Distinguishing between speaker's uncertainty and possibility

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Ignorance Inferences

Plain disjunctive sentences typically give rise to IGNORANCE inferences, suggesting that the speaker does not know which of the two disjuncts is true:

"The mystery box contains a yellow **or** a blue ball."

$\rightsquigarrow$ *the speaker doesn't know which of the two*

$A \vee B \rightsquigarrow (\Diamond_s A \wedge \neg\Box_s A) \wedge (\Diamond_s B \wedge \neg\Box_s B)$

IGNORANCE inferences consist of two components:

$\neg\Box_s A \wedge \neg\Box_s B$ UNCERTAINTY

$\Diamond_s A \wedge \Diamond_s B$ POSSIBILITY

The Traditional Approach

UNCERTAINTY as a primary implicature (Sauerland 2004, Fox 2007, a.o.):

$A \vee B$ ASSERTION

$\{(A \vee B), A, B, (A \wedge B)\}$ ALTERNATIVES

$\neg\Box_s A$, $\neg\Box_s B$, $\neg\Box_s(A \wedge B)$ PRIMARY IMPL.

POSSIBILITY arises from UNCERTAINTY and the assertion (with Quality):

$\Box_s(A \vee B) \wedge \neg\Box_s A \ \wedge \neg\Box_s B$ UNCERTAINTY

$\Rightarrow \neg\Box_s\neg A \ \wedge \neg\Box_s\neg B$

$\equiv \Diamond_s A \wedge \Diamond_s B$ POSSIBILITY

⚠ No POSSIBILITY without UNCERTAINTY

We tested this prediction in two experiments. Both had the same design and led to the same conclusion. The main difference was in control conditions. Here we focus on the second experiment.

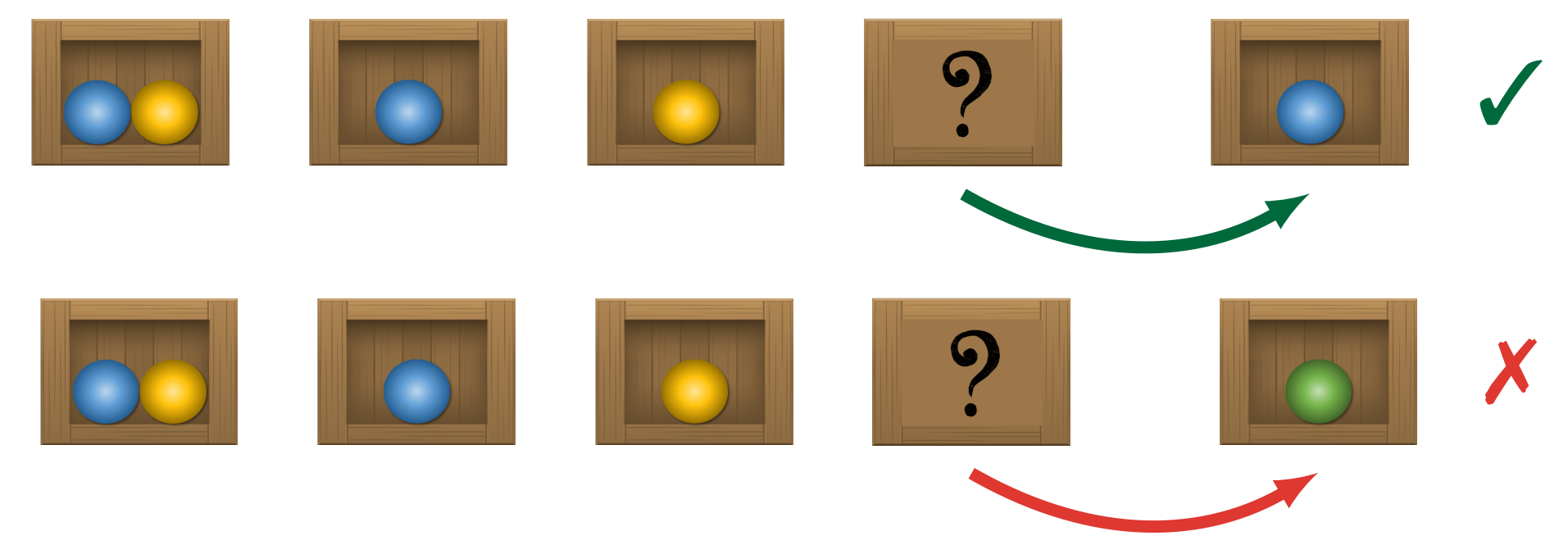
Enjoy a demo!

Participants & Design

Participants: 100 native English speakers recruited online through Prolific.

Design: Adaptation of the Mystery Box paradigm: 3 visible boxes and 1 mystery box.

The rule: The mystery box always has the same content as one of the visible boxes.

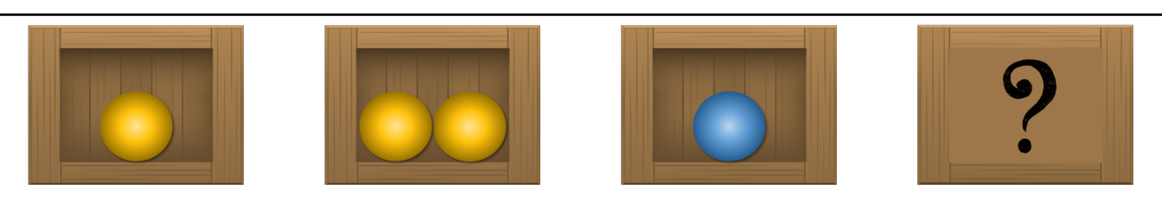
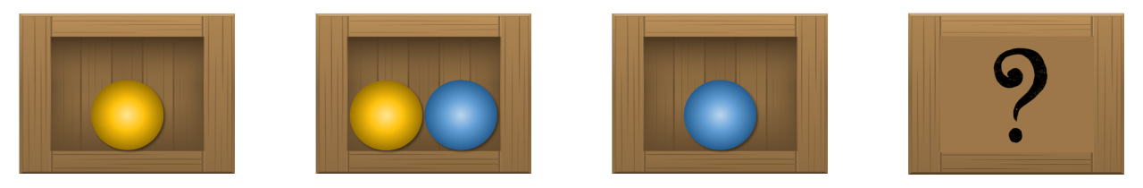
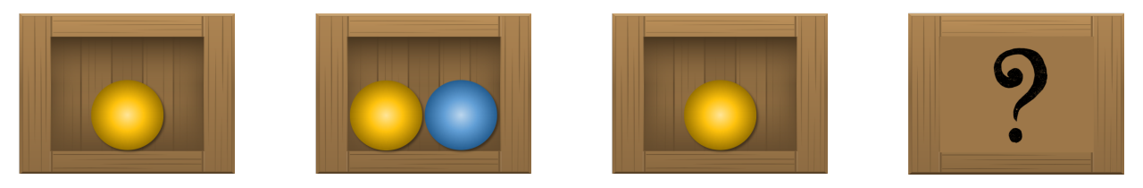
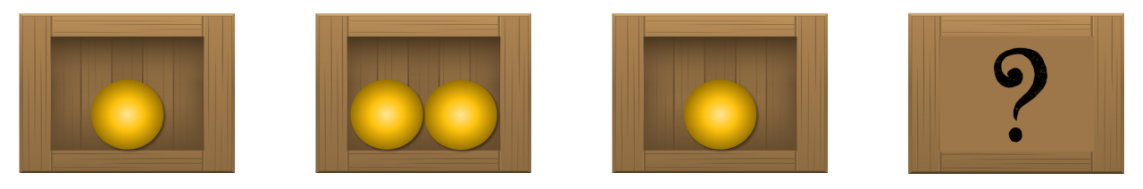
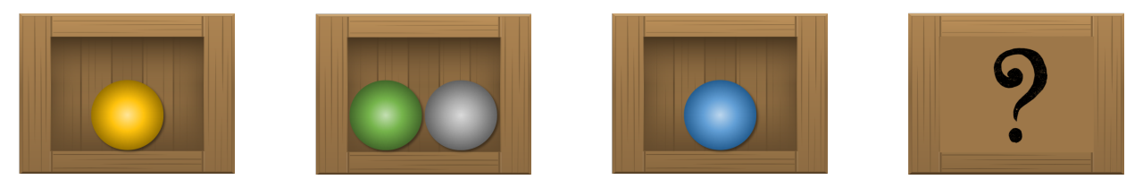


Sentences displayed below the boxes uttered by a child character, who was familiarized with the rule.

Participants judge if the utterance is right given the information available to the character and the rule.

Participants answer using two buttons: 'Good' and 'Bad'. Response and reaction times measured.

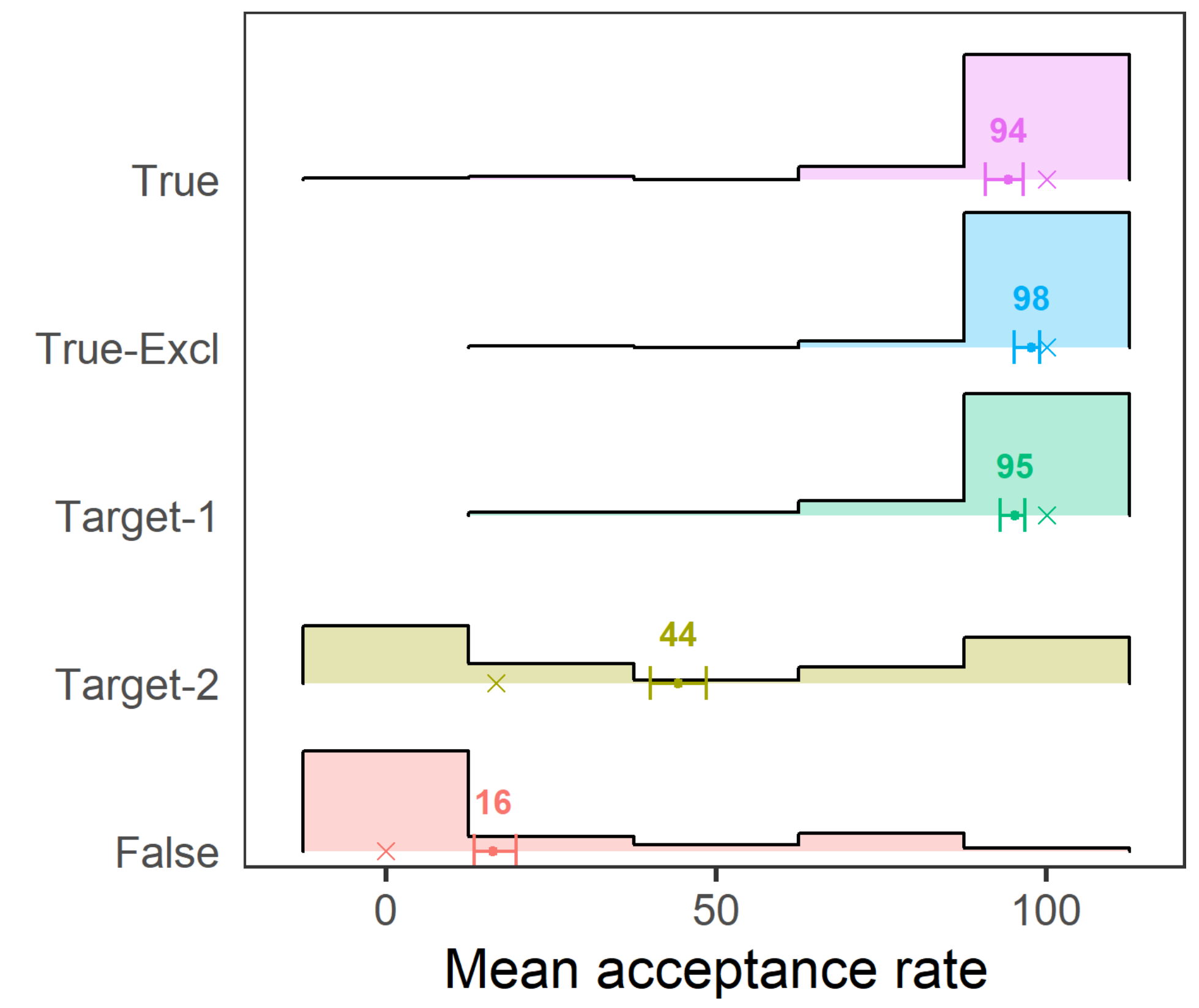
Within-subjects factorial design (5 picture types):

Condition	Example picture
TRUE	 A AA B ?
TRUE-EXCL	 A AB B ?
TARGET-1	 A AB A ?
TARGET-2	 A AA A ?
FALSE	 A CD B ?

Test sentence: *"The mystery box contains a yellow ball or a blue ball."* $(A \vee B)$

	POSSIBILITY	UNCERTAINTY
TARGET-1	True	False
TARGET-2	False	False

Results



High acceptance rate for TARGET-1

$\Rightarrow$ Evidence for reading without UNCERTAINTY

Lower acceptance rate for TARGET-2

$\Rightarrow$ POSSIBILITY can arise without UNCERTAINTY

High acceptance rate for TRUE-EXCL

$\Rightarrow$ Evidence for reading without EXCLUSIVITY

⚠ A challenge for the traditional approach!

Distributive Inferences

"The my. box **must** contain a yellow or a blue ball."

$\Box(A \vee B) \rightsquigarrow \Diamond A \wedge \neg\Box A \wedge \Diamond B \wedge \neg\Box B$

$\neg\Box A \wedge \neg\Box B$ NEGATED UNIVERSAL

$\Diamond A \wedge \Diamond B$ DISTRIBUTIVE

Ramotowska et al. (2022): similar exp. results.

A Recent Implicature Account

Bar-Lev & Fox (2023): recursive EXH + pruning

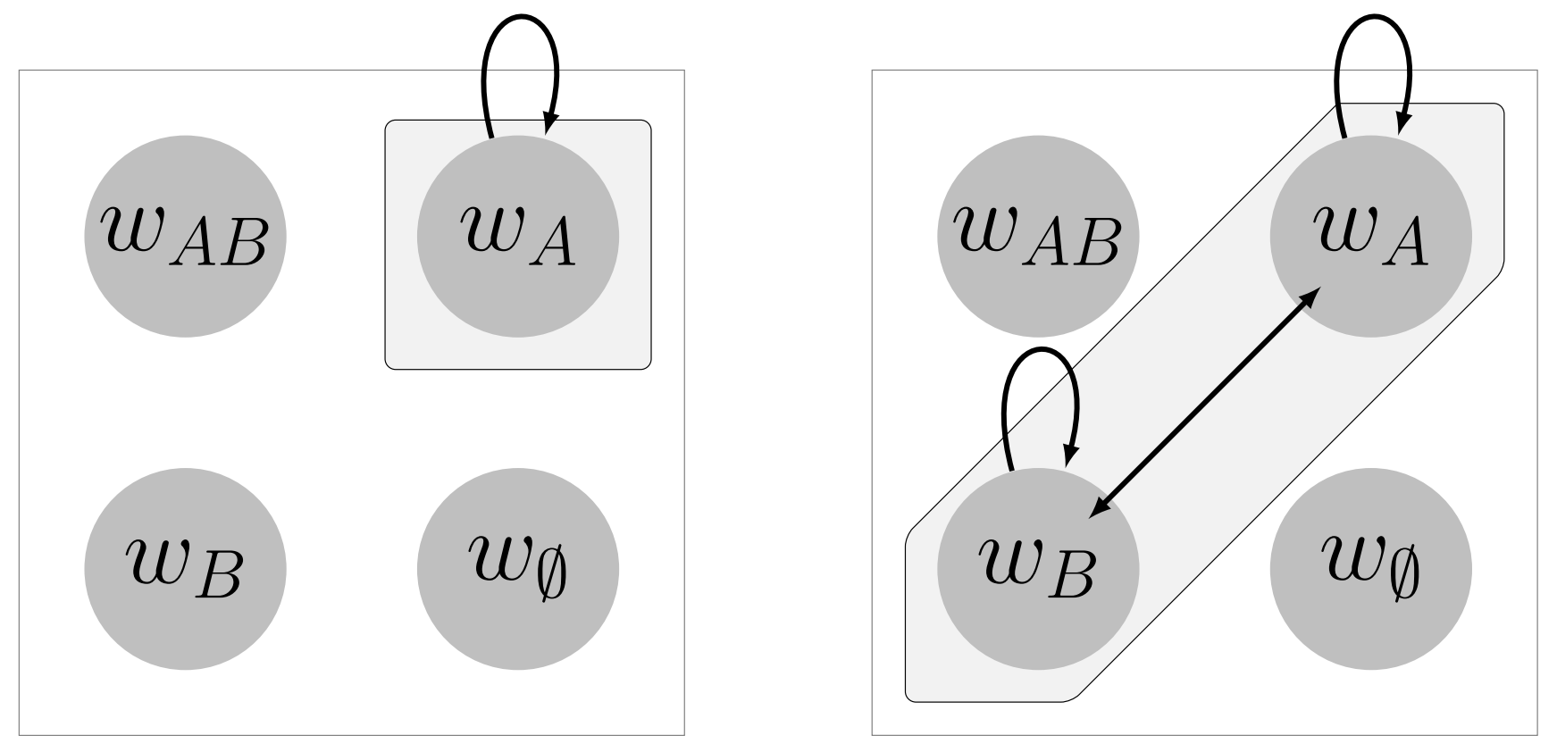
$$Alt(\Box(A \vee B)) = \{\Box(A \vee B), \Box A, \Box B, \Diamond A, \Diamond B, \Diamond(A \vee B), \cancel{\Box(A \wedge B)}, \cancel{\Diamond(A \wedge B)}\}$$

$$\text{EXH}(\text{EXH}(\Box(A \vee B))) =$$
$$\Box(A \vee B) \wedge \neg(\Box A \wedge \neg\Diamond B) \wedge \neg(\Box B \wedge \neg\Diamond A)$$
$$= \Box(A \vee B) \wedge \Diamond A \wedge \Diamond B$$

Extension to ignorance by adopting a silent $\Box_s$.

Problem: What is $\Diamond_s$? Can we ever have it?

A Non-Implicature Account



$\models A \vee B$
$\not\models (A \vee B)^+$

$\models A \vee B$
$\models (A \vee B)^+$

Aloni (2022): inferences captured by 'neglect-zero' pragmatic enrichment $(\cdot)^+$:

$(A \vee B)^+ \models \Diamond_s A \wedge \Diamond_s B$
$(A \vee B)^+ \not\models \neg\Box_s A \wedge \neg\Box_s B$

$[\Box_{(s)}(A \vee B)]^+ \models \Diamond_{(s)} A \wedge \Diamond_{(s)} B$
$[\Box_{(s)}(A \vee B)]^+ \not\models \neg\Box_{(s)} A \wedge \neg\Box_{(s)} B$

Goldstein (2019) makes the same predicitons.

The Role of Exclusivity

EXCLUSIVITY + POSSIBILITY $\rightsquigarrow$ UNCERTAINTY

$\Diamond_s A \wedge \Diamond_s B$ POSSIBILITY

$\Box_s\neg(A \wedge B)$ EXCLUSIVITY

$\rightsquigarrow \neg\Box_s A \wedge \neg\Box_s B$ UNCERTAINTY

Is UNCERTAINTY without EXCLUSIVITY possible?

Next Steps

Verification tasks: production/interpretation?

Follow-up on EXCLUSIVITY with reasoning task?

Generality of the phenomenon: attitude predicates?

References

Aloni. *Semant Pragmat 15(5)* (2022). • Bar-Lev & Fox. On fatal competition and the nature of distributive inferences (2023). • Crnič, Fox & Chemla. *Nat Lang Semantics 23*, 271–305 (2015). • Fox (2007). • Goldstein. *Semant Pragmat 12(23)* (2019). • Marty, Romoli, Sudo & Breheny. What makes an inference robust? (2023). • Sauerland. *Linguist Philos 27* (2004). • Ramotowska, Marty, Romoli, Sudo & Breheny. Diversity with universality (2022).

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