

$$\overset{\text{posterior}}{p(x_k | Z_k)} = \frac{p(x_k, Z_k)}{p(Z_k)}$$

$$p(Z_k) = p(z_k, Z_{k-1}) \frac{p(x_k, z_k, Z_{k-1})}{p(z_k, Z_{k-1})}$$

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

independence,

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

nuisance
variable

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

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