

## Extremal graph theory and flag algebra calculus

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Extremal graph theory asks questions such as: how many edges can there be in a graph (network) if it contains no triangles? Although there are many deep results in this area, numerous tantalising conjectures remain open.

Recently Razborov introduced a dramatic new tool to this field: the flag algebra calculus. This has given rise to a huge amount of work, some of it answering decades old questions that were previously out of reach.

My three lectures will start by giving some background including a basic introduction to graph theory; the main results in extremal graph theory and some simple applications to other areas of mathematics. I will then give an account of Razborov's theory of the flag algebra calculus and in particular show how these can lead to computer-aided proofs. Time permitting I will describe some of the recent applications of the method.

No prior knowledge of graph theory will be assumed.

### *Recommended Reading:*

B. Bollobás, *Modern Graph Theory*, Springer 1998.

A. Razborov, *What is a flag algebra?*, Notices of AMS Nov 2013.

<http://www.ams.org/notices/201310/rnoti-p1324.pdf>