



Discrete Mathematics

Introduction to Course
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Introduction to Course

In this course, we will learn the basics of mathematical models that are used in computer systems.

Let's start by defining
what discrete mathematics is!



What is Discrete Mathematics?

Discrete mathematics is the study of mathematical structures that are fundamentally discrete rather than continuous.

In contrast to real numbers varying slowly, the objects in discrete mathematics such as integers, graphs, and logical expressions change suddenly. Therefore discrete mathematics excludes topics in continuous mathematics.



Main Contents

1. Logic
2. Set Theory
3. Induction
4. Algorithms
5. Combinatorics
6. Graphs
7. Trees
8. Automata



Logic

The term "logic" came from the Greek word "logos", which is sometimes translated as "discourse", "reason", and "rule". As a rough definition, logic is the study of the principles of correct reasoning. Studying the principles of correct reasoning is not the same as studying the psychology of reasoning. Logic is the former discipline, and it tells us how we must to reason if we want to reason correctly.



Set Theory

Set theory is the branch of mathematics that studies sets, which are collections of objects such as {blue, white, red} or the (infinite) set of all prime numbers.

Partially ordered sets and sets with other relations have applications in several areas.

In discrete mathematics, countable sets (including finite sets) are the main focus.

Combinatorics

Combinatorics studies the way in which discrete structures can be combined or arranged.

Enumerative combinatorics concentrates on counting the number of certain combinatorial objects - e.g. permutations, combinations and partitions.

Analytic combinatorics concerns the enumeration of combinatorial structures using tools from complex analysis and probability theory.

Graph Theory

Graph theory, the study of graphs and networks, is often considered part of combinatorics, but has grown large enough and distinct enough, with its own kind of problems. Graphs are among the most used models of both natural and human-made structures. In computer science, they can represent networks of communication, data organization, computational devices, flow of computation, etc.

Theoretical computer science

Theoretical computer science includes areas of discrete mathematics relevant to computing. It draws heavily on graph theory and logic. Included within theoretical computer science is the study of algorithms for computing mathematical results. Computability studies what can be computed in principle while complexity studies the time taken by computations. Automata theory and formal language theory is closely related to computability.

Teaching Staff

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You will find some documents in my web page

- lecture notes we used
- questions of exams (in next weeks)
- student's grades in exams (of course after exams)

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Textbook

Our main textbook is

"Notes on Discrete Mathematics",
by M. A. Lerma
Northwestern University



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Some rules about the Course

1. If you are late, you can enter the class without asking for permission, but silently.
2. If you want to go out early; you can likewise exit without asking.
3. I have to organize attendance list; but absenteeism won't be evaluated.
4. Unless you abuse, minor conversations is not a problem.
5. You can enter the lectures in any group you want (daytime-nighttime).

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