

# Introduction to the Theory of Matroids

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## Abstract

In this series of lectures we will present the foundational core of matroid theory. Specifically we will demonstrate how abstract independence emerges from three seemingly unrelated areas, and then we will explore the many numerous definitions of matroids both axiomatic and algorithmic. Lastly we will present key areas of the theory such as duality and minors.

## Topics

1. Independence in vector spaces, graphs and transversals
  - 1.1 Vector spaces
  - 1.2 Graph theory
  - 1.3 Transversal theory
  - 1.4 Abstract independence
2. Axiom systems
  - 2.1 Independent sets
  - 2.2 Bases
  - 2.3 Circuits
  - 2.4 Rank
  - 2.5 Closure

2.6 Cryptomorphisms

2.7 Greedy algorithm

3. Fundamental theory

3.1 Representability

3.2 Duality

3.3 Minors

3.4 Connectivity