

25 Feb 2025 - Language and Logic - Week 03

## Some background concepts - Propositions

→ Sentence meanings in natural languages are termed propositions

→ "Rough" translations

$\neg P$

$P \wedge Q$

$P \vee Q$

$P \rightarrow Q$

## On the nature and form of conjunction

He took off his trousers and he got into bed  
P Q

Implicature: He took off his trousers and then he got into bed.  
order

Logical issue: commutativity  $P \wedge Q = Q \wedge P$   
but meaning appears different.

Human language seems to be non-commutative.

$$P \wedge Q \neq Q \wedge P$$

He inserted the key and the engine started.

What to do with the truth table?

- Both  $P$  and  $Q$  have to be true at once for entire statement to be true.

Introducing Order

$P$	then	$Q$	$P \wedge Q$
T		T	T
F		T	F
T		F	F
F		F	F

It's always the same thing at parties ...

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$P$  and then  $Q \neq Q$  and then  $P$

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Some more complications

Conjunction is applied to propositions not phrases

The sauce and the cheese are fresh  $\rightarrow$

The sauce is fresh and the cheese is fresh. }  $\rightarrow$  Conjunction can be applied only here

The sauce and the cheese are a perfect marriage of two rivals.

→ Quantifiers do not preserve the structure of  
of preposition  
Names do.

$Q(A)(B) = 1$   
iff  
 $A \wedge B$

$[NP] \wedge [NP] \not\rightarrow P \wedge Q$

$[VP] \wedge [VP] \not\rightarrow P \wedge Q$

$[AP] \wedge [AP] \not\rightarrow P \wedge Q$

xP

xP

still collapses

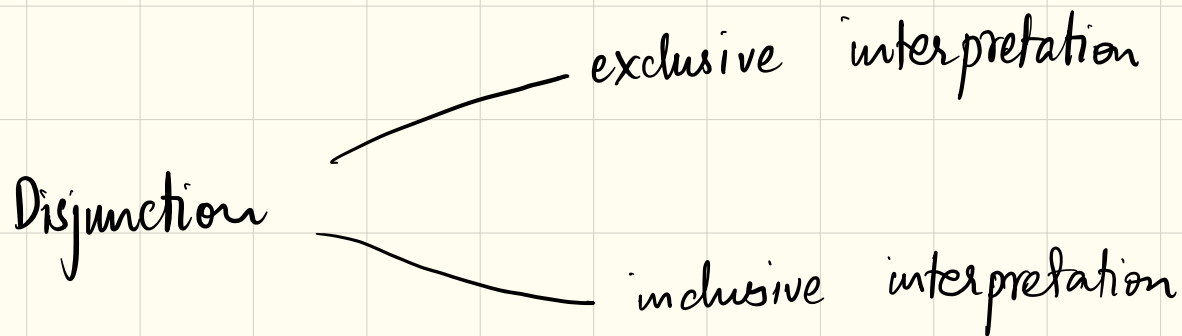
The probability being both inside and outside the class is 0.  
preposition phrase

Can we accommodate all these conditions?

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\* Disjunction — 'or'

Implicature



No one ate (either) rice or salad → Negation makes it inclusive

If you drink or smoke here, I'll kick you out → Conditional ⇒ likely inclusive

Exclusive interpretations

Sanjay left or he didn't

Maya is left-handed or she's right-handed } → Usually,  
Implicature  
is strong

Using 'either' in sentences → exclusive interpretation  
is forced.

← Can be enforced by linguistic devices (either, or)  
or by real-world knowledge.

You have more devices for the inclusive interpretation

Exclusive interpretations arise, especially when two situations cannot hold at once.

A Quandy provides the evidence

How to derive exclusive implicature?

$$(i) \quad P \vee Q$$

$$(ii) \quad \neg(P \wedge Q) \quad \text{as implicature of (i)}$$

$$(iii) \quad P \bar{\vee} Q \quad \text{entailed by (i) and (ii)}$$

$$\therefore (P \vee Q) \wedge \neg(P \wedge Q) \quad \text{has the same truth table} \\ \text{as } P \bar{\vee} Q$$



Order

or  $\equiv$  or else