

Abstract

In this thesis, we study some basic concentration inequalities and their applications to a ranking problem. Concentration inequalities refer to the phenomenon of concentration of a function of independent random variables around the mean. In this thesis, we mainly study how the sum of independent random variables concentrate around the mean. These inequalities are used to study error bounds for estimated ranks in the BTL model [SSD17], which gives a framework to determine the ranks for n objects based on k pair-wise comparisons between pairs of objects. We then study the effect of perturbing the transition matrix of a defined Markov chain on the errors in the estimated rank. In some cases, we obtain an explicit lower bound on the number of comparisons k , in terms of the perturbations, needed to obtain a “good” estimation for the underlying rank. Finally, through simulations, we study what kind of perturbation matrices lead to larger errors.