



CONCENTRATION INEQUALITIES

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PRE-REQUISITES : A course on either probability, random processes or measure theory. Basic mathematical maturity and working familiarity with probability calculations.

COURSE OUTLINE : It is well-known that functions of large numbers of random quantities tend to behave rather predictably and ‘less randomly’ than their constituents. For instance, the laws of large numbers tell us that the average of many independent random variables is asymptotically the expected value; higher-order refinements such as the central limit theorem and large deviations techniques uncover the asymptotic rate at which this reduction in randomness takes place. This graduate-level course on concentration inequalities will cover the basic material on this classic topic as well as introduce several advanced topics and techniques. The utility of the inequalities derived will be illustrated by drawing on applications from electrical engineering, computer science and statistics.

ABOUT INSTRUCTOR :

Prof. Himanshu Tyagi is an Associate Professor Department of Electrical Communication Engineering Participating Faculty Robert Bosch Center for Cyber Physical Systems Member Faculty Analysis and Probability Research Group (APRG)

Prof. Aditya gopalan is working in Department of Electrical Communication Engineering (ECE) IISc Bangalore.

COURSE PLAN :

Week 1: Chernoff bounds

Week 2: Concentration bounds for sums and other functions of independent random variables

Week 3: Variance bounds for functions of independent random variables

Week 4: The Entropy method for concentration inequalities

Week 5: Entropy method (contd.) and Transportation method

Week 6: Transportation method, isoperimetry and concentration

Week 7: Log-Sobolev inequalities revisited

Week 8: Concentration inequalities for sequential data