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- INIT VALUES FOR  $\mu, \Sigma, \pi$  <sup>OLD</sup> ← GOOD INIT K-MEANS
- (E) (EXPECTATION)  $\gamma(z_{nk})$  ←
- (M) (MAXIMIZATION)  $\mu, \Sigma, \pi$  <sup>NEW</sup>

CONVERGENCE: — LOG LIKELIHOOD  
— PARAMETER VALUES

EM ALGORITHM: GENERAL VIEW: FIND ML SOLUTION FOR MODELS WITH LATENT VARIABLES

$\underline{X}, \underline{Z}$  DATA (OBSERVED, LATENT)

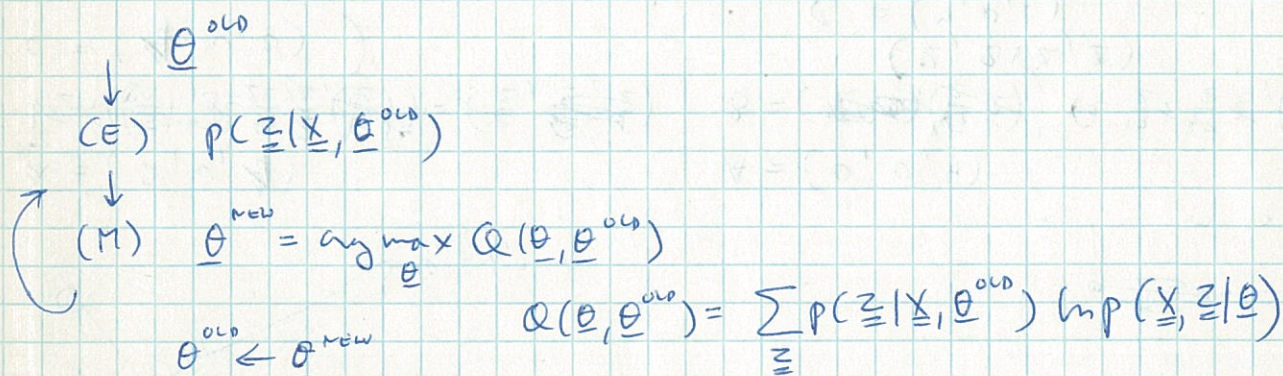
$\underline{\theta}$  MODEL PARAMETERS

$$\ln p(\underline{X}|\underline{\theta}) = \ln \left\{ \sum_{\underline{Z}} p(\underline{X}, \underline{Z}|\underline{\theta}) \right\}$$

$(\underline{X}, \underline{Z})$  COMPLETE DATA SET

$(\underline{X})$  INCOMPLETE —

UNKNOWN ABOUT  $\underline{Z} \leftarrow p(\underline{Z}|\underline{X}, \underline{\theta})$   $\underline{\theta}^{old}$   
↓ EXPECTATION  
↓ MAXIMIZATION  $\underline{\theta}^{new}$



FINDING MAP SOLUTIONS:

$p(\underline{\theta})$   
SOME PRIOR

$$Q(\underline{\theta}, \underline{\theta}^{old}) + \ln p(\underline{\theta})$$