

# Feature Scaling

- ① Standardization  $\rightarrow$  Z-score
- ② Min Max Scaling {Normalization}
- ③ Unit Vector.

## ① Standardization

Age

24

25

26

27

28

29

$$Z\text{-score} = \frac{x_i - \bar{x}}{\sigma}$$

$$\mu = 0, \sigma = 1$$

Age'

$$\mu = 0, \sigma = 1$$

## ② Normalization [Min Max scaler] $\rightarrow$ 0 to 1

Age

24

25

26

27

28

30

TRANSFORMATION



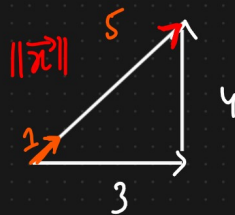
$$x_{\text{scaled}} = \frac{x_i - x_{\min}}{x_{\max} - x_{\min}}$$

Age' [0-1]

③ Unit Vector - Magnitude of 1

$$\vec{x} = (\overset{\downarrow}{3}, \overset{\downarrow}{4})$$

$$\begin{aligned} \|\vec{x}\| &= \sqrt{(3)^2 + (4)^2} = \sqrt{25} \\ &= 5 \end{aligned}$$



$$\hat{u} = \left( \frac{3}{\|\vec{x}\|}, \frac{4}{\|\vec{x}\|} \right) = \left( \frac{3}{5}, \frac{4}{5} \right)$$

$$\begin{aligned} \|\hat{u}\| &= \sqrt{\left(\frac{3}{5}\right)^2 + \left(\frac{4}{5}\right)^2} = \sqrt{\frac{9+16}{25}} \\ &= \sqrt{\frac{25}{25}} \\ &= 1 \end{aligned}$$