

Introduction

Linear Algebra
(spring, 2014)

University of Seoul
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Syllabus

course webpage:

<http://www.minho-kim.com/courses/14sp71007>

Table of Contents of the Textbook

1. Vectors
2. Systems of Linear Equations ($A\mathbf{x} = \mathbf{b}$)
3. Matrices ($A = LU$, $A = P^T LU$, $\text{row}(A)$, $\text{col}(A)$, $\text{null}(A)$)
4. Eigenvalues and Eigenvectors ($A\mathbf{x} = \lambda\mathbf{x}$)
5. Orthogonality ($A = QR$)
6. Vector Spaces (\mathbb{R}^n)
7. Distance and Approximation ($A\mathbf{x} = \mathbf{b} \rightarrow A^T A\mathbf{x} = A^T \mathbf{b}$,
 $A = U\Sigma V^T$)

Applications

- ▶ Error-correcting codes (Chap 3: Matrices)
- ▶ Computer graphics: animation and games (Chap 3.6: Linear Transformations)
- ▶ Ranking sports teams and searching the Internet (Chap 4: Eigenvalues and Eigenvectors)
- ▶ Digital image compression (Chap 7.4: Singular Vector Decomposition)

Applications

(<http://aix1.uottawa.ca/~jkhoury/app.htm>)

- ▶ Coding theory: error-detecting code, error-correcting code, Hamming code
- ▶ Cryptography: encoding/decoding matrices
- ▶ Economics: Leontief input-output model
- ▶ Games: finite linear games, magic square
- ▶ Image compression: Haar wavelet transform, SVD (Singular Vector Decomposition)
- ▶ Graph/network theory: social network, Google's PageRank