

Eigenvalues and eigenvectors of an ill-conditioned matrix

Source: <http://sci.tech-archive.net/Archive/sci.math.num-analysis/2005-01/0010.html>

jcooper_at_ucalgary.ca

Date: 12/31/04

Date: 31 Dec 2004 10:03:39 -0800

I want to find the eigenvalues and eigenvectors for a matrix which is extremely ill-conditioned (true eigenvalues span perhaps 20-30 orders of magnitude). I trust the values in the matrix. When I try to obtain the eigenvalues and eigenvectors using LAPACK's DSYEV, however, the values are good only down to about $1.0E-16$ of the highest eigenvalue. Below that, there's a pile-up of random values including some negative (whereas I know the matrix to be positive semidefinite).

The cutoff seems suspiciously close to the machine error for a double-precision floating point value, and given the negative eigenvalues I suspect that's what I'm running up against.

Is there a standard way to obtain the eigenvalues and eigenvectors of such a matrix?

Thank you.