# Something about Knowledge Graph

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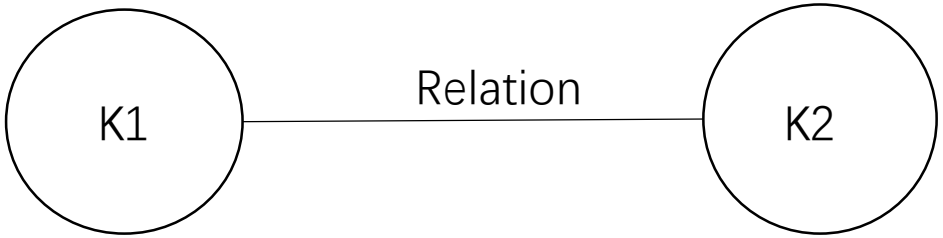
The Research Advances of Knowledge Graph.2017
Knowledge Graph Construction Techniques.2016
Review on Knowledge Graph Techniques.2016
Knowledge Representation Learning:A Review.2016

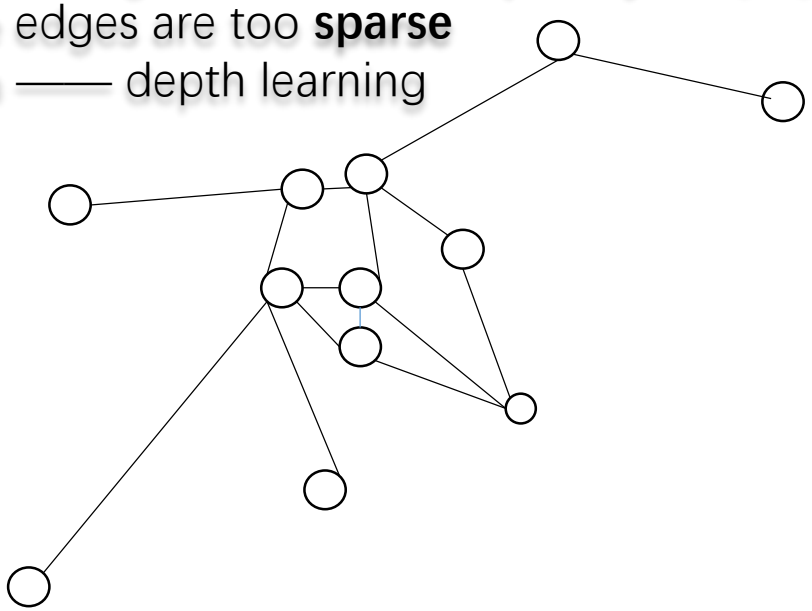
# Knowledge Graph

- Popularity: a network of knowledge
- Specialty: a structured semantic repository used to describe concepts and their relationships in the physical world in symbolic form

**Idea:** 1、Graph theory knowledge and algorithms——**Complexity**：$O(n^2)$
2、Matrix representation: the edges are too **sparse**
**Method :** Dimensionality reduction —— depth learning




The three tuple represents:
(knowledge 1, relation, knowledge 2)



# In the era of big data, how to build this "MAP"?

**Framework**：

$$\begin{cases} Logical\ framework \begin{cases} Data\ Layer：Knowledge\ is\ stored\ in\ facts\ as\ a\ unit\ in\ a\ database \\ Schema\ layer\ (core)\ ：\ knowledge\ extraction \end{cases} \\ Technical\ framework(core)：Iterative\ update\ process \end{cases}$$

```
while(new knowledge have emerged){
        Extracting knowledge elements;
         Integrate knowledge ;
        if(knowledge have a good quality){
                Put knowledge elements into knowledge base;
               ……
        }
}
```

# Professional description of construction technology

- ***Step1*:Information extraction**
- $Extract\ what?$
- $$\begin{cases} \boldsymbol{entity} \begin{cases} methods：Heuristic\ algorithm, statistical\ machine\ learning, \\ adaptive\ perceptron\ .e.t \\ essence\ ：Clustering\ problem \end{cases} \\ \boldsymbol{relationship} \begin{cases} How\ to\ improve\ the\ accuracy\ and\ recall\ rate? \\ How\ to\ deal\ with\ higher\ order\ multivariate\ entity\ relations? \\ How\ to\ extract\ implicit\ semantic\ relation? \end{cases} \\ \boldsymbol{attribute}：How\ to\ extract\ attributes\ from\ massive\ unstructured\ data \begin{cases} machine\ learning \\ data\ mining \end{cases} \end{cases}$$

# Professional description of construction technology

- ***Step2*:Knowledge fusion** (Pattern matching problem)
- **Goal：**
- Eliminate conceptual ambiguity,
- eliminate redundant and erroneous concepts,
- ensure the quality of knowledge

- $$\begin{cases} Entity\ link \begin{cases} Entity\ disambiguation(clustering) \begin{cases} The\ computational\ complexity\ will\ increase\ two\ times \\ The\ data\ quality\ is\ uneven \\ A\ priori\ training\ data\ is\ difficult\ to\ obtain \end{cases} \\ Coreference\ Resolution\ （classification、clustering） \end{cases} \\ Knowledge\ merging \begin{cases} Merge\ external\ database \begin{cases} Data\ Layer：Avoid\ relational\ conflicts \\ Schema\ layer \end{cases} \\ Merge\ relational\ database \end{cases} \end{cases}$$

# Professional description of construction technology

- ***Step3*:Knowledge processing**

- $$\begin{cases} Ontology\ construction \begin{cases} Calculation\ of\ coordinate\ relations\ between\ vertical\ concepts\ (similarity) \\ Upper\ and\ lower\ relation\ extraction \\ Ontology\ generation\ (clustering) \end{cases} \\ Knowledge\ reasoning \begin{cases} Logic\ based \\ Graph\ based \end{cases} ——Trends:\ cross\ knowledge\ base\ reasoning \\ Quality\ evaluation：Quantifying\ knowledge\ reliability \end{cases}$$

- ***Step4*: knowledge updating** $\begin{cases} Full\ update：Consume\ a\ lot\ of\ resources \\ Incremental\ updating：A\ lot\ of\ human\ intervention\ is\ needed \end{cases}$

# Research prospect

- How to improve the accuracy, recall rate and scalability of information extraction?
- How do I implement accurate entity links?
- The innovation of knowledge reasoning technology.
- How to improve the automation of knowledge updating?
- How to solve the problem of knowledge representation, storage and query?

# Thank you!

**The next stage of work**

Read the English literature, focusing on the mathematical model,and look for innovation.

**Timetable**

| | Mon | Tue | Wed | Thu | Fri |
|---|---|---|---|---|---|
| 8:00-9:35 | | lesson | | | |
| 9:50-11:25 | lesson | | lesson | lesson | lesson |
| 13:45-15;20 | lesson | lesson | | lesson | lesson |
| 15:35-17:10 | lesson | | lesson | lesson | |