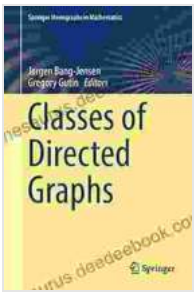
Classes of Directed Graphs: Springer Monographs in Mathematics

A directed graph (digraph) is a graph in which the edges have a direction. Digraphs are used to model a wide variety of real-world systems, such as social networks, transportation networks, and biological networks. The study of digraphs has a long history, dating back to the work of Leonhard Euler in the 18th century.



Classes of Directed Graphs (Springer Monographs in Mathematics) by Theodore Brun

4.1 out of 5

Language	: English
File size	: 15499 KB
Screen Reader	: Supported
Print length	: 658 pages

In recent years, there has been a growing interest in the study of classes of digraphs. A class of digraphs is a set of digraphs that share some common structural property. The study of classes of digraphs has led to a number of important insights into the structure and behavior of digraphs.

Types of Directed Graphs

There are many different types of directed graphs, each with its own unique properties. Some of the most common types of directed graphs include:

- **Tournaments** are digraphs in which every pair of vertices is connected by exactly one edge. Tournaments are used to model competition and ranking systems.
- **Posets** (partially ordered sets) are digraphs in which the edges represent a partial order. Posets are used to model hierarchical structures and decision-making processes.
- **Comparability graphs** are digraphs in which the edges represent a comparability relation. Comparability graphs are used to model preference and similarity relations.

Structural Properties of Directed Graphs

The study of the structural properties of digraphs has led to a number of important insights into their behavior. Some of the most important structural properties of digraphs include:

- **Connectivity**: The connectivity of a digraph is a measure of how well-connected the digraph is. A digraph is strongly connected if there is a path between every pair of vertices. A digraph is weakly connected if there is a path between every pair of vertices when the directions of the edges are ignored.
- **Diameter**: The diameter of a digraph is the maximum number of edges in a shortest path between any two vertices. The diameter is a measure of how far apart the vertices in a digraph are.
- **Girth**: The girth of a digraph is the length of the shortest cycle in the digraph. The girth is a measure of how dense the digraph is.

Algorithmic Applications of Directed Graphs

Digraphs have a wide range of algorithmic applications. Some of the most common algorithmic applications of digraphs include:

- **Shortest path algorithms**: Shortest path algorithms find the shortest path between two vertices in a digraph. Shortest path algorithms are used in a variety of applications, such as routing and navigation.
- **Network flow algorithms**: Network flow algorithms find the maximum flow of a commodity from a source vertex to a sink vertex in a digraph. Network flow algorithms are used in a variety of applications, such as scheduling and logistics.
- **Ranking algorithms**: Ranking algorithms rank the vertices in a digraph based on their importance or influence. Ranking algorithms are used in a variety of applications, such as social network analysis and search engine optimization.

The study of directed graphs is a vast and active area of research. This book provides a comprehensive treatment of classes of directed graphs, with a focus on structural and algorithmic aspects. It covers various types of directed graphs, including tournaments, posets, and comparability graphs, and discusses their properties, characterizations, and algorithmic applications. The book also presents open problems and directions for future research.

References

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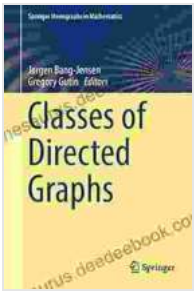

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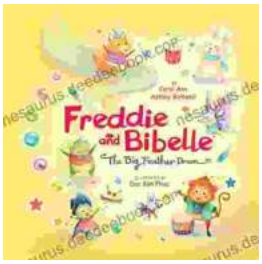

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