

Probability and its notations		Probability and its notations (cont)		Probability and its notations (cont)	
Deterministic processes	outcome can be predicted exactly in advance	Probability events A and B both occur	$P(A \cap B)$	Continuous random variable	range of X is uncountably infinite (that makes a physical measurement)
Random processes	outcome is not known exactly (can desc the probability distribution of possible outcomes)	Events A and B are mutually exclusive or disjoint cannot occur at the same time	$P\{A B\}=0, P\{A \cap B\}=0$	<b>Bayes' Theorem</b>	
Probability of event A	$0 \leq P(A) \leq 1$	Probability events A or B occur	$P(A \cup B)$	Mutually exclusive/disjoint (if both events cannot occur together)	$P(A \cup B) = P(A) + P(B)$
Probability of whole sample space	$P(S)=1, P(A)+P(B)+P(C) = 1$	Conditional probability (event A occurs, given that event B has occurred)	$P(A B)$	Collectively exhaustive (if at least one of the events must occur)	$A \cup B = S$
Event A will almost definitely not occur	$P(A)=0$	Independent (event A does not change the probability of event B)	$P\{A B\} = P(A)$	Events A and B are independent	$P(A \cap B) = P(A) \times P(B)$
Only small chance that event A will occur	$P(A)=0.1$	Complement (event that not occurring)	$P(A')$	Events A and B are not independent	$P(A \cap B) = P(A) \times P(B A)$
50-50 chance that event A will occur	$P(A)=0.5$	Rule of subtraction (event A will occur)	$P(A) = 1 - P(A')$	Conditional probability of A given B	$P(A B) = P(A, B) / P(B)$
Strong chance that event A will occur	$P(A)=0.9$	Rule of multiplication (probability of the intersection of two events)	$P(A \cap B) = P(A) \times P(B A)$	If A and B are statistically independent	$P(A B) = (P(A) \times P(B)) / P(B) = P(A)$
Event A will almost definitely occur	$P(A)=1$	Rule of addition (either event occurs, not mutually exclusive)	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$	if A and B are statistically dependent	$P(A B) \neq P(A)$
Probability successful outcome (S)	$P(S) = r/n$ ; r: num of successful outcomes, n: total num of equally likely outcomes	Random variable	determined by a chance event, outcome of a random experiment, measurable real-valued	Multiplication rule for conditional probabilities	$P(A \cap B) = P(B) \times P(A B)$ or $P(A \cap B) = P(A) \times P(B A)$
Permutations	Order is taken into account	Discrete random variable	range of X is finite or countably infinite (values X can take on, not the size of the values)	Bayes Theorem	$P(A B) = (P(B A) \times P(A)) / P(B)$
Combinations	Order is not important				$P(S F) = (P(F S) \times P(S)) / (P(F S) \times P(S)) + (P(F S') \times P(S'))$
Permutation with repetition	$n^r$			Prior probability	<b>originally</b> obtained <b>before</b> any additional information is obtained
Permutation without repetition	$n!/(n-r)!$			Posterior probability	has been <b>revised</b> by using additional information that is <b>later</b> obtained

Combination with repetition  $(r+n-1)!/r!(n-1)!$

Combination without repetition  $n!/(n-r)!$

n: number of things to choose from ; r: them are chosen



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