$$rac{p(oldsymbol{sterior}}{p(oldsymbol{x}_k | oldsymbol{Z}_k)} = rac{p(oldsymbol{x}_k, oldsymbol{Z}_k)}{p(oldsymbol{Z}_k)} \ = rac{p(oldsymbol{z}_k, oldsymbol{Z}_{k-1})}{p(oldsymbol{z}_k, oldsymbol{Z}_{k-1})}$$

Bayes' rule
$$\frac{p(z_k|x_k, Z_{k-1})p(x_k, Z_{k-1})}{p(z_k|Z_{k-1})p(Z_{k-1})}$$

independence,
Bayes' rule
$$= \frac{p(z_k|x_k)p(x_k|Z_{k-1})p(Z_{k-1})}{p(z_k|Z_{k-1})p(Z_{k-1})}$$

nuisance variable
$$\frac{p(z_k|x_k)p(x_k|Z_{k-1})}{\int p(z_k|x_k)p(x_k|Z_{k-1})dx_k}$$

likelihood prior (prediction)
$$\propto rac{p(z_k|x_k)}{p(x_k|Z_{k-1})}$$