$$E[L_c(\phi^{(l)}|X,Z)\,|\,X,\phi^{l}] = \sum_t^N \sum_i^K E[z_i^t|X,\phi^l]\,[\log \pi_i + \log p(x^t|\phi_i^l)]$$

Expectation: $E[z_i^t|X,\phi^l] = E[z_i^t|x^t,\phi^l]$

$$= p(z_i^t=1\,|\,x^t,\phi^l)$$

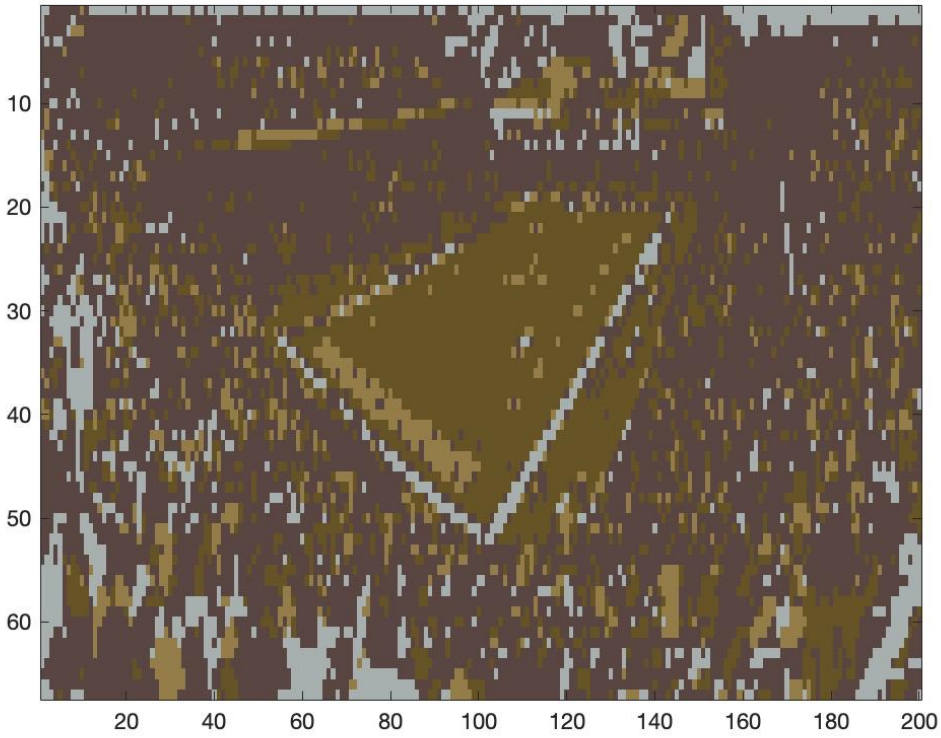
$$= \frac{p(z_i^t=1|\phi^l)\,p(x^t|z_i^t=1,\phi^l)}{p(x^t|\phi^l)}$$

$$= \frac{\pi_i\, p(x^t|\phi_i^l)}{\sum_j \pi_j\, p(x^t|\phi_j^l)} = p(z_i^t=1|x^t,\phi^l)$$

$$\equiv \gamma(z_i^t)$$

Q2.a

K=4



K=8