

Homework #03: Independent events

Isaac Ayala Lozano

2020-01-20

1 Problem

Let A and B be two events in the sample space S. Show that if $P(A)$ and $P(B)$ are non-zero, then A and B cannot be mutually exclusive and independent.

2 Proof

From [1] we observe that for events A and B to be independent then

$$P(A \cap B) = P(A)P(B) \tag{1}$$

Recall that for two events to be mutually exclusive then

$$P(A \cap B) = 0 \tag{2}$$

Thus for two events to be independent and mutually exclusive at the same time then $P(A)P(B) = 0$. The problem states that both $P(A)$ and $P(B)$ are non-zero, hence we conclude that A and B *cannot* be mutually exclusive and independent at the same time because $P(A \cap B) \neq 0$.

References

- [1] W.J. Stewart. *Probability, Markov Chains, Queues, and Simulation: The Mathematical Basis of Performance Modeling*. Princeton University Press, 2009. ISBN: 9781400832811. URL: <https://books.google.com.mx/books?id=ZfRyBS1WbAQC>.