

Bayesian Inference

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Introduction

Bayesian Inference is a set of statistical techniques based on inverse probabilities. In traditional statistical inference, parameters in distributions are considered as constants. In Bayesian Inference, parameters are themselves modeled using distributions, called prior distributions. Models for the parameters are based on prior knowledge about the data, and these models are updated as new data are sampled. These updated models are called posterior distributions. Updating the posterior distribution with each new sample makes Bayesian modeling extremely adaptive, which is ultimately useful when trying to minimize risk in time-sensitive situations.

Bayes' Theorem

- ▶ The simplest form of inverse probability is Bayes' Theorem.

$$P(A_j | B) = \frac{P(B | A_j)P(A_j)}{\sum_{i=1}^n P(B | A_i)P(A_i)}$$

- ▶ This can be extended from probability to statistical analysis.

$$g_t(t | w) = \frac{f_w(w | t)f_t(t)}{\int_{-\infty}^{\infty} f_w(w | t)f_t(t)dt}$$

Which forms the posterior distribution from the prior.