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Designing and Development of Graph Theory and its Application in Engineering Mathematics.

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ABSTRACT:
In this article, we propose some new Designing Social Networks and engineering and are an effective tool for representing and analysing complex relationships between data." Graphs have a wide range of applications in fields of study like computer science, mathematics, in this blog; we will discuss the application of graph data structures and examine how they can be used to solve real-world problems. Graphs are an essential tool when rethinking the way our technological and economic systems work. It can be utilized for solving many problems that we face in the real world. With numerous applications, graph theory can be used to advantage in almost every arena.

Keywords: Designing, Data structure, Epidemiology, Bioinformatics and its application, Artificial Intelligence.

Introduction:
Graph theory is a branch of mathematics that deals with graphs, networks, and their properties. It helps us to understand the network, whether it's personal or professional. It also gives us the tools to explore and measure the relationships between individuals, groups, and things represented in a network. By using graph theory you can easily find out which nodes have the most influence on your network or project by looking at their relationships with other nodes Graphs have a wide range of applications in fields of study like computer science, mathematics, and engineering and are an effective tool for representing and analysing complex relationships between data.
Definition: In mathematics and computer science, a graph is a mathematical structure that consists of two main components: vertices (or nodes) and edges. The study of these graphs in various contexts is called graph theory. A graph G(V, E) is a non-linear which consists of pair of sets (V, E) where V is the non-empty set of vertices (points or nodes). E is the set of edges (lines or branches) such that there is a mapping f: E $\rightarrow$V i.e., from the set E to the set of ordered or unordered pairs of elements of V. The number of called the order of the graphs and the number of edges is called the size of graph G (V, E).
There are various applications of graph theory in real life such as in computer graphics and networks, biology, and many other fields as well. In this article, we will discuss real-life applications of graph theory in various fields like Computer Science, Biology, Sociology, and others in detail
There are no standard notations for graph theoretical objects. This is natural, because the names one uses for the objects reflect the applications. Thus, for instance, if we consider a communications network (say, for email) as a graph, then the computers taking part in this network are called nodes rather than vertices

or points. On the other hand, other names are used for molecular structures in chemistry, flow charts in programming, human relations in social sciences, and so on

Some important application:

1. Computer science; The field of computer science is one of the most well-known applications of graph theory. The internet itself can be thought of as a giant graph, with nodes representing individual computers and edges representing their connections. In graph theory, algorithms for routing data across networks, including the internet, are developed. These algorithms allow traffic flow on the internet to continue uninterrupted, even when there are faults or congestion points. Additionally, algorithms developed using graph theory is typically more efficient than those designed without consideration of this branch.

Fig.1 traffic flow connectivity

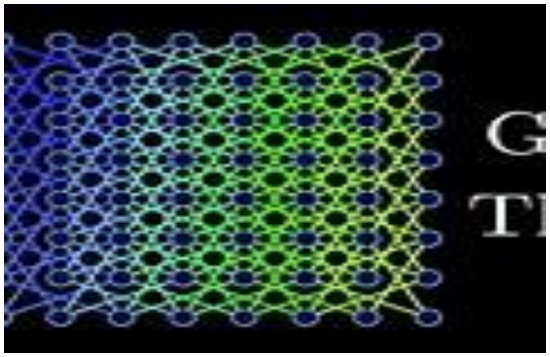

Fig.2 graph in computer science perspective

2. Epidemiology: To better understand how diseases spread, epidemiologists use graph theory. By mapping out who is connected to whom, they can identify which individuals are most at risk and how to control the spread of diseases. Finally, researchers use graphs to identify mutations that may offer some protection from diseases, as well as to suggest treatment options for the same consideration of this branch Epidemiology is the science of infectious diseases. In theory to fully understand the dissemination processes of diseases, all relevant biological factors should be considered, while in practice, such a complex study is not feasible at a human scale. That is why alternatives have been proposed to understand the phenomenon from the point of view of dissemination mechanisms rather than biological considerations

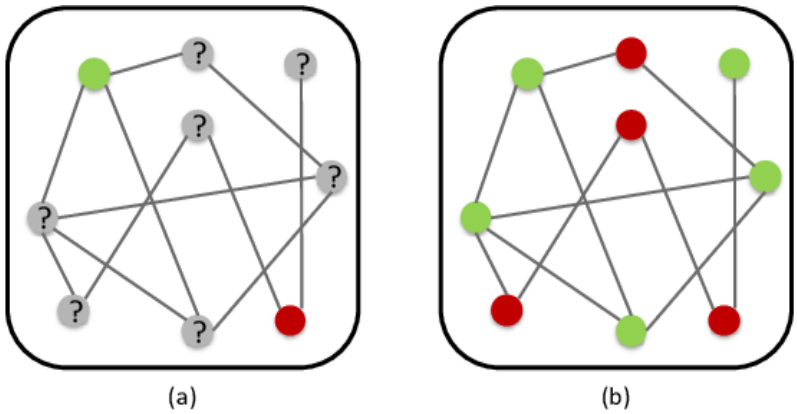

Fig.3 graph Labelling in Epidemiology (a) drawn according to a random layout and (b) drawn with Spring Embedding

3. Bioinformatics: Graphs model and analyse biological data, such as protein-protein interaction and genetic networks. Graph neural networks (GNNs), as a branch of deep learning in non-Euclidean space; perform particularly well in various tasks that process graph structure data. With the rapid accumulation of biological network data, GNNs have also become an important tool in bioinformatics
Statistics of network (GNN) The orange bar shows the total number of (GNN) papers in bioinformatics that year (the number of papers in 2020 is counted until October) the remaining collars in turn, represent the number of papers related to GNN'S in bioinformatics in terms of disease association prediction., drug research, and medical image processing, which are the components of the orange bar

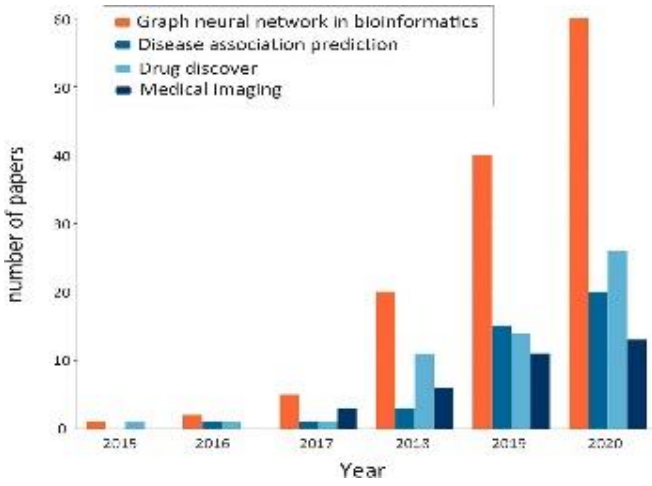

Fig.4 graph Labelling in GNN

4. Cancer treatment; One use of graph theory is in the development of cancer treatments. Medical experts use graphs to model how cancer cells grow and metastasize to develop better, more effective treatments. For example, doctors can analyse the cell structure of cancer cells and design targeted therapies to reduce side effects. This study constructed a knowledge graph for breast cancer prevention and treatment, which enabled the integration and knowledge discovery of relevant literature in the past 5 years. Researchers can gain insights into treatment methods, drugs, preventive knowledge regarding adverse reactions to treatment, and the associations between different knowledge domains from the graph.

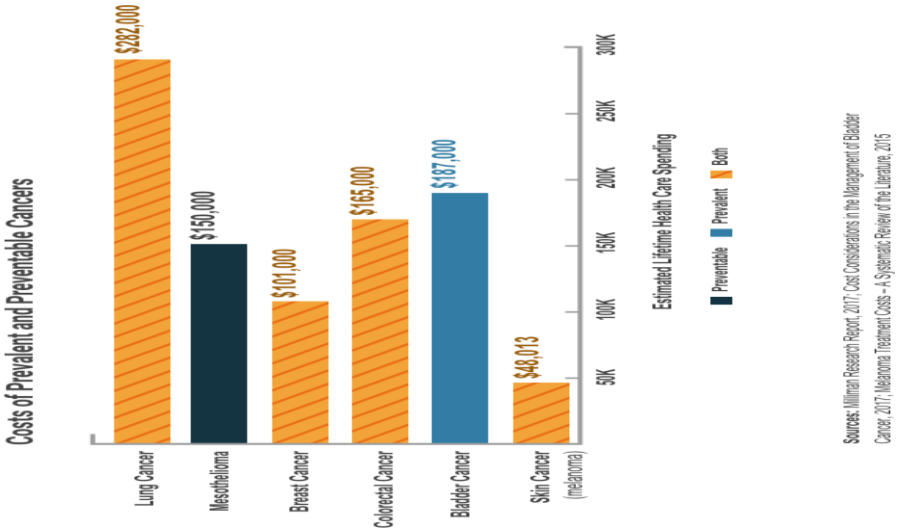

Fig.5 High cost of cancer Treatment chemotherapy

5. Web Graphs: A database of links between web pages is called a "web graph". These graphs are used by search engines such as Google, Bing, and Yahoo! when they index websites into their databases which make it possible for users to find relevant information quickly using keywords associated with them. The web is an extensive collection of references to hyperlinks. In other words, the web is another excellent set of graph data.

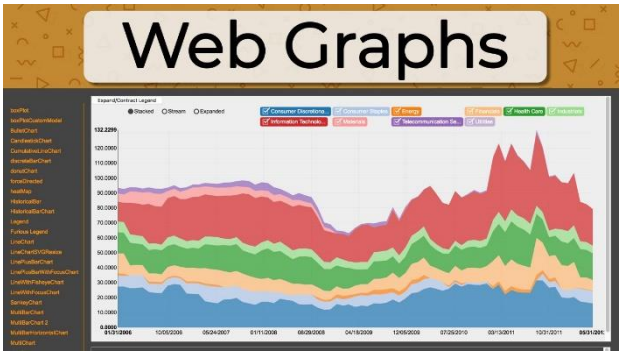

Fig.6 web graph in search in Google

Conclusion:

The main goal of this Article is to encourage the reader to think about problems the way graph theory does abstract the problem and remove all non-important parts behind. This paper is prepared to help the students of engineering to gain the depth knowledge of graph theory and its relevance with other subject of engineering. In this paper we have focused on the application of graph theory in few branches of engineering. We conclude that, this paper motivate not only the students of engineering but also engineering faculty. This Article is used for various things, including finding the shortest routes on a map and drawing scatter plots.in networking, it can be used to create fast networks and allow access to information and some chemical diagrams can also be used to represent molecular structures or flow patterns inside cells.

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