Probability and Statistics (MA6.101)

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Probability (contd.)

Properties of Conditional Probabilities

For any events A, B, E, we have

- $0 \leq P(A \cap E) \leq 1$,
- $P(A \mid E) = 1 - P(A^c \mid E)$,
- $P(A \cap B \mid E) = P(B \mid E)P(A \mid B \cap E)$,
- $P(A \mid B \cap E) = \frac{P(B \mid A \cap E)P(A \mid E)}{P(B \mid E)}$.

Conditional Independence

Two events A, B are conditionally independent if

$$P(A \cap B \mid E) = P(A \mid E)P(B \mid E).$$

Note that independence does not imply conditional independence.

Random Variables

A random variable X is a function from the sample space to real numbers:

$$X : S \to \mathcal{R}.$$

The range of a random variable is the set of possible values it takes. For example, the number of heads in 10 tosses of a fair coin is a random variable.

A random variable may be discrete (having countable range), continuous, or mixed.