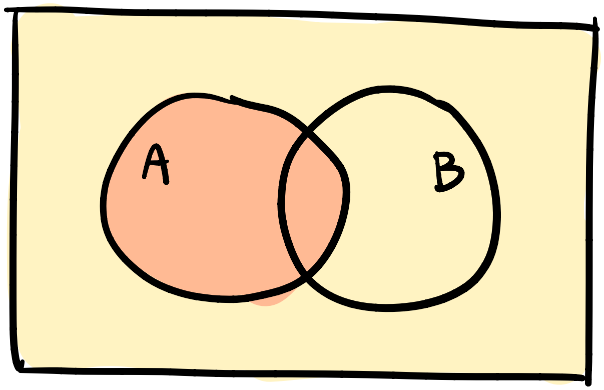
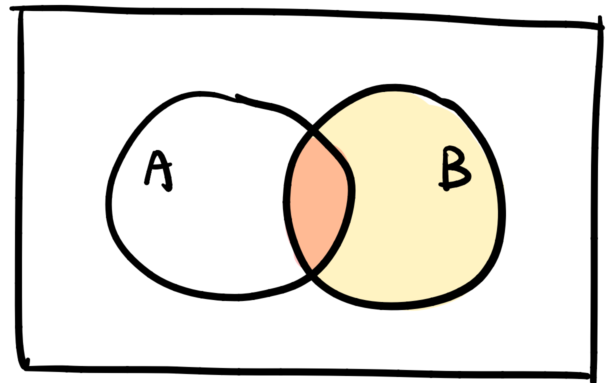
DIS 8B

CONDITIONAL PROBABILITY



$P(A)$



$P(A|B)$

$P(A|B)$ = probability of A given B

(aka conditioning on event B)

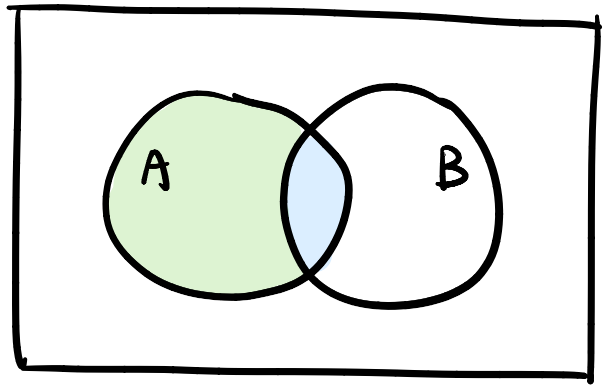
Baye's Rule

$$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{P(B|A)\,P(A)}{P(B)}$$

prior

posterior

TOTAL PROBABILITY



$$P(A) = P(A \cap \bar{B}) + P(A \cap B)$$

$$= P(A \mid \bar{B})\, P(\bar{B}) + P(A \mid B)\, P(B)$$

generalized total probability:

$$P(A) = \sum_{i=1}^{n} P(A \mid B_i)\, P(B_i)$$

where $\sum_{i=1}^{n} P(B_i) = 1$

INDEPENDENCE

events A and B are independent $\iff$ $P(A \cap B) = P(A)P(B)$

$\iff$ $P(A \mid B) = P(A)$

$\iff$ $P(B \mid A) = P(B)$

intuitively, A happening doesn't change the probability that B happens, and vice versa

events $A_1, A_2, \dots A_n$ are mutually independent if for all subsets of events

$$P(A_1 \cap \dots \cap A_j) = P(A_1) \dots P(A_j)$$

events are pairwise independent if they are mutually independent for subsets of size 2