④ Problem on SHAP using Model.

Linear Regression Model.

$f(x_1, x_2) = 10 + 5x_1 + 3x_2$

$x_1 = 2$

$x_2 = 3$

$f(2,3) = 10 + 5(2) + 3(3)$

$= 10 + 10 + 9 = 29$

$f(x) = 29$ = model o/p.

Baseline $\phi = 10$ (without considering the feature value)

$f(x) = b + \omega_1 x_1 + \omega_2 x_2 \ldots$

So from the equation given.

$\omega_1 = 5$

$\omega_2 = 3$

I

| Subset | $f(S)$ | | Include $x_1$ $f(S \cup x_1)$ |
|---|---|---|---|
| $\phi$ | 10 | | $f(2)$ $10+5(2) = 20$ |
| $x_1$ Exclude $x_1$ | 20 | $(\phi, x_1)$ $(10+5(2))$ | — |
| $x_2$ | 19 | $(\phi, x_2)$ $(10+3(3))$ | $f(2,3)$ $10+10+9 = 29$ |

$f(S \cup x_1) - f(S)$

$\Rightarrow 20 - 10 = 10$

$29 - 19 = 10$

$f(S \cup \{x_2\}) - f(S)$

II

| Subset | $f(S)$ | Include $x_2$ | |
|---|---|---|---|
| $\phi$ | 10 | $10+9=19$ | $19-10=9$ |
| $x_1$ | 20 | $10+10+9=29$ | $29-20=9$ |
| $x_2$ | 9 | — | — |

Exclude $x_2$ ✗

$$\phi(x_1) = \frac{1}{2}[10+10] = 10$$

↳ No of features..

$$\boxed{\phi(x_1) = 10}$$

$$\phi(x_2) = \frac{1}{2}[9+9] = 9$$

$$\boxed{\phi(x_2) = 9}$$

$$f(x) = b + \phi(x_1) + \phi(x_2)$$

$$= 10 + 10 + 9$$

↳ baseline

$f(x) = 29 \Rightarrow$ Model o/p.