

FALL 2016

MATH 595

Random Graphs and Networks

Section STP, CRN 58570

9:30-10:50 AM TR, G30 Foreign Languages Building

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Course Description: Graphs and networks have become an essential part of our daily life due to explosion of data and popularity of social networks. The goal of this course is to introduce and analyze various probabilistic models of random graphs and networks, with an emphasis on heuristics on the big picture and background techniques for rigorous proofs. We will consider models of homogeneous and inhomogeneous random graph, small world (small diameter), and scale-free (power-law degree distribution) networks. Specific topics include:

- Branching Processes and Probabilistic Methods.
- Erdos-Renyi Random Graphs and Phase Transitions.
- Random Graphs with Given Degree Distributions.
- Proportional Attachment and Scale-Free Models.
- Small Worlds Models.
- Random Geometric Graphs and Continuum Percolation.
- Dynamics On Random Graphs.

Grading: Grades are based on class participation, presenting papers or solutions to problems at the end of the semester.

Prerequisites: Some familiarity with discrete mathematics and basic probability theory is necessary.

Recommended Text: There is no required textbook. Here, is a list of books which are related to our material. I will make suggestions of more resources (books and papers) throughout the semester.