1. Vector

$\vec{u}.\vec{v} = u_1 * v_1 + u_2 * v_2 = |\vec{u}||\vec{v}|cos(\theta)$

$|\vec{u}|^2 = \vec{u}.\vec{u}$

Linear combination

$a_1\overrightarrow{v_1}+...+a_m\overrightarrow{v_m}$

Span

$span(v_1, ..., v_m) = \{a_1\overrightarrow{v_1}+...+a_m\overrightarrow{v_m}|a_1, ..., a_m \in \mathbb{R}\}$

Linear independent

A list $(v_1, .., v_m)$ is linear independent if the only choice of $a_1, ..., a_m \in \mathbb{R}$ that makes $a_1\overrightarrow{v_1}+...+a_m\overrightarrow{v_m} = 0$ is $a_1 =...= a_m = 0$

Basic of V:

a list of vectors in V that

- linear independent
- span V

every $\vec{v} \in V$ can be written **uniquely** in form of a linear combination of the basic

Dim = len(basic)

Matrix

- Inverse matrix $A^{-1}A = I$

  A is invertible if

  - $det(A) \neq 0$
  - or we can not find a vector $x \neq 0$ that: Ax = 0
    proof: Ax = 0 <=> $A^{-1}Ax = 0$ <=> x = 0

- Singular matrix = matrix that is not invertible <=> det(A)=0

- Eigenvalue λ and eigenvector $\vec{x}$ of a matrix A:

  $Ax = \lambda x$

  How to find λ and $\vec{x}$ of A:

  $Ax = \lambda x$

  <=> $(A - \lambda I)x = 0$

  <=> $(A - \lambda I)\ is\ singular$

  <=> $det(A - \lambda I) = 0$

  find λ then find x

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