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SPECTRA OF DISCRETE STRUCTURES

Addressing the active and challenging field of spectral theory, this book develops the general theory of spectra of discrete structures, on graphs, simplicial complexes, and hypergraphs. In fact, hypergraphs have long been neglected in mathematical research, but because of the discovery of Laplace operators that can probe their structure, and their manifold applications from chemical reaction networks to social interactions, they have now become one of the most active areas of interdisciplinary research. The authors' analysis of spectra of discrete structures embeds intuitive and easily visualized examples, which are often quite subtle, within a general mathematical framework. They highlight novel research on Cheeger-type inequalities that connect spectral estimates with the geometry, more precisely the cohesion, of the underlying structure. Establishing mathematical foundations and demonstrating applications, this book will be of interest to graduate students and researchers in mathematics working on the spectral theory of operators on discrete structures.

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Jürgen Jost is a founding Director and Scientific Member at the Max Planck Institute for Mathematics in the Sciences. He is also a PI at the federal AI project ScaDS.AI (Dresden/Leipzig), a guest member of the Max Planck Institute for Human Cognitive and Brain Sciences and an external faculty member of the Santa Fe Institute for the Sciences of Complexity. He is a recipient of the Gottfried-Wilhelm-Leibniz award of the Deutsche Forschungsgemeinschaft (DFG,1993) and is also a member of the German National Academy of Sciences Leopoldina, the Academy of Sciences and Literature at Mainz, and the Saxon Academy of Sciences and Humanities at Leipzig.

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Dong Zhang is an Assistant Professor at Peking University and was previously a postdoctoral researcher at the Max Planck Institute for Mathematics in the Sciences. His research area is discrete analysis, especially nonlinear spectral graph theory and discrete-to-continuous extensions.

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Spectra of Discrete Structures

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