Why use spreading \Rightarrow Eigenvalues

Behavior of $A^k$

Determined by

Eigenvalues / Eigenvalues of $A$.

$A^k \rightarrow 0$

$A^k \rightarrow \infty$

$A^k \rightarrow 1$

$\frac{A^k}{\|A^k\|}$

$y(x) = \frac{A^k x}{\|A^k x\|}$
What is a Matrix?

2d array.
- a array of Same-sized vectors
- transformation
- a linear combo of Subspaces.
- IR

? More than 2d?

Why aren't some 2d arrays matrices?

\[
\begin{bmatrix}
496 & 0 & 453 \\
494 & 997 \\
494 & 6010 \\
496 & 761
\end{bmatrix} \in \mathbb{R}^{10 \times 7}
\]
More than 2d...

Pure Programs

Pure Math.

Tensor and vector spaces.

Let $A \in \mathbb{R}^{m \times n \times k}$

Fitting polynomial

$p(x) = c_2 x^2 + c_1 x + c_0$

$p(x) = d_2 (x-1)^2 + d_1 (x+1) + d_3 x^4$
$M_c = d$

Why are decays not fundamental?

What can you do w/ decays?

$A \in \mathbb{R}^{m \times n}$

$A \in \mathbb{R}^{n \times n}$

Suppose someone tells you $\lambda$ is an eigenvalue of $A$.

What is the eigenvector?
Known
\[ \hat{A}_x = \hat{x} \times \]
Also need
\[ \|x\|_2 = 1 \]

Given \( A, \lambda \).

\[ (A - \lambda I)x = 0. \]
\( x \in \text{nullspace}(A - \lambda I) \)

How to find \( x \)?

\[ (A - \lambda I) = V^T D V \]
\( V \) is orthogonal \( \ (V^T V = I) \)
\( D \) is diagonal

\[ V = \begin{bmatrix} V_+ & V_0 & V_- \end{bmatrix} \]
\[ D = \begin{bmatrix} D_+ & 0 & 0 \\ 0 & D_0 & 0 \\ 0 & 0 & D_- \end{bmatrix} \]
\( \text{diag}(\bar{D}_0) \)
\[ \| (A - \xi I)^{-1} \| \]