Bayes' Theorem clearly explained!🚀

It's the probability of event B given A has occurred

The prior probability of event A

$$\overbrace{P(A|B)}^{\text{Posterior}} = \frac{\overbrace{P(B|A)}^{\text{Likelihood}} * \overbrace{P(A)}^{\text{Prior}}}{\underbrace{P(B)}_{\text{Evidence}}}$$

It's the probability of event A given B was observed

The probability of observing B

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Imagine you're trying to guess
if it will rain today. ☔ You start
with a general belief based on the
weather forecast (say, a 40% chance of rain).

This is your 'prior' probability:

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Prior probability: The general belief!

☔ P(Rain) = 40%

It's the probability of an event before new evidence is taken into account.

It represents what is known about the event's likelihood before observing any new data or information.

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Then, you notice the sky is getting cloudy. ☁️

This new information is 'evidence' that might affect the probability of rain.

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The evidence!

$$P(\text{Clouds}) = 50\%$$

Let's assume it's 50% or 0.50 for simplicity.

This includes all scenarios -
both when it rains and when it does not.

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Next we consider P(Cloud | Rain), which is used to weigh the likelihood that it rains when it's cloudy.

Check this out 👇

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The likelihood!

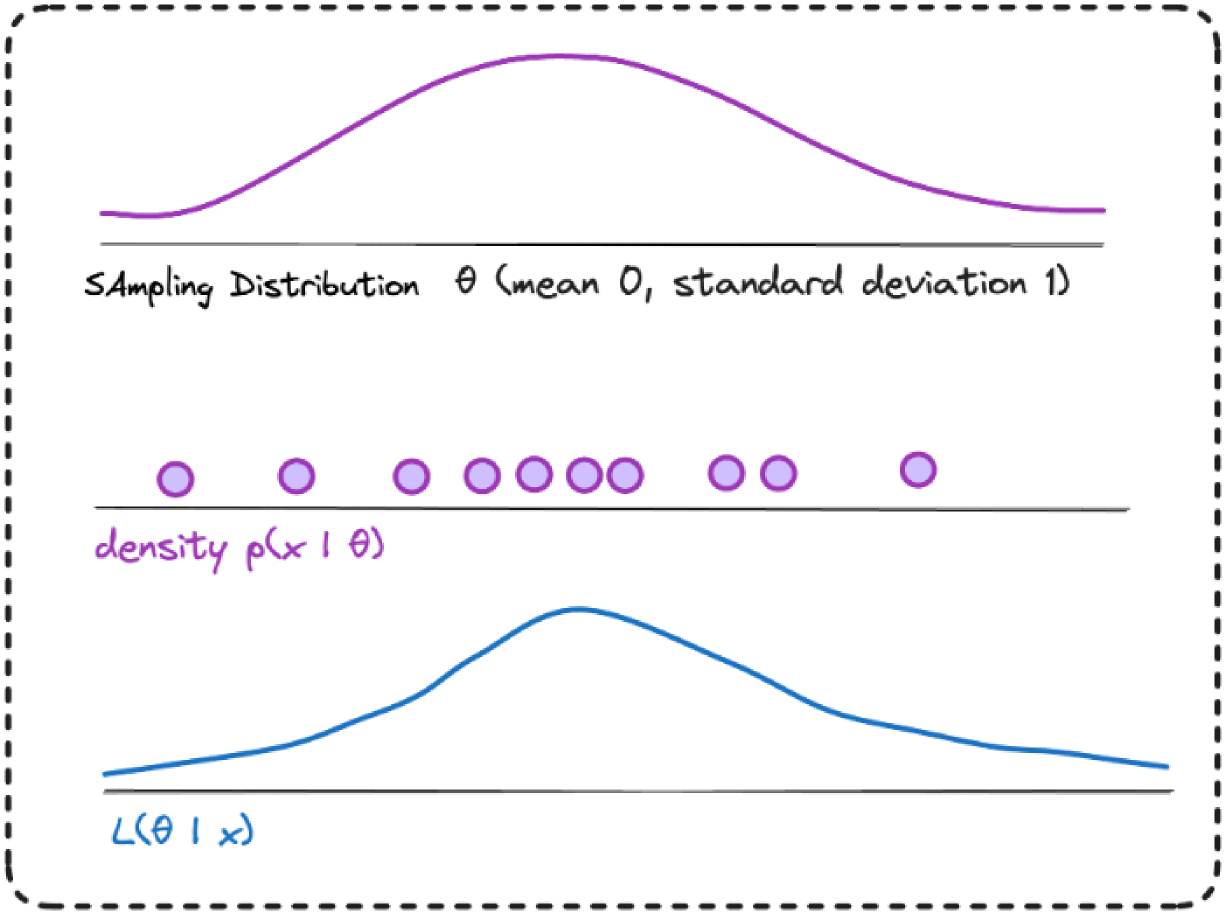
P(Clouds|Rain) = 80% = L(Rain|Clouds)

The probability of observing clouds given that it's raining!

It can also be interpreted as the Likelihood it rains given clouds are there L(Rain|Clouds)!

Although it sounds similar to P(Rain|Clouds), the likelihood function here is used in Bayes' Theorem to weigh the evidence (clouds) in support of our hypothesis (rain), rather than calculating a straightforward probability.

Likelihood function



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We are now ready to update our belief by calculating the probability of rain given it's cloudy using Bayes' Theorem!

Check it out 👇

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Posterior probability: Updating our belief!

P(☔|☁️)

$$P(\text{Rain}|\text{Cloud}) = \frac{P(\text{Cloud}|\text{Rain}) * P(\text{Rain})}{P(\text{Cloud})}$$

$$= \frac{0.8 * 0.4}{0.5} = 0.64$$

Observe that our updated probability rises from 0.40 to 0.64, based on the new evidence!

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I'll leave you with a visual proof of the Bayes' Theorem!

I hope you'll enjoy it!

Swipe ... 👉

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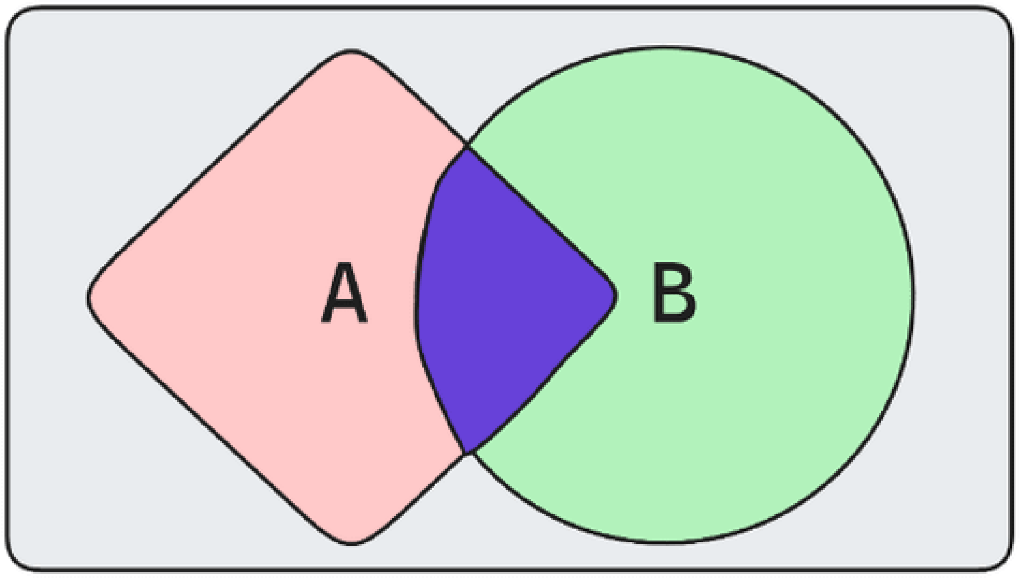
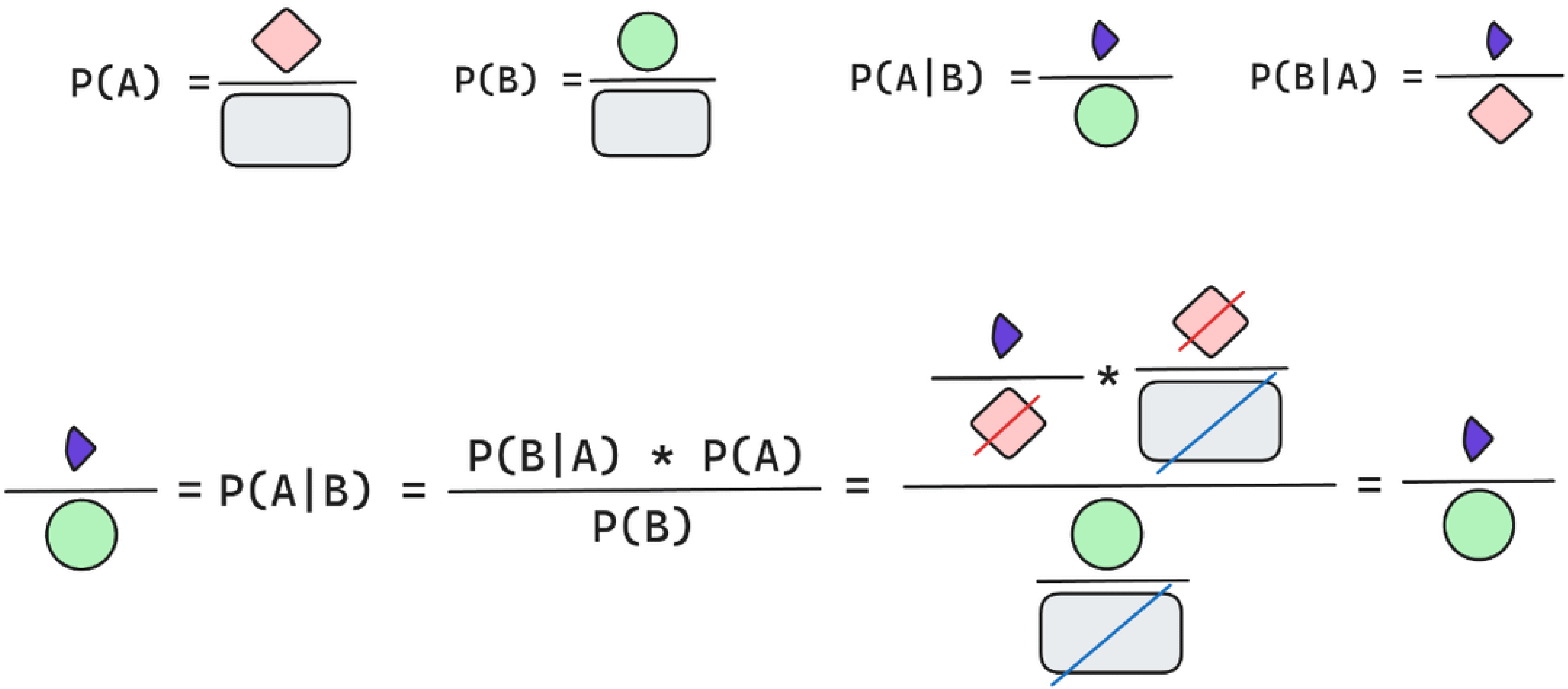
Visual proof of Bayes' Theorem!





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