Relations between Semantic Structures

D. Gueorguiev 11/4/2021

Let us consider the semantic structures S_i and S_j in specific context C.

Is-a relation:
$S_i \leftrightarrow S_j$: S_i *is-a* S_j

Is-not relation
$S_i \nleftrightarrow S_j$: S_i *is-not* S_j

Has-a relation:
$S_i \rightarrow S_j$: S_i *has-a* S_j

Has-not relation
$S_i \nrightarrow S_j$: S_i *has-not* S_j

Equivalent relation:
$S_i \Leftrightarrow S_j$: S_i is true *iff* S_j is true

Not-equivalent relation:
$S_i \nLeftrightarrow S_j$: *if* S_i *is true then it does not follow that* S_j *is true* ***or*** *if* S_j *is true then it does not follow that* S_i *is true*

Implication:
$S_i \Rightarrow S_j$: *if* S_i is true *then* S_j is true

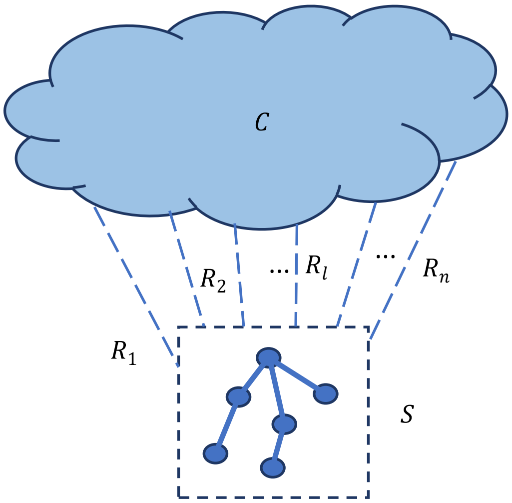
Not-Implication:
$S_i \nRightarrow S_j$: *if* S_i *is true then it does not follow that* S_j *is true*

General relationship:
Let G is a semantic DAG, $V(G)$ is the set of vertices of G and $A(G)$ is the set of arcs of G. We say that S_i is *related to* S_j when S_i and S_j are subgraphs of G.

$S_i \leftrightarrow S_j$: the structures S_i and S_j have the same semantic meaning. Two semantic structures have the same semantic meaning when the semantic distance between them is small enough. Evaluating semantic distance involves evaluating their respective semantic signatures. We need to consider all possible semantic association chains when we evaluate the structures in the given context. We will discuss an algorithm constructing augmented semantic structures S_i^+ and S_j^+ from S_i and S_j respectively.

Constructing Augmented Semantic Structure

Let us have a semantic structure S in the context C. S is related to the context C by a set of relationships R_1, R_2, …, R_l, …, R_n.



In the future we will denote this augmented semantic structure S^+ in the context C by the notation $[C\langle R_1, R_2, \ldots, R_n\rangle S]$. Shortly:

$$S^+(C) = [C\langle R_1, R_2, \ldots, R_n\rangle S]$$

The approach to construct R_1, R_2, …, R_n is reminiscent to the process discussed in Semantic Parsing. We are attaching a set of match-seeking particles MA_i and match-repelling particles MR_j to substructures of S. Similarly, we are attaching match-seeking particles $MA^l, l = 1,2..$ and match-repelling particles MR^m, m=1,2,.. to substructures of C. Each matching-seeking particle MA_i attaches to a substructure S_i^swhich is subgraph of S. Each match-seeking particle exposes particular region of the semantic signature of the substructure it attaches to. A similarity link association is established by our match-seeking particle on S and another attached on C if the exposed regions on both sides are similar enough. More than one match-seeking particle can be attached to a specific substructure where each of the match-seeking particles exposes different region of the semantic signature of the same substructure. More on this topic in Note on Match-seeking and Match-repelling particles.