ABSTRACTION:
Unlocking meaning from experience through language

May 19th, AMSTERDAM NL
Analogy & Abstraction in AI

ABSTRACTION

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The research group

Abstraction

Definition: The process of forming general ideas or concepts by extracting similarities and general tendencies from direct experience, language, or other concepts.

% Endorsement: 100%; **Confidence (mean)**: 82 (of 100)

Reilly et (many) al. (2025). **What we mean when we say semantic: Toward a multidisciplinary semantic glossary.** *Psychonomic Bulletin & Review* 32:243–280

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Generalization   Analogy

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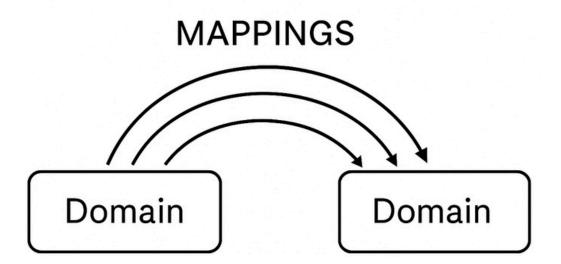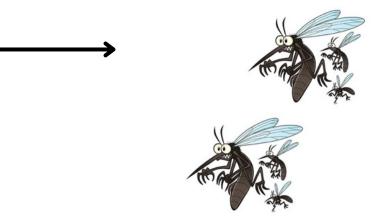
Linguistic examples

- **Abstraction** enables **category formation** via the identification of commonalities among elements that can therefore be grouped together.

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GENERALIZING IN DOMAIN:
Mosquitoes fly
Mosquitoes bite
Mosquitoes carry malaria

GENERALIZING OUT OF DOMAIN:
You are so annoying, you're a mosquito!

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- **Analogy** is the mechanism that underlie the **transfer of knowledge** operating behind generalization. It involves structural alignment and mapping between domains.

  ANALOGIZING (courtesy of ChatGPT):
  - *A mosquito is the spam email of nature*
  - *Self-doubt is the mosquito of ambition*
    (X IS THE Y OF Z)

ANALOGY AS MECHANISM OF LINGUISTIC GENERALIZATIONS

ANALOGY IN LANGUAGE ACQUISITION

She's dancing, She's playing, She's laughing →She's [ACTION]ing

ANALOGY IN LANGUAGE CHANGE

"Cactus" → PL. cactuses (instead of cacti)

Generalization by analogy: the inferential process by which an unfamiliar linguistic structure (the target) is seen as an analogue of known linguistic one of the same type (the base) so that properties that are known about the latter are assumed to be transferable to the former.

Interpreting a novel compound involves:

- accessing the concepts denoted by the words
- selecting a relation to form a unified conceptual representation

Hypothesis from Gagné and colleagues

The on-line interpretative processing of novel nominal compounds is affected by analogous lexicalized compounds

AVOCADO CHAIR

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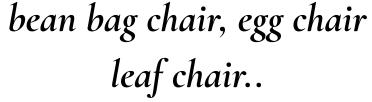
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ANALOGY IS STILL CHALLENGING

Key challenges include:

- Operationalizing analogy in corpora.
- Integrating insights across disciplines (psycholinguistics, computational linguistics,..).
- Understanding constraints and prerequisites for analogy in language.

Promising line of research: train Language Models (on controlled linguistic input) and compare their generalization with human.

Thank you

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WORD LADDERS

ABSTRACTION