LECT 19 10/13/99

CLASSICAL PROBABILITY

SAMPLE SPACE = Set of possible outcomes of an experiment

EVENT = Subset of the sample space

EXAMPLE: An experiment: Two dice are rolled

THE SAMPLE SPACE = \{ (1, 1), (1, 2), \ldots, (6, 6) \}

36 pairs total

AN EVENT: The sum of the two dice is 4

\{ (1, 3), (2, 2), (3, 1) \} 4 pairs

The main assumptions under which the classical definition of probability operates:

1. Sample space \( S \) is finite
2. All outcomes in \( S \) are equally likely

\( P(E) = \frac{n(E)}{n(S)} \)

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Complementary Event \( E = S - E \)

\( P(E) = 1 - P(E) \)

PROOF: \( P(E) = 1 - P(E) = 151 - 151 \)

EXAMPLE: Find the probability that an integer \( x \in \{ 1, 2, \ldots, 18 \} \) has at least one 9 in its decimal expansion.

\( E = \{ x \text{ has no 9} \} \), by the product rule:

- 151 total possible numbers
- 9 choices for each position

\( P(E) = 1 - 0.53 = 0.47 \)

EXAMPLE (Coin tossing): A sequence of 10 bits is randomly generated. What is the probability that at least one of them is 1?

\( E = \{ \text{all bits are 0s} \} \), \( 1/2 = 1 \)

\( P(E) = 1 - P(E) = 1024 \)

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