Starting Research in Computer Science: A Structured Guide for Beginners

Mr.Bhanu Chander Pachimadla[1]., P.Shivani[2]

1 Assistant Professor, Department of CSE, Malla Reddy College of Engineering for Women., Maisammaguda., Medchal., TS, India

2, B.Tech CSE (20RG1A05N8),

Malla Reddy College of Engineering for Women., Maisammaguda., Medchal., TS, India

ABSTRACT

One of the main reasons why any field or area of study advances and changes is because of research. However, researchers with the necessary expertise are few. Taught as part of the curriculum at the university's undergraduate level. Learn "how to start performing research" in a certain domain of computer science with the help of this paper's "Eight-Step Approach to Research," a practical and efficient framework or technique. Although this work is aimed at those with an interest in doing research in the subject of computer science, the methods presented here may be used in any academic discipline.

1. INTRODUCTION

After doing research, one must read several research papers for a variety of objectives, including evaluating them for a conference, journal, or course. To bring you up to speed in the topic, do a literature review of a related discipline, or add to the body of knowledge in that area of study. This was explained thoroughly in S. Keshav's "How to Read a Paper" essay [1]. Although there are excellent publications on how to read a research paper systematically, the majority of these materials neglect to instruct students on the most important first step: developing a research question. Knowledge of and practice with the methods by which one might begin doing research in a certain subject or area are prerequisites for both reading and writing research papers, whether they are written for a technical audience or not. Therefore, the main goal of this article is to instruct first-time computer science researchers and students on how to start a research project.

First, we'll talk about what inspired me to create this paper in the next part, and then in the third, you'll find out exactly what that paper is about. The straightforward "Eight-Step Approach to Research," which will provide the reader with a foundation from which to launch their own investigation. Then, in Section 4, we'll talk about the challenges we've encountered when using this paradigm, and in Section 5, we'll discuss some of the associated work that's been done.

2. MOTIVATION

The knowledge and abilities essential to doing research are often introduced during graduate study, either at the conclusion of the master's program or just before the student begins their studies at the master's level. Thesis, or upon starting graduate school (Ph.D. or M.Phil.). However, the many fields in which computer science finds application mean that it is one of the most dynamic and rapidly changing fields in the world today. This calls for an increase in the number of qualified computer programmers and academics studying the topic. However, few undergraduate institutions adequately prepare students for the world of research by providing them with the foundational knowledge they need to get started. In 2012, 235 students (at both the undergraduate and graduate levels) in the Computer Science Department at St. Xavier's College (Autonomous), India, took part in a poll to determine how many would feel at ease competing in a technical writing/poster competition. One of the most frequently requested counter-survey questions was "Where and How to start a Research Work?" which caught the survey's creator off guard. This means that, out of a total of 235 students, 198 had the same question.

Five hundred and ninety-four students from the School of Computer Science at the University of Manchester were surveyed in 2013. Educated levels from undergraduate through postgraduate. Only 419 of the 594 students had not previously asked where and how to begin their investigation. According to the data collected, a staggering 84.26 percent of computer science students at St. Xavier's College (Autonomous), India, and 70.54 percent of computer science students at the University of Manchester had either no notion or a hazy concept of where to begin their study. Research skills are often taught at the postgraduate level by the students' individual supervisors, tutors, or mentors, but they are not emphasized in the classroom or at the undergraduate level. Most kids these days are also learning about the many ways technology may be put to use, but it's even more important to instil in them the fundamentals of research.

3. THE EIGHT-STEP APPROACH TO RESEARCH

This section will teach you the basic eight-step procedure for beginning any research project or doing any study in picture 1, we see a block diagram depicting the process.

In Figure 1 we see a schematic representation of the "Eight-Step Approach to Research."
Figure 1 includes instructions meant to put readers at ease by suggesting that they can easily follow along. Block diagram depicting the algorithmic 'Step' approach of the methodology, but it can also be comprehended by any reader in any field of study by following the description of the methodology in the next line.

Step 1: Select a Subject Area that You Like

This initial step might be challenging yet rewarding. It is important to focus on the specific areas of interest to you while studying a subject, in this instance computer science and engineering. In the area where your reading and thinking are most fulfilled. After making your selections, jot them down or scrawl them onto paper.

Step 2: Search Databases

Selecting your preferred subjects is the first stage in doing a database search. Now, whenever individuals thinking about looking for anything whenever people need to find anything (outside of the physical world), they immediately think to use a search engine. However, it is important to remember that the search results produced by these engines are broad in scope and that the sources they pull from may not be reliable.

Scholarly search engines, databases, and archival systems are all good places to look for the keywords or 'something' linked to academic publications and papers. Given the paper's intended audience, the following databases contain the most relevant research articles/papers: ACM Digital Library [7], IEEEXplore Digital Library [8], INSPEC IET Digital Library [9], DBLP [10], Elsevier Publishing Facilities [11], Scopus [12], Science Direct [13], Springer Publishing Facilities [14], etc. Please be aware that the above list of databases is by no means comprehensive, but rather includes some of the most well-known and often used databases in which computer scientists and other professionals in the field typically publish their work.
Google Scholar [15], Microsoft Academic Search [16], and the Arrive Preprint Server are also other places you may do a search. Or SAO/NASA Astrophysics Database [18], etc. A search on Google Scholar, Microsoft Academic Search, Arrive, or NASA ADS may provide results that aren't limited to the discipline of computer science.

Step 3: Sort Scholarly Articles and Research Papers

When I say "sort articles" or "sort research papers," I don't intend to immediately begin using a sorting algorithm, such fast sort or merge sort, to the articles or papers. This is more difficult than it first seems and requires human interaction rather than automated processing. This process, however, cannot be explained unless you have a basic grasp of the many forms that academic papers might take. There are two main categories of research articles [2]: Research Paper (Either Argumentative or Analytical) an argumentative research paper presents a set of arguments and the author's position in support of or opposition to those arguments. In this kind of paper, the writer presents an argument and then uses supporting evidence to convince the reader that the argument is true.
In an Analytical Research Paper, you analyze a topic or line of reasoning and provide your own thoughts and opinions on the subject. If you've already done the legwork of searching databases for a list of academic articles and papers on your preferred subject, you can go on to the next step, which is selecting the articles or papers that best serve your purpose and interest. To achieve this, however, you must first read the research paper's title and abstract to acquire a feel for the general topic area (either an argumentative or analytical research paper).
It may take some time and experience before you become an expert at this, but once you know what kind of document it is, determining whether it is relevant to your study will be much simpler. Therefore, at this stage, you need to choose the research papers or articles depending on your

interest and the kind of research paper that will serve your goal.

Step 4: Read Articles/Papers

Keshav's [1] "How to Read a Work" paper is helpful for this phase since it presents a three-pronged strategy for reading scientific articles. Paper proficiently so that you may grasp its essential ideas with ease.

Step 5: Brainstorming and Innovate

Having a brainstorming session is different from just thinking about current events for a few moments. It takes a lot of effort to do this. The analyses and critiques in this work are thoughtful and well-thought-out. Take just what you will use. You need to make an attempt to think rationally and critically about the article or paper, taking into account the reasoning's and arguments that are presented without question. Getting you to think critically may be difficult at first, but with enough practice, you can accomplish it. To get started, consider asking yourself the following questions regarding the attached paper. Explain how this paper addresses the problem.

Is there any way to fix this, and where can we get it?

What criteria are used to evaluate the efficacy of these approaches?

(Metrics for success, the ability to replicate the experiment, the solution, etc.)

How did the authors of this research arrive at their hypotheses?

When and why does the study fail to do so?

Paper?

Asking, "What is the most significant work that came before?"

Could I/we improve it? Prospective ideas for the company's development!

On a scale from 1-10, how would you assess the quality of the paper?

After you've done your homework and asked and answered the above questions, you'll be free to develop your own unique line of reasoning or theory to back up your claims. Throughout the study, the analysis is all-encompassing. As of right moment, though, the clock starts ticking at the first sign of creativity. However, it is essential that it be kept alive. Don't forget that it's conceivable you won't retain 100% of the information presented here. You may react to such a circumstance by discussing it with as many of your colleagues as possible. Or companions in the same line of inquiry; or a group of people who can some assistance from someone who is capable of providing viewpoint on the significance of the findings. Most importantly, this is the

Vital but entertaining component of study. So don't forget, after finishing a paper or article, Do some mind-mapping and then come up with something new. Bear in mind that making connections is a crucial component of research. The greater your number of opinions on a certain topic, the more issue, the more objective your analysis will be. And you'll be in a better position to avoid prejudice because of it. Anything related to your field of study.

Step 6: List all Relevant References

Here, you'll compile a list of each source mentioned in your reference section. The crucial inquiry you may ask about this stage is "Why do I have to put in the citations?" Something like this may be considered an investment for the long run. Create a bibliography of supplementary materials that are pertinent to that study field that might help you understand the work. You may need to study the papers and articles mentioned by the one you're now reading in order to fully grasp the concepts and arguments presented in the paper you're currently reading, which may only provide you a partial image or viewpoint of the situation. Step 2 then involves utilizing this list to study the articles in order to have a more comprehensive understanding of the field in question.

Step 7: List all Relevant Keywords

Here, instead of compiling a list of sources, you will compile a list of keywords from the aforementioned sources. Thesis or dissertation that you are now reading. In order to find publications that are relevant to your study, choose the appropriate keywords and utilize the list to carry out step 2.

Step 8: Do While || END

This is the very last stage, and it serves as a conclusion to your study, so you shouldn't do it until everything else is wrapped up. Concentrate on a certain subject. Proceed with Step 2 and Step 7 until you have achieved the pinnacle of your investigation.

4. Limitations and Experience of this Approach

Keep in mind that this isn't a strict guideline for doing your first study; rather, it's meant to serve as a fundamental scientific foundation for those who are just getting started in the field. Investigation with this one-of-a-kind method. The strategy suggested in this article is aimed at newcomers and CS students, although it may be used by anybody to kick off their own investigation into a subject. It's important to remember that individual researchers or supervisors may have different preferred methods of doing research, but that this is only one of many methods that are simple and reasonable enough to carry out. As early as my first year of college, I began doing research in the subject of

computer science. It was challenging for me to do research on a topic without a supervisor since I lacked a computer science background before getting a degree in this field in college. However, as I gained more knowledge and experience, I was able to formulate this strategy to aid novice students and researchers in embarking on their own independent studies. Over the last four years, I've taught this method to several students and researchers, all of whom have praised its usefulness. While the methods outlined in this article may serve as a good jumping-off point, it is important to remember that the real magic of research happens when you start connecting the dots and asking the fundamental "Why and how?" questions.

5. Related Work

It is recommended that you read "How to Read a Paper" by Keshav [1] before attempting to use this eight-step technique to research. If you Reading the articles by Schulzrinne [3] and Whiteside's [4] might be helpful if you need guidance writing technical papers. And if you want to know what research is, you should check out either Johnson's [5] online paper or Somers' [6] "What is Research?" presentation.

7. REFERENCES

[1]. Keshav, S., How to Read a Paper, ACM SIGCOMM, Online. Available at http://ccr.sigcomm.org/online/files/p83-keshavA.pdf [Retrieved on 06/01/2014]

[2]. Genre and the Research Paper, Purdue Online Writing Lab (Purdue OWL). Available at https://owl.english.purdue.edu/owl/resource/658/02/ [Retrieved on 08/01/2014]

[3]. Schulzrinne, H., *Writing Technical Articles*, Online. Available at http://www.cs.columbia.edu/~hgs/etc/writing-style.html [Retrieved on 08/01/2014]

[4]. Whiteside's, G. M., *Whiteside's' Group: Writing a Paper*, Online. Available at http://www.che.iitm.ac.in/misc/dd/writepaper.pdf [Retrieved on 08/01/2014]

[5]. Johnson, C., *What is Research in Computer Science*, Online. Available at http://www.dcs.gla.ac.uk/~johnson/teaching/research_skills/resear ch.html [Retrieved on 08/01/2014]

[6]. Somers, H., *What is Research*, Online. Available at personalpages.manchester.ac.uk/staff/harold.somers/RPD/RPD2.p pt [Retrieved on 08/01/2014]

[7]. ACM Digital Library, http://dl.acm.org

[8]. IEEEXplore Digital Library, http://ieeexplore.ieee.org/Xplore/home.jsp

[9]. INSPEC IET Digital Library, http://www.theiet.org/resources/inspec/

[10]. DBLP Computer Science Bibliography, http://www.informatik.uni-trier.de/~ley/db/

[11]. Elsevier Publishers, http://www.elsevier.com

[12]. Scopus, http://www.scopus.com/

[13]. Science Direct, http://www.sciencedirect.com

[14]. Springer Publisher, www.springer.com

[15]. Google Scholar, http://scholar.google.co.in

[16]. Microsoft Academic Search, http://academic.research.microsoft.com

[17]. ArXiv, Cornell University Library, http://arxiv.org

[18]. SAO/NASA Astrophysics Database, Harvard University, http://adswww.harvard.edu