



Matrix-Vector Products

1 Why

TODO

2 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.

2.1 Notation

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

If we denote Ax by b , then

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

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

$$A = \begin{bmatrix} a_1^T \\ a_2^T \\ \vdots \\ a_m^T \end{bmatrix}$$

Or, if a_i^T is the i th row of A , then

$$b_i = a_i^T x$$

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



