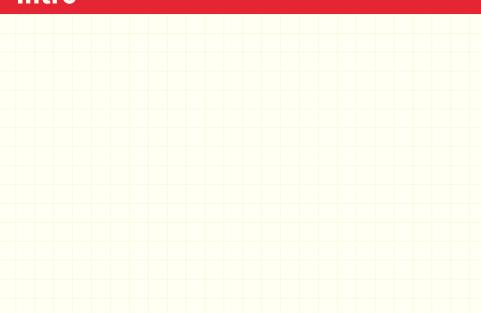
Lecture 5.2: Eigenvalues & Eigenvectors

Optimization and Computational Linear Algebra for Data Science

Intro



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Definition

Definition

Let $A\in\mathbb{R}^{n\times n}$. A **non-zero** vector $v\in\mathbb{R}^n$ is said to be an *eigenvector* of A is there exists $\lambda\in\mathbb{R}$ such that

$$Av = \lambda v$$
.

The scalar λ is called the eigenvalue (of A) associated to v.

Matrix with no eigenvalues/vectors



Eigenspaces

Definition

If $\lambda \in \mathbb{R}$ is an eigenvalue of $A \in \mathbb{R}^{n \times n}$, the set

$$E_{\lambda}(A) = \{x \in \mathbb{R}^n \mid Ax = \lambda x\} = \text{Ker}(A - \lambda \text{Id})$$

is called the eigenspace of A associated to λ . The dimension of $E_{\lambda}(A)$ is called the multiplicity of the eigenvalue λ .