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An Introduction to Matrix Concentration Inequalities

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Subjects
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Abstract

Random matrices now play a role in many areas of theoretical, applied, and computational mathematics. Therefore, it is desirable to have tools for studying random matrices that are flexible, easy to use, and powerful. Over the last fifteen years, researchers have developed a remarkable family of results, called matrix concentration inequalities, that achieve all of these goals.

This monograph offers an invitation to the field of matrix concentration inequalities. It begins with some history of random matrix theory; it describes a flexible model for random matrices that is suitable for many problems; and it discusses the most important matrix concentration results. To demonstrate the value of these techniques, the presentation includes examples drawn from statistics, machine learning, optimization, combinatorics, algorithms, scientific computing, and beyond.

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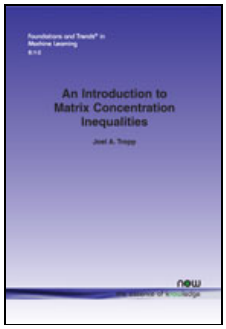

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In recent years, random matrices have come to play a major role in computational mathematics, but most of the classical areas of random matrix theory remain the province of experts. Over the last decade, with the advent of matrix concentration inequalities... In recent years, random matrices have come to play a major role in computational mathematics, but most of the classical areas of random matrix theory remain the province of experts. Over the last decade, with the advent of matrix concentration inequalities, research has advanced to the point where we can conquer many (formerly) challenging problems with a page or two of arithmetic.