Combining Multiple Statistical Classifiers to Improve the Accuracy of Task Classification

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Abstract. Task classification is an important subproblem of Spoken Language Understanding (SLU) in automated systems providing natural language user interface, whose goal is to identify the topic of a query from the user. This paper presents a combination of multiple statistical classifiers to improve the accuracy of task classification in the context of city public transportation information inquiry domain. Three different typical types of statistical classifiers are trained on the same data to be the base classifiers of the combination system: naïve bayes classifier, n-gram model, and support vector machines. The combination method of two-stage classification is emplored to yield better overall performance. Our experiments showed that support vector machines outperform excessively the other base classifiers for task classification in our domain. The comparative experimental results between two-stage classification and voting strategy indicated, under the circumstance that the best base classifier has the overwhelming performance over the other base classifiers, the strategy of two-stage classification was more effective and could produce better results than the best component classifier.

1 Introduction

Task classification is a subproblem of Spoken Language Understanding (SLU) in automated systems providing natural language user interface, whose goal is to identify the topic of a query from the user (e.g. **ShowFare** is the topic for "*What is the minimum taxi fare?* ".) [1,2,3]. It is essentially one type of shallow semantic analysis of the input utterance. If the semantic representation is formalized as a frame with an internal structure consisting of slot/value pairs, then task classification can be regarded as identifying the frame type. Task classification is critical for SLU in many applications, for example, the well-known Airline Travel Information (ATIS) domain. Task classification may help the deep semantic analysis component such as rule-based robust parser by restricting the parser to only apply the grammar corresponding to the recognized task class [2]. It is a typical pattern recognition problem and suitable to be handled using statistical classification techniques. Similar works include call routing [4], classification of speech acts or dialog acts [5,6], etc.

In the literature of task classification, the reported error rates of task classification of text or speech input suggest it is necessary to endeavour to improve the accuracy