MATH-332: Linear Algebra Chapter: 7

Symmetric Matrices and Quadratic Forms

Section 7.4: The Singular Value Decomposition

pgs. 471 - 482 *August 4, 2009*

Lecture: The Singular Value Decomposition

Topics:	Singular Values Singular Value Decomposition
Problems	Prac: 1 Prob: 3, 7, 11, 13, 15, 17, 19, 21

Section Goals

- Understand the symmetry of $\mathbf{A}^{\mathrm{T}}\mathbf{A}$ can be used to define a decomposition avalible to all matrices regardless of its spectrum or dimension.

Section Objectives

- Define the singular values of a matrix and show that their definition gives rise to a set of vectors, which forms an orthogonal basis for the column-space of a matrix.
- State and prove theorem 7.4.10 on page 474, which states that any matrix can be decomposed into $\mathbf{U\Sigma V}^{\mathrm{T}}$, which is known as the singular value decomposition (SVD) of the matrix $\mathbf{A}$.
- Show and example of SVD applied to a matrix that does not have full row-rank.