Probability and its notations

Determ-inistic processes	outcome can be predicted exactly in advance
Random processes	outcome is not known exactly (can desc the probability distribution of possible outcomes)
Probability of event A	0<=P(A)<=1
Probability of whole sample space	P(S)=1, P(A)+P(B)+P(C) = 1
Event A will almost definitely not occur	P(A)=0
Only small chance that event A will occur	P(A)=0.1
50-50 chance that event A will occur	P(A)=0.5
Strong chance that event A will occur	P(A)=0.9
Event A will almost definitely occur	P(A)=1
Probability successful outcome (S)	P(S) = r/n ; r: num of successful outcomes, n: total num of equally likely outcomes
Permut-ations	Order is taken into account
Combin-ations	Order is not important
Permutation with repetition	n^r
Permutation without repetition	n!/(n-r)!

Probability and its notations (cont)

Probability events A and B both occur	P(A∩B)
Events A and B are mutually exclusive or disjoint cannot occur at the same time	P{A|B}=0, P{A∩B}=0
Probability events A or B occur	P(A∪B)
Conditional probability (event A occurs, given that event B has occured)	P(A|B)
Independent (event A does not change the probability of event B)	P{A|B} = P(A)
Complement (event that not occuring)	P(A')
Rule of subtraction (event A will occur)	P(A) = 1 - P(A')
Rule of multiplic-ation (probability of the intersection of two events)	P(A∩B) = P(A) x P(B|A)
Rule of addition (either event occurs, not mutually exclusive)	P(A∪B) = P(A) + P(B) - P(A∩B)
	P(A∪B) = P(A) + P(B) - (P(A) x P(B|A))
Random variable	determined by a chance event, outcome of a random experiment, measurable real-v-alued
Discrete random variable	range of X is finite ot countably infinite (values X can take on, not the size of the values)

Probability and its notations (cont)

Continuous random variable	range of X is uncountably infinite (that makes a physical measurement)

Bayes' Theorem

Mutually exclus-ive/disjoint (if both events cannot occur together)	P(A∪B) = P(A)+P(B)
Collectively exhaustive (if at least one of the events must occur)	A∪B = S
Events A and B are independent	P(A∩B) = P(A) x P(B)
Events A and B are not independent	P(A∩B) = P(A) x P(B|A)
Conditional probability of A given B	P(A|B) = P(A,B) / P(B)
If A and B are statistically indepe-ndent	P(A|B) = (P(A) x P(B)) / P(B) = P(A)
if A and B are statistically dependent	P(A|B) != P(A)
Multiplication rule for conditional probabilities	P(A∩B) = P(B) x P(A|B) or P(A∩B) = P(A) x P(B|A)
Bayes Theorem	P(A|B) = (P(B|A) x P(A)) / P(B)
	P(S|F) = (P(F|S) x P(S)) / (P(F|S) x P(S)) + (P(F|S') x P(S'))
Prior probability	**originally** obtained **before** any additional information is obtained
Posterior probab-ility	has been **revised** by using additional information that is **later** obtained

Combin-ation with repetition	(r+n-1)!/r!(n-1)!
Combin-ation without repetition	n!/(n-r)!
	n: number of things to choose from ; r: them are chosen

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