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CS109

Section #4 Warmup

Based on the work of Gili Rusak and Alex Tsun

1 Lecture 11, 4-29-20: Joint Distributions

1. Given a Normal RV $X \sim N(\mu, \sigma^2)$, how can we compute $P(X \leq x)$ from the standard Normal distribution Z with CDF ϕ?
2. What is a continuity correction and when should we use it?
3. If we have a joint PMF for discrete random variables $p_{X,Y}(x, y)$, how can we compute the marginal PMF $p_X(x)$?

2 Lecture 12, 5-1-20: Independent Random Variables

1. What distribution does the sum of two independent binomial RVs $X + Y$ have, where $X \sim Bin(n_1, p)$ and $Y \sim Bin(n_2, p)$? Include the parameter(s) in your answer. Why is this the case?
2. What distribution does the is of two independent Poisson RVs $X + Y$ have, where $X \sim \text{Poi}(\lambda_1)$ and $Y \sim \text{Poi}(\lambda_2)$? Include the parameter(s) in your answer.
3. If $Cov(X, Y) = 0$, are X and Y independent? Why or why not?

3 Lecture 13, 5-13-20: Joint Random Variables Statistics

1. **True or False?** The symbol Cov is covariance, and the symbol ρ is Pearson correlation.

$X \perp Y \implies Cov(X, Y) = 0$	$Var(X + X) = 2Var(X)$
$Cov(X, Y) = 0 \implies X \perp Y$	$X \sim \mathcal{N}(0, 1) \land Y \sim \mathcal{N}(0, 1) \implies \rho(X, Y) = 1$
$Y = X^2 \implies \rho(X, Y) = 1$	$Y = 3X \implies \rho(X, Y) = 3$