

Goal: approximate the true posterior $q(\theta) \approx p(\theta|\mathcal{D})$

$$\begin{aligned}
 p(\theta|\mathcal{D}) &\propto p_0(\theta) \, p(\mathcal{D}_1|\theta) \, p(\mathcal{D}_2|\theta) \\
 \mathcal{D} &= \mathcal{D}_1 \cup \mathcal{D}_2, \, \mathcal{D}_1 = \{x_1\}, \, \mathcal{D}_2 = \{x_2, x_3\} \\
 N &= 3, N_1 = 1, N_2 = 2
 \end{aligned}$$

DEP

$$\begin{aligned}
 \tilde{p}(\theta) &\propto p_0(\theta) \, F_1(\theta) \, p(\mathcal{D}_2|\theta) & q^{new}(\theta) &\propto p_0(\theta) \, F_1(\theta) \, F_2^{new}(\theta) \\
 &\text{[green]} \, \text{[red]} \, \text{[wavy mag]} \, \text{[wavy yellow]} & & \text{[green]} \, \text{[red]} \, \text{[solid pink]}
 \end{aligned}$$

SDEP

$$\begin{aligned}
 \tilde{p}(\theta) &\propto p_0(\theta) \, f(\theta)^{N-N_2} \, p(\mathcal{D}_2|\theta) & q^{new}(\theta) &\propto p_0(\theta) \, f^{new}(\theta)^N \\
 &\text{[green]} \, \text{[blue]} \, \text{[wavy mag]} \, \text{[wavy yellow]} & & \text{[green]} \, \text{[solid blue]}
 \end{aligned}$$

DSEP

$$\begin{aligned}
 \tilde{p}(\theta) &\propto p_0(\theta) \, f_1(\theta)^{N_1} \, f_2(\theta)^{N_2-1} & q^{new}(\theta) &\propto p_0(\theta) \, f_1(\theta)^{N_1} \, f_2^{new}(\theta)^{N_2} \\
 &\text{[green]} \, \text{[red]} \, \text{[pink]} \, \text{[wavy yellow]} & & \text{[green]} \, \text{[red]} \, \text{[solid pink]} \\
 & & & p(x_3|\theta)
 \end{aligned}$$