

Linear Algebra

Berlin Chen

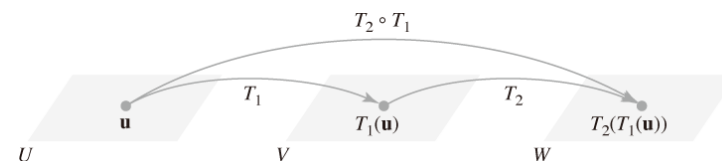
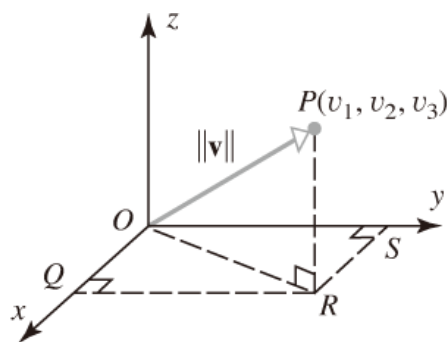
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Linear Algebra

- Linear algebra is a branch of mathematics and continues to figure prominently in computer science and electrical engineering
 - Computation, geometry, theory, practical applications, to name just a few
- Simply put, linear algebra is the study of vectors, matrices, vector spaces and linear transformations

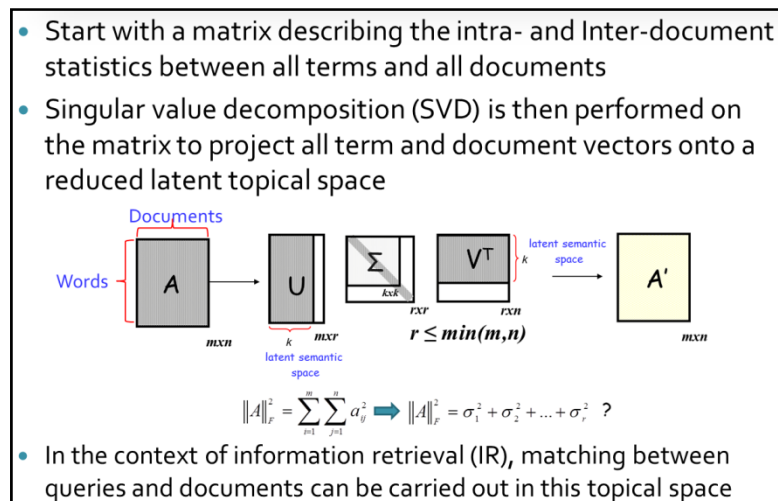
$$\begin{aligned} a_{11}x_1 + a_{12}x_2 + \cdots + a_{1n}x_n &= b_1 \\ a_{21}x_1 + a_{22}x_2 + \cdots + a_{2n}x_n &= b_2 \\ \vdots & \\ a_{m1}x_1 + a_{m2}x_2 + \cdots + a_{mn}x_n &= b_m \end{aligned}$$

$$\begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} & b_1 \\ a_{21} & a_{22} & \cdots & a_{2n} & b_2 \\ \vdots & \vdots & & \vdots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} & b_m \end{bmatrix}$$



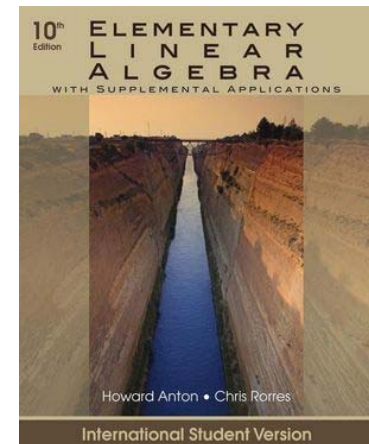
Main Objectives

- Develop the definitions, concepts and theories associated with linear algebra
 - Fundamentals: vectors operations, matrices operations, determinants, Euclidean vector spaces, linear systems, etc.
 - Further topics: matrix diagonalization, matrix factorization, linear transforms, numerical methods, practical applications, etc.
- Learn to make effective use of linear algebra in dealing with practical issues of interest
 - E.g., multimedia (text, speech, music and image) processing



Textbook & Course Website

- H. Anton, C. Rorres, *Elementary Linear Algebra with Supplemental Applications*, 10th edition, Wiley, 2011



- Website

<http://as.wiley.com/WileyCDA/WileyTitle/productCd-EHEP002162.html>

- Course Website

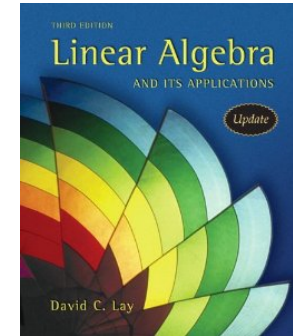
http://berlin.csie.ntnu.edu.tw/Courses/LinearAlgebra/2013F-LA_Main.htm

Reference Books

- D. C. Lay, *Linear Algebra and Its Applications, 3rd Updated Edition*, Addison Wesley, 2005

– Website

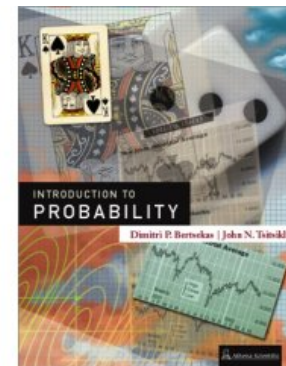
<http://www.laylinalgebra.com/>



- D. P. Bertsekas, J. N. Tsitsiklis, *Introduction to Probability, 2nd Edition*, Athena Scientific, 2008

– Website

<http://www.athenasc.com/probbook.html>



Tentative Topic List

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| 1. | Systems of Linear Equations and Matrices |
| 2. | Determinants |
| 3. | Euclidean Vector Spaces |
| 4. | General Vector Spaces |
| 5. | Eigenvalues and Eigenvectors |
| 6. | Inner Product Spaces |
| 7. | Diagonalization and Quadratic Forms |
| 8. | Linear Transformations |

Grading (*Tentatively!*)

- Midterm and Final: 45%
- Quizzes (≥ 5 times) and Homework: 45%
- Attendance/Other: 10%

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