Inference of Semantic Structures

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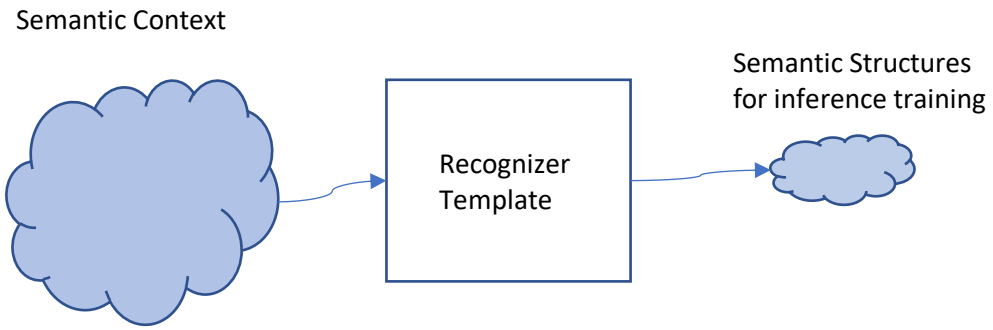
Stages in the Semantic Inference Process

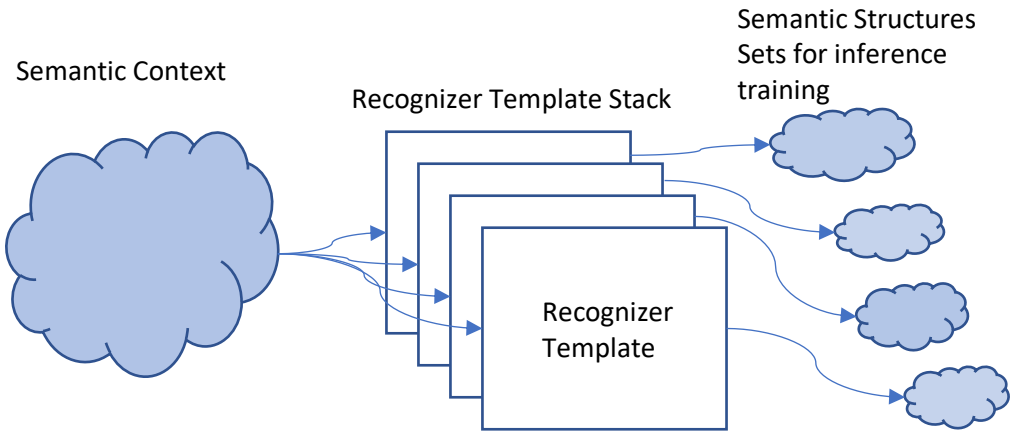
1. Identifying Semantic Structures which are related and can be used for creating an Inference Building Template
2. Creating an Inference Building Template
3. Identifying Semantic Structures for application of the Inference Building Template
4. Applying the Inference Building Template
5. Inference as a special case of Execution of Semantic Structures

Identifying Semantic Structures for creating an Inference Building Template

This is done by applying a special *Recognizer Template* to the Semantic Structures which are close enough semantically.



In general we will have a stack of recognizer templates which will be applied to each semantic context and their application to the latter will produce a stack of sets of semantic structures for application of various inference building templates.



Let us consider an Example with two semantic structure which could serve is input for building inference template:

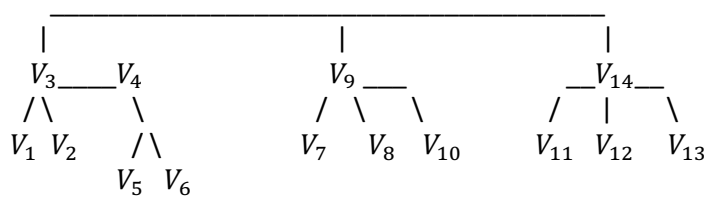
Learning data:

$$S_1 = \begin{cases} Humans\ can\ breathe\ using\ their\ lungs. \\ Fish\ don't\ have\ lungs. Therefore, fish\ don't\ breathe. \end{cases}$$

$$S_2 = \begin{cases} Cars\ can\ move\ using\ their\ engines. \\ Bicycles\ do\ not\ have\ engines. Therefore, bicycles\ do\ not\ move. \end{cases}$$

Test data:

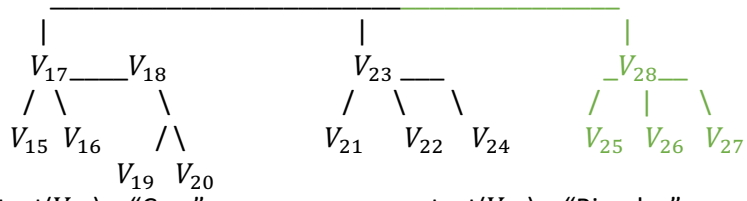
$$S_3 = \{People\ can\ walk\ using\ their\ legs. Snakes\ do\ not\ have\ legs.$$



text(V_1) = "Humans"
text(V_2) = "can"
text(V_3) = "breathe"
text(V_4) = "using"
text(V_5) = "lungs"
text(V_6) = "their"

text(V_7) = "Fish"
text(V_8) = "don't"
text(V_9) = "have"
text(V_{10}) = "lungs"

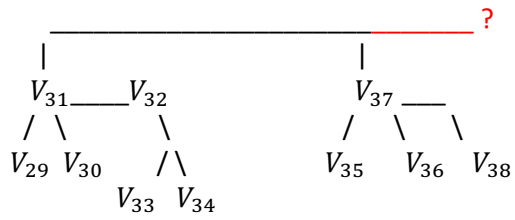
text(V_{11}) = "Therefore"
text(V_{12}) = "fish"
text(V_{13}) = "don't"
text(V_{14}) = "breathe"



text(V_{15}) = "Cars"
text(V_{16}) = "can"
text(V_{17}) = "move"
text(V_{18}) = "using"
text(V_{19}) = "engines"
text(V_{20}) = "their"

text(V_{21}) = "Bicycles"
text(V_{22}) = "don't"
text(V_{23}) = "have"
text(V_{24}) = "engines"

text(V_{25}) = "Therefore"
text(V_{26}) = "bicycles"
text(V_{27}) = "don't"
text(V_{28}) = "move"



text(V_{29}) = “People”
text(V_{30}) = “can”
text(V_{31}) = “walk”
text(V_{32}) = “using”
text(V_{33}) = “legs”
text(V_{34}) = “their”

text(V_{35}) = “Snakes”
text(V_{36}) = “don’t”
text(V_{37}) = “have”
text(V_{38}) = “legs”

$T_1 : [V_i\ A_j, i = 1..6, j = 1..5]$
$T_2 : [V_i\ A_j, i = 7..10, j = 6..8]$
$T_3 : [V_i\ A_j, i = 11..14, j = 9..11]$
$T_4 : [V_i\ A_j, i = 15..20, j = 12..16]$
$T_5 : [V_i\ A_j, i = 21..24, j = 17..19]$
$T_6 : [V_i\ A_j, i = 25..28, j = 20..22]$
$T_7 : [V_i\ A_j, i = 29..34, j = 23..27]$
$T_8 : [V_i\ A_j, i = 35..38, j = 28..30]$

Training set: $T_1, T_2 \rightarrow T_3$; $T_4, T_5 \rightarrow T_6$
Test set: $T_7, T_8 \rightarrow T_9$

How could the inference work? Generally, by setting up a predictor (regressor, neural net, etc) and train it. But the question really is what is the best way to perform inference when dealing with semantic structures?

One way to perform the learning step: the properties which are “seen” more than once in the training examples on similar relative locations are strengthened. Tuning the strengthening algorithm with a *meta-algorithm* is desirable. How does the meta-algorithm do the tuning? One output of the tuning algorithm would be the strengthening or weakening of the retainability rank of each property. Second optimization cohort in the algorithm would be to maintain alternative property representation for each semantic particle and to rank each alternative representation. This task can be performed by a special *recognizer template*.

Let us discuss what are the important points helping to identify the semantic structures which will serve as input (or training dataset) when creating such *recognizer template*.

Creating an Inference Building Template
Identifying Semantic Structures for Template Application
Applying the Inference Building Template
Inference as a special case of execution of a Semantic Structures