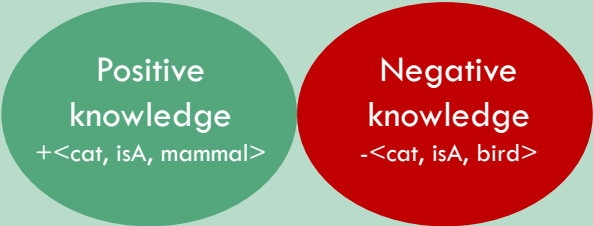# Creating a Unified Structure for Positive and Negative Common Sense Knowledge

1. Background

Common sense knowledge is knowledge that is just assumed to be known by all humans, without being noted down. |2|

Positive knowledge is knowledge that is known to be true.
Negative knowledge is known to be false.
Negative knowledge is important, because a computer cannot make an assumption simply from lack of knowledge. |1|
In general, knowledge bases contain only positive knowledge.
Lack of knowledge != Fact
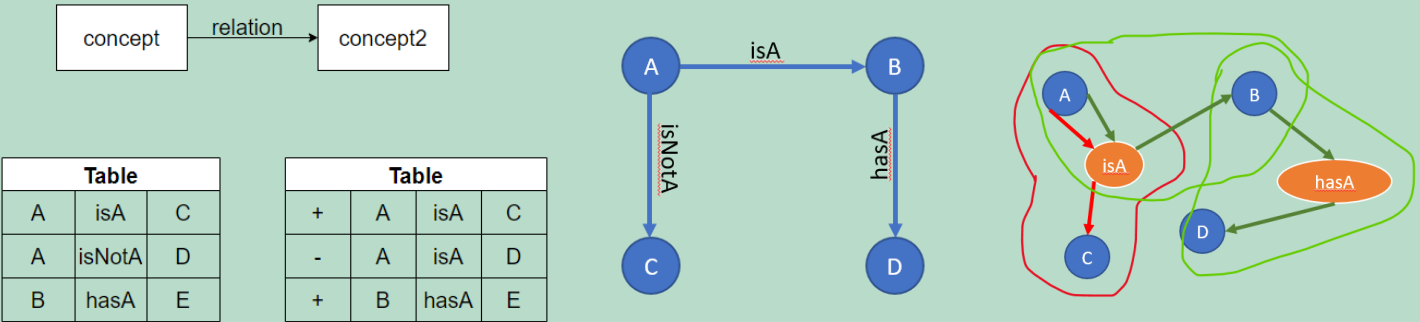
2. Research question

1. What structures can be used for a unified organization of positive and negative knowledge?
2. How can different knowledge organizations be evaluated and how do they compare?

3. Method

Literature review of existing solutions
Complexity analysis of possible solutions

4. Solutions

+ complex number space solutions solutions

5. Conclusions

	3-tuple	4-tuple	graph	hypergraph
<*, H, *, *>	O(m)	O(m)	O(n)	O(n)
<+/-, H, *, *>	O(m)	O(m)	O(n)	O(n)
<+/-, H, R, *>	O(m)	O(m)	O(n)	O(n)
<*, *, R, T>	O(m)	O(m)	O(n)	O(1)
<+/-, *, R, T>	O(m)	O(m)	O(n)	O(n)
adding	O(1)	O(1)	O(n)	O(n)
deleting	O(m)	O(m)	O(n)	O(n)

Ideal solution depends on n and m, but generally $m>n$.
Hypergraph can expand most easily
Complex number space is worth exploring further

References:
|1| Agathe Balayn, Gaole He, Andrea Hu, Jie Yang, and Ujwal Gadiraju. Ready player one! eliciting diverse knowledge using a configurable game. In Proceedings of the ACM Web Conference 2022, WWW '22, page 1709–1719, New York, NY, USA, 2022. Association for Computing Machinery.
|2| Filip Ilievski, Alessandro Oltramari, Kaixin Ma, Bin Zhang, Deborah L. McGuinness, and Pedro Szekely. Dimensions of commonsense knowledge. Knowledge-Based Systems, 229:107347, 2021.

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