Linear Algebra Vocabulary

A Comprehensive Glossary

Haadi Majeed / EN.625.252.81 Fall 2025

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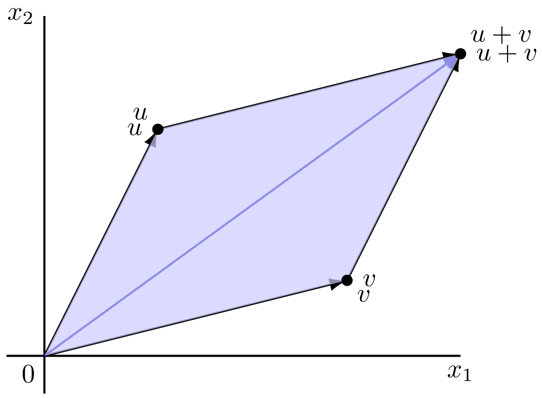
Contents

1. Module 2

1.1. Parallelogram Rule for Addition

Parallelogram Rule for Addition, Lay 1.3
If $\mathbf{u}$ and $\mathbf{v}$ in $\mathbb{R}^2$ are represented as points in the plane, then $\mathbf{u}+\mathbf{v}$ corresponds to the fourth vertex of the parallelogram whose other vertices are $\mathbf{u}$, $\mathbf{0}$, and $\mathbf{v}$. See Figure 3.



1.2. Algebraic Properties

Algebraic Properties of $\mathbb{R}^n$
For all $\mathbf{u}$, $\mathbf{v}$, $\mathbf{w}$ in $\mathbb{R}^n$ and all scalars c and d:

1. $\mathbf{u}+\mathbf{v}=\mathbf{v}+\mathbf{u}$
2. $(\mathbf{u}+\mathbf{v})+\mathbf{w}=\mathbf{u}+(\mathbf{v}+\mathbf{w})$
3. $\mathbf{u}+\mathbf{0}=\mathbf{0}+\mathbf{u}=\mathbf{u}$
4. $\mathbf{u}+(-\mathbf{u})=-\mathbf{u}+\mathbf{u}=\mathbf{0}$,
   where $-\mathbf{u}$ denotes $(-1)\mathbf{u}$
5. $c(\mathbf{u}+\mathbf{v})=c\mathbf{u}+c\mathbf{v}$
6. $(c+d)\mathbf{u}=c\mathbf{u}+d\mathbf{u}$
7. $c(d\mathbf{u})=(cd)\mathbf{u}$
8. $1\mathbf{u}=\mathbf{u}$

1.3. Linear Combination and Span

A linear combination, definition, Lay, 1.3

Let $\mathbf{v}_1, \mathbf{v}_2, \ldots, \mathbf{v}_p$ be vectors in $\mathbb{R}^n$.

A linear combination of $\mathbf{v}_1, \mathbf{v}_2, \ldots, \mathbf{v}_p$ is a vector

$$c_1\mathbf{v}_1 + c_2\mathbf{v}_2 + \cdots + c_p\mathbf{v}_p, \quad c_1, c_2, \ldots, c_n \in \mathbb{R}$$

The span of $\mathbf{v}_1, \mathbf{v}_2, \ldots, \mathbf{v}_p$ is the set of all linear combinations

$$\{c_1\mathbf{v}_1 + c_2\mathbf{v}_2 + \cdots + c_p\mathbf{v}_p, \quad c_1, c_2, \ldots, c_n \in \mathbb{R}\}$$

1.4. Properties of Matrix-Vector Product

If A is an $m \times n$ matrix, $\mathbf{u}$ and $\mathbf{v}$ are vectors in $\mathbb{R}^n$, and c is a scalar, then:

a. $A(\mathbf{u} + \mathbf{v}) = A\mathbf{u} + A\mathbf{v}$;

b. $A(c\mathbf{u}) = c(A\mathbf{u})$.