Letter to the Editor

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The Brain is a Knowledge Graph

In 2013, I constructed a model to divide all knowledge into two parts: sciences and scientific methods. So there was a gap between these two kinds of knowledge. In this letter, I propose a new theory that the brain is a knowledge graph, which will fill in the gap.

I will review my knowledge organization model (Xiao 2013) at first. For one thing, sciences are the first kind of knowledge which include natural sciences (investigating nature and life), social sciences (investigating economics, politics and society) and cognitive science (investigating the mind). For another, scientific methods covers languages (the most basic method), mathematics, philosophy, statistics, information, education and communication. In the information age, every scientific method has an accompanying information technology: computer languages, discrete mathematics, computation theory, machine learning, knowledge graph theory and computational communication.

Computational communication is about how knowledge is spread and takes effect. So we can get a result that the most ensemble scientific method is knowledge graph theory. In the same way, we select the most complex research object in the world: the mind.

The key of the theory is to link the mind and the knowledge graph. Knowledge graphs, also called semantic networks, are now widely used in knowledge representation and storage taking place of the traditional ontology model (tree model). It can be used not only in natural, social and cognitive sciences but also the knowledge science itself. Why has the knowledge graph model a general function in knowledge organization? Considering the simple fact that knowledge is the product of the mind, I suggest the theory that the brain is a knowledge graph.

The theory can be expressed that the mind and the knowledge create each other during the evolution process, so they have the same organization structure or they are homogeneous. Some studies might support the theory. Huth et al. (2016) found that the meaning of language is represented in regions of the cerebral cortex known collectively as the "semantic system" and decoded the brain dictionary map. And Nastase, Mihalcea and Radev (2015) reviewed the knowledge graphs being used to study the natural language processing which is the simulation of the mind. Of course, further studies are needed to compare these two detail structures. If the theory is confirmed, both cognitive science and knowledge science should be promoted: cognition should have a new knowledge graph model, and the semantic neural network model might be a better deep learning algorithm due to lack of explanation of present neural network models.

In summary, there are three most important types of knowledge: languages, computer languages and knowledge graphs. The first links all human beings, the second links all machines(computers), the third (a technology for human beings to talk with machines directly) links machines and human beings. I think the philosophic basis of the communication between human beings and machines is that the machine can organize the knowledge in a readable format by the same thinking mode of human beings: knowledge graphs.

References

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