Similarity

Cogsci 131

Kemp & Tenenbaum (2008)

- **In many cases, psychological space has interesting, nontrivial structure.**
- **How do you learn these domains?**

+ relational d

(or similarity

feature-base

The model infers the structure behind the observed relational data

A rich set of hypotheses:

Also can model developmental trends

Quillian 1968

Semantic networks
(Collins & Loftus 1975)

Similarity?

- **So what is similarity exactly?**
- **Can it function as the “core” of conceptual representations?**

Properties of distance

- **A lot of work on similarity is motivated by thinking about properties of distance (in mathematics, called a metric)**

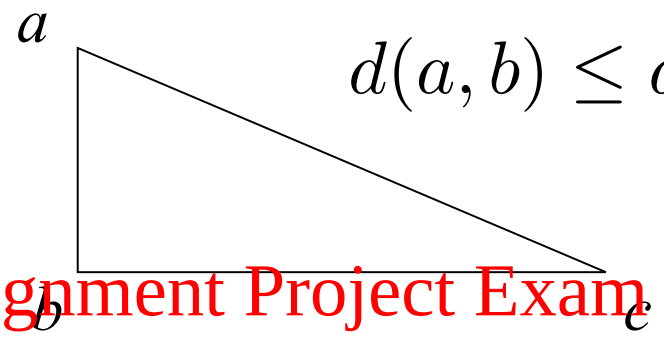
- **Distances are symmetric:**

$$d(a,b) = d(b,a)$$

- **Distances obey the triangle inequality:**

$$d(a,b) \leq d(a,c) + d(c,b)$$

Violations of triangle inequality



$$d(a,b) \leq d(a,c) + d(c,b)$$

Can find simila **late this:**

a c b

(Tversky, 1977)

Some complications of similarity

- **Some quirks of psychological similarity:**
  - Similarity and distance are not always inversely related (across studies)
  - Similarity is not always symmetric.
  - Similarity depe

Similarity is not symmetric

- **Examples:**
  - 1007 is similar to 1000, but 1000 is not similar to 1007
  - An ellipse is similar to a circle, but a circle is not similar to an ellipse.
- Why is this a problem for MDS? e measures in MDS necessarily symmetric?

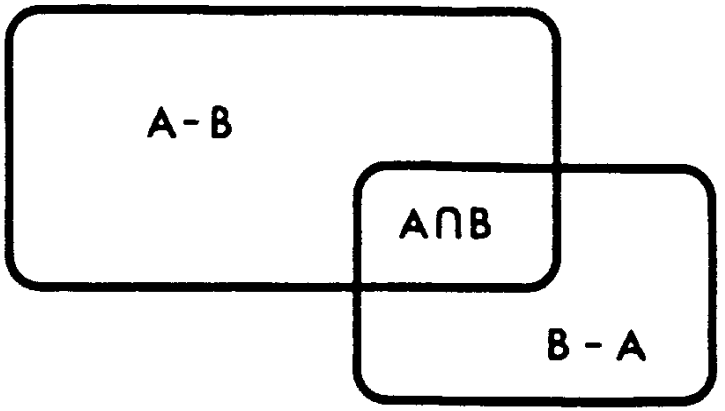
Tversky & Gati

Similarity depends on context

Similarity depends on context

$$s(a,b) = \theta f(A \cap B) - \alpha f(A - B) - \beta f(B - A)$$

where $\theta, \alpha, \beta \geq 0$



Tversky's contrast model

$$s(a,b) = \theta f(A \cap B) - \alpha f(A - B) - \beta f(B - A)$$

where $\theta, \alpha, \beta \geq 0$