Makine Öğrenmesi

2020

Perceptron

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TEMEL KURALLAR

- Broadcasting ✓
- Notasyon ✓

Makine Öğrenmesi

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Broadcasting

$$\begin{bmatrix}1\\2\\3\\4\end{bmatrix}+\begin{bmatrix}100\\100\\100\\100\end{bmatrix}=\begin{bmatrix}101\\102\\103\\104\end{bmatrix}$$

$$\begin{bmatrix}1\\2\\3\\4\end{bmatrix}+\underline{100}=\begin{bmatrix}101\\102\\103\\104\end{bmatrix}$$

$$\underset{2\times 3}{\begin{bmatrix}1&2&3\\4&5&6\end{bmatrix}}+\underset{1\times 3 \to 2\times 3}{\begin{bmatrix}100&200&300\end{bmatrix}}=\begin{bmatrix}101&202&303\\104&205&306\end{bmatrix}$$

$$\begin{bmatrix}1&2&3\\4&5&6\end{bmatrix}+\begin{bmatrix}100&200&300\\\underline{100}&\underline{200}&\underline{300}\end{bmatrix}=\begin{bmatrix}101&202&303\\104&205&306\end{bmatrix}$$

$$\underset{2\times 3}{\begin{bmatrix}1&2&3\\4&5&6\end{bmatrix}}+\underset{2\times 1 \to 2\times 3}{\begin{bmatrix}100\\200\end{bmatrix}}=\begin{bmatrix}101&102&103\\204&205&206\end{bmatrix}$$

$$\begin{bmatrix}1&2&3\\4&5&6\end{bmatrix}+\begin{bmatrix}100&\underline{100}&\underline{100}\\200&\underline{200}&\underline{200}\end{bmatrix}=\begin{bmatrix}101&102&103\\204&205&206\end{bmatrix}$$

Broadcasting

$$(m,n) \ \text{matris} \quad \begin{matrix} + \\ - \\ \times \\ / \end{matrix} \quad \begin{matrix} (1,n) \longrightarrow (m,n) \longrightarrow m \text{ satır çoğaltmakta (kopyalamakta)} \\ (m,1) \longrightarrow (m,n) \longrightarrow n \text{ kolon çoğaltmakta} \end{matrix}$$

$$\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} + 100 = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} + \begin{bmatrix} 100 \\ 100 \\ 100 \end{bmatrix} = \begin{bmatrix} 101 \\ 102 \\ 103 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 2 & 3 \end{bmatrix} + 100 = \begin{bmatrix} 1 & 2 & 3 \end{bmatrix} + \begin{bmatrix} 100 & 100 & 100 \end{bmatrix} = \begin{bmatrix} 101 & 102 & 103 \end{bmatrix}$$

Notasyon

x_1 x_2 y

	exam1	exam2	decision
0	34.623660	78.024693	0
1	30.286711	43.894998	0
2	35.847409	72.902198	0
3	60.182599	86.308552	1
4	79.032736	75.344376	1

$$X = \begin{bmatrix} 34.623660 & 78.024693 \\ 30.286711 & 43.894998 \\ 35.847409 & 72.902198 \\ 60.182599 & 86.308552 \\ 79.032736 & 75.344376 \end{bmatrix}_{5\times 2} \qquad x_1 = \begin{bmatrix} 34.623660 \\ 30.286711 \\ 35.847409 \\ 60.182599 \\ 79.032736 \end{bmatrix}_{5\times 1} \qquad x_2 = \begin{bmatrix} 78.024693 \\ 43.894998 \\ 72.902198 \\ 86.308552 \\ 75.344376 \end{bmatrix}_{5\times 1}$$

$$x^{(1)} = [34.623660 \quad 78.024693]_{1\times 2}$$
$$x^{(2)} = [30.286711 \quad 43.894998]_{1\times 2}$$
$$x^{(3)} = [35.847409 \quad 72.902198]_{1\times 2}$$
$$x^{(4)} = [60.182599 \quad 86.308552]_{1\times 2}$$
$$x^{(5)} = [79.032736 \quad 75.344376]_{1\times 2}$$

$$y = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \\ 1 \end{bmatrix}_{5\times 1} \qquad w = \begin{bmatrix} w_1 \\ w_2 \end{bmatrix}_{2\times 1}, \; w_0 = b$$

$$X \rightarrow [m\times n]$$

$$w \rightarrow [n\times 1], \; b \rightarrow [1\times 1]$$

$$z = Xw + b \rightarrow \underbrace{[m\times n][n\times 1]} + [1\times 1]$$

$$[m\times 1] + [m\times 1] = [m\times 1]$$

Kolon Vektörü

$$\hat{y} = a = h_w(x) = f(z) \longrightarrow [m\times 1]$$

Notasyon

	exam1 (x_1)	exam2 (x_2)	decision (y)
0	34.623660	78.024693	0
1	30.286711	43.894998	0
2	35.847409	72.902198	0
3	60.182599	86.308552	1
4	79.032736	75.344376	1

$$X = \begin{bmatrix} 34.623660 & 78.024693 \\ 30.286711 & 43.894998 \\ 35.847409 & 72.902198 \\ 60.182599 & 86.308552 \\ 79.032736 & 75.344376 \end{bmatrix}_{5\times2}$$

$$X^T = x = \begin{array}{ccccc} x_{(1)} & x_{(2)} & x_{(3)} & x_{(4)} & x_{(5)} \end{array}$$
$$X^T = x = \begin{bmatrix} 34.623660 & 30.286711 & 35.847409 & 60.182599 & 79.032736 \\ 78.024693 & 43.894998 & 72.902198 & 86.308552 & 75.344376 \end{bmatrix}_{2\times5}$$

$$x_{(1)} = \begin{bmatrix} 34.623660 \\ 78.024693 \end{bmatrix}_{2\times1}$$

$$x_{(2)} = \begin{bmatrix} 30.286711 \\ 43.894998 \end{bmatrix}_{2\times1}$$

$$x_{(3)} = \begin{bmatrix} 35.847409 \\ 72.902198 \end{bmatrix}_{2\times1}$$

$$x_{(4)} = \begin{bmatrix} 60.182599 \\ 86.308552 \end{bmatrix}_{2\times1}$$

$$x_{(5)} = \begin{bmatrix} 79.032736 \\ 75.344376 \end{bmatrix}_{2\times1}$$

$$X^T = x = \begin{bmatrix} - & x_1^T & - \\ - & x_2^T & - \end{bmatrix}$$

$$w^T = [w_1 \quad w_2]_{1\times2}, \; w_0 = b$$

$$y = [0 \quad 0 \quad 0 \quad 1 \quad 1]_{1\times5}$$

$X \rightarrow [m \times n]$, $X^T = x \rightarrow [n \times m]$

$w \rightarrow [n \times 1]$, $b \rightarrow [1 \times 1]$

$$z = w^T x + b = \underbrace{[1 \times n][n \times m]}_{[1 \times m]} + [1 \times 1]$$

$$[1 \times m] + [1 \times m] = [1 \times m]$$

Satır vektörü

$$\hat{y} = a = h_w(x) = g(z) \rightarrow [1 \times m]$$

Notasyon

$$w = \begin{bmatrix} w_1 \\ w_2 \end{bmatrix},\ w_0 = b$$

$$X = \begin{bmatrix} | & | \\ x_1 & x_2 \\ | & | \end{bmatrix}$$

$$z = Xw + b$$

[m x 1]

$$w = \begin{bmatrix} w_0 \\ w_1 \\ w_2 \end{bmatrix}_{(n+1)\times 1}$$

$$X = \begin{bmatrix} | & | & | \\ x_0 & x_1 & x_2 \\ | & | & | \end{bmatrix}_{m\times(n+1)}$$

$$z = Xw$$

[m x 1]

$$w = \begin{bmatrix} w_1 \\ w_2 \end{bmatrix},\ w_0 = b$$

$$X = \begin{bmatrix} | & | \\ x_1 & x_2 \\ | & | \end{bmatrix}$$

$$x = X^T = \begin{bmatrix} - & x_1^T & - \\ - & x_2^T & - \end{bmatrix}$$

$$z = w^T x + b$$

[1 x m]

$$w = \begin{bmatrix} w_0 \\ w_1 \\ w_2 \end{bmatrix}$$

$$X = \begin{bmatrix} | & | & | \\ x_0 & x_1 & x_2 \\ | & | & | \end{bmatrix}$$

$$x = X^T = \begin{bmatrix} - & x_0^T & - \\ - & x_1^T & - \\ - & x_2^T & - \end{bmatrix}$$

$$z = w^T x$$

[1 x m]