5.

Mid Term due Mar 4, 2020 05:29 IST *Completed*

Variance of Difference of Indicators

0.0/2.0 points (graded)

Let A be an event, and let I_A be the associated indicator random variable (I_A is 1 if A occurs, and zero if A does not occur). Similarly, let I_B be the indicator of another event, B. Suppose that $P(A) = p$, $P(B) = q$, and $P(A \cap B) = r$.

Find the variance of $I_A - I_B$, in terms of p, q, r.

$\text{Var}(I_A - I_B) =$

p*q*(1-p)*(1+q)-4*r

Answer: p-2*r+q-(p-q)^2

$p \cdot q \cdot (1-p) \cdot (1+q) - 4 \cdot r$

STANDARD NOTATION

Solution:

$$\begin{aligned}
\text{Var}(I_A - I_B) &= \mathbf{E}\left[(I_A - I_B)^2\right] - \left(\mathbf{E}\left[(I_A - I_B)\right]\right)^2 \\
&= \mathbf{E}\left[I_A^2 - 2I_A I_B + I_B^2\right] - \left(\mathbf{E}\left[I_A\right] - \mathbf{E}\left[I_B\right]\right)^2 \\
&= \mathbf{E}\left[I_A^2\right] - 2\mathbf{E}\left[I_A I_B\right] + \mathbf{E}\left[I_B^2\right] - \left(\mathbf{E}\left[I_A\right]\right) - \left(\mathbf{E}\left[I_B\right]\right)^2 \\
&= \mathbf{E}\left[I_A\right] - 2\mathbf{E}\left[I_A I_B\right] + \mathbf{E}\left[I_B\right] - \left(\mathbf{E}\left[I_A\right]\right) - \left(\mathbf{E}\left[I_B\right]\right)^2 \\
&= P(A) - 2P(A \cap B) + P(B) - \left(P(A) - P(B)\right)^2 \\
&= p - 2r + q - (p-q)^2
\end{aligned}$$

Submit You have used 1 of 3 attempts

Answers are displayed within the problem

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?	Is there a set of parentheses missing in lines 3 and 4 of the solution? Not that I expect anyone to see this ever, but I'm looking over my previous mistakes, and trying to un...	1
	My appraoch to Q5, please help to spot my error first I identify possible outcomes of IA−IB: (IA−IB) ^2 =0 if Both A and B do not happen i.e. (0-0) OR Bot...	4
?	How does E[IA*IB] becomes A intersect B if they are not independent ? From my understanding, if IA and IB are not independent then E [IA*IB] should be P(A) P(B|A) which i...	3
	STAFF: Q5 Answer is right Answer for question 5 is correct, just expanded (p-q)^2. Can you please review? Thank you in advance.	12
?	[Staff] The progress show my answer is incorrect. I simplified the answer. Please check if this can be given the mark :) [Staff]. The progress show my answer is incorrect. I simplified the answer. Please check if this can be ...	7
?	[STAFF] Incorrect Gradding Pls Fix my mark Hello Staff, I have the same correct answer but yours is factorized that all. Pls expand the parenthesis...	4
?	I got the write answer but, instead of leaving it with brackets I extended it, and I got 0 points. Could this be reviewed, please? This question is for staff :) For the Var($IA-IB$) I obtained the write answer but decided to do the opera...	4
?	STAFF: My answer for number 5 on the Exam was marked incorrect and it is correct based on the answer Could you check on this for me please.	3
	My answer to Q5 14 new	23
?	Is this not correct? I just want to confirm, based off of the discussions, it seems like the answer is p + q - 2*r - (p - q)^2 I s...	1
?	When can we get the answer?	

When can we get the answer?

Please check the answers again

Please check the answers again, I think my all answers are correct. There is some error

1