

# LEXICOGRAPHIC BREADTH-FIRST SEARCH AND EXACT ALGORITHMS FOR THE MAXIMUM CLIQUE PROBLEM

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## INTRODUCTION

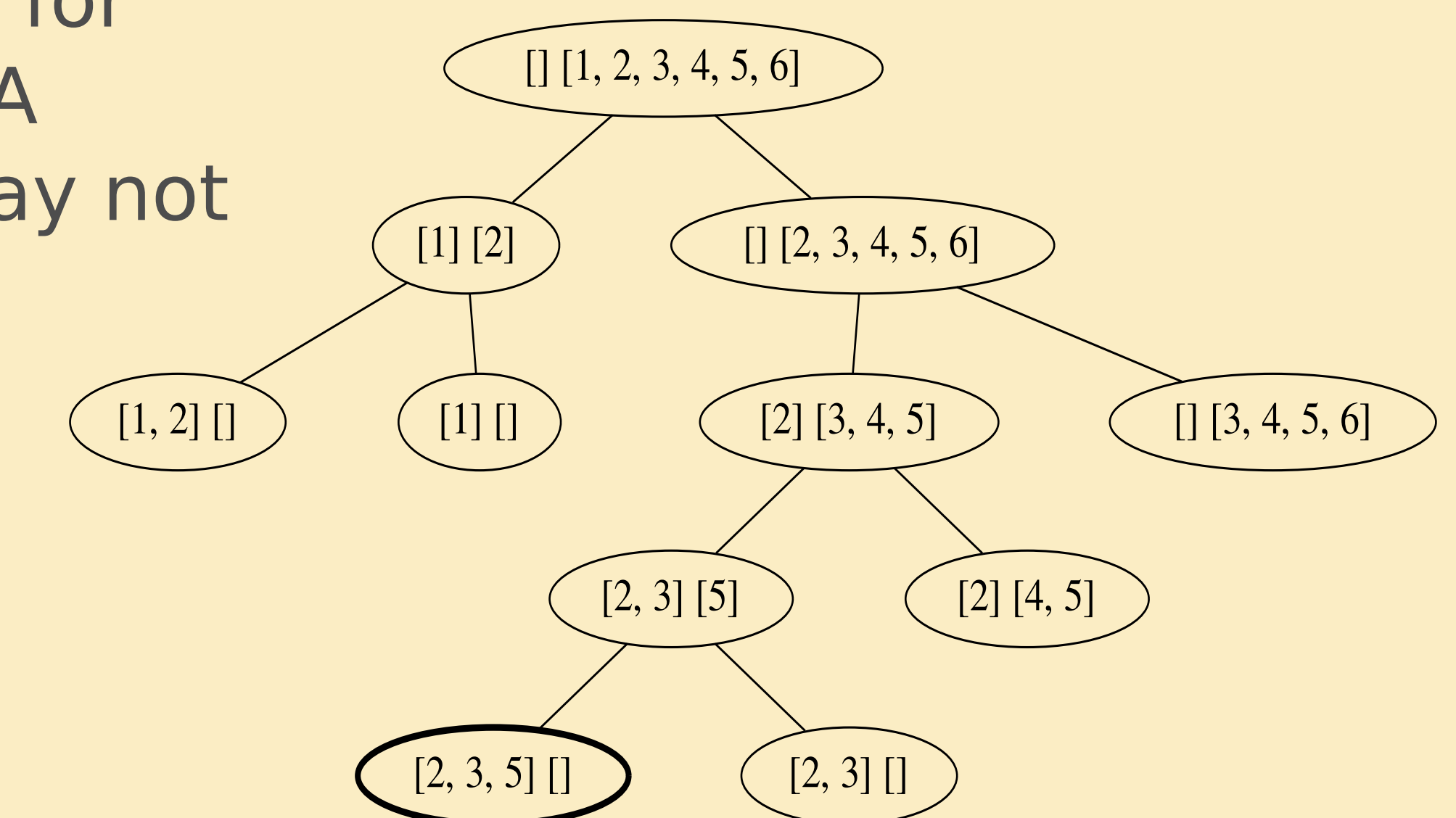
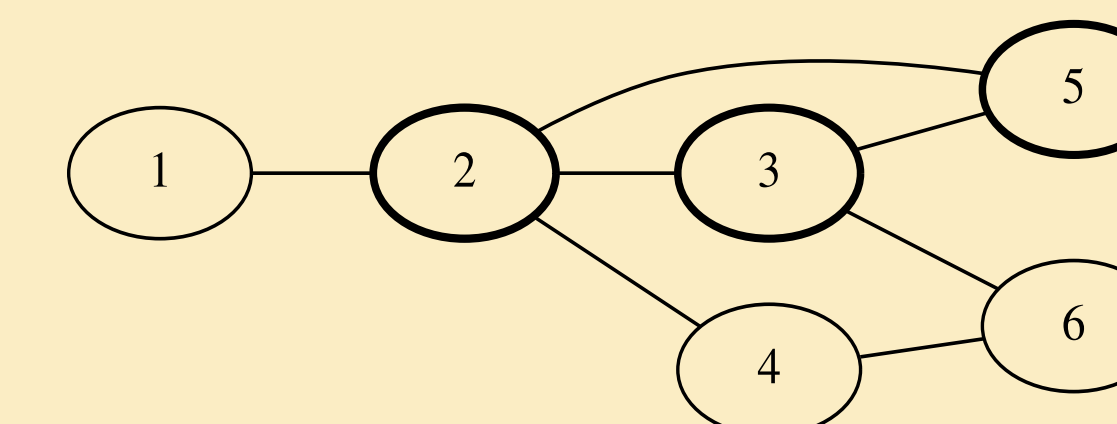
In this work five exact algorithms for the maximum clique problem (MC) were modified with Lexicographic Breadth-first Search (**LexBFS**) algorithm. Also, Experimental Analysis of Algorithms and hypothesis test were used to evaluate the changes.

## OBJECTIVES

1. Study **branch and bound** algorithms that use vertex coloring to solve MC modified with the **LexBFS** algorithm.
2. Apply Experimental Analysis of Algorithms.
3. Apply Statical Inference Theory.

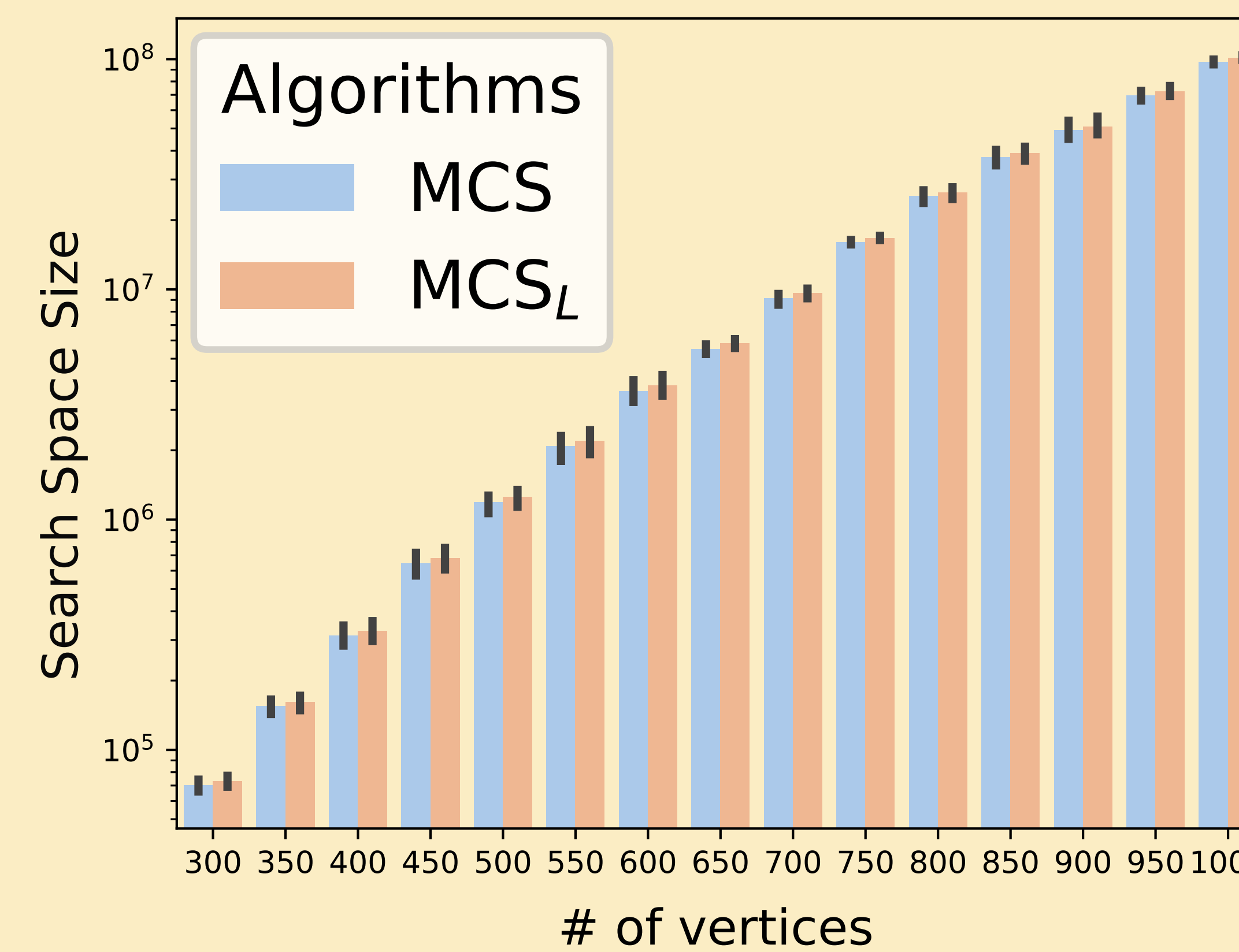
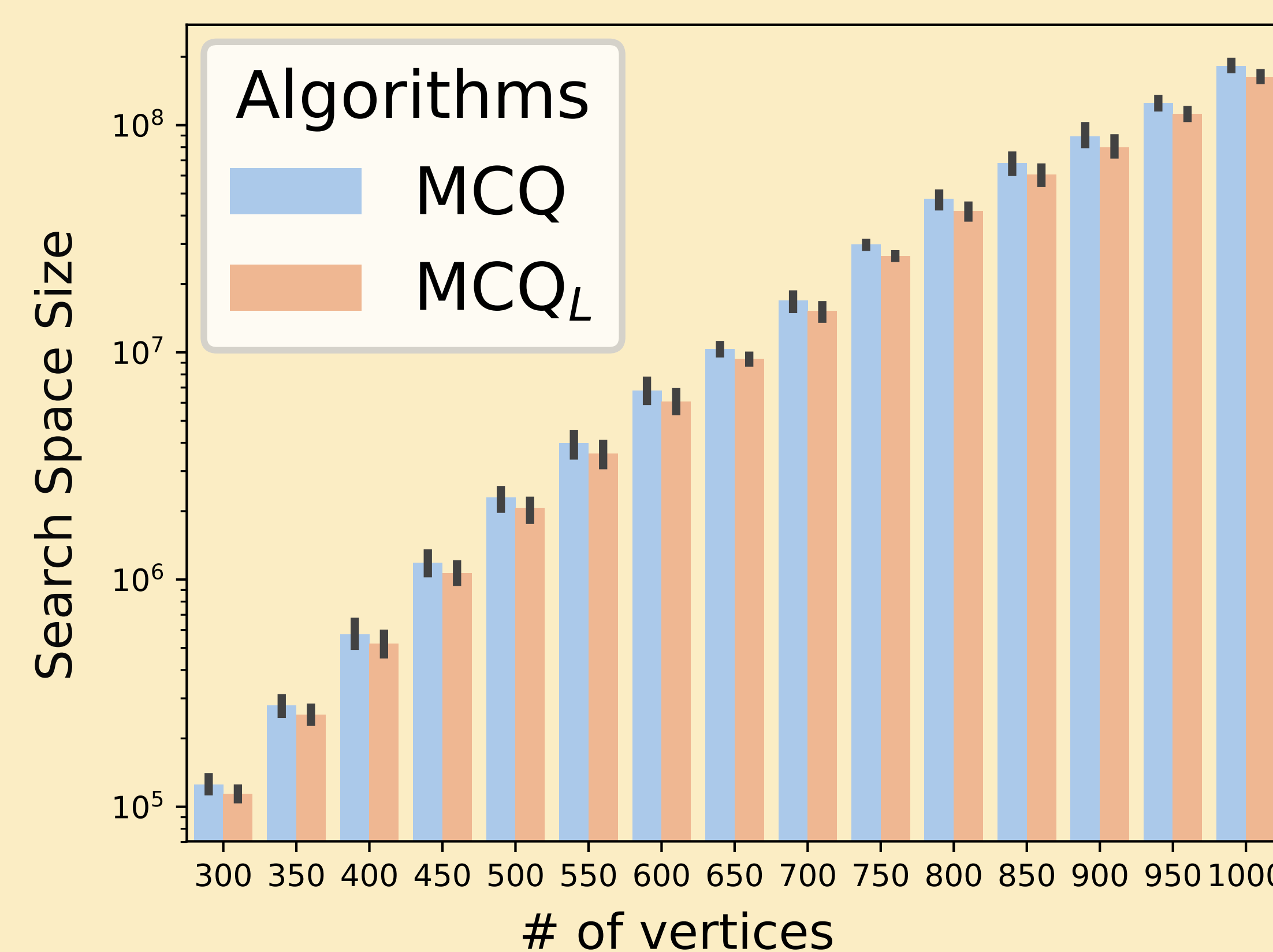
## MAXIMUM CLIQUE ALGORITHMS

Branch and bound algorithms for MC evaluate a search space. A small search space may or may not result in shorter runtime.



## RESULTS

- 80 instances from *DIMACS Second Implementation Challenge*
- 150 instances: random graphs, chordal graphs and cographs
- C++ implementation in <https://gitlab.c3sl.ufpr.br/apzuce/maxcliquebb>



Comparison of the search space evaluated by two algorithms and their respective modifications. For each vertex set size there is a sample size of 10.

## CONCLUSION

With algorithms modified by LexBFS the search space is significant smaller, but the runtime was significant longer.

### References

McGeoch, Catherine C. A guide to experimental algorithmics. Cambridge University Press, 2012.

Tomita, Etsuji, and Tomokazu Seki. "An efficient branch-and-bound algorithm for finding a maximum clique." International conference on discrete mathematics and theoretical computer science. Springer, 2003. [https://doi.org/10.1007/3-540-45066-1\\_22](https://doi.org/10.1007/3-540-45066-1_22).

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