

四 Addition and subtraction

四 Addition

$$A = \begin{bmatrix} 1 & 2 \\ 4 & 5 \\ 7 & 6 \end{bmatrix}_{3 \times 2}$$

$$B = \begin{bmatrix} 7 & 8 \\ 10 & 11 \\ 1 & 2 \end{bmatrix}_{3 \times 2}$$

$$\begin{aligned} A + B &= \begin{bmatrix} 1+7 & 2+8 & 3+9 \\ 4+10 & 5+11 & 6+12 \end{bmatrix} \\ &= \begin{bmatrix} 8 & 10 & 12 \\ 14 & 16 & 18 \end{bmatrix} \end{aligned}$$

四 Subtraction

$$\begin{aligned} A - B &= \begin{bmatrix} 1-7 & 2-8 & 3-9 \\ 4-10 & 5-11 & 6-12 \end{bmatrix} \\ &= \begin{bmatrix} -6 & -6 & -6 \\ -6 & -6 & -6 \end{bmatrix} \end{aligned}$$

Scalar Broadcasting

$$A + S = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} + S$$

$$= \begin{bmatrix} a_{11} + S & a_{12} + S \\ a_{21} + S & a_{22} + S \end{bmatrix}$$

Scalar addition

$$A = \begin{bmatrix} 2 & 5 \\ 7 & 1 \end{bmatrix} = A + A$$

$$A + B = \begin{bmatrix} 2+3 & 5+3 \\ 7+3 & 1+3 \end{bmatrix}$$

$$= \begin{bmatrix} 5 & 8 \\ 10 & 4 \end{bmatrix}$$

$$\begin{bmatrix} 0-0 & 8-8 & 0-0 \\ 0-0 & 11-8 & 0-0 \\ 0-0 & 0-0 & 0-0 \end{bmatrix} = 0 - A$$

$$\begin{bmatrix} 2-2 & -2-2 & 2-2 \\ 2-2 & 2-2 & 2-2 \end{bmatrix}$$

Trace calculation ilqifan xintom

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

$$\text{tr}(A) = 1 + 5 + 9 = 15$$

$$A = \begin{bmatrix} 2 & 4 & 6 \\ 1 & 3 & 5 \\ 7 & 8 & 9 \end{bmatrix}$$

$$B = \begin{bmatrix} 5 & 2 & 1 \\ 6 & 4 & 3 \\ 7 & 8 & 8 \end{bmatrix}$$

$$A+B = \begin{bmatrix} 7 & 6 & 7 \\ 2 & 7 & 8 \\ 14 & 17 & 17 \end{bmatrix}$$

$$\therefore \text{tr}(A+B) = 7 + 7 + 17 = 31$$

$$A-B = \begin{bmatrix} -3 & 2 & 5 \\ -5 & -1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\therefore \text{tr}(A-B) = (-3) + (-1) + 1 = -3 - 1 + 1 = -3$$

Matrix Multiplication

$$A_{m \times n} \times B_{n \times p} = C_{m \times p}$$

1 row matrix = 2 matrix column

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \quad \xrightarrow{\text{Row}} \quad B = \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix} \quad \downarrow \text{Column}$$

$$C_{IJ} = \sum (\text{Row of } A \times \text{Column of } B)$$

$$C = \begin{bmatrix} (1 \times 5 + 2 \times 7) & (1 \times 6 + 2 \times 8) \\ (5 \times 3 + 4 \times 7) & (3 \times 6 + 4 \times 8) \end{bmatrix}$$

$$C = \begin{bmatrix} 5 + 14 & 6 + 16 \\ 15 + 28 & 18 + 32 \end{bmatrix}$$

$$= \begin{bmatrix} 19 & 22 \\ 43 & 50 \end{bmatrix}$$