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Efficient and Effective Practical Algorithms for
the Set-Covering Problem

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I started the project before receiving the SAIF grant. I developed different algorithms to speed up the running time of the program, but did not have enough time to implement the algorithms and hence was not sure about the impact of the new algorithms.

After the grant was received, a student helper, Jamie MacPeek, was hired to implement the different algorithms. Although he was a good student with excellent programming skills, he had a difficult time with many issues at the beginning, since it was the first time he was working with such complicated algorithms. We worked together on those issues one at a time, and sometimes he had some good suggestions. We also received valuable help from Dr. Joe Clifton in my department.

The final result was very good. A short report was presented at the Research Poster Day on campus, and a full paper was accepted as a regular research paper by the 2008 International Conference on Scientific Computing (CSC’08), which is one of 25 conferences of The 2008 World Congress in Computer Science, Computer Engineering and Applied Computing (WorldComp’08). I attended the conference in Las Vegas, July 14 – 17, and presented the paper.

The following is the summary of the paper:

We proposed a new version of greedy algorithm for the set-covering problem based on linked list presentation of a matrix and updating the uncovered count for each set. Our algorithm runs faster than the previous presented algorithm CAR and generates smaller result cover in all test cases.

One issue related to the problem is still not solved: How to get input data efficiently. The goal of our proposal was to improve the algorithm, and we ignored the input time. After the algorithm is implemented in a very efficient and effective way, the input issue becomes the last obstacle to solve the entire Set-Covering problem. This could be the goal of a new project for the future.