



## Expectation Maximization

### 1 Why

I am doing a homework on this.

### 2 Definition

Let  $Z$  and  $X$  be non-empty finite sets. We want to model a distribution  $p^\theta : Z \times X \rightarrow \mathbf{R}$ . We parameterize a family of distributions by a parameter  $\theta$ . We have a dataset  $(x^1, \dots, x^n)$ . Given a parameter  $\theta^0$ , we want to solve

$$\begin{aligned} & \textbf{find } \theta \\ & \textbf{to maximize } \sum_{k=1}^n \mathbf{E}_{p_{z|x}^{\theta^0}(z, x^k)} [\log p^\theta(z, x)] \end{aligned}$$

#### 2.1 Binary Gaussian Mixture Example

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