4.2.7.1 Lift

Association Rule : Tea → Coffee

	coffee	$\overline{\text{coffee}}$	
Tea	150	50	200
$\overline{\text{Tea}}$	650	150	800
	800	200	1000

Q : Lift (Tea, coffee) = ?

independent?

positively correlated?

negatively correlated?

P(Coffee ∪ Tea) 代表喝咖啡或喝茶（或两者都喝）的概率

Solution 1

① $Lift(Tea, coffee) = \frac{confidence(Tea \to Coffee)}{Support\ (Coffee)}$

② $Support\ (coffee) = p(coffee) = \frac{800}{1000} = 0.8$

③ $confidence(Tea \to coffee)$

$= \frac{p(Tea \cup coffee)}{p\ (Tea)}$

$= \frac{\frac{150+50+650}{1000}}{\frac{200}{1000}} = 4.25$

	coffee	$\overline{coffee}$	
Tea	150	50	200
$\overline{Tea}$	650	150	800
	800	200	1000

④ $Lift = \frac{4.25}{0.8} = 5.3125$

P(Coffee ∩ Tea) 代表既喝咖啡又喝茶的概率

Solution 2

confidence (Tea → coffee)

= p(coffee | Tea)

= $\frac{150}{200}$

	coffee	$\overline{\text{coffee}}$	
Tea	150	50	200
$\overline{\text{Tea}}$	650	150	800
	800	200	1000

$p(Tea) = \frac{200}{1000} = 0.2$ $p(coffee) = \frac{800}{1000} = 0.8$

$p(coffee \mid \overline{Tea}) = \frac{650}{800} = 0.8125$

即使你忽略某人是否喝茶，喝咖啡的概率也是 80%

知道喝茶反而会降低喝咖啡的概率

$$Lift(X,Y) = \frac{cofidence(X \to Y)}{Support(Y)}$$

$$= \frac{p(X \cup Y)}{p(X)} \cdot \frac{1}{Support(Y)}$$

$$= \frac{p(X \cup Y)}{p(X)} \cdot \frac{1}{p(Y)}$$

$$= \frac{P(Y|X)}{P(Y)}$$

$$\text{Lift}(\text{Tea} \rightarrow \text{Coffee}) = \frac{P(\text{Coffee} \mid \text{Tea})}{P(\text{Coffee})}$$

$$= \frac{150/200}{0.8}$$

$$= \frac{0.75}{0.8}$$

$$= 0.9375 < 1$$

not interesting

负相关