

Span, basis and dimension:

Span:

$\{v_1, v_2, \dots, v_m\}$ span "a Vector Space" consisting of all linear combinations of v_1, v_2, \dots, v_m .

Ex: $\left\{ \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} \right\}$

I - Span a vector space of 3×1 matrices

with 0 in 3rd row.

II - this is a vector subspace of 3×1 matrices.

Basis:

Is a set of minimum # of vectors that span the space.

Ex: Considering the previous example:

basis: $\left\{ \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix} \right\}$ or $\left\{ \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} \right\}$

or $\left\{ \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} \right\}$

Dimension:

The dimension of a vector space is the number of basis vectors.