In recent years, with the development and popularity of software engineering, software development is not only a professional job, but more and more students and non-professionals also join in. Low-code development, which has been popular in recent years, allows simple software customization by dragging and dropping modules. There is also a very well-known open source project  Copilot on GitHub, and Copilot can directly generate code by writing comments. There is no doubt that these projects have greatly lowered the threshold for software development and made more ideas a reality. In addition, these projects can also save a lot of time and cost for professional engineers. Some simple codes will take a lot of time whether they are implemented by themselves or in the library. Tools like Copilot liberate engineers and allow them to More focus on business logic and professional engineering code.

The problem that this project wants to study is to directly generate an application running on firebase through a set of user stories. There is not a lot of information on this project at present, but there are some prevalent related projects, such as the conversion of text to SQL through natural language processing, and there is a very close connection between SQL and application. When we get the user stories, the first thing we need to do is to extract the keywords and understand the semantics through NLP, then generate the corresponding modules through analysis and then assemble them. For many functional modules, it is essentially a combination of one or more SQL, so if we can realize the conversion between text and application, we can solve an important step in this problem. This article will mainly study the conversion of text to SQL, combined with some popular open source projects, and briefly introduce the technologies and models used.

First, let's introduce what is the standard natural language to SQL conversion format. For example, if you ask what is the grade of Chengzhi, the SQL statement will be “Select grade from Student where name = chengzhi dong”, we can see that the part marked with color will be the part that we need to fill in according to the semantics. Because the key to solving the problem is how to recognize natural language and how to fill it in the correct position. Natural language processing usually uses machine learning to train the model and generate a powerful system that enables it to complete the functions we mentioned, but for our problem, using NLP still has the following challenges.

First of all, we must understand that for the same question, we have different formulations, such as the score of the urban chronicle and the score of the urban chronicle test. But how to make the computer understand the problem of different formulations? The commonly used method is to train a system through a large amount of other data (such as Wikipedia) and then optimize the available system according to the field of the project. Because such a system learns a large number of natural languages, it is difficult to understand most of the semantics. can be parsed. The more popular ones are BERT, RoBERTa, XLNET.

The second challenge is how do we extract keywords and map them to the corresponding positions, that is, how to realize the computer's understanding of semantics? Since the SQL statement is not only related to the query conditions, but also to the schema, so first we need to take the schema as input, and use the attention mechanism to optimize the system. The attention mechanism is to only focus on the part of the input that is closest to the corresponding label, so we also need a lot of data for training to improve the accuracy of judgment.

The last challenge is that we need to make some restrictions on operators. Since different fields in the schema have different data types, many operation statements may actually be illegal. We can restrict illegal statements through execution-guided decoding. Thereby improving the accuracy of the answer.

Through the above analysis, we can draw a general model. The input is the request and table structure of natural language. The first layer is to parse the semantics through BERT, RoBERTa, and XLNET, and extract the corresponding keywords; the second layer is to use the LSTM or SELF ATTENTION mechanism to correspond keywords to labels; the third layer To calculate the positional correspondence between the final keyword and the SQL statement. The specific training method minimisze the loss, which can be calculated by the kullback-leibler divergence method.