

Vector Spaces:

Vector Space = set of vectors

(column matrices) + set of scalars (\mathbb{R})

+ closed under vector addition and
scalar multiplication

Example of a Vector Space:

Set of Vectors: ALL 3×1 matrices

Set of scalars: real numbers

U, V 3×1 matrices

$w = aU + bV \Rightarrow w$ is a 3×1 matrix

$$a \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} + b \begin{pmatrix} y_1 \\ y_2 \\ y_3 \end{pmatrix} = \begin{pmatrix} ax_1 + by_1 \\ ax_2 + by_2 \\ ax_3 + by_3 \end{pmatrix}$$

Vector spaces associated with matrices:

- Null space
- column space
- Row space
- Left null space