Coding the Matrix: Linear Algebra through Applications to Computer Science

Philip N. Klein

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Coding the Matrix: Linear Algebra through Applications to Computer Science Philip N. Klein An engaging introduction to vectors and matrices and the algorithms that operate on them, intended for the student who knows how to program. Mathematical concepts and computational problems are motivated by applications in computer science. The reader learns by *doing*, writing programs to implement the mathematical concepts and using them to carry out tasks and explore the applications. Examples include: error-correcting codes, transformations in graphics, face detection, encryption and secret-sharing, integer factoring, removing perspective from an image, PageRank (Google's ranking algorithm), and cancer detection from cell features. A companion web site,

`codingthematrix.com`

provides data and support code. Most of the assignments can be auto-graded online. Over two hundred illustrations, including a selection of relevant *xkcd* comics.

Chapters: *The Function*, *The Field*, *The Vector*, *The Vector Space*, *The Matrix*, *The Basis*, *Dimension*, *Gaussian Elimination*, *The Inner Product*, *Special Bases*, *The Singular Value Decomposition*, *The Eigenvector*, *The Linear Program*

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