Singular Value Decomposition in Inner Product Spaces with Applications to DNA Microarrays

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Abstract

Singular Value Decomposition (SVD) is a very useful and versatile tool in pure and applied mathematics. Usually one considers an $N \times M$ real valued matrix A as a linear operator from $\mathbb{R}^M \to \mathbb{R}^N$, where $\mathbb{R}^M$ and $\mathbb{R}^N$ are endowed with the standard inner products. In this talk we consider the SVD of A when $\mathbb{R}^M$ and $\mathbb{R}^N$ endowed with arbitrary inner products. This case has a natural interpretation in Principal Component Analysis when one considers correlated random variables.

We show that the singular value decomposition with respect to a certain inner product in $\mathbb{R}^M$ gives the generalized singular value decomposition for two matrices with M columns and different sizes of rows, introduced recently to compare two sets of DNA microarrays of different organisms.
S. Friedland, Singular Value Decomposition in DNA Microarrays,
http://www.ima.umn.edu/preprints/jan2004/jan2004.html