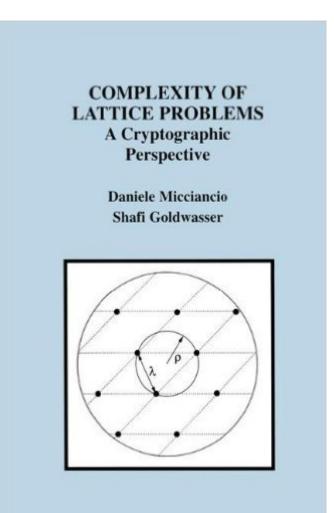
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Complexity Of Lattice Problems: A Cryptographic Perspective (The Springer International Series In Engineering And Computer Science)





Synopsis

Lattices are geometric objects that can be pictorially described as the set of intersection points of an infinite, regular n-dimensional grid. DeÂ- spite their apparent simplicity, lattices hide a rich combinatorial strucÂ- ture, which has attracted the attention of great mathematicians over the last two centuries. Not surprisingly, lattices have found numerous apÂ- plications in mathematics and computer science, ranging from number theory and Diophantine approximation, to combinatorial optimization and cryptography. The study of lattices, specifically from a computational point of view, was marked by two major breakthroughs: the development of the LLL lattice reduction algorithm by Lenstra, Lenstra and Lovasz in the early 80's, and Ajtai's discovery of a connection between the worst-case and average-case hardness of certain lattice problems in the late 90's. The LLL algorithm, despite the relatively poor quality of the solution it gives in the worst case, allowed to devise polynomial time solutions to many classical problems in computer science. These include, solving integer programs in a fixed number of variables, factoring polynomials over the rationals, breaking knapsack based cryptosystems, and finding solutions to many other Diophantine and cryptanalysis problems.

Book Information

Series: The Springer International Series in Engineering and Computer Science (Book 671) Hardcover: 220 pages Publisher: Springer; 2002 edition (March 31, 2002) Language: English ISBN-10: 0792376889 ISBN-13: 978-0792376880 Product Dimensions: 6.1 x 0.6 x 9.2 inches Shipping Weight: 8.8 ounces (View shipping rates and policies) Average Customer Review: Be the first to review this item Best Sellers Rank: #4,610,754 in Books (See Top 100 in Books) #57 in Books > Computers & Technology > Programming > Software Design, Testing & Engineering > Coding Theory #598 in Books > Computers & Technology > Security & Encryption > Encryption #632 in Books > Computers & Technology > Security & Encryption > Cryptography

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