60-475 Project One

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1 Implementation and Testing

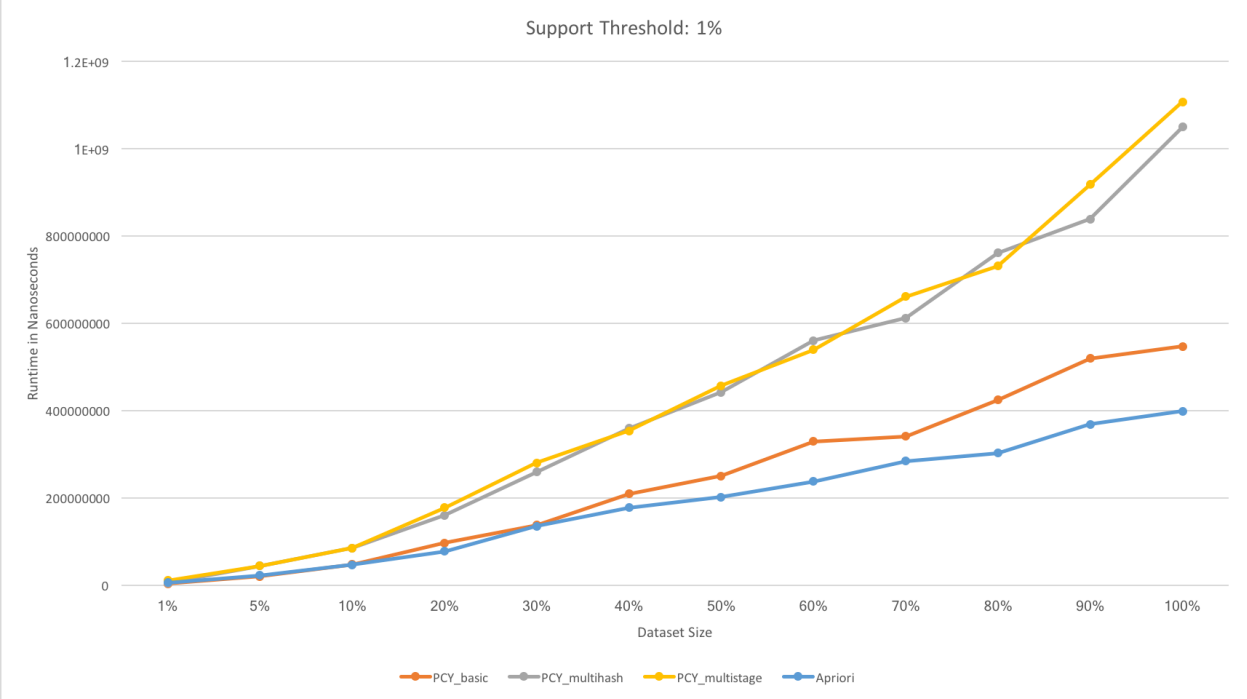
The implementation of the A-Priori, PCY, PCY multihash, and PCY multistage algorithms were made in a single C++ file, which iterates through various percentages of the *retail.txt* data and outputs the runtime of the algorithms with various support thresholds. This data is then put into a .csv file, and graphed accordingly.

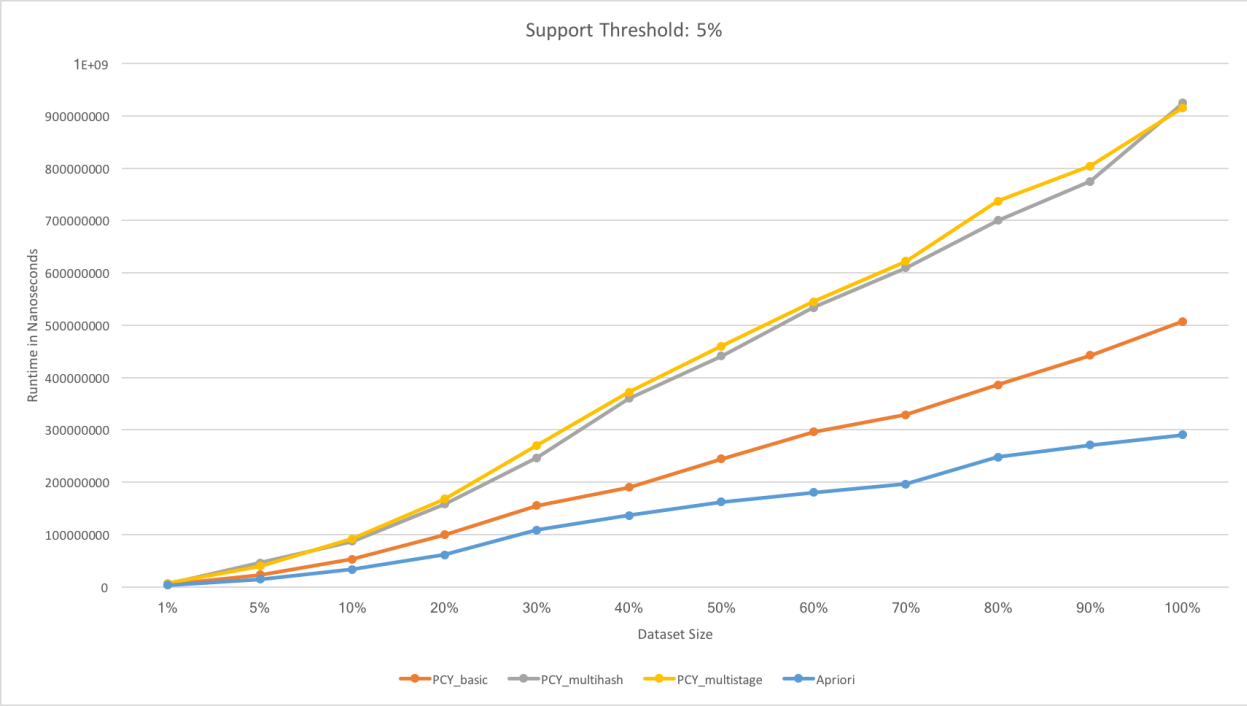
All experiments were run on a late 2011 MacBook Pro, running Mac OS 10.12.3, with a 2.3GHz Intel i5 and 8GB of RAM.

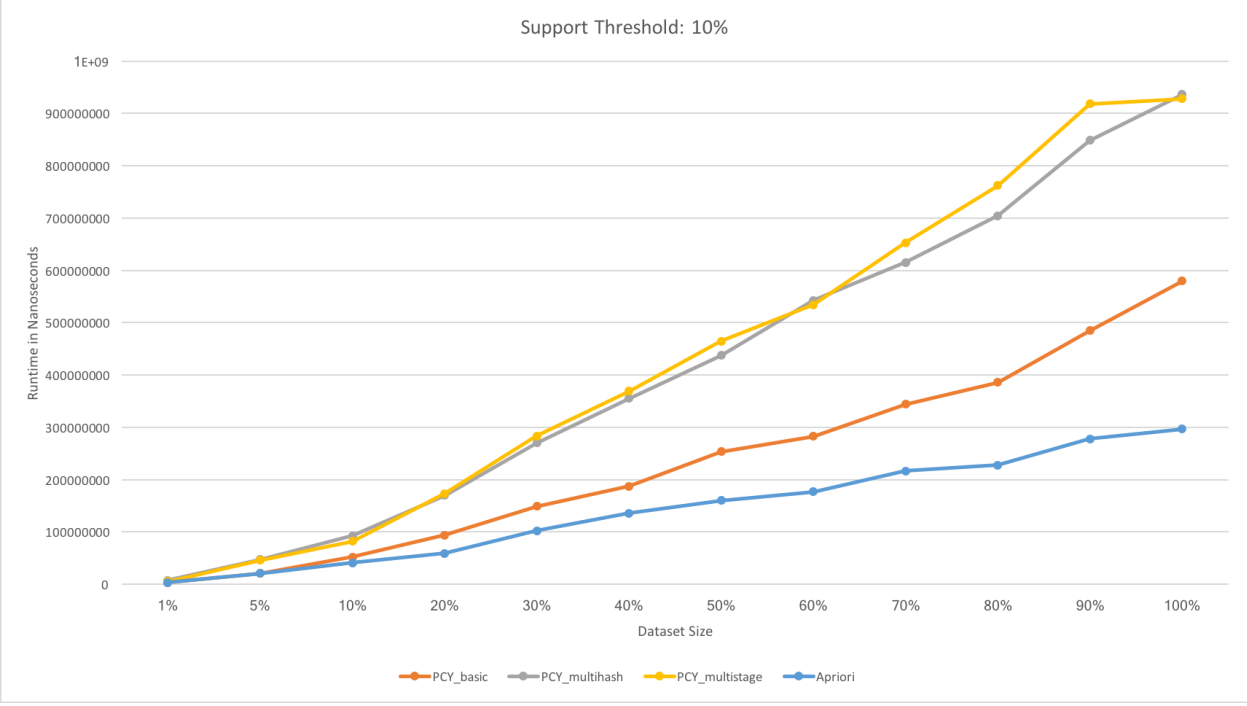
2 Results With Provided Data

In the graphs below, it is shown that A-Priori is the quickest algorithm for this data set. This is because the data set is fairly small, so the extra overhead of PCY does not result in a lower runtime. If we had a larger set of data, then it is likely that the payoff of PCY would be much more apparent.

PCY multihash and multistage are even slower, since it requires additional overhead to run, and the data set is not nearly large enough to see the payoff that these algorithms might provide.

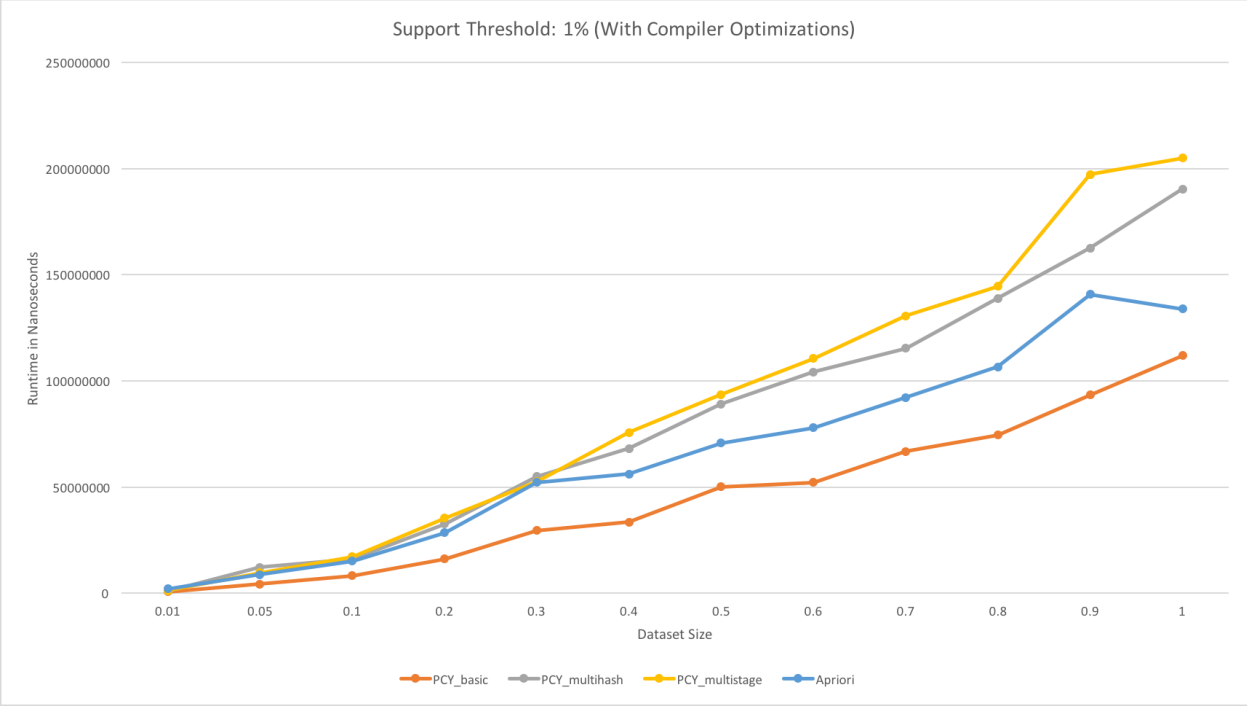






2.1 The Effects of Compiler Optimization

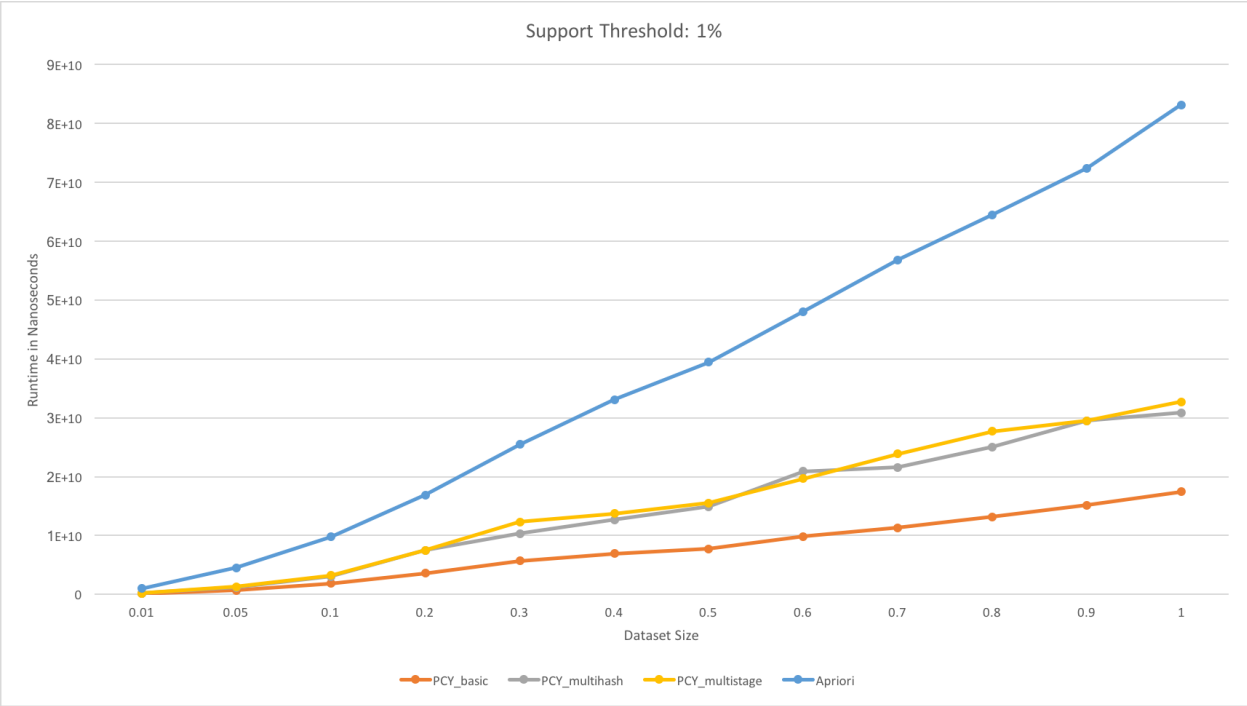
An interesting observation that we noticed was that when we ran the program with clang's compiler optimizations enabled (set the -O3 flag), PCY met or beat the performance of A-Priori with the same set of data. We suspect that this is due to the reduction of calls to the hashing function, as the compiler may have inserted its instructions inline.

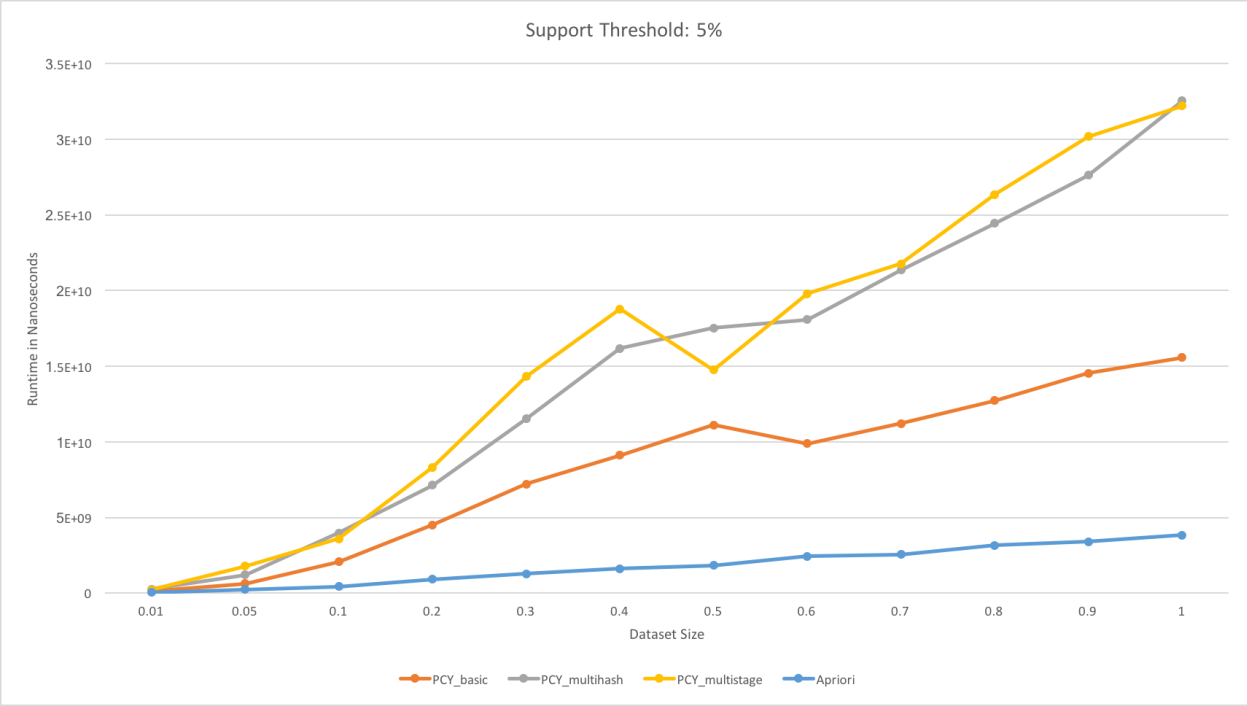


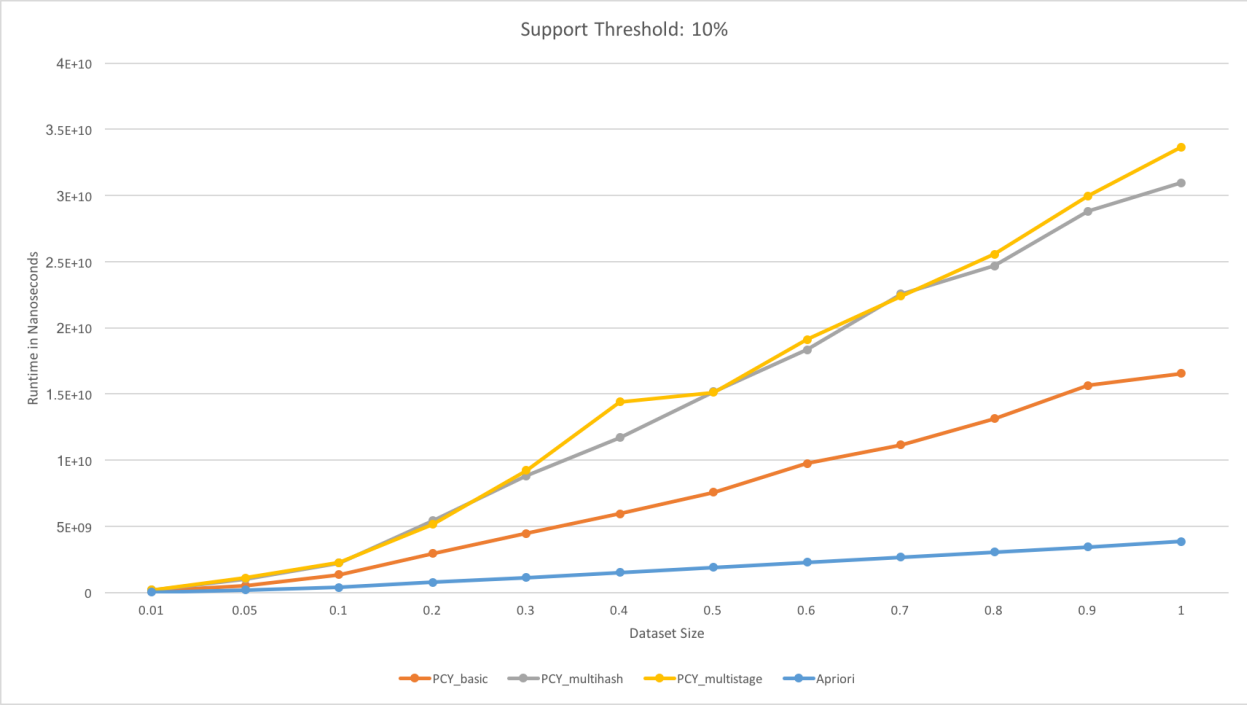
3 Results with Large Randomized Data

Since the provided dataset was not large enough to show off the true abilities of PCY, we wrote a python script that would generate a dataset with random baskets in the same format of *retail.txt*.

We then fed a 100MB file into our C++ program, and got the following results:







Here, we can see that when the support threshold is low, A-Priori is the slowest algorithm by far. However, when we raise the support threshold, the benefits of PCY disappear and A-Priori goes back to being the quickest.

4 Conclusion

In conclusion, for the dataset provided it is best to use the A-Priori algorithm since it has the least amount of overhead and will run the quickest overall. It is only with large sets of data that the benefits of PCY are truly apparent.