

CSC-450, Finding published research.

An important part of carrying out research is obtaining relevant articles. When you first start exploring a topic, you will likely start with a keyword search (possibly limited to the title/abstract) of the topic that you are interested in. Almost any recent peer-reviewed article you find that are related to your topic will be a good place to start. References cited in this article may then be followed up for additional information.

When conducting research, it is important to keep in mind that most research is *incremental* in nature. This is important. Good research is hardly ever groundbreaking, but good research does make a concrete contribution to the field by either answering a specific question (such as determining which sorting method is better), or by providing a service that meets a need (such as developing a tool that other researchers can use). In both cases, good research involves putting this contribution in the context of similar research that has been done.

In this assignment you will gain experience finding specific articles using the databases (ABI Inform Complete, ACM Digital Library, Google Scholar) discussed in class, by finding articles that investigate sorting algorithms, with an emphasis on quicksort.

The quicksort algorithm is a divide-and-conquer sorting algorithm that consists of 3 steps: (1) choosing a pivot value p , (2) partitioning the data so that all elements smaller (or equal) to p are placed on its left, and all elements larger (or equal) to p are placed on its right, and (3) recursively calling quicksort to sort the left and right parts.

1. The *quicksort* algorithm was originally published by Hoare in 1961. Search the ACM library to find this original publication. (Hint: only the *Algorithm* is available, and it helps to do an *Advanced Search* by *Author* name and *Publication Year*). What algorithm number is this published as?
2. Using Google Scholar, find the follow-up paper called "Quicksort" that was published by Hoare in 1962. In this paper, quicksort is compared with mergesort. According to Table 1 on page 13, mergesort can sort 1000 items in 4 min. and 48 seconds. How long does it take quicksort to sort these items?
3. In 1970, M.H. van Emden wrote a paper called "Increasing the Efficiency of Quicksort", that proposes an alternative method of selecting the pivot (or bound, as the author calls it). According to the abstract, his modification to quicksort leads to what percent decrease in the number of comparisons of the algorithm compared to the original quicksort algorithm?
4. In 1980, Curtis Cook and Do Kim wrote a paper titled "Best Sorting Algorithm for Nearly Sorted Lists." What methods did they combine to produce a new algorithm to sort nearly sorted lists?

5. Find the abstract for, "Multi-Pivot Quicksort: Theory and Experiments", which was presented at the 2014 Proceedings of the Sixteenth Workshop on Algorithm Engineering and Experiments. The authors found that including multiple pivots leads to a 7-8% improvement in experimental tests. How many pivots did they use?