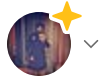




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Meronymy and Holonymy in Natural Language Processing



Yash Jain · Follow

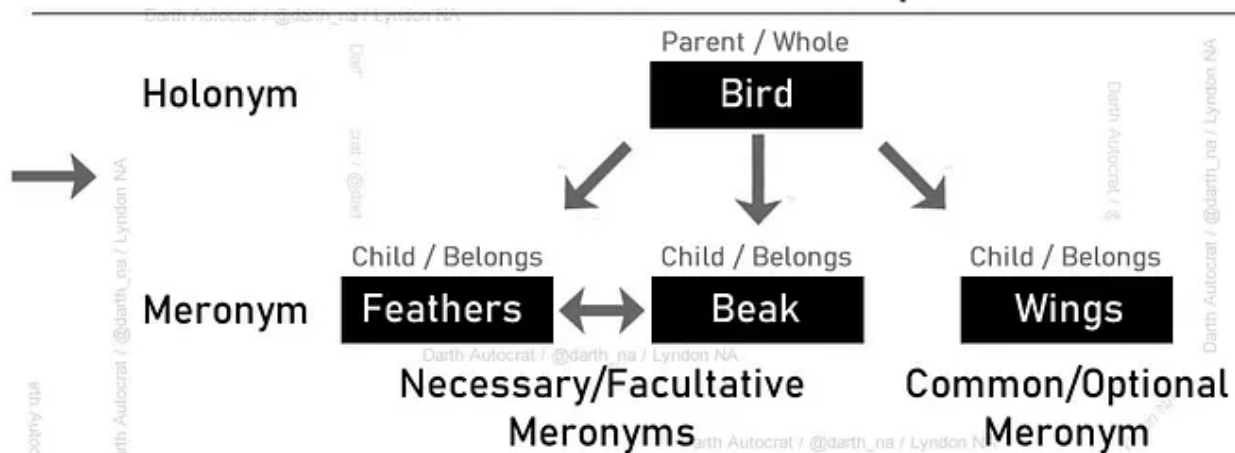
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Hierarchical Relationships



Meronym to Holonym

X is a part of a YX1 and X2 are parts of YX is a member of YX1 and X2 are members of Y

part(s) of / constituent(s) of
component(s) of / bit(s) of
piece(s) of

Holonym to Meronym

Y is made of a XY is made of X1 and X2

made of / comprise(s/d) of
 consist(s/d) of / include(s/d)

Necessary / Facultative

This means the parts are considered
 as vital to the whole.

(A microphone is
 necessary for a phone)

Common/Optional

The parts are often present,
 or are not present in some cases
 (A screen is not necessary
 for a phone – but is common)

Darth Autocrat / @darth_na / Lyndon NA

Source: https://twitter.com/darth_na/status/1235161987077804035

Meronym is a linguistic relationship that exists between two words when one word is a part or a member of the other. In this relationship, **the part is called the meronym**, and **the whole is called the holonym**. For example, “wheel” is a meronym of “car,” and “car” is the holonym of “wheel.”

Understanding meronym and holonym can enhance the performance of NLP tasks by providing additional context and meaning. By recognizing meronym-holonym relationships, NLP systems can make better sense of phrases, sentences, and texts. For instance, in sentiment analysis, recognizing that “wheel” is a part of a “car” can help identify sentiments about a specific car part.

We’ll see implementation in python here, we will use the popular NLP library, NLTK, and its WordNet module, which contains a rich lexical database.

```
import nltk
from nltk.corpus import wordnet as wn

nltk.download('wordnet')

def get_meronyms(word):
    synsets = wn.synsets(word)
    meronyms = []

    for synset in synsets:
        meronyms.extend(synset.part_meronyms())

    return set(meronyms)

def get_holonyms(word):
    synsets = wn.synsets(word)
    holonyms = []
```

```
for synset in synsets:
    holonyms.extend(synset.part_holonyms())

return set(holonyms)

word = 'car'
meronyms = get_meronyms(word)

print("Meronyms:")
for meronym in meronyms:
    print(meronym.name().split('.')[0])

word2 = 'tail_fin'
holonyms = get_holonyms(word2)

print("\n\nHolonyms:")
for holonym in holonyms:
    print(holonym.name().split('.')[0])
```

Output:

```
Meronyms:
automobile_engine
high_gear
tail_fin
stabilizer_bar
reverse
accelerator
gasoline_engine
car_seat
car_door
roof
fender
rear_window
automobile_horn
floorboard
grille
car_mirror
third_gear
buffer
auto_accessory
glove_compartment
```

```
luggage_compartment  
car_window  
window  
first_gear  
suspension  
sunroof  
running_board  
bumper  
air_bag  
hood
```

Holonyms:

```
fish  
car  
vertical_tail
```

As you can notice we got the output of Meronyms for car as air_bag, window, car_mirror and so on. This list represents parts of car.

Although library is not good enough to get all holonyms still we can see few examples it has printed. For holonyms we got output as fish, car, vertical_tail these are referred as whole part of tail_fin.

One use case I can notice is in semantic search and understanding, while building a conversational nlp system. You want to search for *air_bag* but you can't remember name, instead you search for car and it showed the result of air_bag also and that might resolve issue for you.

Incorporating holonymy in NLP systems can lead to improved understanding and interpretation of human language. By leveraging Python and NLP libraries such as NLTK, NLP practitioners can easily extract valuable information about the relationships between words, ultimately enhancing the performance of various NLP tasks.

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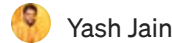
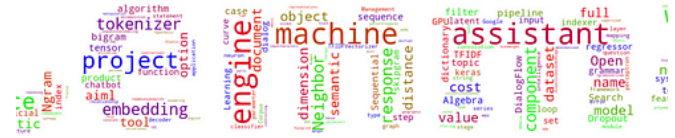


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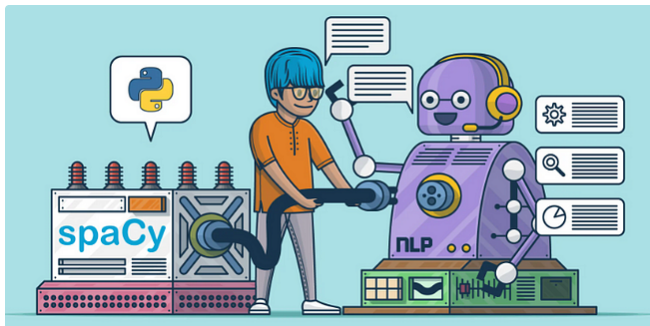
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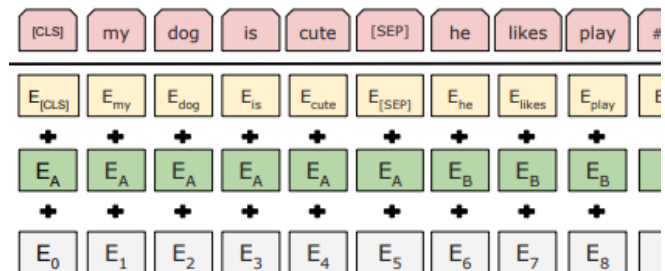


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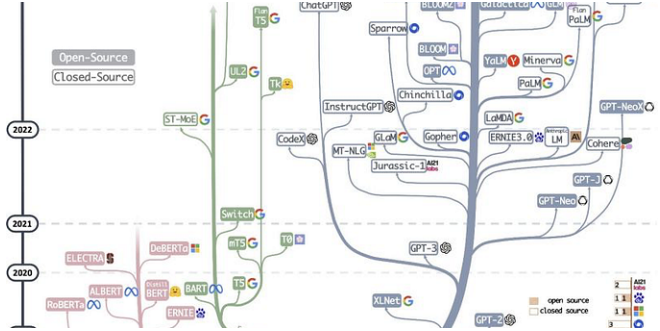


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