

# Lecture - 12

## Probability & Statistics.

$$B(n, p) \sim \text{Pois}(np)$$

$n$  is large and  $p$  is small

Prob Gary Kasparov, a world chess champion plays against 100 amateurs in a large simultaneous exhibition. It has been estimated from past experience that Kasparov wins in such exhibitions 99% of his games on the average. What are the probabilities that he will win 100 games, 98 games, 95 games and 90 games?

$$\begin{aligned} P(\text{Bin}(100, .01) = 0) &= 0.366 \\ P(\text{Bin}(100, .01) = 2) &= 0.185 \\ P(\text{Bin}(100, .01) = 5) &= 0.00290 \\ P(\text{Bin}(100, .01) = 10) &= 7.006 \times 10^{-8} \end{aligned}$$

$$\begin{aligned} P(\text{Pois}(1) = 0) &= 0.368 \\ P(\text{Pois}(1) = 2) &= 0.184 \\ P(\text{Pois}(1) = 5) &= 0.00306 \end{aligned} \quad \begin{aligned} P(\text{---} = 10) \\ &= 1.001 \times 10^{-8} \end{aligned}$$

Now Karpov plays his Kasparov plays  
 simultaneously against 5  
 opponents, now we, however  
 stronger we than the probability  
 of a win per game is 0.9.

Then ?

K	0	1	2	3	4	5
Bin-	0.590	0.328	0.0729	0.0081	0.000150	0.0001
Pois	0.605	0.303	0.0758	0.0126	0.0016	0.00016

For small  $n$  Bin( $n, p$ )  $\approx$  Pois( $np$ )

