Matrix Methods in Data Mining and Pattern Recognition (Fundamentals of Algorithms)

Lars Eldén

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Matrix Methods in Data Mining and Pattern Recognition (Fundamentals of Algorithms) Lars Eldén Several very powerful numerical linear algebra techniques are available for solving problems in data mining and pattern recognition. This application-oriented book describes how modern matrix methods can be used to solve these problems, gives an introduction to matrix theory and decompositions, and provides students with a set of tools that can be modified for a particular application. Matrix Methods in Data Mining and Pattern Recognition is divided into three parts. Part I gives a short introduction to a few application areas before presenting linear algebra concepts and matrix decompositions that students can use in problem-solving environments such as MATLAB®. Some mathematical proofs that emphasize the existence and properties of the matrix decompositions are included. In Part II, linear algebra techniques are applied to data mining problems. Part III is a brief introduction to eigenvalue and singular value algorithms. The applications discussed by the author are: classification of handwritten digits, text mining, text summarization, pagerank computations related to the GoogleÔ search engine, and face recognition. Exercises and computer assignments are available on a Web page that supplements the book. Audience The book is intended for undergraduate students who have previously taken an introductory scientific computing/numerical analysis course. Graduate students in various data mining and pattern recognition areas who need an introduction to linear algebra techniques will also find the book useful. Contents Preface; Part I: Linear Algebra Concepts and Matrix Decompositions. Chapter 1: Vectors and Matrices in Data Mining and Pattern Recognition; Chapter 2: Vectors and Matrices; Chapter 3: Linear Systems and Least Squares; Chapter 4: Orthogonality; Chapter 5: QR Decomposition; Chapter 6: Singular Value Decomposition; Chapter 7: Reduced-Rank Least Squares Models; Chapter 8: Tensor Decomposition; Chapter 9: Clustering and Nonnegative Matrix Factorization; P

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