

Why

1

## Definition

The matrix-vector product between an  $m \times n$ -matrix and an n-vector is the result of the linear combination of the columns of the matrix with the sequence of scalars in the vector. So the matrix-vector product is an m-vector.

## Notation

Let C be a nonempty set. Let  $A \in C^{m \times n}$  and let  $x \in C^n$ . As usual, we denote the matrix-vector product of A with x by Ax, read "A x," and defined by

$$b_i = \sum_{j=1}^n a_{ij} x_j$$

for  $i \in \{1, 2, ..., m\}$ . Let

$$A = \left[ egin{aligned} a_1^{ op} \ a_2^{ op} \ dots \ a_m^{ op} \end{array} 
ight]$$

Or, if  $a_i^{\top}$  is the *i*th row of A, then

$$b_i = a_i^{\top} x$$

for 
$$i \in \{1, 2, \dots, m\}$$
.

<sup>&</sup>lt;sup>1</sup>Future editions will include.

