Common Exponential Family Distributions

Distribution	Example Use	Parameters	Mean	Variance
Binomial (m, p)	Counting my # of wins over m fights, where the chance of winning each fight is p.	m = # of trials p = probability of success	mp #trials × Prob each = 1	$mp(1-p)$
Poisson (μ)	Counting the # of people who walk into a store every houre	μ = average # of people who walk in	μ	μ
Negative Binomial (r, p)	Count the number of fights I will LOSE BEFORE I win r fights where the chance of winning each fight is p.	r = # set successes p = prob of success	$\frac{rp}{1-p}$	$\frac{rp}{(1-p)^2}$
Exponential Distribution $Exp(\lambda)$	Measure the wait time between train arrivals at the station	λ = average time between arrivals	$\frac{1}{\lambda}$	$\frac{1}{\lambda^2}$
Geometric (p)	Count the number of cereal boxes I have to buy before I get a prize that has a probability of p of being in any box	p = probability of success.	$\frac{1}{p}$	$\frac{1-p}{p}$
Normal (μ, σ^2)	Measure the height of every person at the university	μ = average σ^2 = variance	μ	σ^2
Beta $(k, m-k)$ or (α, β) $k \quad n+1-k$	Measure the k^{th} smallest number from $(m-1)$ numbers from a random number generator	k = order of number (how extreme it is) $m-k$ = # of bigger numbers (we don't care about)	$\frac{k}{m}$	$\frac{k(m-k)}{m^2(m+1)}$