

# **RESEARCH PROPOSAL**

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Area of Research : Graph Theory

Broad Area of Research : Domination and Coloring in Graphs

## **DOMINATION AND COLORING IN GRAPHS**

### **RESEARCH PROPOSAL**

Graph Theory plays a vital role in various fields such as mechanics, chemical kinetics, computing, computer science, polymer systems, social sciences, natural sciences, and information systems. Among the diverse areas of study, two important topics are graph domination and graph coloring. Both concepts independently have strong theoretical foundations and wide-ranging applications, yet the joint application of domination and coloring has received comparatively less attention in literature.

A graph in this context is a finite set of vertices connected by edges, assumed to be undirected, simple, and connected. Domination refers to selecting a subset of vertices such that every vertex in the graph is either in the subset or adjacent to at least one vertex in the subset. Coloring refers to assigning integers (colors) to vertices such that adjacent vertices receive distinct colors, typically aiming to minimize the number of colors used.

The study of domination dates back to classical research on network control and resource allocation, while graph coloring is rooted in map-coloring problems and has been extended to scheduling, frequency assignments, and register allocation.

A detailed survey of the state of the art indicates that only a limited number of parameters reflect the joint application of domination and coloring. Among them, two notable parameters are the dominator chromatic number and the dominating- $\chi$ -color number. Although some results and characterizations exist, these parameters remain relatively less explored compared to the vast research conducted independently on domination and coloring. This opens up opportunities to extend and enrich the theory by introducing new parameters, deriving bounds, and exploring applications.

## Proposed Research

As a continuation of earlier works on domination and coloring of graphs, we intend to extend the results in the following directions:

1. To extend the idea of domination–coloring parameters and, if admissible, to propose the definition of new parameters of graphs.
2. To characterize the proposed parameters for general graphs.
3. To characterize both the existing and proposed parameters for specific families of graphs.
4. To describe new algorithms for computing the proposed parameters of graphs.
5. To develop programs for the computation of the proposed parameters of graphs.
6. To illustrate some real-life situations where the proposed parameters could be applied effectively.

## REFERENCE

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