

Category use

- How do categories get used?
- Category based induction
- Conceptual combination
- How use influences learning

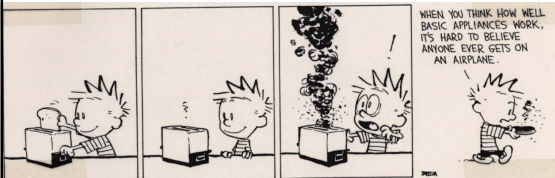
What are categories for?

- Classification
 - What we have discussed most so far
- Inductive inference (Prediction)
- Causal reasoning
- Communication

These uses have also been studied.



Category-based induction



Category-based induction

- Our category structures help us predict.

Bears have glutamate in their brains
How likely is it that deer have
glutamate in their brains?

- How can you answer this question?
 - What if you know nothing about the property?
 - These are called *blank predicates*
 - What if you do have some relevant knowledge?

Induction with blank predicates

- When we know nothing about the property, we rely in similarities among categories

Stronger	Weaker	
Bears have X Horses have X	Bears have X Birds have X	Similarity
Bears have X Birds have X Lizards have X	Bears have X Horses have X Lizards have X	Diversity
Bears have X Mammals have X	Prairie Dogs have X Mammals have X	Typicality

Similarity and coverage

- Why are these effects obtained?
 - Osherson, Smith, and colleagues
- Similarity-coverage model
 - The more similar the premise categories to the conclusion, the stronger the argument
 - The better the premise categories cover the category contained by the conclusion, the stronger the argument.

What about non-blank predicates?

- Sometimes we know a little bit about the properties
 - How does that affect induction?
- Heit and Rubinstein
 - Behavioral and morphological properties
 - Behavioral and morphological similarity

Stronger

Dolphins have antifreeze in their blood
Sharks have antifreeze...

Foxes are good trackers
Sharks are good trackers

Weaker

Foxes have antifreeze in their blood
Sharks have antifreeze...

Dolphins are good trackers
Sharks are good trackers

What if you know a lot?

- Experts act differently than novices
 - Similarity becomes far less important
 - Causal reasoning based on domain knowledge
- Premise diversity effects disappear in experts

White Pines get Disease X
Weeping Willows get Disease X
All Trees get Disease X

River Birch get Disease Y
Paper Birch get Disease Y
All Trees get Disease Y

- College students prefer argument on left
 - Consistent with diversity
- Tree experts prefer argument on right
 - Consistent with their causal reasoning.

Conceptual combination

- We can use known concepts to create new ones.
- Noun-noun combinations
 - Modifier noun
 - Head noun
- Skunk squirrel
- Radiator box
- Helicopter flower
- How do people create these combinations?

Types of combinations

- Relational combination
 - Relation given between head and modifier
 - Skunk box: A box that contains a squirrel
- Property mapping combination
 - Property of modifier attributed to head
 - Skunk squirrel: A squirrel with a white stripe on its back.
- Hybrid combinations
 - A cross between the head and modifier
 - Robin bluebird: A bird that parts of robins and bluebirds

Interpreting combinations

- People are very good at using context

Mom set the table, and put a cup of water next to one plate, and a cup of apple juice next to the other. Then she called Sally and John to the table. She asked Sally to sit at the apple juice seat.

- If there is no context, then they use similarity
- Property combination are more likely than relation combinations as the nouns get more similar
 - Skunk squirrel
 - Skunk tree

Learning and use

- Does the way we use categories affect what we learn about them?
 - Currently a hot topic of research
- Classification
 - Most popular way to study category acquisition

Focuses people on ways to distinguishing among categories.

Predictive inference and use

- People make predictions about category members

Focuses people on what different members of a category have in common

Communication and use

- We must be able to communicate with categories
 - Cat



- Categories are learned while communicating
 - Ensures that categories are synchronized across people
 - Allows us to communicate with people from our culture that we have never met.

Summary

- Category-based induction
 - In the absence of knowledge, similarity is used
 - With some knowledge, specific types of similarity may be used
 - With a lot of knowledge, causal reasoning
- Conceptual combination
 - Property combinations
 - Relation combinations
 - Hybrids
- The way categories are used affects what is learned about them.