] (Bill)

defined only if Bill is male ([[VP]], [[DP']])

= 1 iff Bill is rich and Bill is a mobster and Billis from Jersey

defined only if Bill is male

Check list

- Do you understand the rules?

  FA, PM, TN1,**TN2**, NN, **AID**

- Do you know how do the derivation using these rules?

  Truth-conditions/ definedness (*the*)

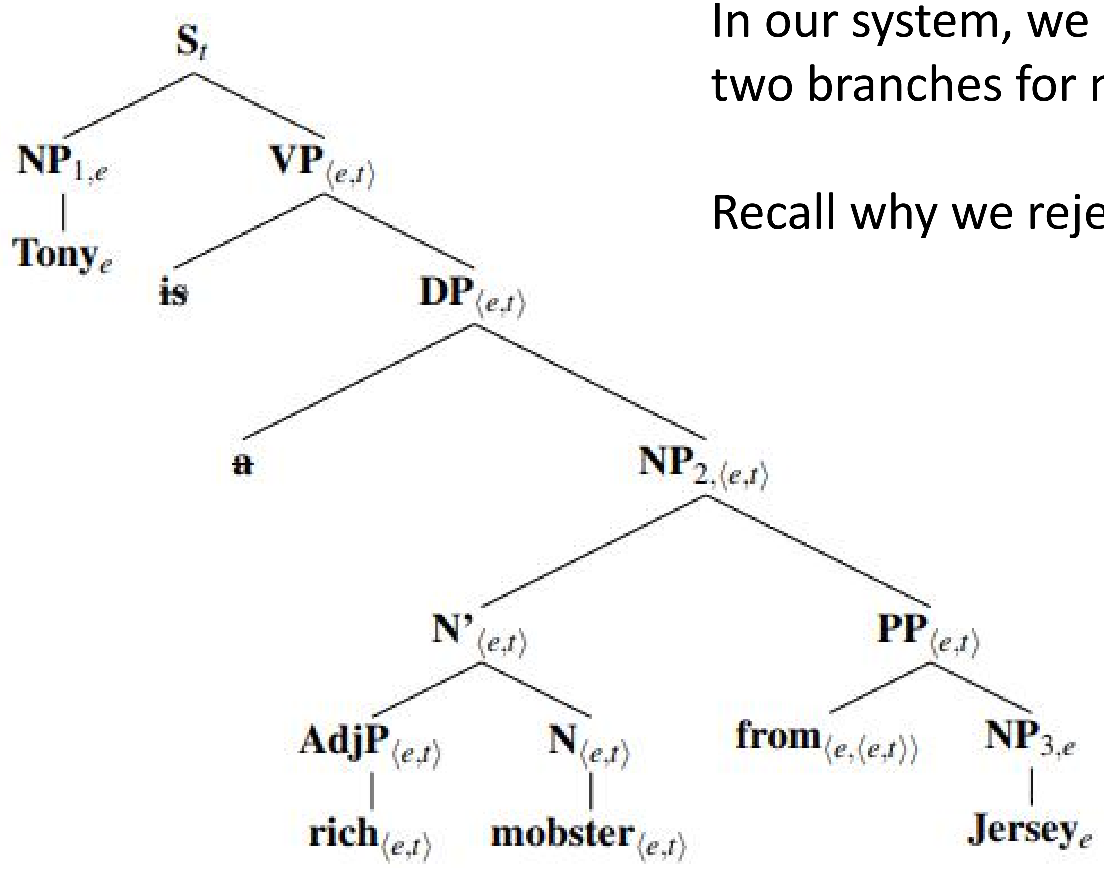
- Do you understand how the operatros work?

  [[not]] [[or]] [[and]]

- Do you know how to handle **adjustments to our system**? (Like in assignment 1, 3 and 4...).

  Different rules, lexical entries, syntactic structure...

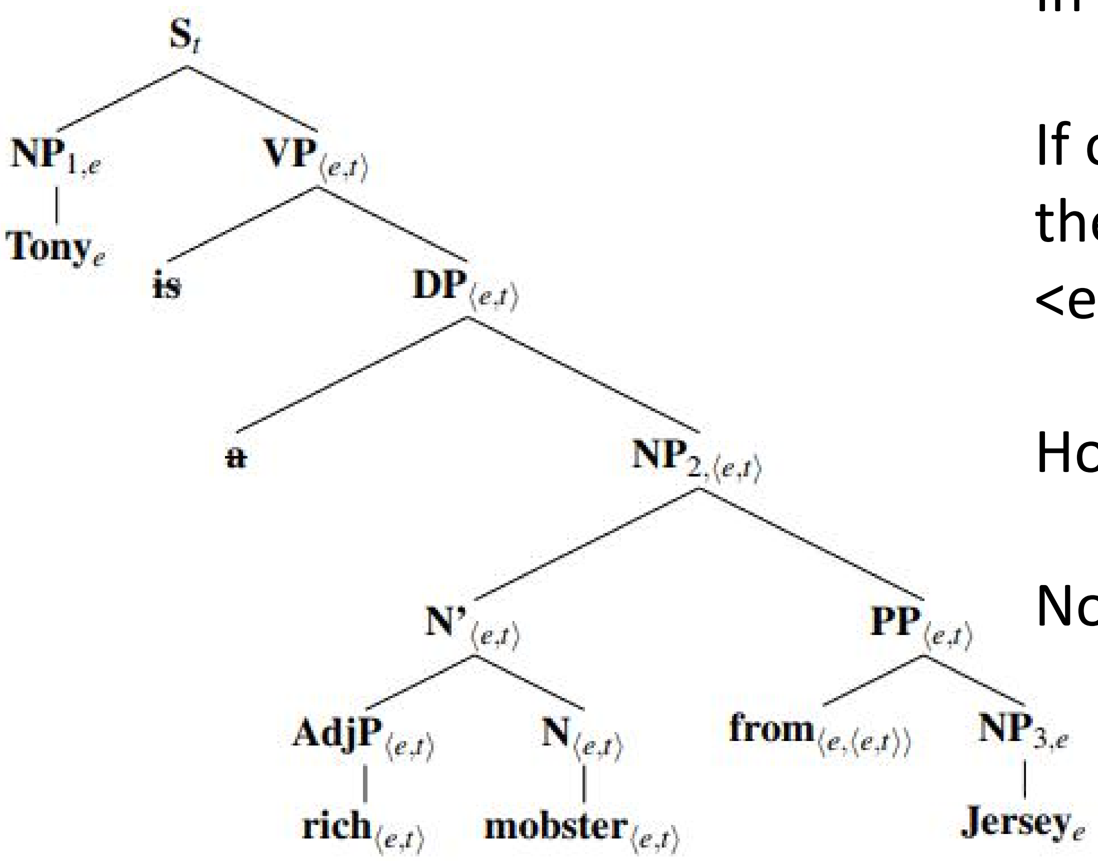
Adjustments: An example



In our system, we use the rule PM to combine two branches for modification.

Recall why we rejected FA.

Adjustments: An example to think about



In fact, it is not impossible to use FA here.

If one charFunction can be seen as an argument, the other one should be the function from <e,t> to <e,t>.

How could we realize modification in this way?

Note: PM is equivalent to generalized conjunction.

Good luck with the exam!