### Why

I am doing a homework on this.

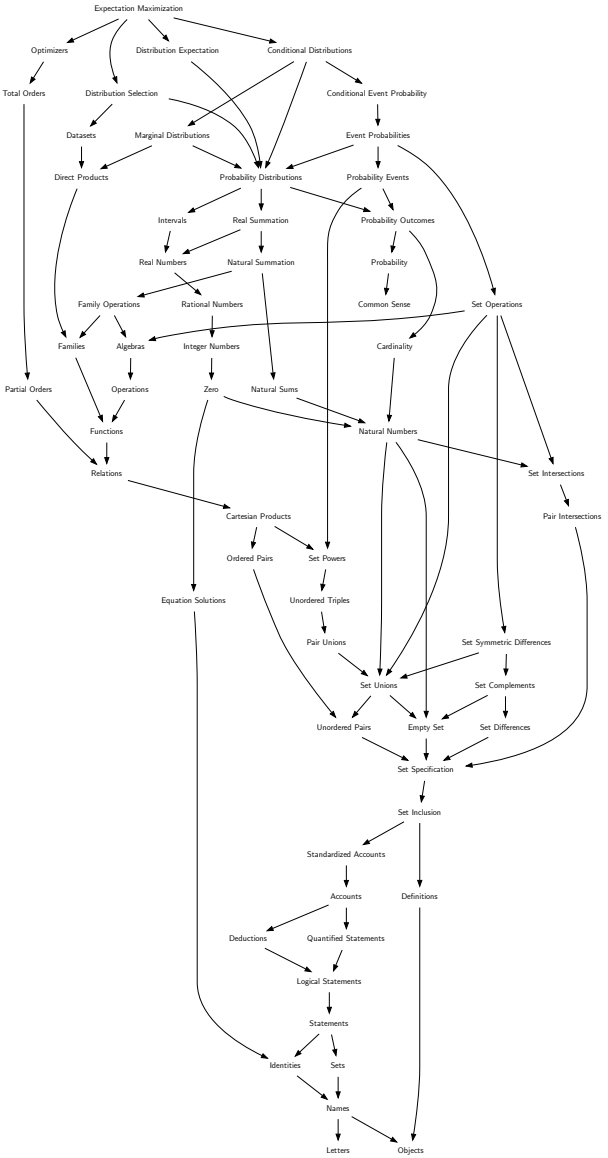
### Definition

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

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

### 0.1 Binary Gaussian Mixture Example

The


Expectation Maximization
Optimizers
Distribution Expectation
Conditional Distributions
Total Orders
Distribution Selection
Conditional Event Probability
Datasets
Marginal Distributions
Event Probabilities
Direct Products
Probability Distributions
Probability Events
Intervals
Real Summation
Probability Outcomes
Real Numbers
Natural Summation
Probability
Family Operations
Rational Numbers
Common Sense
Set Operations
Families
Algebras
Integer Numbers
Cardinality
Partial Orders
Operations
Zero
Natural Sums
Functions
Natural Numbers
Relations
Set Intersections
Cartesian Products
Pair Intersections
Ordered Pairs
Set Powers
Equation Solutions
Unordered Triples
Pair Unions
Set Symmetric Differences
Set Unions
Set Complements
Unordered Pairs
Empty Set
Set Differences
Set Specification
Set Inclusion
Standardized Accounts
Accounts
Definitions
Deductions
Quantified Statements
Logical Statements
Statements
Identities
Sets
Names
Letters
Objects