

How to find and state a research problem in computer science

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Abstract

This paper generally described the methods and rules about finding and stating a research problem in computer science. After understanding the types of research and the criteria of suitable research problem, researchers could find a suitable research problem by reading, thinking and communicating. How to state a research problem clearly is another big concern in this paper. The statement should start by stating the core idea and the importance of the problem clearly. Some complex problems might be divided in several researchable subproblems. The research problem would be logical and clear by clarifying hypotheses, approach, methods, potential results and applications.

Keywords research problems, methods

1. Introduction

Finding a suitable research problem is the basic for research at any area including computer science. Stating the research problem clearly enables the successful process of research activity and the support from experts and others. This paper tries to depict how to find and state a research problem step by step with some examples in computer science.

2. How to find a research problem in computer science

2.1 Two types of research

With different objects, research can be divided into two types, basic research and applied research[3]. Basic research aims for enhancing and extending human knowledge about natural and social phenomena. While doing applied research, researchers attempt to solve specific issues and serve for decision making on practical problems. In computer science, quantum computer is an excellent example of basic research; and cloud

computing could be considered as typical applied research.

2.2 Criteria for suitable research problems

To find a good research problem, we should know firstly what kinds of research problems are good and suitable. A good research problem intends to address an important problem or new thinking, knowledge and possible applications. It is the first step of a systematic research activity. In computer science, how to create and apply new algorithms are good research problems since new algorithms would highly improve performance.

Besides, a suitable research problem does not just compare or calculate a correlation coefficient of two sets of data. A research problem is also not a question with a simple yes or no answer.

2.3 Finding a legitimate research problem in computer science

Since the research problem is fundamental to research activity, researchers need find a legitimate research problem to start a good research[3]. At the beginning, researchers should find a domain or an area they are really interested in, for instance, we choose computer science as PhD program because it is a fascinating area to us. Diving in computer science area, we should try best to know what specific problems we want to address through various ways, which include reading literature, searching materials, thinking independently, attending relative professional conferences and seminars and communicating with others especially experts.

For new researchers in computer science, reading high-quality papers published on top journals and conferences leads the methods for finding a good research problem. ACM conferences publish amount of inspiring papers with novel ideas and solutions to practical problems. In another word, great ideas will inspire us

to discover and think. Attending seminars could also be regarded as a beneficial way. We could get to know what experts have done and plan to do, and discuss with them about our own ideas. For myself, I love talking to my advisor, who is always full of novel thoughts and very open and supportive to my own thoughts. I believe a friendly working environment guarantee a good research problem could be generated and developed.

When knowing well about what we want to do, we would understand the significance, operability, applicability and potential risk [1]. We sometimes need collaborate with others to fulfill the research so that the research problem should be interesting and valuable to the collaborators too.

3. Principles to state a research problem in computer science

3.1 The rules for stating a research problem

When a great idea comes to us, we commonly write down first to think and understand it thoroughly then. Similarly, we should state a research problem clearly after finding one. Firstly, we are supposed to consider and state the core idea concisely. Then the whole research problem should be stated logically, clearly and completely. The clearance means it is clear to not only the author self, but also other people. In the research statement or proposal, we also need articulate the importance and feasibility to readers.

More than half research programs in computer science should be practical and applicable. In this condition, the statement of the clearance and importance concerning single research problem may directly lead to the possible acceptance from the outside world. A research statement of new software could be used here as a good example. If the advantage and outstanding functions are clarified in the statement, it could gain understanding and support with high probability. In contrast, if these are not stated clearly, people might think they do not need the software.

3.2 Identifying subproblems

Sometimes, the research problem could be divided into several researchable subproblems for clarifying it more easily and precisely[3]. Each subproblem represents a certain part of the main problem with connection to other ones and the interpretation of available data. Identifying subproblems is quite difficult. We should take advantage of our brain and other tools to know how to

divide the research problem logically and which subproblems are necessary and worthy to address. Remember that the number of subproblems should be limited so that the divisor helps to make the problem clearer and more researchable rather than make it more complicated.

Based on research problems, researchers begin to think about how to answer or solve them. And then the thinking might become or generate hypotheses about those problems. In hypotheses, data collection and analysis should be stated clearly.

3.3 Stating proper approach and methods

Researchers should also state their research approach and methods when stating a research problem. It will show how they try to figure out the problem and whether their methods are appropriate and efficient[2]. If there is no proper approach or methods, a good research problem won't realize its value. In fact, many methods could solve a problem in computer science study.

3.4 Thinking about potential results and applications

A research problem intends to extend human knowledge or figure out a practical issue, hence, it should lead to potential results. When stating a research problem, its potential and reasonable results should be mentioned to point out that the research problem is suitable. A good applied research program helps to solve problems, for instance analyzing climate change using former climate data by cloud computing.

4. Conclusion

This paper generally depicted how to find and state a research problem with computer science as example. By consulting study materials, new researchers start to know how to find a suitable research problem by various ways and how to clarify the problem step by step.

References

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