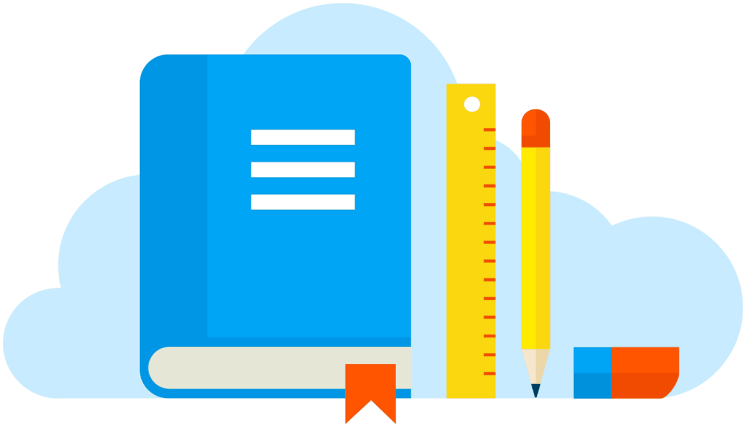


Data Science Notes by Sarowar Ahmed

📊 Chapter: Probability Theory

📊 Topic: Prior, Posterior, and Likelihood!

🔎 Hello, GitHub family! Today, let's unravel the essence of prior, posterior, and likelihood, fundamental concepts in probability theory that underpin Bayesian inference. I'll break down these concepts in a way that's easy to understand for everyone, with clear examples to illustrate each one.

🌟 What are Prior, Posterior, and Likelihood?

▪ Imagine you're exploring a maze, armed with a map and some clues. Before you start, you have some initial beliefs about where the exit might be (prior). As you navigate the maze and uncover new

information (likelihood), you update your beliefs to refine your understanding of the most probable exit location (posterior).

📐 Formulas:

Prior (Priors):
▪ The prior probability represents your initial beliefs about the likelihood of different outcomes before observing any new evidence. It is denoted by P(H), where H is the hypothesis.

Likelihood (Likelihood Function):
▪ The likelihood function measures the probability of observing the evidence given a specific hypothesis. It is denoted by $P(E|H)$, where E is the evidence and H is the hypothesis.

Posterior (Posterior Probability):
▪ The posterior probability represents your updated beliefs about the likelihood of different outcomes after observing the evidence. It is calculated using Bayes' Theorem and is denoted by $P(H|E)$, where H is the hypothesis and E is the evidence.

📊 Understanding with Examples:

Let's consider a simple example of diagnosing a medical condition.

▪ Prior: Before conducting any tests, you might believe there's a 50% chance a patient has a certain illness (P(H)=0.5).

▪ Likelihood: The likelihood function tells you how likely it is to observe certain symptoms given the presence or absence of the illness ($P(E|H)$).

▪ Posterior: After conducting tests and observing symptoms, you update your belief about the likelihood of the patient having the illness ($P(H|E)$).

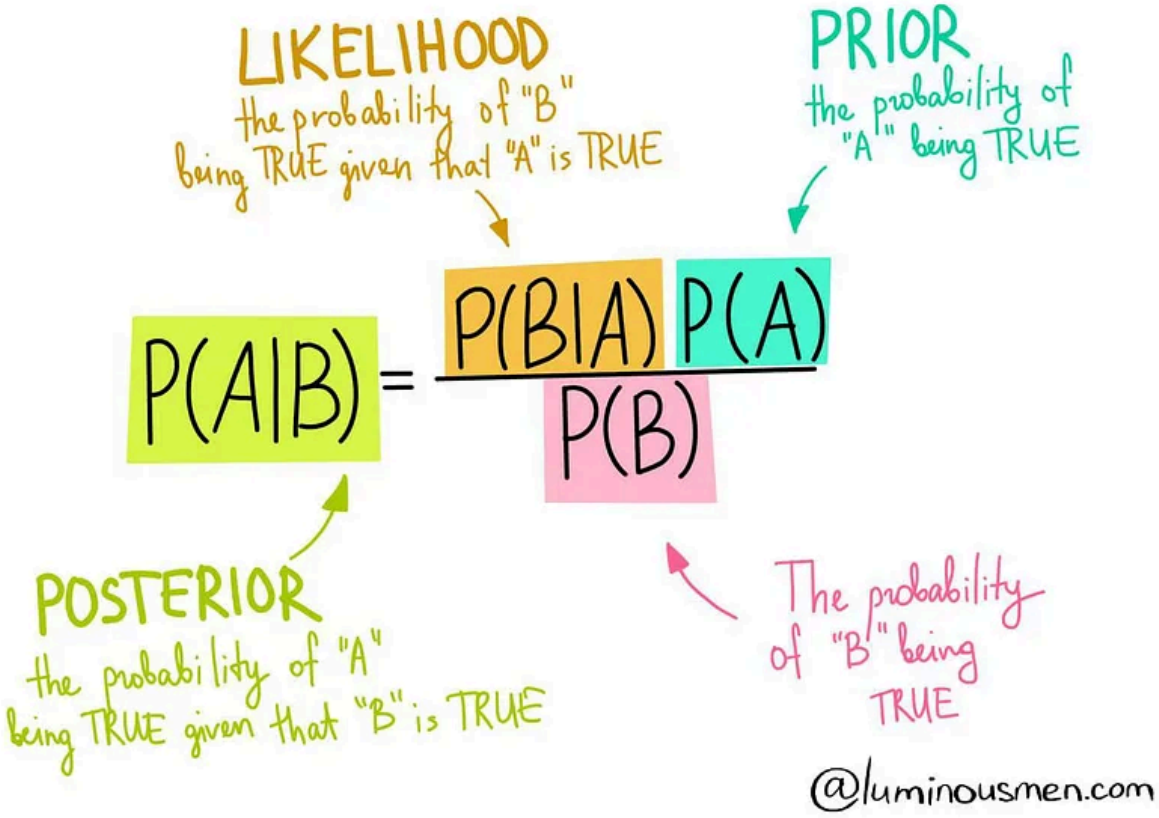
📈 Mathematical Example:

▪ Suppose you flip a coin, and your prior belief is that it's a fair coin (50% chance of heads and 50% chance of tails). You observe that the coin comes up heads 3 times in a row.

▪ Prior: $P(H)=0.5$, $P(T)=0.5$

▪ Likelihood: Given that the coin is fair, the likelihood of getting 3 heads in a row is $0.5^3=0.125$

▪ Posterior: Using Bayes' Theorem, you update your belief about the fairness of the coin based on the observed outcomes.



🚀 Why Does This Matter?

▪ Understanding prior, posterior, and likelihood is essential for making informed decisions and drawing meaningful conclusions in various fields, including healthcare, finance, and machine learning.

Got any questions about Prior, Posterior, and Likelihood!? Feel free to ask me via Linkedin! Let's keep learning together.

My LinkedIn Date: 17/04/2024