**Domination in Graph Theory**

**Abstract**

Graph Theory is a field of study that allows us to create graphical models of complicated data sets and relationships. It can be applied in the study of social networks, the planning of infrastructure, and optimizing the location of key resource. The notion of domination and k domination is used to find the set of vertices of a graph such that all vertices are either, part of the domination set, adjacent to the domination set, or within some distance k of a vertex in domination set. A vertex in a graph can represent an individual entity or a cluster of entities and an edge between these vertices can represent a structural relationship as required by the application.

This concept can be applied in many real-world situations such as: optimizing the location of medical clinics, fire station, police patrols, post offices and other public utilities.

The k dominating sets provide the location of vertices in a network which can be accessed by all vertices in the network. A graph can have multiple dominating sets for an application. The question then is how one chooses the optimum one. We are investigating the creation of an optimal k dominating sets dependent on the need for robustness, reduction of cost, security, and reliability.   
  
In this presentation we will discuss the robustness of dominating sets when the size of k changes. This will relate to planning cost effective infrastructure, reaching all parts of a social network with a targeted message, and efficient establishment of franchise store locations.



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**Keywords**: Dominating Set, Graph Theory, Vertices