



## Why

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## 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

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

## Binary Gaussian Mixture Example

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<sup>1</sup>Future editions will rework this sheet.

<sup>2</sup>Future editions will expand.



