

Assignment 7

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Papoulis ch2 problems 2.4

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Problem

Q) Show that

- (a) If $Pr(A) = Pr(B) = Pr(AB)$, then $Pr(A\bar{B} + B\bar{A}) = 0$
- (b) If $Pr(A) = Pr(B) = 1$, then $Pr(AB) = 1$

Solution

a) Given

$$Pr(A) = Pr(B) = Pr(AB) \quad (1)$$

Now,

$$A = AB + A\bar{B} \quad (2)$$

$$Pr(A) = Pr(AB) + Pr(A\bar{B}) \quad (3)$$

from (1) and (3) we can say

$$Pr(A\bar{B}) = 0 \quad (4)$$

similarly,

$$B = AB + B\bar{A} \quad (5)$$

$$Pr(B) = Pr(AB) + Pr(B\bar{A}) \quad (6)$$

from (1) and (6) we can say

$$Pr(B\bar{A}) = 0 \quad (7)$$

Now from (4) and (7) we get

$$Pr(A\bar{B} + B\bar{A}) = Pr(A\bar{B}) + Pr(B\bar{A}) = 0 + 0 \quad (8)$$

$$Pr(A\bar{B} + B\bar{A}) = 0 \quad (9)$$

- b) Given

$$Pr(A) = Pr(B) = 1 \quad (10)$$

Now we know that

$$Pr(A + B) = Pr(A) + Pr(B) - Pr(AB) \quad (11)$$

$$(12)$$

on rearranging and using (10)

$$Pr(A + B) + Pr(AB) = 2 \quad (13)$$

From basics of probability we know that

$$0 \leq Pr(A + B) \leq 1 \quad (14)$$

$$0 \leq Pr(AB) \leq 1 \quad (15)$$

om comparing (13) , (14) and (15) we can conclude that $Pr(AB)$ must be equal to 1.

CODES

Python

Download python code from - Python

Beamer

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