

Cheatsheet for Math Exercises

Probability and Conditional Probability

| Notation | Value | Formula |
|---------------|--|--|
| $P(A)$ | Probability of event A occurring. | $P(A) = \frac{\text{Number of favorable outcomes for } A}{\text{Total number of possible outcomes}}$ |
| $P(A \mid B)$ | Conditional probability of event A occurring, given that event B has occurred. | $P(A \mid B) = \frac{P(A \cap B)}{P(B)}$ |
| $P(A \cap B)$ | Probability of both events A and B occurring. | In general: $P(A \cap B) = P(A) \cdot P(B \mid A)$ If A and B are independent events, then: $P(A \cap B) = P(A) \cdot P(B)$ |
| $P(A \cup B)$ | Probability that event A or event B (or both) occur. | $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ |

Information Theory

| Notation | Value | Formula |
|----------|--|--|
| $I(A)$ | Information content or self-information of an event A. | $I(A) = -\log_2 P(A) \text{ [bits]}$ |
| $H(X)$ | Entropy, which measures the average amount of information (or uncertainty) in a random variable X. | $H(X) = -\sum_{x \in X} P(x) \log_2 P(x) \text{ [bits]}$ |
| $R(X)$ | Redundancy, which measures the portion of duplicative information within a message. | $R(X) = 1 - \frac{H(X)}{\log_2 X }$ |

Combinatorics

From:

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Last update: 2024/09/06 12:21

