FORBIDDEN CONFIGURATIONS IN DISCRETE GEOMETRY

This book surveys the mathematical and computational properties of finite sets of points in the plane, covering recent breakthroughs on important problems in discrete geometry and listing many open problems. It unifies these mathematical and computational views using forbidden configurations, which are patterns that cannot appear in sets with a given property, and explores the implications of this unified view. Written with minimal prerequisites and featuring plenty of figures, this engaging book will be of interest to undergraduate students and researchers in mathematics and computer science.

Most topics are introduced with a related puzzle or brain-teaser. The topics range from abstract issues of collinearity, convexity, and general position to more applied areas including robust statistical estimation and network visualization, with connections to related areas of mathematics including number theory, graph theory, and the theory of permutation patterns. Pseudocode is included for many algorithms that compute properties of point sets.

David Eppstein is Chancellor's Professor of Computer Science at the University of California, Irvine. He has more than 350 publications on subjects including discrete and computational geometry, graph theory, graph algorithms, data structures, robust statistics, social network analysis and visualization, mesh generation, biosequence comparison, exponential algorithms, and recreational mathematics. He has been the moderator for data structures and algorithms on arXiv.org since 2006 and is a major contributor to Wikipedia's articles on mathematics and theoretical computer science. He was elected as an ACM fellow in 2012.

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