Truncated SVD

Another method of regularizing the problem that is practical, especially when the model space is significantly smaller than the data space, is the truncated singular value decomposition. Then we apply the ideas of the SVD, but in the course of computing singular values and vectors, we are careful to choose a method that generates the largest singular values first. Then, we use some stopping criterion when the singular values get below some small fraction of the largest value. This approach has the advantage that, at least for the larger singular values, the spectrum of the operator is not disturbed.

Comparison of DLS and Truncated SVD

This is clearly not true for damped least squares. On the other hand, the spectrum is disturbed for the smaller singular values just as in the case of damped least squares, but this time zeroes are left alone, and it is the smallest nonzero values that are set equal to zero in the result.