

English-to-Japanese Cross-Language Question-Answering System using Weighted Adding with Multiple Answers

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Abstract—We describe a method of using multiple documents with decreasing weights as evidence to improve the performance of a question-answering system. We also describe how it was used in cross-language question answering (CLQA) tasks. Sometimes, the answer to a question may be found in multiple documents. In such cases, using multiple documents for prediction generates better answers than using a single document. Therefore, our method uses information from multiple documents by adding the scores of candidate answers extracted from the various documents. Because simply adding scores degrades the performance of question-answering systems, we add scores with decreasing weights to reduce the negative effect of simply adding. We used this method in the CLQA part of NTCIR-5. It was incorporated into a commercially available translation system that carries out cross-language question-answering tasks. Our method obtained relatively good CLQA results.

Index Terms—Machine translation, cross-language question-answering, decreased adding, multiple documents, NTCIR.

I. INTRODUCTION

A question-answering system is an application designed to produce the correct answer to a question given as input. For example, when “What is the capital of Japan?” is given as input, a question-answering system may retrieve a document containing a sentence, like “Tokyo is Japan’s capital and the country’s largest and most important city. Tokyo is also one of Japan’s 47 prefectures.” from an online text, such as a website, a newspaper article, or an encyclopedia. The system can then output “Tokyo” as the correct answer. We expect question-answering systems to become increasingly important as a more convenient alternative to systems designed for information retrieval and as a basic component of future artificial intelligence systems. Recently, many researchers have been attracted to this important topic. These researchers have produced many interesting studies on question-answering systems [1], [2], [3], [4], [5], [6]. Evaluation conferences or contests on question-answering systems have been held in both the U. S. A. and Japan. In the U. S. A., one evaluation conference was called the Text REtrieval Conference (TREC)

[7], while in Japan, another conference was called the Question-Answering Challenge (QAC) [8]. These evaluation conferences aim to improve question-answering systems by having researchers use their question-answering systems to solve the same questions, and then examining each system’s performance to glean possible methods of improvement. We investigated the potential of question-answering systems [9] and studied their construction by participating in the QAC [8] at NTCIR workshop [10].

We proposed a new method that uses multiple documents as evidence but decreases adding to improve performance. Sometimes, the answer to a question may be found in multiple documents. In such cases, question answering systems that use multiple documents for prediction generate better answers than those that use only one document [3], [4], [5], [11]. In our method, information from multiple documents is used by adding the scores for the candidate answers extracted from the various documents [4], [11]. Because simply adding the scores degrades the performance of a question-answering system, our method adds the scores with decreasing weights to overcome the problems of simple adding. More concretely, our method multiplies the score of the i -th candidate answer by a factor of $k^{(i-1)}$ before adding the score to the running total. The final answer is then determined based on the total score. For example, suppose that “Tokyo” is extracted as a candidate answer from three documents and has scores of “26”, “21”, and “20”, and that k is 0.3. In this case, the total score for “Tokyo” is “34.1” ($= 26 + 21 \times 0.3 + 20 \times 0.3^2$). Thus, we calculate the score in the same way for each candidate and take the answer with the highest score as the correct answer. When this method was used at CLQA (NTCIR-5), it scored higher than most participants’ methods.

II. USE OF MULTIPLE DOCUMENTS AS EVIDENCE WITH DECREASED ADDING

Suppose that the question, “What is the capital of Japan?”, is input to a question-answering system, with the goal of obtaining the correct answer, “Tokyo”. A typical question-answering system would output the candidate answers and scores listed in Table I. These systems also output a document ID indicating the document from which each candidate answer was extracted.

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