

LTCC Advanced Course

Title: Matroids

Basic Details:

- Core Audience: Master's and PhD students
- Course Format: Extended: 5 x 2hr lectures

Course Description:

- Keywords:
matroids, combinatorics, discrete geometry, tropical geometry
- Syllabus:
The theory of matroids or combinatorial geometries originated in linear algebra and graph theory, and has deep connections with many other areas, including field theory, matching theory, submodular optimization, Lie combinatorics, and total positivity. Matroids capture the combinatorial essence that these different settings share.
In the 21st century, matroid theory and its connections to other fields have developed immensely. In particular, the (classical, polyhedral, algebraic, and tropical) geometric roots of the field have grown much deeper, bearing new fruits. In this month-long module we will explore the theory of matroids, taking students from the beginnings of the field to recent successes.
- Recommended reading:
 - Lecture notes by the lecturer
 - J. Oxley. Matroid theory.
- Additional Optional reading:
 - F. Ardila. Algebraic and geometric methods in enumerative combinatorics.
 - R. Stanley. An introduction to hyperplane arrangements.
 - V. Reiner. Lectures on matroids and oriented matroids.
- Prerequisites:
Linear algebra. I will make the module as accessible as possible, while giving each student ample opportunities to explore matroid theory as deeply as they would like to.

Format:

- No of discussion/problem sheets: 4
- Electronic lecture notes (these are strongly encouraged, as they will form the core of the individual study of the students): Yes (will be provided)
- Necessary support facilities: N/A

Lecturer Details:

- Lecturer: Federico Ardila-Mantilla

- Lecturer home institution: Queen Mary University of London
- Lecturer e-mail: f.ardila@qmul.ac.uk