

Similarity

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Cogsci 131

Kemp & Tenenbaum (2008)

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

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+ relational d

(or similarity <https://eduassistpro.github.io/>
feature-base

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The model infers the structure behind the observed relational data

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**A rich set of
hypotheses:**

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Also can model developmental trends

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Quillian 1968

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Semantic networks

(Collins & Loftus 1975)

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Similarity?

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

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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: <https://eduassistpro.github.io/>

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

- Distances obey the triangle in [Add WeChat edu_assist_pro](#)

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

Violations of triangle inequality

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

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Can find simila

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late this:

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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 depends on the context.

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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.

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- Why is this a problem for MDS? e measures in MDS necessarily symmetric?

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Tversky & Gati

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Similarity depends on context

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Similarity depends on context

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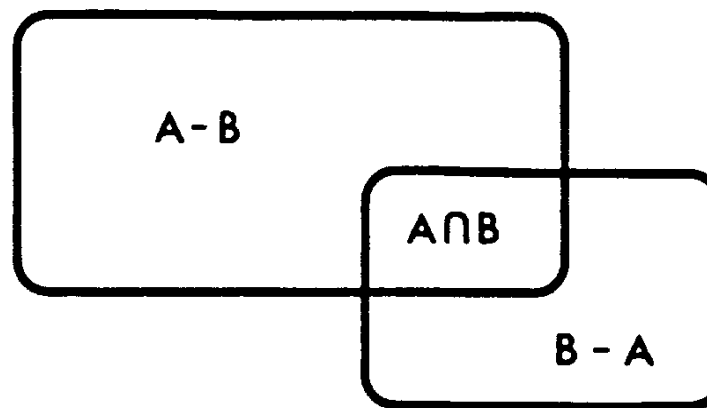
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$$s(a, b) = \theta f(A \cap B) - \alpha f(A - B) - \beta f(B - A)$$

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

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Tversky's contrast model

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

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

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