Cue validity

- Cue validity - predictiveness of a cue for a given category

- Central intuition:
  - Some features are more strongly associated with a distinct category than others
    - Paw - shared by many animals
    - Mane - only a few animals have (horses, donkeys, zebras)
Cue validity

The cue validity for a feature (cue) and a given category is the conditional probability that an item belongs to the category given the cue.

\[
P(\text{category} | \text{cue}) = \frac{P(\text{cat.} \ & \ \text{cue})}{P(\text{cue})} = \frac{\text{co-ocurrence of cat.} \ & \ \text{cue}}{\text{occurrence of cue}}
\]
Cue validity

Ex. Imagine a micro world with 3 animal categories and 3 types of features:
categories: bear(10), fish(10), horse(10)
features: tail, mouth, mane

1. Cue validity for tail in cueing for horse
   - assume 10 horses all have tails and 10 bears also all have tails

\[
P(\text{horse}|\text{tail}) = \frac{P(\text{horse} \& \text{tail})}{P(\text{tail})}
\]

\[
= \frac{10}{20}
\]

\[
= 0.5
\]
Cue validity

2. Cue validity for mouth to cue for horse
   \[
   P(\text{horse}|\text{mouth}) = \frac{P(\text{horse}+\text{mouth})}{P(\text{mouth})}
   = \frac{10}{30}
   = 0.33
   \]

3. Cue validity for mane to cue for horse
   \[
   P(\text{horse}|\text{mane}) = \frac{P(\text{horse} & \text{mane})}{P(\text{mane})}
   = \frac{10}{10}
   = 1
   \]
Cue validity of category

- **Cue validity for a category** is defined as the sum of cue validities for all cues associated with the category.

- **Basic intuition**: a category with high cue validity has lots of features that are good cues for that category (relative to the total number of cues).

- **Categories with high cue validity** maximize trade off between high internal resemblance and high differentiation from other categories.
Mutual information

\[ \text{MI}(\text{category}, \text{feature}) = \frac{\text{P}(\text{category} \& \text{feature})}{\text{P}(\text{category}) \times \text{P}(\text{feature})} \]

- co-occurrence of category & feature
- occurrence of cat. * occurrence of feature
Category levels

- **Category 1 = Me**
  - High internal resemblance in category (every member has exact same features)
  - Low differentiation - most features designating me apply to other people as well

- **Category 2 = things** (thimble, rock, potato, iguana, toe, rocket, Canada, etc.)
  - Low internal resemblance in category
  - High differentiation - things are well distinguished from non-things
Category levels

- Category 3 = apple
  - Well distinguished from other objects
  - Many features shared by all members

- Categories like category 3 form around natural discontinuities of features. They are basic level categories.
Category levels

- Categories which subsume basic level categories are *superordinate*.

- Categories which share all the features of the basic level category but are characterized by additional features as well are *subordinate*.

- Basic level categories are defined in terms of their psychological and experiential reality. Superordinate categories and subordinate categories are defined on the basis of their relationship to basic level categories.
Category Levels

- Basic level category - privileged status psychologically salient and relevant.

- Objects/events tend to be identified, named or translated for others using terms for basic level categories.
Category Levels

- Prototypes and naming

- Similarity to prototype for category also seems to play a role in how something is named

- Members which are less central may typically be thought of in terms of subordinate categories
Basic Level Categories

Basic level category
- A category’s category
- Based on our optimal interaction with the environment

1. Highest level at which a single mental image can represent the entire category
   - Furniture, tool, animal (superordinate)
   - Chair, screwdriver, dog (basic)
   - Easy chair, Philips screwdriver, basset hound (subordinate)
Basic Level Category

2. Highest level at which category members have similarly perceived overall shapes.
   - *Cat*, but not *animal*,
   - *Hammer*, but not *tool*.

3. Highest level at which a person uses similar motor actions for interacting with category members.
   - Separate motor programs for interacting with chair, bed, table, but not for interacting with *furniture*. 
Basic Level Category

4. Highest level for which numerous attributes can be listed
Basic Level Category

- Basic level category terms are often used in subordinate category terms
  - Claw hammer, tack hammer, ballpeen hammer
  - Figure skates, hockey skates, in line skates
- Basic level category terms tend to be learned early and occur frequently
Schemas

- Schemas are abstract representations of feature bundles which exhibit high co-occurrence.
Schema

- Schema - abstract representation of the category

- Not necessarily including linguistic information
Schemas

Referent and linguistic representations associated
Schemas

A simplified network showing mapping of schema to linguistic representation

Schema                  linguistic representation
Ambiguity, polysemy & Vagueness

- Words map onto (form part of the associative network with) schemas

- Words may become associated with schemas in different ways
Ambiguity, polysemy & Vagueness

(1) Linguistic form is associated with concepts with no meaning overlap (ambiguity)
   - Bank (river’s edge) vs. Bank (financial institution)

(2) Linguistic form is associated with two or more highly related concepts (vagueness)
   - Aunt (father’s sister) vs. Aunt (mother’s sister)

(3) Linguistic form is associated with two or more concepts that have some level of overlap
   - Paint (a mural) vs. Paint (a house)

(Tuggy, David 1993)
Ambiguity, polysemy & Vagueness

- Puns can be formed off of ambiguity, not vagueness.
  1. A pirate burying his gold at the edge of the river could be said to be putting his money in the bank.

- Zeugma (crossed reading) effect for ambiguity, not vagueness (and so does... test).
  1. I have an aunt (mother’s sister) and so does bill (father’s sister).
  2. *I went to the bank (financial inst.) And so did bill (river’s edge).
Zeugma effect for polysemy variable.

1. I have been painting (in watercolor) and so has Jane (in oils).
2. *I have been painting (stripes on a road) and so has Jane (an oil painting).
Ambiguity, polysemy & Vagueness

- Ambiguity: word is associated with more than one well distinguished schema
Ambiguity, polysemy & Vagueness

- Vagueness: word is associated with more than one not well established schema

Diagram:

- aunt
- Father’s sister
- Mother’s sister
Ambiguity, polysemy & Vagueness

- Vagueness probably always present to some extent, not always felt or bothersome

- Ex. Gaps - male/female terms exist for animals we have closer ties to: bull/cow, buck/does

  No terms for male turkey, female turkey
Ambiguity, polysemy & Vagueness

Polysemy somewhere in between

- paint
- a house
- a mural