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Research and Exploration of Intelligent Question Answering System Based on Neural Network

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Abstract: Abstract: Neural network is an algorithmic mathematical model that imitates the behavioral characteristics of animal neural network and performs distributed parallel information processing. This kind of network depends on the complexity of the system, and achieves the purpose of processing information by adjusting the interconnected relationship between a large number of internal nodes. On the whole, in the field of dialogue, the most widely involved is NLP, NLP is neuro-linguistic programming. In Hong Kong, it is also intentionally translated as mind-body grammar programming. N (Neuro) refers to the nervous system, including the brain and thought processes. L (Linguistic) refers to language, more precisely, refers to the process from the input of sensory signals to the formation of meaning. P (Programming) refers to a set of specific instructions to be executed in order to produce a certain consequence. It refers to the habits of our thinking and behavior, just like the programs in the computer, which can be changed by updating the software. Hence, NLP is interpreted as the study of how our brains work. Therefore, NLP is translated as mind-body grammar programming or neurolinguistic programming.

Keywords: Neural Network, NLP, Dialogue System.

1. Natural Language Processing (NLP)

Natural language processing originated in the late 1940s when the first AI systems were built. They have to process natural language and recognize words to understand human commands. In 1950, Alan Turing published a paper describing the first machine translation algorithm. The algorithmic process focuses on the morphology, syntax, and semantics of programming languages. The title of the thesis is "Computers and Intelligence". Turing wrote more research papers on natural language, but his work in this area did not continue. In 1959, he wrote a paper "On Computable Numbers". The idea of artificial intelligence is introduced to solve problems that humans cannot solve by themselves. The algorithm processes information and performs tasks beyond human capabilities or time constraints, such as playing chess at lightning speed.

2. Introduction to Question Answering System

In the specific mode of question answering processing, question answering system is similar to information retrieval and database query. Both question answering system and information retrieval need to perform answer information retrieval on the Web according to the questions raised by users. Or query the answer information on the knowledge base, but there are differences in the specific input and output, information acquisition process, application scenarios and so on. The characteristics of the three mainstream question answering systems are shown in the following table.

Type	Input	Output	Data interpretation
Information retrieval	keyword	Document or structure Chemical data	Users let search engines know White search intention
SQL query	Structured	Data aggregation	Users need to understand the database Schema and SQL
Question answering system	natural language	correct answer	The data solution is undertaken by the machine Release work

Figure 1. Question and answer system feature table based on task processing mode

2.1. Classification of Question Answering Systems

Web Question Answering (WebQA) based on Web Information Retrieval: The WebQA system is based on the search engine. After understanding and analyzing the user's question intent, it is supported by the search engine to search for relevant answers in the entire network. Feedback to users, typical systems include Ask Jeeves and AnswerBus systems.

Knowledge Based Question Answering (KBQA): The KBQA system uses unstructured text information (such as Wikipedia, Baidu Encyclopedia), advance valuable information by means of information extraction, and build a knowledge base as the support of the question answering system, combined with knowledge reasoning and other methods to provide users with answers for deeper semantic understanding [2].

2.2. Figures of Question Answering Systems

Community Question Answering (CQA): CQA system is

also known as a question answering system based on social media, and most of its answers are provided by netizens. The user asks semantically similar questions and the answers are fed back to the user. In addition to the above three types of question answering systems, it also includes question answering systems for other special scenarios, such as hybrid question answering system (Hybird QA), multilingual question answering system (Multilingual QA), question answering system based on FAQ (Frequently Asked Question, FAQ), etc. . Among them, KBQA is the most widely used. It not only realizes the semantic understanding of complex problems, but also integrates relevant knowledge among multiple knowledge bases, and conducts knowledge reasoning for complex problems. At present, some question answering systems based on search engines also combine the knowledge of knowledge graph, collect information from various sources by means of semantic retrieval, can conduct certain reasoning according to the user's question, and return the appropriate answer to the user to improve the search Quality, such as Google Knowledge Graph and Baidu Knowledge Graph, etc.

3. Question Answering System Design

3.1. Knowledge Base Management

Knowledge Base (KB) is a special database used for the collection, arrangement and extraction of related domain knowledge. The knowledge in the knowledge base comes from experts in related fields and is a collection of domain knowledge required to solve problems, including basic facts, rules and other relevant information. The representation of the knowledge base is an object model (Object Model), usually an ontology, including classes, subclasses and entities. Different from the traditional database, the knowledge stored in the knowledge base contains special knowledge representation, its structure is more complex than that of the database, and it can be used to store more complex semantic data. The knowledge base was first applied to the expert system. It is a knowledge-based system, including a series of knowledge representing the facts of the objective world and an inference engine, and it relies on certain rules and logical forms to infer some new facts.

3.2. Relational Architecture Design

A typical question answering system includes core systems such as question sentence understanding, answer information extraction, answer sorting and generation. Combined with the typical structure of the question answering system, this paper refines the modules of the system. The main modules include Question Analysis, Phrase Mapping, Disambiguation and Query Construction. After the question sentence understanding module extracts the question entity, the answer information extraction module obtains the knowledge base subgraph centered on the entity node by querying the entity in the knowledge base, and extracts from the extracted subgraph according to certain rules or templates. Corresponding nodes or edges, get the feature vectors that characterize the features of the question and the candidate answer, and finally use the feature vector of the candidate answer as the input of the classification model, and filter the candidate answers through the scores output by the model to get the final answer.

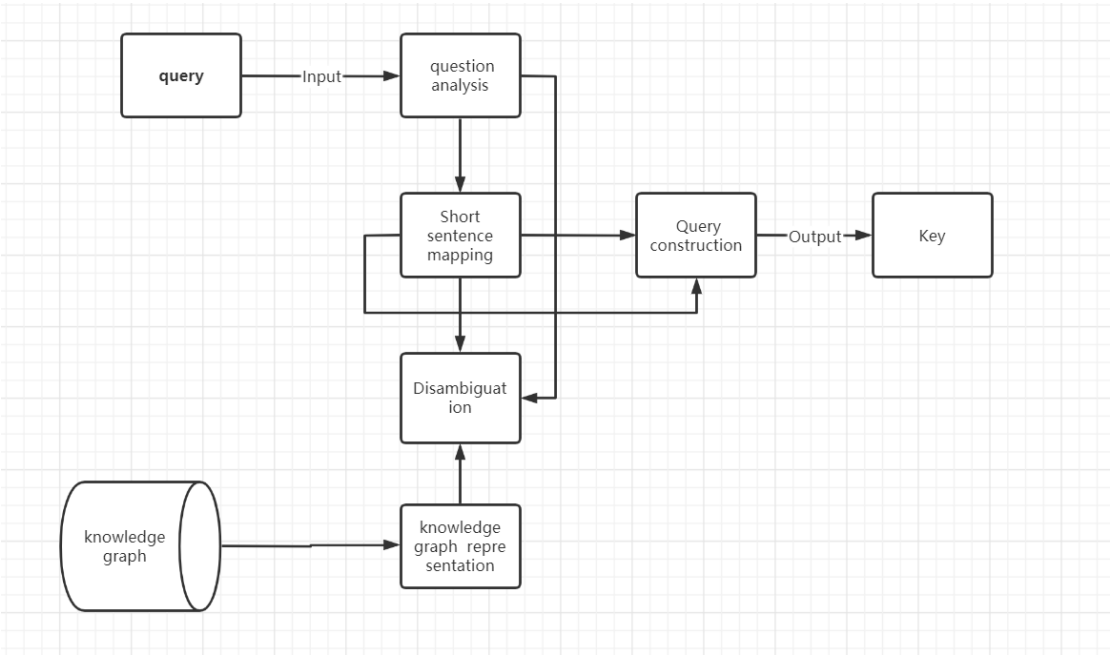

Figure 2. Relational Architecture Design

4. Specific Application Implementation

In the specific implementation process, the natural language understanding module extracts the query information words (time, location, query intent words), and inputs the query information words into the knowledge map. And through ontology mapping, the user's natural language is matched with the standard definition of knowledge graph. The knowledge graph will send a query request (query_Request) according to the user's intention, and return the query response (query_Response) to the knowledge graph. The knowledge graph will output the information required by the intention and the rules corresponding to the intention to the natural language generation module, which is generated by natural language After the module produces and ranks candidate answers, it is fed back to the user.

5. Conclusion

The knowledge graph will send a query request

(query_Request) according to the user's intention, and return the query response (query_Response) to the knowledge graph. The knowledge graph will output the information required by the intention and the rules corresponding to the intention to the natural language generation module, which is generated by natural language After the module produces and ranks candidate answers, it is fed back to the user.

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