1.

$$P(+u|+e) = \frac{P(+u,+e)}{P(+e)}$$

First compute $P(+u,+e)$.

$$P(+u,+e) = \sum_h P(h) \sum_i (+u|i,h) \sum_t P(t|i) \cdot P(i) \cdot P(+e|t,+u)$$

$$= \sum_h P(h) \sum_i (+u|i,h) f_1(i)$$

compute: $f_1(+i) = P(+t|+i) \cdot P(+i) \cdot P(+e|+t,+u)$

$$+$$

$$P(-t|+i) \cdot P(+i) \cdot P(+e|-t,+u)$$

$$= 0.8 \times 0.7 \times 0.9 + 0.2 \times 0.7 \cdot 0.7$$

$$= 0.602$$

$$f_1(-i) = P(+t|-i) \times P(-i) \times P(+e|+t,+u)$$

$$+$$

$$P(-t|-i) \times P(-i) \times P(+e|-t,u)$$

$$= 0.5 \times 0.3 \times 0.9 + 0.5 \times 0.3 \times 0.7$$

$$= 0.24$$

orginal equation $= \sum_h P(h) f_2(h)$

compute $f_2(+h) = (+u|+i,+h) \cdot f(+i) + (+u|-i,+h) \cdot f(-i)$

$$= 0.9 \times 0.602 + 0.5 \times 0.24$$

$$= 0.6618$$

$$f_2(-h) = (+u|+i,-h) \cdot f(+i) + (+u|-i,-h) \cdot f(-i)$$

$$= 0.3 \times 0.602 + 0.1 \times 0.24$$

$$= 0.2046$$

Now compute $f_3 = \sum_h P(h) f_2(h)$

$$= 0.6 \times 0.6618 + 0.4 \times 0.2046$$

$$= 0.47892$$

As a result, $P(+u, +e) = 0.47892$

To calculate: $P(+e) = P(+u, +e) + P(-u, +e)$

Compute: $P(-u, +e) = \sum_h P(h) \sum_i (-u|i,h) \sum_t P(t|i) \cdot P(i) \cdot P(+e|t, -u)$

$$= \sum_h P(h) \sum_i (-u|i,h) f_1(i)$$

$f_1(+i) = P(+t|+i) \cdot P(+i) \cdot P(+e|+t, -u) + (-t|+i) \cdot P(+i) \cdot P(+e|-t, -u)$

$$= 0.8 \cdot 0.7 \cdot 0.5 + 0.2 \times 0.7 \times 0.3 = 0.322$$

$f_1(-i) = P(+t|-i) \cdot P(-i) \cdot P(+e|+t, -u) + (-t|-i) \cdot P(-i) \cdot P(+e|-t, -u)$

$$= 0.5 \times 0.3 \times 0.5 + 0.5 \times 0.3 \times 0.3 = 0.12$$

Orginal equation $= \sum_h P(h) f_2(h)$

$f_2(+h) = (-u|+i, +h) \cdot f(+i) + (-u|-i, +h) \cdot f(-i)$

$$= 0.1 \cdot 0.322 + 0.5 \cdot 0.12 = 0.0922$$

$f_2(-h) = (-u|+i, -h) \cdot f(+i) + (-u|-i, -h) \cdot f(-i)$

$$= 0.7 \cdot 0.322 + 0.9 \times 0.12 = 0.3334$$

$f_3 = \sum_h P(h) \cdot f_2(h) = 0.6 \cdot 0.0922 + 0.4 \cdot 0.3334 = 0.18868$

$$P(+u|+e) = \frac{P(+u, +e)}{P(+e)} = \frac{P(+u, +e)}{P(+u, +e) + P(-u, +e)}$$

$$= \frac{0.47892}{0.47892 + 0.18868} \approx 0.7174$$