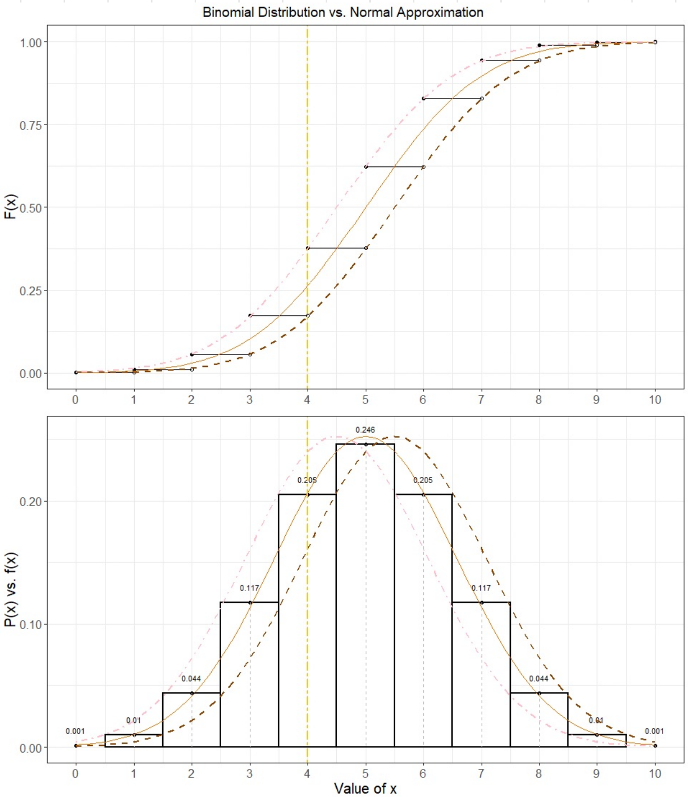
The Integer Correction (Continuity correction)

Say $X \sim \text{Binom}(n,p)$ with $np \geq 10$ and $Y \sim N(np, npq)$ with $q = (1-p)$



Let $Y' = Y + \frac{1}{2} \Rightarrow F_{Y'}(y) = F_Y(y - \frac{1}{2})$

$\Rightarrow |P(X<x) - F_Y(x)| > |P(X<x) - F_{Y'}(x)|$

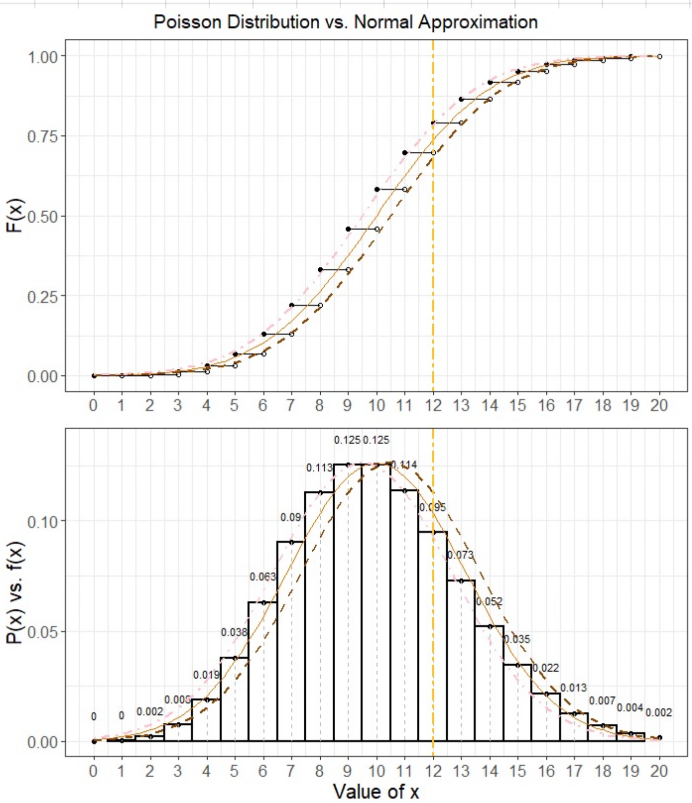
$\therefore F_{Y'}(x)$ is better than $F_Y(x)$ when approximating the value of $P(X<x)$.

Let $Y'' = Y - \frac{1}{2} \Rightarrow F_{Y''}(y) = F_Y(y + \frac{1}{2})$

$\Rightarrow |F_X(x) - F_Y(x)| > |F_X(x) - F_{Y''}(x)|$

$\therefore F_{Y''}(x)$ is better than $F_Y(x)$ when approximating the value of $F_X(x)$.

The continuity correction can also be applied to better approximate the Poisson distribution when $\lambda > 10$.



Actually the normal approximation can be applied to any distribution that can be constructed as the sum of other distribution thanks to the Central Limit Theorem.

Use the following table:

If $P(X=n)$ use $P(n-0.5 < Y < n+0.5)$
If $P(X>n)$ use $P(Y > n+0.5)$
If $P(X \geq n)$ use $P(Y \geq n-0.5)$
If $P(X<n)$ use $P(Y < n-0.5)$
If $P(X \leq n)$ use $P(Y \leq n+0.5)$

See: https://online.stat.psu.edu/stat414/lesson/28