Computational Cognitive Modeling for

syntatic acquisition

Based on: Pearl (2022), Section 1.1–1.3



1.1 About computational cognitive modeling

for syntactic acquisition

Defining Computational Cognitive Modeling

"The computational part refers to implementing an idea... The cognitive part refers to what the implemented ideas are about... The modeling part refers to the theory itself" (Pearl, 2022).

- cognition
- cognition

- Computational: Precisely
 - implements a theory, often using
 - math on computers
- Cognitive: Refers to human
- Modeling: Represents or
 - "models" the theory about

1.1 Application to syntactic acquistion

"With this tool of computational cognitive modeling, we can then make a theory about syntactic acquisition concrete enough to evaluate..." (Pearl, 2022

• Dr. Pearl emphasizes that computational cognitive modeling allows researchers to formulate syntactic acquisition theories with testable precision • These models enable the

generation of predictions

regarding children's syntactic

behavior, which can then be

evaluated against empirical data

1.1 Models as a proof of concept

"This is proof there is at least one way the theory could explain human behavior..." (Pearl, 2022

• When predictions from the model align with observed behavior, it offers support for the implemented version of the theory • Such alignment serves as a proof of concept, demonstrating that the theory could account for human syntactic behavior

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1.2 Implementing a theory in a computational

cognitive model

Implementing a theory in a model

First, the model needs to encode relevant prior knowledge and learning abilities..." (Pearl, 2022).

2 "Second, the model needs to learn from realistic input..."

"Third, the model needs to output predictions that connect in some 3 interpretable way to children's behavior..."



4 "Fourth, the model needs to encode learning..." (Pearl, 2022).

13. Road map

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Focusing on integrative models

"The syntactic acquisition theories implemented by these models assume that syntactic learning proceeds by children attending to information from these different sources, rather than solely syntactic sources" (Pearl, 2022).

- Dr. Pearl focuses on models that integrate both linguistic and nonlinguistic sources of information
- Children attend to multiple cues in the environment—not just syntactic input

Overview of the Case Studies

"These case studies involve the acquisition of syntactic knowledge about linking theories, the passive, and pronoun interpretation" (Pearl, 2022).

Overview of the Case Studies • Case studies come from Dr. Pearl's own modeling work • They involve acquisition of: • Linking theories

- - Passives

Pronoun interpretation

Looking Forward

- Future model development should draw from:
 - Existing child behavioral data
 - Insights from current
 - modeling research



"I also discuss more specifically how we can think about building better models, and how we can incorporate the insights..." (Pearl, 2022). Dr. Pearl emphasizes that computational cognitive modeling allows researchers to formulate syntactic acquisition theories with testable precision These models enable the generation of predictions regarding children's syntactic behavior, which can then be evaluated against empirical data "With this tool of computational cognitive modeling, we can then make a theory about syntactic acquisition concrete enough to evaluate..." (Pearl, 2022