

Bayesian Analysis/Model

(As defined by [MathWorld](#))

Prepared by Tse-Chuan Yang

Definition: Bayesian analysis is a statistical procedure which endeavors to estimate parameters of an underlying distribution based on the observed distribution. Begin with a "prior distribution" which may be based on anything, including an assessment of the relative likelihoods of parameters or the results of non-Bayesian observations. In practice, it is common to assume a uniform distribution over the appropriate range of values for the prior distribution.

Given the prior distribution, collect data to obtain the observed distribution. Then calculate the likelihood of the observed distribution as a function of parameter values, multiply this likelihood function by the prior distribution, and normalize to obtain a unit probability over all possible values. This is called the posterior distribution. The mode of the distribution is then the parameter estimate, and "probability intervals" (the Bayesian analog of confidence intervals) can be calculated using the standard procedure. Bayesian analysis is somewhat controversial because the validity of the result depends on how valid the prior distribution is, and this cannot be assessed statistically.

Many people advocate the Bayesian approach because of its philosophical consistency. Various fundamental theorems show that if a person wants to make consistent and sound decisions in the face of uncertainty, then the only way to do so is to use Bayesian methods. On the other hand, prior probabilities are intrinsically subjective – your prior information is different from mine – and many statisticians see this as a fundamental drawback to Bayesian statistics. Advocates of the Bayesian approach argue that this is inescapable, and that other methods also entail subjective choices.

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