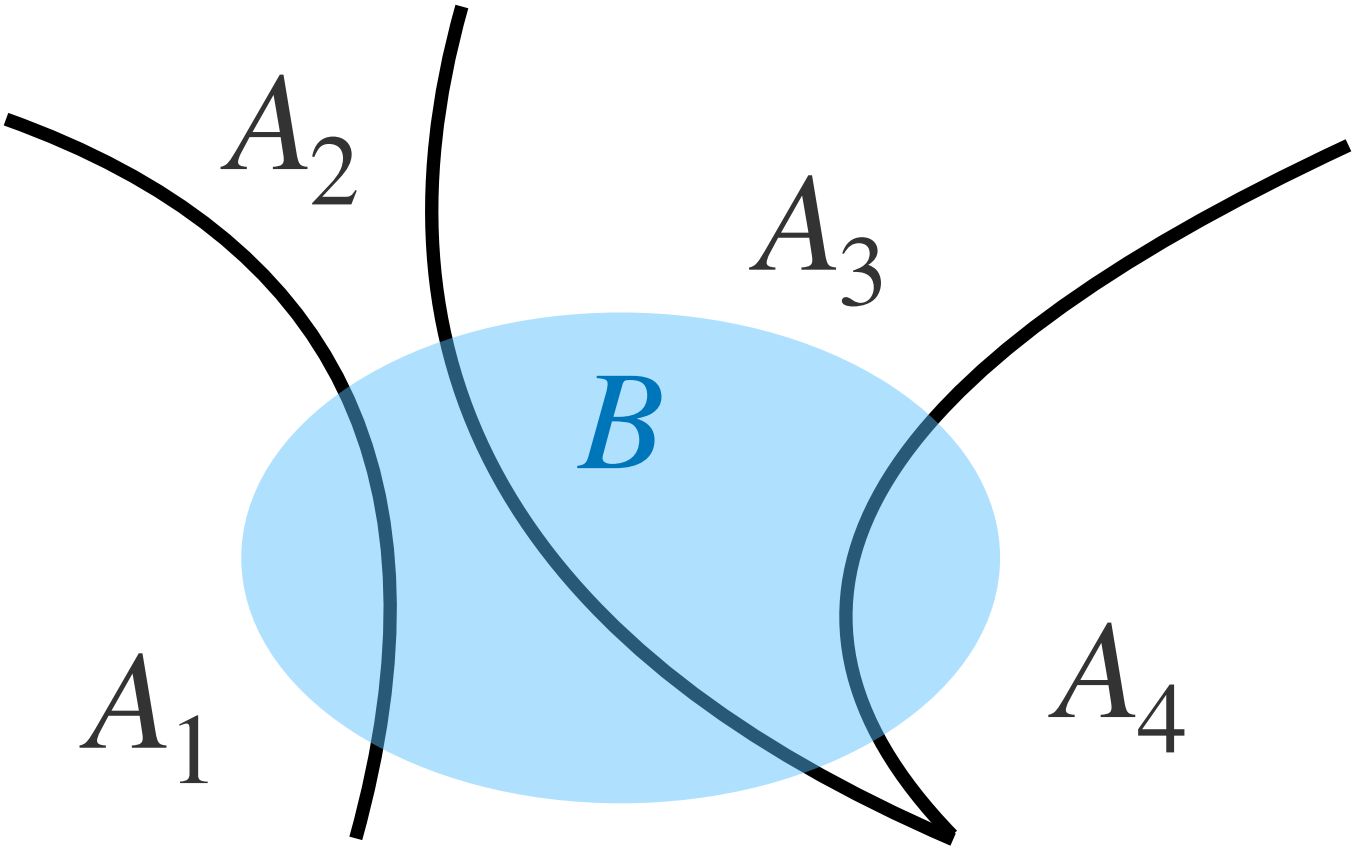


Rule of Total Probability

providing miles





{events collectively exhaustive}

{mutually exclusive}

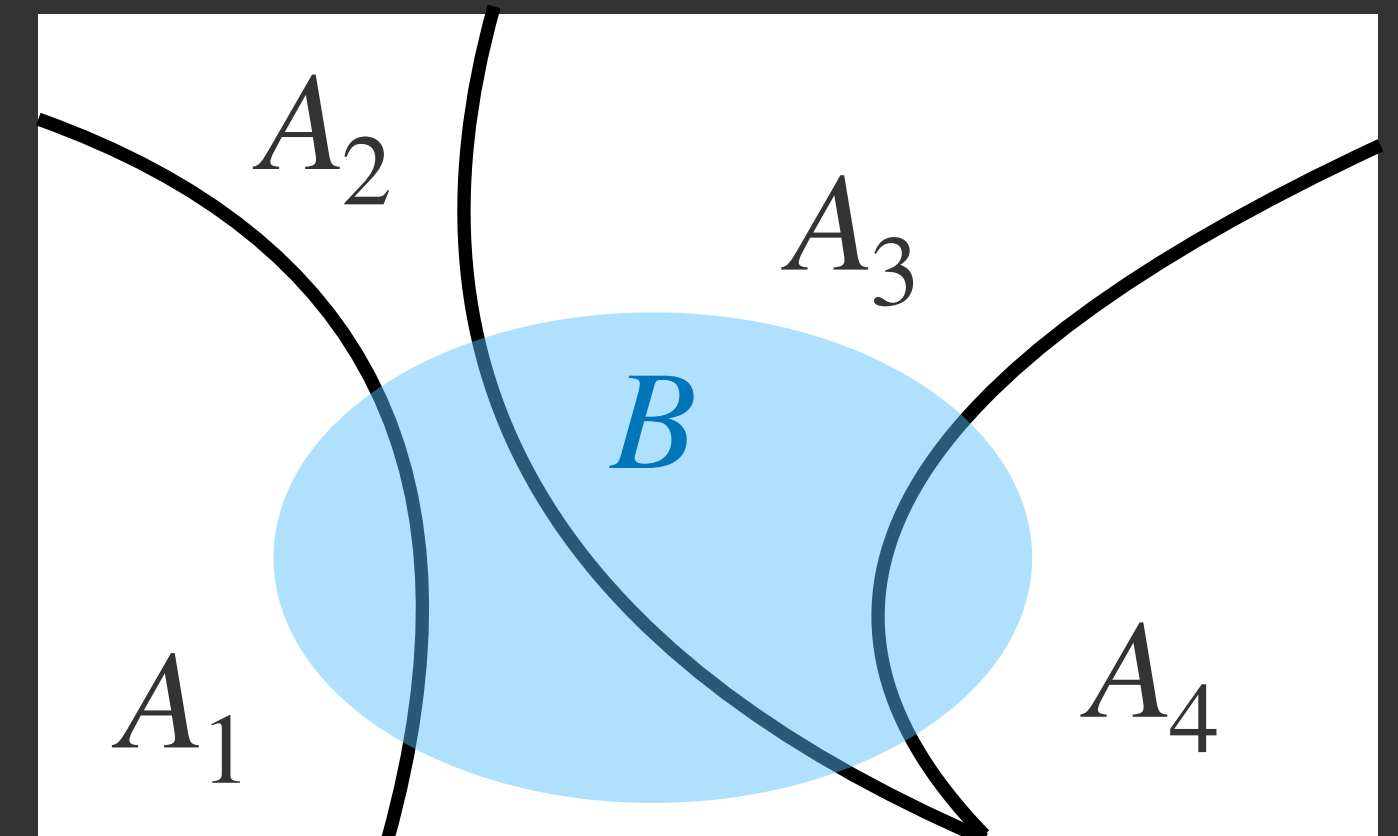
probability rules

Rule of Total Probability

If events A_1, A_2, \dots, A_k constitute a partition of the sample space Ω and $P(A_i) \neq 0 \ \forall i$, then for any event B in Ω

$$P(B) = \sum_{i=1}^k P(A_i)P(B | A_i)$$

Proof: $P(B) = P(B \cup (A_1 \cup A_2 \cup \dots \cup A_k))$
 $= P((B \cap A_1) \cup (B \cap A_2) \cup \dots \cup (B \cap A_k))$
{events collectively exhaustive}
 $= \sum_{i=1}^k P(B \cap A_i)$
{mutually exclusive}
 $= \sum_{i=1}^k P(A_i)P(B | A_i) \quad \blacksquare$



so this rule only applies to MECE events!

probability rules

Bayes Rule

{rule of total probability}