

PLSA

$$F \approx \Phi \Theta$$

ARTM

$$\begin{bmatrix} F^1 \\ F^2 \end{bmatrix} \approx \begin{bmatrix} \Phi^1 \\ \Phi^2 \end{bmatrix} \Theta$$

hARTM with Φ reg.

$$\begin{bmatrix} F^1 \\ F^2 \end{bmatrix} \begin{bmatrix} \Phi^{l,1} \\ \Phi^{l,2} \end{bmatrix} \approx \begin{bmatrix} \Phi^1 \\ \Phi^2 \end{bmatrix} \Theta \Psi$$

hARTM with Θ reg.

$$\begin{bmatrix} F^1 \\ F^2 \\ \Theta^l \end{bmatrix} \approx \begin{bmatrix} \Phi^1 \\ \Phi^2 \\ \tilde{\Psi} \end{bmatrix} \Theta$$