ABSTRACT

The expectation-maximization algorithm is an approach for performing maximum likelihood estimation in the presence of latent variables. It does this by first estimating the values for the latent variables, then optimizing the model, then repeating these two steps until convergence. It is an effective and general approach and is most commonly used for density estimation with missing data, such as clustering algorithms like the Gaussian Mixture Model.

A common modeling problem involves how to estimate a joint probability distribution for a dataset. Density estimation involves selecting a probability distribution function and the parameters of that distribution that best explain the joint probability distribution of the observed data. There are many techniques for solving this problem, although a common approach is called maximum likelihood estimation, or simply “maximum likelihood.”

Maximum likelihood estimation is an approach to density estimation for a dataset by searching across probability distributions and their parameters.

It is a general and effective approach that underlies many machine learning algorithms, although it requires that the training dataset is complete, e.g. all relevant interacting random variables are present. Maximum likelihood becomes

intractable if there are variables that interact with those in the dataset but were hidden or not observed, so-called latent variables.

A limitation of maximum likelihood estimation is that it assumes that the dataset is complete, or fully observed. This does not mean that the model has access to all data; instead, it assumes that all variables that are relevant to the problem are present. This is not always the case. There may be datasets where only some of the relevant variables can be observed, and some cannot, and although they influence other random variables in the dataset, they remain hidden. More generally, these unobserved or hidden variables are referred to as latent variables.

Reference :

https://machinelearningmastery.com/expectation-maximization-em-algorithm/