

Probability Theory

Textbook: *Introduction to Probability* by Blitzstein and Hwang

Previous Lecture

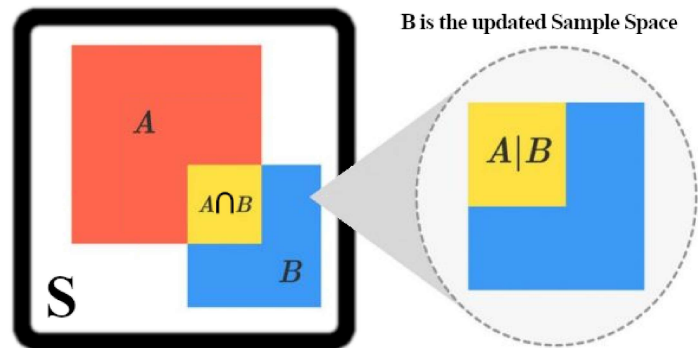
- ◆ Story Proofs
- ◆ General definition of probability
- ◆ General properties of probability



§2.1 - Conditional Probability, the Importance of Thinking Conditionally

What if you've calculated a prob for some event A , and then some new information B , relevant to the event becomes known? How do you update (*condition*) your prob?

Conditional probability $P(A|B)$ shows how to **incorporate evidence** into our understanding of the world in a logical, coherent manner.



$P(A)$ being updated to $P(A|B)$ if we know B occurred.

Ex (Conditional Rain). Let $P(R)$ be our assessment of the probability of rain before looking outside.



Then, we hear dripping B_1 , we notice it smells of rain B_2 , etc.

Incorporating these bits of evidence into our prob, we write: $P(R|B_1, \dots, B_n)$.

If eventually we observe that it's raining, our conditional probability becomes 1.



Def (Conditional Probability): If A, B are events with $P(B) > 0$, then the conditional probability of A given B , denoted $P(A|B)$, is: $P(A|B) = \frac{P(A \cap B)}{P(B)}$.

What did we learn?

◆ Conditional Probability



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