

①

	repbone	TO	любов	a	zoprice	TO	высота
P_{u1}	$\frac{1}{7}$	$\frac{2}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{2}{7}$	$\frac{1}{7}$
P_{u2}	1	1	$\frac{1}{2}$	1	1	1	$\frac{1}{2}$

	red	is	love	but	black	is	sadness
P_{e1}	$\frac{1}{7}$	$\frac{2}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{2}{7}$	$\frac{1}{7}$
P_{e2}	1	1	$\frac{1}{2}$	1	1	1	$\frac{1}{2}$

Entropy for ukrainian text.

$$H_{1u} = - \sum p_{u1} \log p_{u1} = - \left(\frac{1}{7} \cdot 5 \log_2 \frac{1}{7} + \left(\frac{2}{7} \cdot 2 \log_2 \frac{2}{7} \right) \right)$$

$$= 3.03$$

$$H_{2u} = - \frac{1}{7} \sum \log_2 p_{u2} = - \frac{1}{7} \left(5 \log_2 1 + 2 \log_2 \frac{1}{2} \right)$$

$$= - \frac{1}{7} \cdot 2(-1) = \frac{2}{7}$$

For english text

$$H_{1e} = - \sum p_{e1} \log p_{e1} = - \left(\frac{1}{7} \cdot 5 \log_2 \frac{1}{7} + \frac{2}{7} \cdot 2 \log_2 \frac{2}{7} \right)$$

$$= 3.03$$

$$H_{2e} = - \frac{1}{7} \left(2 \cdot (-1) \right) = \frac{2}{7}$$

③ Combined.

	repbone	TO	любов	a	zoprice	TO	высота	red	is	love	but	black	is	sadness
p_1	$\frac{1}{14}$	$\frac{2}{14}$	$\frac{1}{14}$	$\frac{1}{14}$	$\frac{1}{14}$	$\frac{2}{14}$	$\frac{1}{14}$	$\frac{1}{14}$	$\frac{2}{14}$	$\frac{1}{14}$	$\frac{1}{14}$	$\frac{1}{14}$	$\frac{2}{14}$	$\frac{1}{14}$
p_2	1	1	$\frac{1}{2}$	1	1	$\frac{1}{2}$	1	1	$\frac{1}{2}$	1	1	1	1	$\frac{1}{2}$

$$H_{1c} = - \sum p_1 \log p_1 = - \left(\frac{1}{14} \cdot 10 \log_2 \frac{1}{14} + \frac{2}{14} \cdot 4 \log_2 \frac{2}{14} \right) =$$

$$= 5.92$$

$$H_{2c} = - \frac{1}{14} \sum \log_2 p_2 = - \frac{1}{14} \left(\log_2 1 \cdot 10 + \log_2 \frac{1}{2} \cdot 4 \right) =$$

$$= - \frac{1}{14} \cdot 4 \cdot (-1) = \frac{2}{7}$$

$$H_{1u} = H_{1e} = H_{2combined} = \frac{2}{7}$$

So we can see that entropy changed but conditional entropy does not changed after combination