Introduction to Formal Semantics

Tutorial Lecture 1: Meaning and Form

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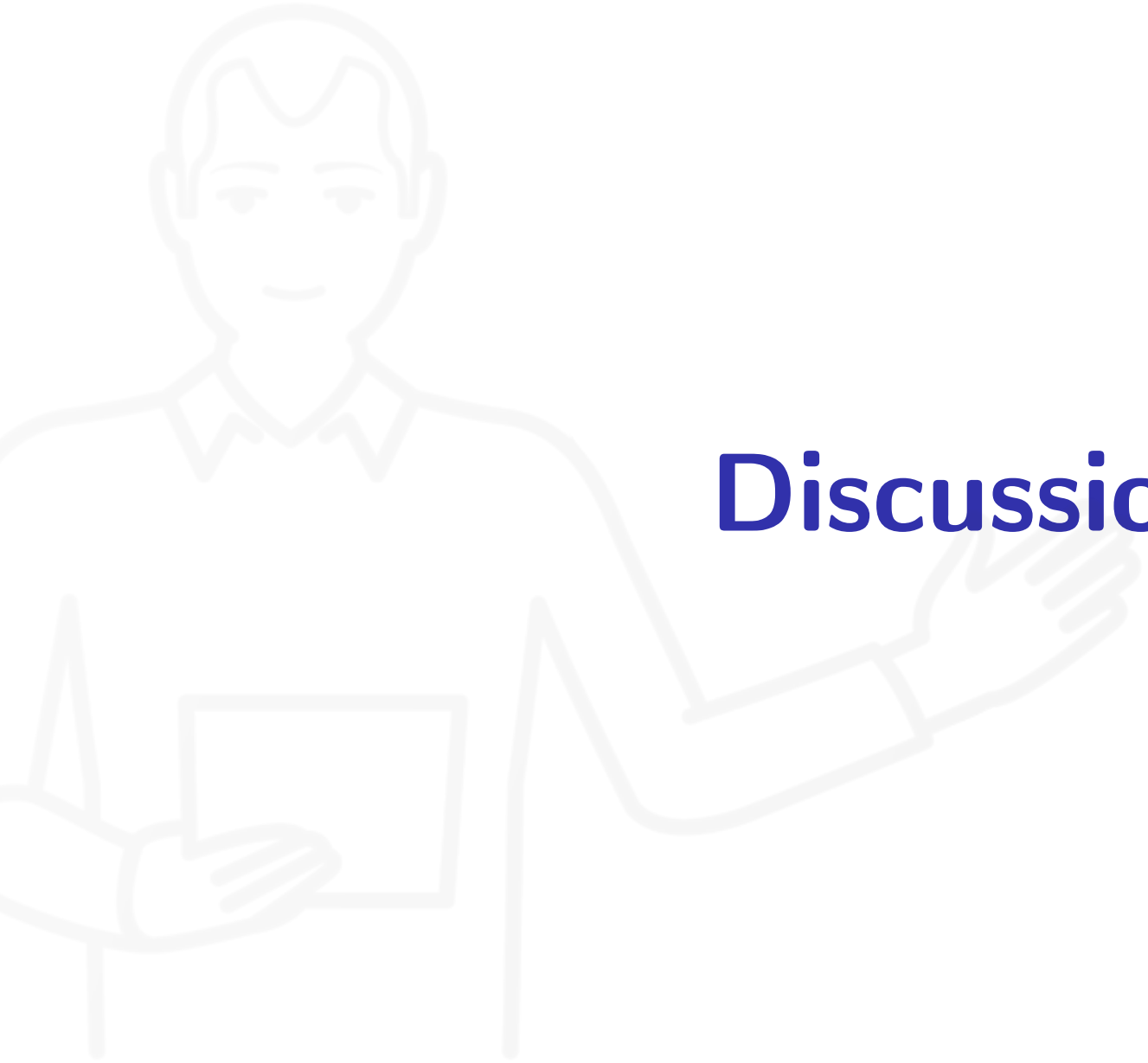
Tutorial Overview

- **Meaning Representation**
  Exercise 2
- **Reasoning, Entailments**
  Exercises 3,4
- **Models and Truth Conditions**
  Exercise 5
- **(Direct) Compositionality**
  Exercise 6

Reading:

- Winter, Y. (2016). Elements of formal semantics: An introduction to the mathematical theory of meaning in natural language. Edinburgh University Press. (Ch. 1)
- Coppock, E., and Champollion, L. (2021). Invitation to formal semantics. Manuscript, Boston University and New York University (Ch.1)



Discussion

Discussion

- Did you have any difficulties understanding **the main concepts**?
- Were the **exercises** difficult?
- Is there something in particular you would like to **review**?

Exercises

Exercise 2

Translating NL sentences into Predicate Logic sentences

(1) Brian runs.

$R(b)$

(2) Brian runs home.

$R(b,h)$

(3) Peter and Louis bought donuts.

$B(p,d) \wedge B(l,d)$

(4) Mark gave Sandy the tickets.

$G(m,s,t)$

(5) Saarbrücken welcomes every student.

$\forall x(Sx \rightarrow W(s,x))$

Exercise 2

Translating NL sentences into Predicate Logic sentences

(6) Someone stabbed Caeser.

$\exists x(S(x,c))$

(7) Prince Harry and Meghan love each other.

$L(h,m) \wedge L(m,h)$

(8) London is the capital of England.

$l = c(e)$

(9) There's no King without a crown.

$\neg\exists x\exists y(Kx \wedge Cy \wedge \neg H(x,y))$

$\forall x(Kx \rightarrow \exists y(Cy \wedge H(x,y)))$

(10) Every sailor loves a mermaid.

$\forall x(Sx \rightarrow \exists y(My \wedge L(x,y)))$ (wide scope)

$\exists x(Mx \wedge \forall y(Sy \rightarrow L(y,x)))$ (narrow scope)

Exercise 3

Entailments

(1a) Susan's watch is navy blue ⊭ (1b) Susan's watch is blue. ✗

(1a) ⊨ (1b) ✓

(2a) Tom Hardy is an actor and a father ⊨ (2b) Tom hardy is a good actor. ✗

(2a) ⊭ (2b) Tom hardy is a **good** actor.

(2a) ⊨ (2b) Tom Hardy is an actor. ✓

(2a) ⊨ (2c) Tom Hardy is a father. ✓

(3a) Sue wears lipstick and kissed John. ⊨ (3b) The lipstick on John is Sue's. ✗

(3a) ⊭ (3b) The lipstick on John was Sue's.

e.g. Sue might have worn the lipstick after kissing John!

(3a) ⊨ (3b) Sue kissed John. ✓

(3a) ⊨ (3c) Sue wears lipstick. ✓

Exercise 4

Entailments and Reasoning

(4) [1] Some linguists are well educated.
[2] Bart is a linguist.
[3] Bart is well educated.

$(4) = [1] \wedge [2] \not\Rightarrow [3]$ ✗

(5) [1] All donkeys eat carrots.
[2] Some donkeys are white.
[3] All white donkeys eat carrots.

$(5) = [1] \wedge [2] \Rightarrow [3]$ ✓

Exercise 5

Models and truth-conditions

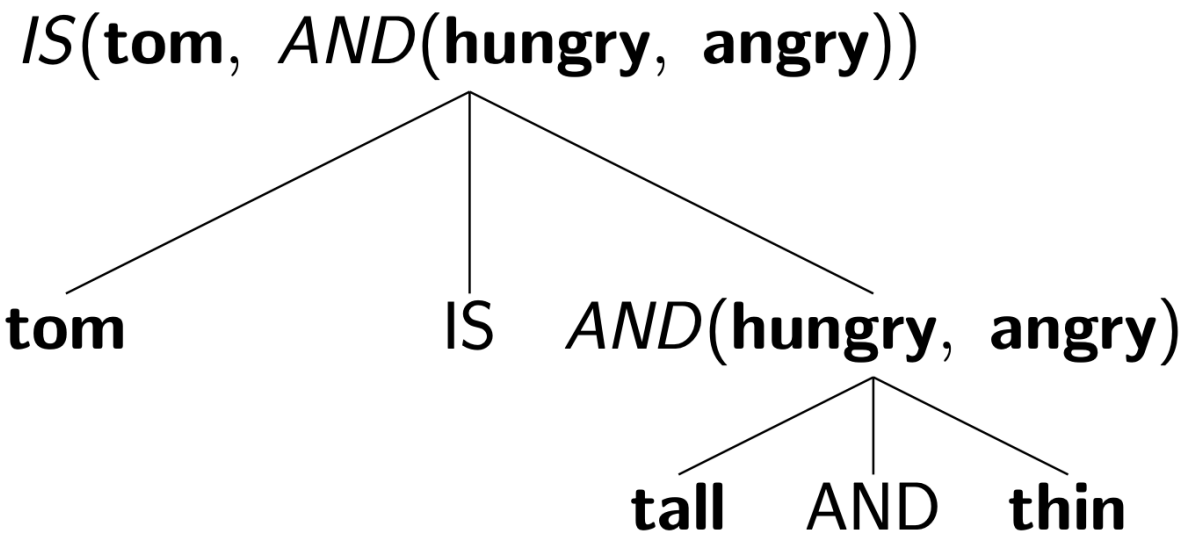
(1) Tom plays soccer.
(2) Ann plays volleyball.
(3) Susan and Mark play soccer.
(4) Susan is healthy.
(5) Ann and Tom are friends.

$[[Tom]]^{M1} = a$;
$[[Ann]]^{M1} = b$;
$[[Susan]]^{M1} = c$;
$[[Mark]]^{M1} = d$;

$[[play\_soccer]]^{M1} = \{a,c,d\}$
$[[play\_volleyball]]^{M1} = \{b\}$
$[[healthy]]^{M1} = \{c\}$
$*[[are\_friends]]^{M1} = \{\langle a,b\rangle,\langle b,a\rangle\}$
$**[[friend]]^{M1} = \{a,b\}$

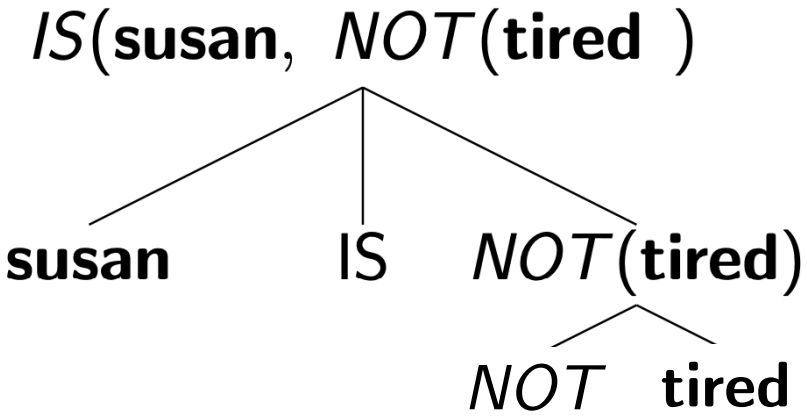
Exercise 6

(1) M_1:



Exercise 6

(2) M_2:



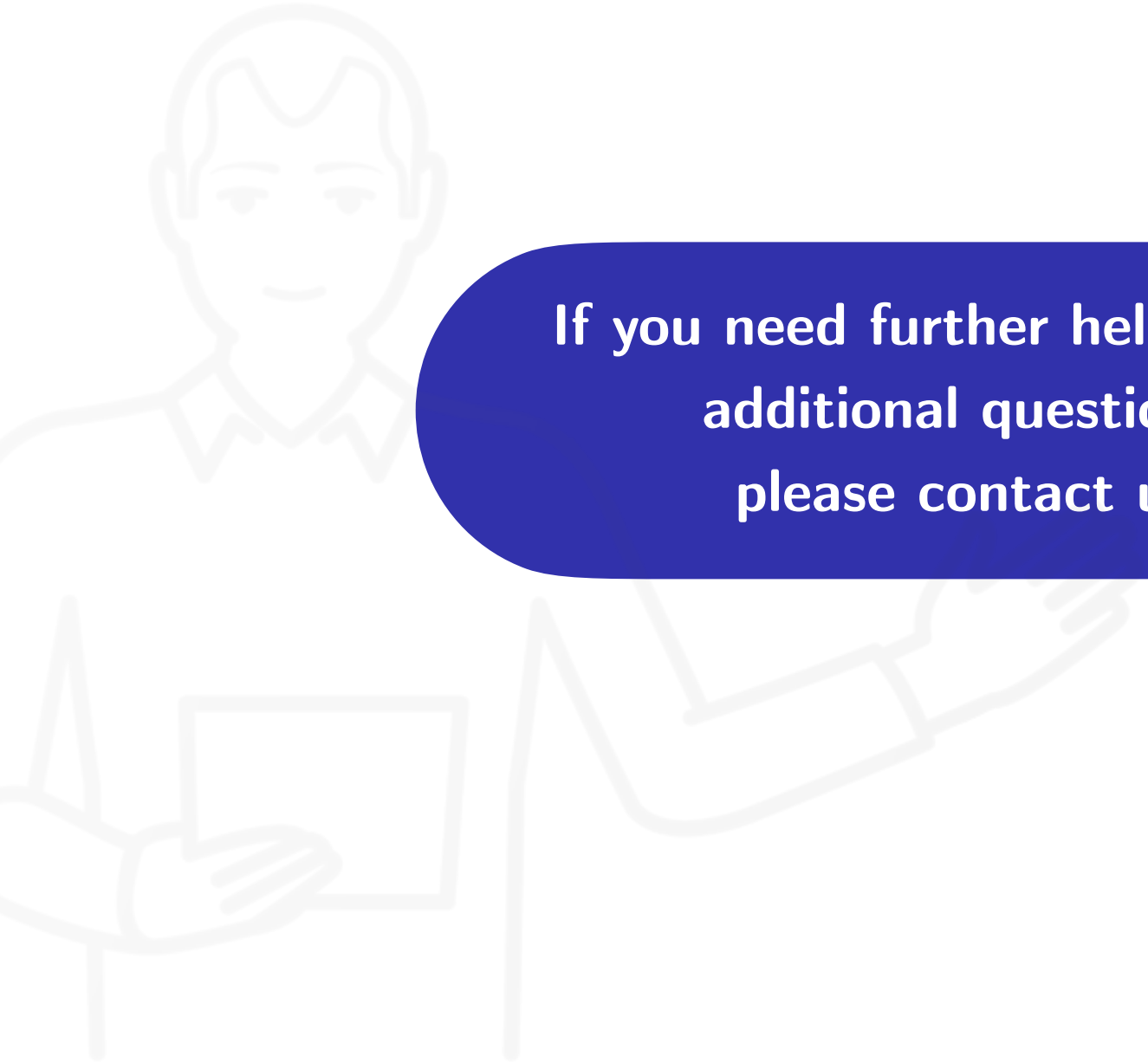
Exercise 6

Table 1

Expression	**Cat.**	**Type**	**Abstract denotation**	**Denotation for all Model** $E = \{a,b\}$	
				M_1	M_2
Tom	PN	entity	**tom**	a	
Susan	PN	entity	**susan**	-	b
hungry	A	set of entities	**hungry**	{a}	-
angry	A	set of entities	**angry**	{a}	-
hungry and angry	AP	set of entities	AND(**hungry**,**angry**)	{a}	-
tired	A	set of entities	**tired**	-	{}
Tom is hungry and angry	S	truth-value	IS(**tom**, AND(**hungry**,**angry**))	1	0
Susan is not tired	S	truth-value	IS(**susan**, NOT(**tired**))	0	1

Conclusion

Conclusion



If you need further help or have additional questions, please contact us.