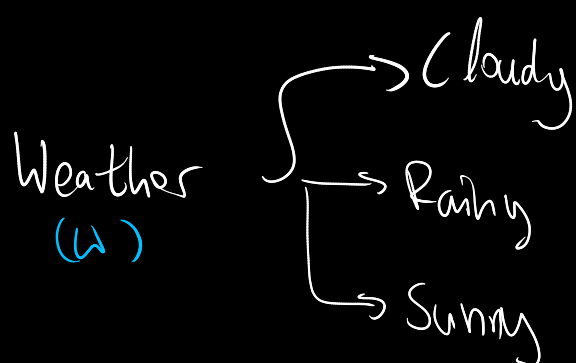


One-Hot-Categorical



→ one-hot encoding

$$\underline{w} \in \{C, R, S\}$$

0 1 2

$$\underline{w} \in \{C, R, S\}$$

$[1, 0, 0]^T$ $[0, 1, 0]^T$ $[0, 0, 1]^T$

encoding as a one-hot encoding

$\rightarrow \cancel{p(w)} \rightarrow p(\underline{w})$

↑
Random variable as a vector

We have to solve:

$$\begin{aligned} p(\underline{w} = [1, 0, 0]^T) &= \theta_0 && \text{Cloudy} \\ p(\underline{w} = [0, 1, 0]^T) &= \theta_1 && \text{Rainy} \\ p(\underline{w} = [0, 0, 1]^T) &= \theta_2 && \text{Sunny} \end{aligned} \quad \left. \vphantom{\begin{aligned} p(\underline{w} = [1, 0, 0]^T) &= \theta_0 \\ p(\underline{w} = [0, 1, 0]^T) &= \theta_1 \\ p(\underline{w} = [0, 0, 1]^T) &= \theta_2 \end{aligned}} \right\} \underline{\theta} = \begin{bmatrix} \theta_0 \\ \theta_1 \\ \theta_2 \end{bmatrix}$$

pmf:

$$p(\underline{w}) = \underline{\theta}^T \underline{w} \quad (= \underline{\theta} \cdot \underline{w})$$

Example

$$\underline{\theta} = \begin{bmatrix} 0.2 \\ 0.3 \\ 0.5 \end{bmatrix}$$

$$\begin{aligned} p(\underline{w} = R) &= p(\underline{w} = [0, 1, 0]^T) \\ &= \begin{bmatrix} 0.2 \\ 0.3 \\ 0.5 \end{bmatrix}^T \cdot \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} \end{aligned}$$

$$= 0.2 \cdot 0 + 0.3 \cdot 1 + 0.5 \cdot 0$$

$$= \underline{\underline{0.3}}$$