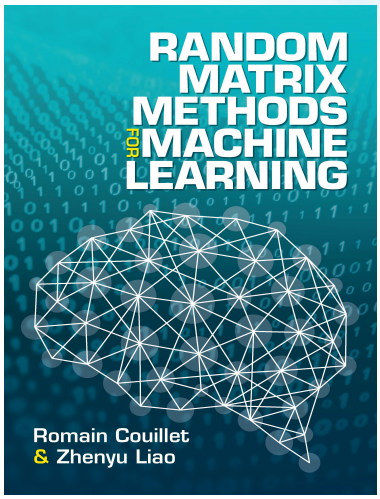
Random Matrix Methods for Machine Learning

Romain Couillet
Université Grenoble Alpes
and Zhenyu Liao
Huazhong University of Science and Technology, China



This book presents a unified theory of random matrices for applications in machine learning, offering a large-dimensional data vision that exploits concentration and universality phenomena. This enables a precise understanding, and possible improvements, of the core mechanisms at play in real-world machine learning algorithms. The book opens with a thorough introduction to the theoretical basics of random matrices, which serves as a support to a wide scope of applications ranging from SVMs, through semi-supervised learning, unsupervised spectral clustering, and graph methods, to neural networks and deep learning. For each application, the authors discuss small- versus large-dimensional intuitions of the problem, followed by a systematic random matrix analysis of the resulting performance and possible improvements. All concepts, applications, and variations are illustrated numerically on synthetic as well as real-world data, with MATLAB and Python code provided on the accompanying website.

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