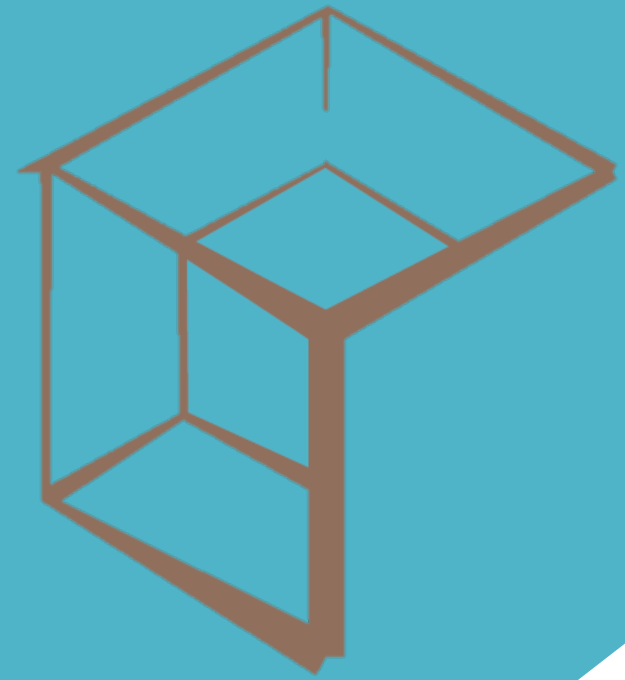


Knowledge Graphs for innovation



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Dawa Chang



Title: Knowledge Graphs (KGs) as a supporting technology for innovation



- ▶ It's about studying ...

How
+
Under what conditions } KGs can help ... → To overcome the cognitive limitations of humans
in the innovation process.

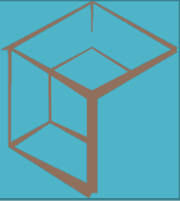
- ▶ What cognitive limitations & innovation process?

- In the **very early stages** of innovation; so called fuzzy front end
- with tasks such as A. ideation and B. idea selection
- characterized by ...

A. high demands for creativity

B. high uncertainty when **making** filtering **decisions** on which ideas to pursue





Human cognitive trap:

tend to only search **locally**,
focus on what they already know
bounded rationality



makes innovation
more likely
incremental/biased



ordinary innovation
(Not substantial innovation)

Local search

Factual knowledge
Information search

vs.



Distance search

Ideation stimuli
Inspiration search

vs.



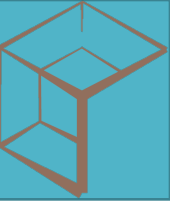
analogy, metaphor, combination, etc.

Everything that helps
distance search is useful for
more **substantial innovation**.¹

How many calories are in Schnitzel?



The importance of distance search in innovation



I'm Innovator.

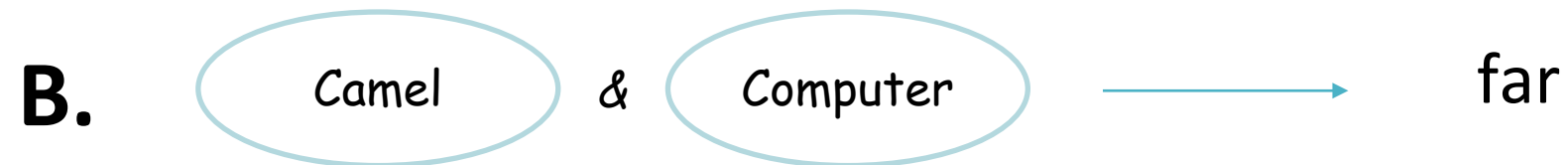
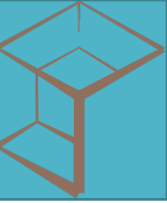
*And what I'm looking for is ~~Schnitzel~~...
ideation **Stimuli**
from far far away!*



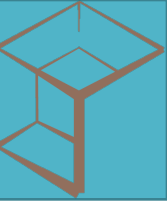
Is the KG able to support the distance-search?

What is the distance ("far") in KGs?

Conceptual distance of far vs. near



Conceptual distance of far vs. near



Camel

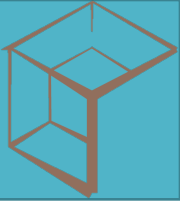
&

Computer

<https://asknature.org/>



DIS-C: conceptual distance in ontologies, a graph-based approach



DIS-C algorithm

To compute the conceptual distance between concepts of an ontology

Based on

- An ontology can be represented as a strongly connected graph
- Assign weight values to each relation taking into consideration the proximity between concepts

Methodology

Composed of two main steps + 1 (generality metric)

1. An expert of the ontology domain assigns initial weight values to each of the relations in the ontology
2. An automatic method for computing the conceptual relations refines the weights assigned to each relation
3. Introduce a metric called generality that is defined in order to evaluate the accessibility of each concept

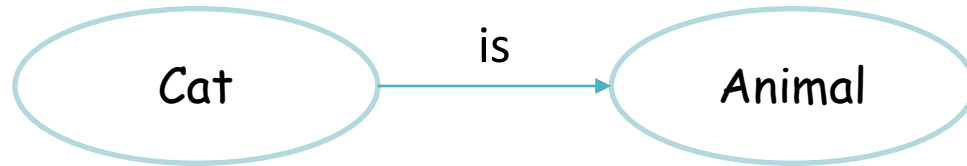
Conclusion

- The DIS-C algorithm computes similarity between concepts in ontologies that are not necessarily represented in a hierarchical or taxonomic structure
- It's capable of incorporating a wide variety of relationships between concepts such as meronym, antonym, functionality and causality

Conceptual distance of far vs. near

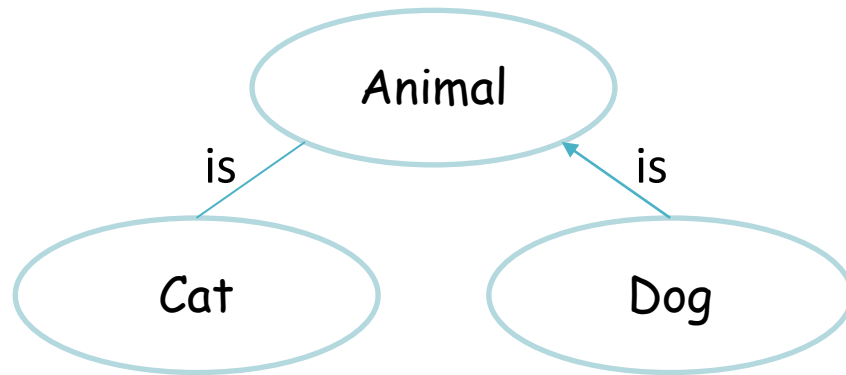


"Cat is an animal."

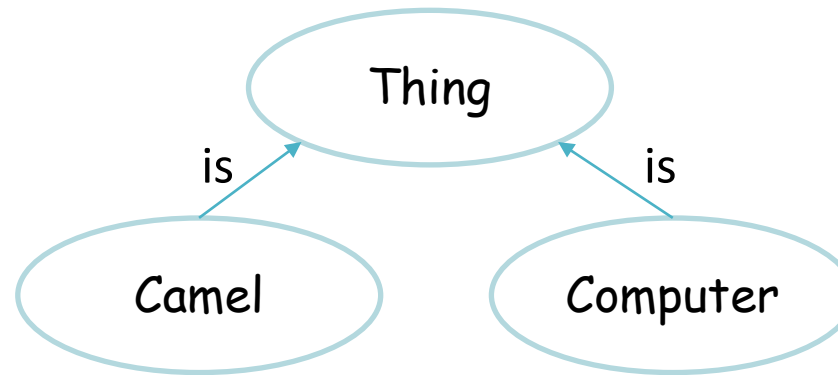


$\text{distance}(\text{cat}, \text{animal}) = 1$

$\text{distance}(\text{animal}, \text{cat}) = 0$



Cat & dog are **near** to each other...



A. Camal & computer are **far** to each other... 

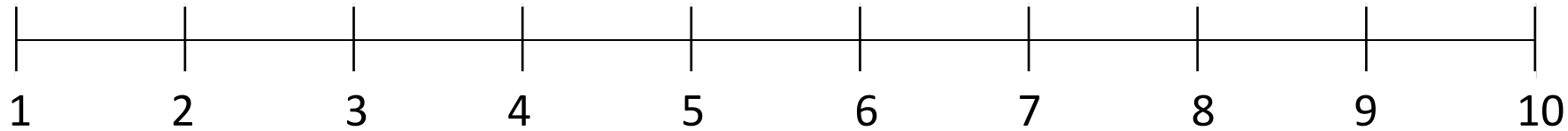
B. Well, they are both things. 

It's fact.

Conceptual distance of far vs. near



Cat & Dog = 1



Camel & Computer = ?

