Normal approximation to the binomial distribution

Binomial distribution

$$B(n,p)$$

$$q = 1 - p$$

$$p(x = r) = \binom{n}{r} p^r \, q^{n-r}$$

De Moivre–Laplace theorem

$$x \approx B(n,p), \quad x' \approx N(\mu,\sigma)$$

$$n > 30, \quad np > 5, \quad nq > 5$$

$$\mu = np, \quad \sigma = \sqrt{npq}$$

$$B(n,p) \rightarrow N(np, \sqrt{npq})$$

Continuity correction

$x \approx B(n,p)$	$x' \approx N(\mu,\sigma)$
$p(x \le r)$	$p(x' \le r + 0.5)$
$p(x < r)$	$p(x' \le r - 0.5)$
$p(x \ge r)$	$p(x' \ge r - 0.5)$
$p(x > r)$	$p(x' > r + 0.5)$
$p(x = r)$	$p(r - 0.5 < x' < r + 0.5)$

n	Number of trials
p	Probability of success for each trial
q	Probability of failure for each trial
r	Number of successes
μ	Arithmetic mean
σ	Standard deviation
x	Discrete random variable of the binomial distribution
x'	Continuous random variable of the normal distribution