Linear Algebra

Matrix Arithmetic

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Matrix times a Vector $\frac{1}{2} \left[\frac{1}{2} - \frac{1}{2} \right] \cdot \left[\frac{2}{1} \right] = \left[\frac{2(1)}{2(0)} + \frac{1}{2(0)} + \frac{2}{2(1)} \right] \\
= \left[\frac{2(1)}{2(0)} + \frac{1}{2(0)} + \frac{2}{2(1)} \right]$

3x3

- The resulting column rector is given by the dot product of each row up the rector.

- The # of columns must match sector dim.

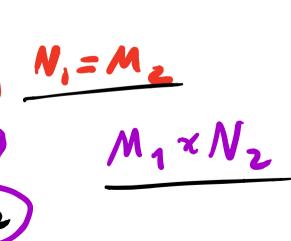
Matrix times a Vector $\begin{bmatrix} 2 & 0 & 2 \\ -5 & 1 & 2 \end{bmatrix} \begin{bmatrix} 2 \\ -2 \end{bmatrix} = \begin{bmatrix} 0 \\ -13 \end{bmatrix}$ $A = \begin{bmatrix} 2 \\ -13 \end{bmatrix}$ - I can multiply on y 3D rector by a matrix of size Mx3 The result will be a M-D rector. VTA - (21-2) []-17 -> 2 DuctrMatrix times a Vector

Ax is equivalent to

- computing a lin. comb. of the cols of A

- Mapping a 30 rector to an 3D rector

dim (B) = M2 × N2



Matrix times a Matrix Commutative mult: Xy = yx 2(3) = 3(2) $\begin{bmatrix} 2-i \end{bmatrix} \begin{bmatrix} 3-i \end{bmatrix} = \begin{bmatrix} 3-i \end{bmatrix}$ $\begin{bmatrix} 3 & 1 & 1 \\ 3 & 1 \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ 1 & 0 \end{bmatrix}$

Matrix Addition

$$\begin{bmatrix} 1 & -1 \\ -1 & 0 \end{bmatrix} + \begin{bmatrix} 5 & 10 \\ 0 & -1 \end{bmatrix}$$

$$= \begin{bmatrix} 1+5 & -1+10 \\ -1+0 & 0-1 \end{bmatrix} = \begin{bmatrix} 6 & 9 \\ -1 & -1 \end{bmatrix}$$

Matrix Arithmetic

Intuition: Ax as a linear map Want

 $-(A+B)\ddot{x} = A\ddot{x} + B\ddot{x}$

 $-(AB)\vec{x} = A(B\vec{x})$