

# Minimum Dominating Set of a Graph

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## 1 Introduction

In this paper, we explore the Minimum Dominating Set of a Graph and how to find it. The Minimum Dominating Set of a Graph is the Set of all nodes such that every node or one of its neighbors is in the set.

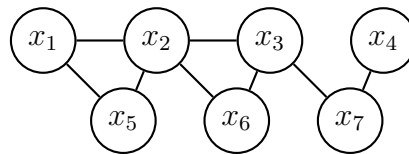
There are two basic algorithms for finding a minimum set. The first algorithm uses a brute force approach, checking every possible set of vertices. The second algorithm uses a greedy approach, using the first available vertex with the highest out-degree. The greedy approach does not guarantee a minimum set.

This paper is divided into the following sections. Section 2 contains background information on the Minimum Dominating Set. Section 3 contains the algorithms used to

solve for the Minimum Dominating Set. Section 4 contains experimental data when running the algorithm. Section 5 concludes the paper.

## 2 Background

The Minimum Dominating Set of a Graph is defined as the set of vertices for which each vertex or one of its neighbors is in the set. The size of the minimum set will be unique, however there may be multiple sets of that size that are a minimal covering. Consider the graph below.



This graph has minimum dominating sets,  $\{x_2, x_4\}$  and  $\{x_2, x_7\}$ . The vertex  $x_2$

covers vertices  $\{x_1, x_3, x_5, x_6\}$ , leaving nodes  $x_4$  and  $x_7$ . Either vertex can dominate the other and complete a covering of the graph. In this example, both the approximate algorithm and brute force approach would find an equally sized set.