I M B M istanbul matematiksel bilimler merkezi
istanbul center for mathematical sciences

Istanbul Discrete Mathematics Meetings

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Lecture Series on The Probabilistic Method and Extremal Graph Theory

Monday, June 10, 2019

10:15 - 11:15: A Brief Introduction to Ramsey Theory
Abstract: This is a brief introduction to Ramsey Theory. Ramsey Theory appears in all branches of mathematics. It says, in essence, that complete disorder is impossible. Regardless of what sort of structure you are looking at, you will always find something that is nicely ordered. A few examples will be presented from geometry, graph theory and number theory.

11:30 - 12:30: Ramsey Theory and Coloring
Abstract: A cocoloring of a graph is a coloring where each color class induces a complete or empty graph. We will introduce the topic of cocolorings and show how the parameter provides a link between Ramsey Theory and traditional graph colorings. Results in these areas tell us something about the difficulty of computing the cochromatic number and provide bounds. Further, we consider some extremal results developed by Paul Erdös and myself and use probabilistic methods to show they are, in some sense, best possible. We will develop some variants on the topic and see a role that probability plays in providing extremal examples.

Tuesday, June 11, 2019

10:15 - 11:15: Graph Theory and Probability

Abstract: We will consider some of the classic results in probabilistic graph theory and see why they are of interest to others working in the field. We will then consider some contemporary applications. In particular, we will show that if H is a fixed graph and G is a graph drawn at random from the set of all graphs on n vertices, then it is almost surely the case that every set with at least log(n) vertices in G contains an induced copy of H. Here, the base of the log depends on G. This provides extremal graphs in many different situations.

11:30 - 12:30: Domination and Approximations

Abstract: The domination number of a graph is the order of the fewest number of vertices having the property that each vertex not in the set is adjacent to some vertex in the set. In general, computing the domination number of a graph is difficult. But we consider a fast algorithm that comes close to finding the minimum value. Further, we look at a fractional version of the problem. That is, we attach to each vertex a nonnegative number in such a manner that when we sum across all closed neighborhoods, we get a value of at least one. Further, we take one such labeling where the sum of all labels is minimized. This minimum sum forms a lower bound on the domination number. We use the random graph, as developed in previous lectures, to show how far apart these parameters can be.

Place: : IMBM Seminar Room, Bogazici University South Campus

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