TODO 5

$$
\begin{aligned}
&p(X=x,\Psi,k|Y=y) \propto \\
&\frac{1}{\sqrt{2\pi\sigma_{x_s}^2}}\exp\left\{-\frac{1}{2}\sum_{s\in\Omega}\left(\frac{y_s-\mu_{x_s}}{\sigma_{x_s}}\right)^2\right\} \\
&\times\frac{\exp\left\{-\sum_{s\in\Omega}\left(\beta_{x_s}^{(0)}+\beta^{(1)}V\left(x_s,\eta_s\right)\right)\right\}}{\prod_{s\in\Omega}\sum_{c\in\Lambda}\exp\left\{-\left(\beta_c^{(0)}+\beta^{(1)}V\left(c,\eta_s\right)\right)\right\}} \\
&\times p_r\left(\beta^{(1)}\right)p_r(k)\prod_{c\in\Lambda}p_r\left(\mu_c\right)p_r\left(\sigma_c\right)p_r\left(\beta_c^{(0)}\right)
\end{aligned}
\tag{1}
$$

6

$$
\begin{aligned}
&p\left(x_s=c|\ y_s,\eta_c,\Psi_c\right)\propto \\
&\frac{1}{\sqrt{2\pi\sigma_c^2T_t}}\exp\left\{-\frac{1}{T_t}\left[\frac{1}{2}\left(\frac{y_s-\mu_c}{\sigma_c}\right)^2+\left(\beta_c^{(0)}+\beta^{(1)}V\left(c,\eta_s\right)\right)\right]\right\}
\end{aligned}
\tag{2}
$$

7

$$
\begin{aligned}
p\left(\mu_c,\sigma_c|Y,X\right) &\propto \prod_{s:x_s=c}p\left(y_s|\mu_c,\sigma_c\right)p_r\left(\mu_c\right)p_r\left(\sigma_c\right) \\
&=\frac{1}{\sigma_c\left(2\pi\sigma_c^2T_t\right)^{n_c}}\exp\left\{-\frac{1}{2T_t}\sum_{s:a_{s=c}}\left(\frac{y_s-\mu_c}{\sigma_c}\right)^2\right\}
\end{aligned}
\tag{3}
$$

8

$$
\begin{aligned}
&p\left(\beta_c^{(0)},c\in\Lambda|X\right) \\
&\quad=p\left(X|\beta_c^{(0)},c\in\Lambda\right)p_r\left(\beta_c^{(0)},c\in\Lambda\right) \\
&\quad=\textstyle\prod_{(c\in\Lambda,\psi_\eta)}\left(\frac{\exp\left(-\frac{1}{T_t}\left[\beta_c^{(0)}+\beta^{(1)}V(c,\eta)\right]\right)}{\sum_{i\in\Lambda}\exp\left(-\frac{1}{T_t}\left[\beta_i^{(0)}+\beta^{(1)}V(i,\eta)\right]\right)}\right)^{n_{(c,n)}} \\
&\quad=\textstyle\prod_{(c\in\Lambda)}\left(\frac{\exp\left(-\frac{1}{T_t}\left[\beta_c^{(0)}\right]\right)}{\sum_{i\in\Lambda}\exp\left(-\frac{1}{T_t}\left[\beta_i^{(0)}\right]\right)}\right)^{n_c} \\
&\quad\times\textstyle\prod_{(c\in\Lambda,\psi\eta)}\left(\frac{\exp\left(-\frac{1}{T_t}\left[\beta^{(1)}V(c,\eta)\right]\right)\sum_{i\in\Lambda}\exp\left(-\frac{1}{T_t}\left[\beta_i^{(0)}\right]\right)}{\sum_{i\in\Lambda}\exp\left(-\frac{1}{T_t}\left[\beta_i^{(0)}+\beta^{(1)}V(i,\eta)\right]\right.}\right)^{n_{(c,n)}}
\end{aligned}
\tag{4}
$$

12

$$
\begin{aligned}
&\beta_{c1}^{(0)}=\beta_c^{(0)}-T_t\ln\left(u_1\right)\quad\beta_{c2}^{(0)}=\beta_c^{(0)}-T_t\ln\left(1-u_1\right) \\
&\mu_{c1}=\mu_c-u_2\sigma_c\sqrt{\frac{1-u1}{u1}}\quad\mu_{c2}=\mu_c+u_2\sigma_c\sqrt{\frac{u1}{1-u1}} \\
&\sigma_{c1}^2=u_3\left(1-u_2^2\right)\sigma_c^2\frac{1}{u_1}\quad\sigma_{c2}^2=\left(1-u_3\right)\left(1-u_2^2\right)\sigma_c^2\frac{1}{1-u_1}
\end{aligned}
\tag{5}
$$

13

$$
\frac{\partial\left(\Psi_{c1},\Psi_{c2}\right)}{\partial\left(\Psi_c,u_1,u_2,u_3\right)}|=\frac{T_t\sigma^2}{u_1^2\left(1-u_1^2\right)\sqrt{u3(1-u3)}}
\tag{6}
$$

15

$$
d\left(y^{(1)},y^{(2)}\right)=\max_k\left|\hat{F}_1(k)-\hat{F}_2(k)\right|
\tag{7}
$$

16

$$
\begin{aligned}
&\frac{p\left(X=x^+,\psi^+,k^+|Y=y\right)}{p(X=x,\psi,k|Y=y)}\frac{1}{p_\beta\left(u_1\right)p_\beta\left(u_2\right)p_\beta\left(u_3\right)} \\
&\quad\times\frac{\partial\left(\Psi_{c1},\Psi_{c2}\right)}{p(\text{segmentation})}\left|\frac{1}{\partial\left(\Psi_c,u_1,u_2,u_3\right)}\right|
\end{aligned}
\tag{8}
$$

17

$$T_t = (1+\alpha_1)^{\alpha_2\left(1-\frac{t}{N_t}\right)} \tag{9}$$