



Spectra and pseudospectra of matrices

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Abstract

Given $A \in M_n(\mathbb{C})$ and $\varepsilon > 0$ be given. The ε -pseudospectrum of A is defined to be the set

$$\Lambda_\varepsilon(A) := \{z \in \mathbb{C} : \|(zI - A)^{-1}\| \geq \varepsilon^{-1}\}.$$

The concept of pseudospectra has its roots in the study of the behavior of non-normal matrices and their spectra. One of the early works on pseudospectra was done in 1967 by Jim Varah in his Stanford PhD thesis. The idea was further developed by other researchers, among them Lloyd N. Trefethen and Mark Embree who published a book in 2005 entitled *Spectra and Pseudospectra*.

In this lecture we review recent results in spectra and ε -pseudospectra of matrices. Also, we study the shapes and behavior of the connected components of ε -pseudospectra for special kinds of matrices. Moreover, growth rate of ε -pseudospectra is considered.

Keywords: spectrum, pseudospectra, connected component, convergence rate

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