Lifting conditionals to inquisitive propositions

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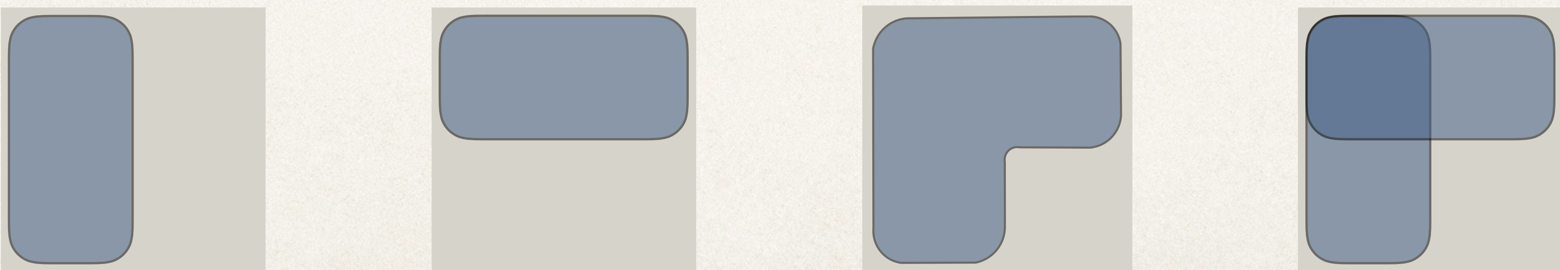
Introduction

- Traditionally, sentence meaning is equated with truth-conditions.
- **Inquisitive semantics** takes a different starting point: meaning is given by support conditions w.r.t. information states.
- This move has two repercussions:
  1. a uniform semantic framework for statements and questions;
  2. a more fine-grained view of the semantics of operators.



A | B | classical disjunction | inquisitive disjunction

Introduction

In the truth-conditional setting, **many accounts of conditionals**, both indicative and counterfactual, have been developed:

- strict (e.g., Warmbrōd 81)
- variably strict (e.g., Stalnaker 68, Lewis 73)
- premise semantics (e.g., Kratzer 81)
- causal accounts (e.g., Pearl 00, Schulz 11, Kaufmann 13)

Introduction

- In this talk, we will see how any such account can be **lifted to the setting of inquisitive semantics**.

- The lifting comes with three benefits:

A. better predictions for **disjunctive antecedents**;
If Alice or Bea invites Charlie, he will go.

B. allows us to interpret **unconditionals**;
Whether Alice invites him or not, Charlie will go.

C. allows us to interpret **conditional questions.**
If Alice invites Charlie, will he go?

Disjunctive antecedents

1. *If Alice or Bea invites Charlie, he will go.*

   Simplification of disjunctive antecedents

2. *If Alice invites Charlie, he will go.*

   Antecedent strengthening

3. *If Alice invites Charlie and then cancels, he will go.*

$$\frac{\text{If A or B then C}}{\text{If A then C}} \quad \text{(SDA)} \quad ✓ \qquad\qquad \frac{\text{If A then C}}{\text{If A and B then C}} \quad \text{(AS)} \quad ✗$$

Problem: given a truth-conditional semantics and classical treatment of connectives, (SDA) and (AS) are inter-derivable. (Ellis et. al., 1977)

Disjunctive antecedents

Proposal: (Alonso-Ovalle 09)

- Adopt a special, non-classical treatment of disjunction: disjunction forms sets of propositions.
- **Disjunctive antecedents provide multiple assumptions**: the consequent must follow on each of them.
- Our lifting incorporates this fundamental idea, but:
  - implements it differently: disjunction is not special;
  - generalizes it to arbitrary base account of conditionals;
  - derives it as a special case of a more general account of the interaction between conditionals and inquisitiveness.

Unconditionals

Whether there is music or not
Whether they play jazz or tango } *the party will be fun.*
Whatever music they play

Unconditionals are tightly related to conditionals.
E.g., the first sentence above can be paraphrased as:

The party will be fun if there is music, and also if there is no music.

Unconditionals

Proposal: (Rawlins 08)

- Unconditionals are a kind of conditional construction.
- The "antecedent" is an interrogative.
  Its semantic value is a set of propositions.
- Each proposition provides a restrictor to the main clause.
  The "consequent" must be true on each of these restrictions.
- Same fundamental idea as in Alonso-Ovalle 09:
  antecedents can provide multiple assumptions.
- We generalize this to arbitrary accounts of conditionals, and view it as a special case of conditionals interacting with inquisitiveness.

Conditional questions

While the literature on conditionals has focused on statements,
the class of conditional sentences includes also **conditional questions:**

If Alice invites Charlie, will he go?
If Alice had invited Charlie, would he have gone?

A truth-conditional account cannot be fed an interrogative consequent.

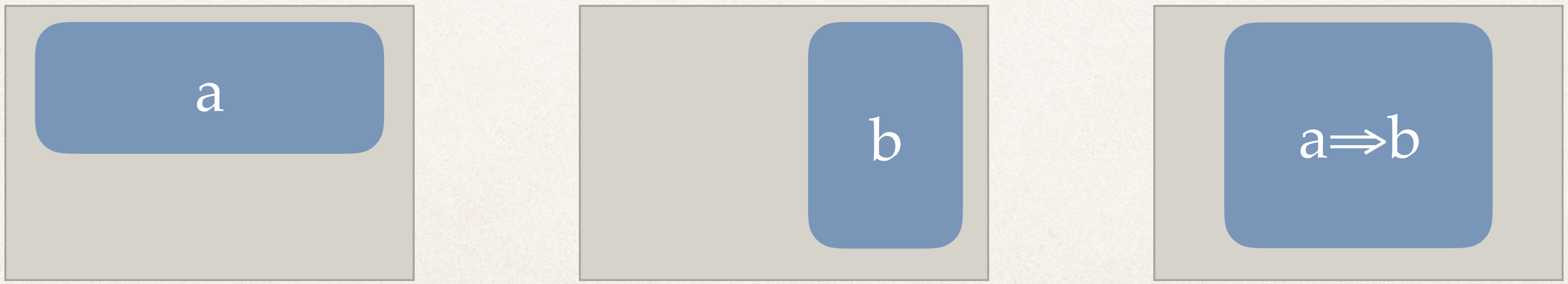
By contrast, the lifted account interprets in a uniform way both conditional statements and conditional questions.

The propositional system IPL$^{>}$

Language: φ ::= p | $\varphi \wedge \varphi$ | $\varphi \vee \varphi$ | $\neg\varphi$ | $\varphi > \varphi$

Models: M = (W,V,⇒), where

- W is a set of possible worlds;
- V is a valuation function for atoms;
- ⇒ is a binary operation on propositions — our base account.



Propositional system $\mathrm{IPL}^{>}$

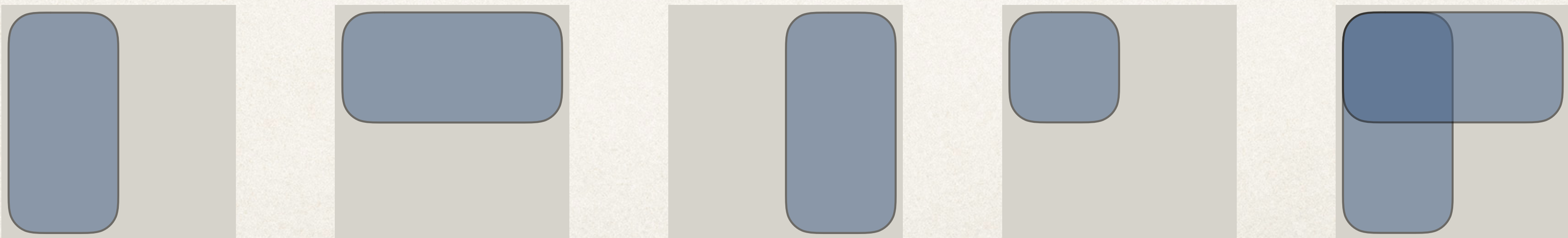
Semantics in given in terms of **support at an information state**, where an information state is a set of possible worlds.

- $s \vDash p \iff V(p,w)=1$ for all $w \in s$
- $s \vDash \varphi \wedge \psi \iff s \vDash \varphi$ and $s \vDash \psi$
- $s \vDash \varphi \vee \psi \iff s \vDash \varphi$ or $s \vDash \psi$
- $s \vDash \neg\varphi \iff s \cap t = \varnothing$ for any $t \vDash \varphi$

The maximal states supporting φ are called the **alternatives** for φ.

The set of alternatives for φ is denoted is denoted **Alt(**φ**)**.

φ is **true** at w if $w \in \bigcup \mathrm{Alt}(\varphi)$. The **truth-set** of φ is $|\varphi| := \bigcup \mathrm{Alt}(\varphi)$.

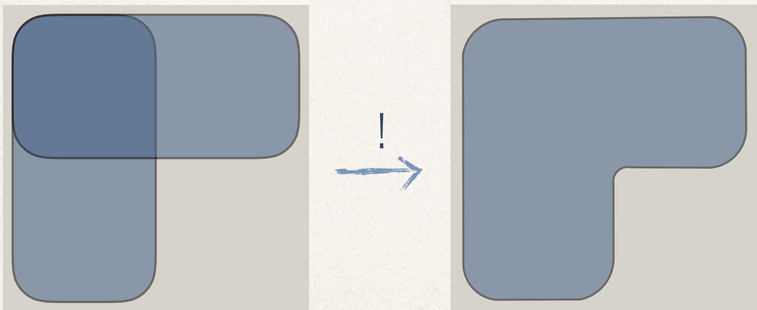


p $\quad$ q $\quad$ $\neg p$ $\quad$ $p \wedge q$ $\quad$ $p \vee q$

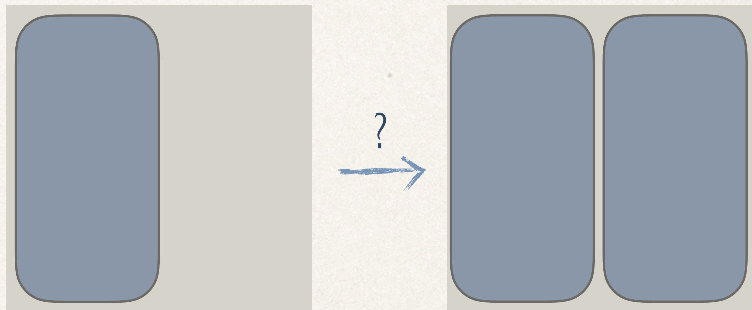
Propositional system IPL$^{>}$

We will also make use of two defined operators.

- $!\varphi := \neg\neg\varphi$
- $?\varphi := \varphi \vee \neg\varphi$



pvq !(pvq)



p ?p

Propositional system $\mathrm{IPL}^{>}$

Finally, the **conditional operator** is interpreted by the following clause:

- $s \models \varphi > \psi \iff \forall a \in \mathrm{ALT}(\varphi)\ \ \exists b \in \mathrm{ALT}(\psi)$ such that $s \subseteq a \Rightarrow b$

Translating sentences to $IPL^{>}$

Translation sketch: (to be refined later)

- basic clauses $\rightsquigarrow$ p, q, r
- if-conditionals $\rightsquigarrow$ $>$
- unconditionals $\rightsquigarrow$ $>$
- not, and, or $\rightsquigarrow$ $\neg$, $\wedge$, $\vee$
- polar interrogatives $\rightsquigarrow$?
- declarative main clauses $\rightsquigarrow$!
  [omitted whenever vacuous]

NB: this is a rough simplification of an inquisitive Montague grammar.
(For more on this, see Theiler 14, Ciardelli & Roelofsen 15)

Examples:

- If P then Q $\rightsquigarrow$ $p > q$
- If P or Q then R $\rightsquigarrow$ $p \vee q > r$
- Whether or not P, Q $\rightsquigarrow$ $?p > q$
- If P, then Q? $\rightsquigarrow$ $p > ?q$

Predictions 1: basic conditional statements

(1) *If Alice invites Charlie, he will go.* $\rightsquigarrow$ $p{>}q$

$\mathrm{Alt}(p) = \{|p|\}$ $\quad$ $\mathrm{Alt}(q) = \{|q|\}$

$$s \models p{>}q \iff s \subseteq |p| \Rightarrow |q|$$

$$\mathrm{Alt}(p{>}q) = \{\, |p| \Rightarrow |q| \,\}$$

Basic conditionals are interpreted just as in the base account.
This extends to all conditionals which involve no inquisitiveness.

Predictions 2: disjunctive antecedents

(2) *If Alice or Bea invites Charlie, he will go.* $\rightsquigarrow$ $p \vee q > r$

$\mathrm{Alt}(p \vee q) = \{|p|, |q|\}$ $\qquad$ $\mathrm{Alt}(r) = \{|r|\}$

$$s \vDash p \vee q > r \iff s \subseteq |p| \Rightarrow |r| \text{ and } s \subseteq |q| \Rightarrow |r|$$
$$\iff s \subseteq |(p > r) \wedge (q > r)|$$

$\mathrm{Alt}(p \vee q > r) = \{\, |(p > r) \wedge (q > r)| \,\}$

- **Disjunctive antecedents provide multiple assumptions.**
- Simplifying the antecedent of (2) is a valid inference.

Predictions 3: unconditionals

(3) *Whether Alice invites him or not, Charlie will go.* $\rightsquigarrow$ $?p > q$

$\mathrm{Alt}(?p) = \{|p|,|\neg p|\}$ $\mathrm{Alt}(q) = \{|q|\}$

$$s \models\, ?p > q \iff s \subseteq |p| \Rightarrow |q| \text{ and } s \subseteq |\neg p| \Rightarrow |q|$$
$$\iff s \subseteq |(p>q) \wedge (\neg p>q)|$$

$\mathrm{Alt}(p > ?q) = \{ |(p>q) \wedge (\neg p>q)| \}$

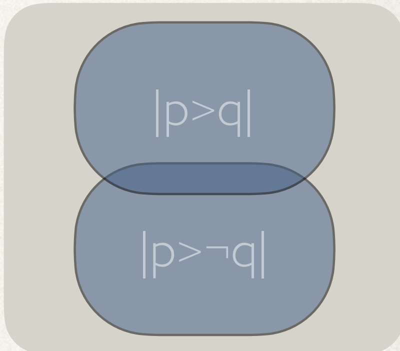
Unconditional "antecedents" provide multiple assumptions too.

Predictions 4: conditional questions

(4) *If Alice invites Charlie, will he go?* $\rightsquigarrow$ $p > ?q$

$\mathrm{Alt}(p) = \{|p|\}$ $\mathrm{Alt}(?q) = \{|q|, |\neg q|\}$

$$s \vDash p > ?q \iff s \subseteq |p| \Rightarrow |q| \text{ or } s \subseteq |p| \Rightarrow |\neg q|$$
$$\iff s \subseteq |p>q| \text{ or } s \subseteq |p>\neg q|$$



$p > ?q$

$\mathrm{Alt}(p > ?q) = \{\, |p>q| \,,\, |p>\neg q| \,\}$

Thus, (4) can be resolved by establishing either:

A. *If Alice invites Charlie, he will go.*

B. *If Alice invites Charlie, he won't go.*

Predictions: summing up

Our lifted account:

- coincides with the base account on “plain” conditionals;
- improves on it on conditionals with disjunctive antecedents;
- extends it to unconditionals and conditional questions.

Conditionals and unconditionals

(5) *If they play jazz or tango, the party will be fun.* $\rightsquigarrow$ $p \vee q > r$

(6) *Whether they play jazz or tango, the party will be fun.* $\rightsquigarrow$ $p \vee q > r$

We have accounted for the **similarity** between these sentences.

Both sentences are true in case:

- *the party will be fun if they play jazz*;
- *the party will be fun if they play tango*.

But how are these sentences **different**?

Conditionals and unconditionals

(5) *If they play jazz or tango, the party will be fun.* $\rightsquigarrow$ $p \vee q > r$

(6) *Whether they play jazz or tango, the party will be fun.* $\rightsquigarrow$ $p \vee q > r$

Idea: they differ in that (6) presupposes that they *will* play jazz or tango.
(cf. Zaefferer 91)

This can be derived from two independently motivated assumptions:

- interrogatives generally presuppose that one alternative obtains;
- conditionals inherit the presuppositions of their antecedent.

Adding presuppositions

Language: φ ::= p | $\varphi \wedge \varphi$ | $\varphi \vee \varphi$ | $\neg\varphi$ | $\varphi > \varphi$ | $\varphi_{\langle\varphi\rangle}$

With each φ we associate a set $\boldsymbol{\pi}(\varphi)$ of presuppositions:

- $\boldsymbol{\pi}(\mathrm{p}) = \varnothing$
- $\boldsymbol{\pi}(\varphi_{\langle\psi\rangle}) = \boldsymbol{\pi}(\varphi) \cup \boldsymbol{\pi}(\psi) \cup \{\psi\}$
- $\boldsymbol{\pi}(\neg\varphi) = \boldsymbol{\pi}(\varphi)$
- $\boldsymbol{\pi}(\varphi \wedge \psi) = \boldsymbol{\pi}(\varphi) \cup \{\varphi \rightarrow \chi \mid \chi \in \boldsymbol{\pi}(\psi)\}$
- $\boldsymbol{\pi}(\varphi \vee \psi) = \boldsymbol{\pi}(\varphi) \cup \{\neg\varphi \rightarrow \chi \mid \chi \in \boldsymbol{\pi}(\psi)\}$
- $\boldsymbol{\pi}(\varphi > \psi) = \boldsymbol{\pi}(\varphi) \cup \{\varphi > \chi \mid \chi \in \boldsymbol{\pi}(\psi)\}$

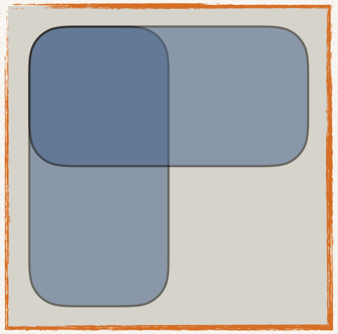
where $\varphi \rightarrow \chi$ abbreviates $\neg\varphi \vee \chi$

An information state **s admits** φ if it supports all its presuppositions. Support is then restricted to those states that admit the sentence.

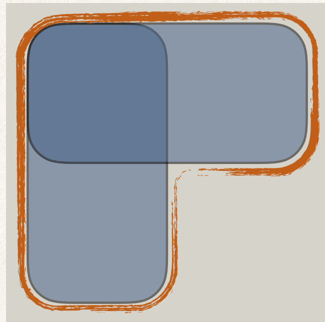
Conditionals and unconditionals

They play jazz or tango $\rightsquigarrow$ $p \vee q$

Whether they play jazz or tango $\rightsquigarrow$ $(p \vee q)_{\langle !(p \vee q) \rangle}$



$p \vee q$



$(p \vee q)_{\langle !(p \vee q) \rangle}$

(5) *If they play jazz or tango, it will be fun.* $\rightsquigarrow$ $p \vee q > r$

$\rightarrow$ no presupposition

(6) *Whether they play jazz or tango, it will be fun.* $\rightsquigarrow$ $(p \vee q)_{\langle !(p \vee q) \rangle} > r$

$\rightarrow$ presupposes $!(p \vee q)$

Conditionals and unconditionals

Our account captures the observation in Zaefferer 91:

> "Although intuitively the difference between conditionals and unconditionals seems to be striking […], it lies only in the acceptability conditions of its utterance, not in [their] truth-conditions"

Conditionals and unconditionals

Zaefferer goes on to say something interesting:

"If the antecedent of a conditional proposition exhausts the […] background […], then it is an unconditional, if not it is a regular conditional. In each case it should be encoded accordingly […]"

Conditionals and unconditionals

We can read this as postulating the following pragmatic rule:

- if the alternatives for the antecedent cover the context set, use an unconditional;
- otherwise, use a conditional.

Can we explain this requirement in terms of the semantic difference between conditionals and unconditionals?

Conditionals and unconditionals

Part II: if the alternatives don't cover the context, use a conditional.

Explanation: the corresponding unconditional has a presupposition that is not supported by the context.

Conditionals and unconditionals

Part I: if the alternatives cover the context, use an unconditional.

This can be explained in terms of **maximize presupposition**:

- conditional and unconditional forms are in competition;
- if the alternatives cover the context, the presupposition of the unconditional is satisfied;
- MP requires the speaker to use the unconditional rather than the equivalent conditional, which lacks one presupposition.

Conditionals and unconditionals

This also accounts for the oddness of (7):

(7) ??? *If there is music or not, the party will be fun.*

The alternatives for the antecedent cover the whole logical space.
So, a speaker is always required to use instead the unconditional:

(8) *Whether there is music or not, the party will be fun.*

Conclusions

- By moving beyond truth-conditional semantics we obtain a **more general view on conditional constructions**, which:
  - solves the traditional problem of disjunctive antecedents;
  - encompasses unconditionals and conditional questions.
- Observation: all these constructions involve **multiple alternatives**.
- Proposal: conditionals interact with alternatives by a **∀∃ pattern**:

  $s \vDash \varphi > \psi \iff \forall a \in ALT(\varphi)\ \exists b \in ALT(\psi)$ such that $s \subseteq a \Rightarrow b$
- Many features of the semantics of conditional expressions **depend only on this pattern**, not on the specific base account.

Thank you!

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Unconditional questions

* *Whether or not Alice invites Charlie, will he go?* $\rightsquigarrow$ $?p > ?q$

Problem: why is this ungrammatical? (see Hara, 2015)

Will Charlie go whether or not Alice invites him? $\rightsquigarrow$ $?\,(?p>q)$

$Alt(?(?p>q)) = \{\ |?p>q|\ ,\ |\neg(?p>q)|\ \}$

The unconditional question can be resolved by establishing either:

A. *Charlie will go whether or not Alice invites him.*
B. *It is not the case that Charlie will go whether or not Alice invites him.*

Conditional questions with disjunctive antecedents

If Alice or Bea invites Charlie, will he go? $\rightsquigarrow$ $p \vee q > ?r$

$\text{Alt}(p \vee q) = \{|p|, |q|\}$ $\text{Alt}(?r) = \{|r|, |\neg r|\}$

$$\text{Alt}(p \vee q > ?q) = \{\ |(p>r) \wedge (q>r)|,\quad |(p>r) \wedge (q>\neg r)|,\\ |(p>\neg r) \wedge (q>r)|,\ |(p>\neg r) \wedge (q>\neg r)|\ \}$$

Thus, (3) can be resolved by establishing either:

A. C will go if A or B invites him.
B. C will go if A invites him, but not if B invites him.
C. C will go if B invites him, but not if A invites him.
D. C won't go if A or B invites him.

Negating conditionals with disjunctive antecedents

(II) *It is not true that if A or B invites C, he will go.* $\rightsquigarrow$ $\neg(p \vee q > r)$

$$\equiv \neg((p>r) \wedge (q>r))$$

This seems correct, as (II) admits the following continuations:

He will go if Alice invites him, but not it Bea invites him.

He will go only if Alice invites him.

(But this deserves more careful assessment.)

On simplification of disjunctive antecedents

The validity of SDA has been challenged based on examples like:

i. If Spain had fought with the axis or the allies in WWII,
   it would have fought with the axis.

$$\not\Downarrow$$

ii. If Spain had fought with the allies, it would have fought with the axis.

On simplification of disjunctive antecedents

But now consider a variant of i. where disjunction is more prominent:

iii. ??? If Spain had fought with the axis, or had betrayed Hitler and joined the allies, it would have fought with the axis.

This difference is unexpected if we deny the validity of SDA.

If SDA is valid, the oddness of iii is expected.

On simplification of disjunctive antecedents

Diagnosis:
The antecedent of i. provides *one* assumption: that Spain fought with either; the logical form of this antecedent is $!(p \vee q)$

Independent evidence from questions:
- disjunctions are sometimes closed off by the ! operator;
- much easier if they are not syntactically or prosodically salient.

Did Spain fight with the axis or the allies in WWII ? $\leadsto$ $?!(p \vee q)$

polar reading possible

Did Spain fight with the axis or betray Hitler and join the allies? $\overset{?}{\leadsto}$ $?!(p \vee q)$

polar reading hard

Why are there no counterfactual unconditionals?

* *Whether Alice had invited him or not, Charlie would have gone.*

Proposal:

- A counterfactual $\varphi > \psi$ presupposes $\neg\varphi$
- An unconditional $\varphi > \psi$ presupposes $!\varphi$, where $!\varphi := \neg\neg\varphi$
- Thus, a counterfactual unconditionals would have inconsistent presuppositions.

More on conditional questions

- Things are similar for conditional alternative questions:

  If Alice invites Charlie, will he go or make an excuse? $\rightsquigarrow$ $p > q \vee r$

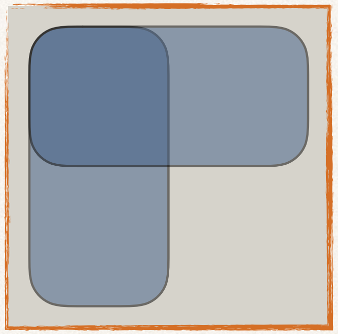
- This is not limited to the *indicative* conditional questions.
  If $\Rightarrow$ is an account of counterfactuals, then:

  If Alice had invited Charlie, would he have gone? $\rightsquigarrow$ $p > ?q$

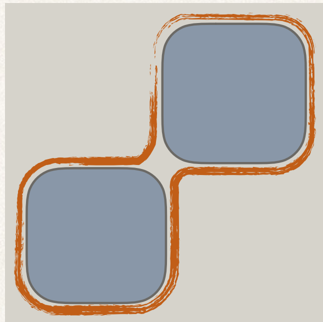
Conditionals and unconditionals

They play jazz or tango $\rightsquigarrow$ $p \vee q$

Whether they play jazz or tango $\rightsquigarrow$ $(p \vee q)_{\langle !(p \vee q)\rangle \langle \neg (p \wedge q)\rangle}$



$p \vee q$



$(p \vee q)_{\langle !(p \vee q)\rangle \langle \neg (p \wedge q)\rangle}$

If they play jazz or tango, it will be fun. $\rightsquigarrow$ $p \vee q > r$

→ no presupposition

Whether they play jazz or tango, it will be fun. $\rightsquigarrow$ $(p \vee q)_{\langle !(p \vee q)\rangle} > r$

→ presupposes $!(p \vee q)$

Conditionals and unconditionals

Part I: if the alternatives cover the context, use an unconditional.

This can be explained in terms of **maximize presupposition**:

Maximize Presupposition: suppose $\varphi \equiv_{\pi} \psi$ and $\boldsymbol{\pi}(\varphi) \subset \boldsymbol{\pi}(\psi)$.
If the context supports all $\chi \in \boldsymbol{\pi}(\psi)$, an utterance of φ is infelicitous.