Probability of Happening at Least One Independent Event

Data Science and A.I. Lecture Series

Bindeshwar Singh Kushwaha

PostNetwork Academy

Probability of Happening at Least One Independent Event

- If A and B are independent events, the probability of happening at least one of the events is:

$$P(A \cup B) = 1 - P((A \cup B)^c)$$

Probability of Happening at Least One Independent Event

- If A and B are independent events, the probability of happening at least one of the events is:

$$P(A \cup B) = 1 - P((A \cup B)^c)$$

- Using De Morgan's law:

$$P(A \cup B) = 1 - P(A^c \cap B^c)$$

Probability of Happening at Least One Independent Event

- If A and B are independent events, the probability of happening at least one of the events is:

$$P(A \cup B) = 1 - P((A \cup B)^c)$$

- Using De Morgan's law:

$$P(A \cup B) = 1 - P(A^c \cap B^c)$$

- Since A and B are independent, A^c and B^c are also independent:

$$P(A^c \cap B^c) = P(A^c) \cdot P(B^c)$$

Probability of Happening at Least One Independent Event

- If A and B are independent events, the probability of happening at least one of the events is:

$$P(A \cup B) = 1 - P((A \cup B)^c)$$

- Using De Morgan's law:

$$P(A \cup B) = 1 - P(A^c \cap B^c)$$

- Since A and B are independent, A^c and B^c are also independent:

$$P(A^c \cap B^c) = P(A^c) \cdot P(B^c)$$

- Therefore:

$$P(A \cup B) = 1 - \left(P(A^c) \cdot P(B^c)\right)$$

Probability of Happening at Least One Independent Event

- If A and B are independent events, the probability of happening at least one of the events is:

$$P(A \cup B) = 1 - P((A \cup B)^c)$$

- Using De Morgan's law:

$$P(A \cup B) = 1 - P(A^c \cap B^c)$$

- Since A and B are independent, A^c and B^c are also independent:

$$P(A^c \cap B^c) = P(A^c) \cdot P(B^c)$$

- Therefore:

$$P(A \cup B) = 1 - \left(P(A^c) \cdot P(B^c)\right)$$

- For n independent events $A_1, A_2, \ldots, A_n$:

$$P(A_1 \cup A_2 \cup \cdots \cup A_n) = 1 - \prod_{i=1}^{n} P(A_i^c)$$

Probability of Happening at Least One Independent Event

- If A and B are independent events, the probability of happening at least one of the events is:

$$P(A \cup B) = 1 - P((A \cup B)^c)$$

- Using De Morgan's law:

$$P(A \cup B) = 1 - P(A^c \cap B^c)$$

- Since A and B are independent, A^c and B^c are also independent:

$$P(A^c \cap B^c) = P(A^c) \cdot P(B^c)$$

- Therefore:

$$P(A \cup B) = 1 - \left(P(A^c) \cdot P(B^c)\right)$$

- For n independent events $A_1, A_2, \ldots, A_n$:

$$P(A_1 \cup A_2 \cup \cdots \cup A_n) = 1 - \prod_{i=1}^{n} P(A_i^c)$$

- This is equivalent to $1-$ probability of none of the events occurring.

Example: Probability the Target is Hit

Problem:

- A person is known to hit the target in 4 out of 5 shots.

Example: Probability the Target is Hit

Problem:

- A person is known to hit the target in 4 out of 5 shots.
- Another person is known to hit the target in 2 out of 3 shots.

Example: Probability the Target is Hit

Problem:

- A person is known to hit the target in 4 out of 5 shots.
- Another person is known to hit the target in 2 out of 3 shots.
- Find the probability that the target is hit when both try.

Example: Probability the Target is Hit

Problem:

- A person is known to hit the target in 4 out of 5 shots.
- Another person is known to hit the target in 2 out of 3 shots.
- Find the probability that the target is hit when both try.
- **Solution:**

Example: Probability the Target is Hit

Problem:

- A person is known to hit the target in 4 out of 5 shots.
- Another person is known to hit the target in 2 out of 3 shots.
- Find the probability that the target is hit when both try.

- **Solution:**
- Let A: First person hits the target. $P(A) = \frac{4}{5}$.

Example: Probability the Target is Hit

Problem:

- A person is known to hit the target in 4 out of 5 shots.
- Another person is known to hit the target in 2 out of 3 shots.
- Find the probability that the target is hit when both try.

- **Solution:**
- Let A: First person hits the target. $P(A) = \frac{4}{5}$.
- Let B: Second person hits the target. $P(B) = \frac{2}{3}$.

Example: Probability the Target is Hit

Problem:

- A person is known to hit the target in 4 out of 5 shots.
- Another person is known to hit the target in 2 out of 3 shots.
- Find the probability that the target is hit when both try.

- **Solution:**
- Let A: First person hits the target. $P(A) = \frac{4}{5}$.
- Let B: Second person hits the target. $P(B) = \frac{2}{3}$.
- The probability of at least one hitting the target is:

$$P(A \cup B) = 1 - P(A^c \cap B^c)$$

Example: Probability the Target is Hit

Problem:

- A person is known to hit the target in 4 out of 5 shots.
- Another person is known to hit the target in 2 out of 3 shots.
- Find the probability that the target is hit when both try.

- **Solution:**
- Let A: First person hits the target. $P(A) = \frac{4}{5}$.
- Let B: Second person hits the target. $P(B) = \frac{2}{3}$.
- The probability of at least one hitting the target is:

$$P(A \cup B) = 1 - P(A^c \cap B^c)$$

- Compute $P(A^c)$ and $P(B^c)$:

$$P(A^c) = 1 - \frac{4}{5} = \frac{1}{5}, \quad P(B^c) = 1 - \frac{2}{3} = \frac{1}{3}$$

Example: Probability the Target is Hit

Problem:

- A person is known to hit the target in 4 out of 5 shots.
- Another person is known to hit the target in 2 out of 3 shots.
- Find the probability that the target is hit when both try.

- **Solution:**
- Let A: First person hits the target. $P(A) = \frac{4}{5}$.
- Let B: Second person hits the target. $P(B) = \frac{2}{3}$.
- The probability of at least one hitting the target is:

$$P(A \cup B) = 1 - P(A^c \cap B^c)$$

- Compute $P(A^c)$ and $P(B^c)$:

$$P(A^c) = 1 - \frac{4}{5} = \frac{1}{5}, \quad P(B^c) = 1 - \frac{2}{3} = \frac{1}{3}$$

- Calculate $P(A^c \cap B^c)$:

$$P(A^c \cap B^c) = P(A^c) \cdot P(B^c) = \frac{1}{5} \cdot \frac{1}{3} = \frac{1}{15}$$

Example: Probability the Target is Hit

Problem:

- A person is known to hit the target in 4 out of 5 shots.
- Another person is known to hit the target in 2 out of 3 shots.
- Find the probability that the target is hit when both try.

- **Solution:**
- Let A: First person hits the target. $P(A) = \frac{4}{5}$.
- Let B: Second person hits the target. $P(B) = \frac{2}{3}$.
- The probability of at least one hitting the target is:

$$P(A \cup B) = 1 - P(A^c \cap B^c)$$

- Compute $P(A^c)$ and $P(B^c)$:

$$P(A^c) = 1 - \frac{4}{5} = \frac{1}{5}, \quad P(B^c) = 1 - \frac{2}{3} = \frac{1}{3}$$

- Calculate $P(A^c \cap B^c)$:

$$P(A^c \cap B^c) = P(A^c) \cdot P(B^c) = \frac{1}{5} \cdot \frac{1}{3} = \frac{1}{15}$$

- Substitute into the formula:

$$P(A \cup B) = 1 - \frac{1}{15} = \frac{14}{15}$$

Example: Probability the Target is Hit

Problem:

- A person is known to hit the target in 4 out of 5 shots.
- Another person is known to hit the target in 2 out of 3 shots.
- Find the probability that the target is hit when both try.

- **Solution:**
- Let A: First person hits the target. $P(A) = \frac{4}{5}$.
- Let B: Second person hits the target. $P(B) = \frac{2}{3}$.
- The probability of at least one hitting the target is:

$$P(A \cup B) = 1 - P(A^c \cap B^c)$$

- Compute $P(A^c)$ and $P(B^c)$:

$$P(A^c) = 1 - \frac{4}{5} = \frac{1}{5}, \quad P(B^c) = 1 - \frac{2}{3} = \frac{1}{3}$$

- Calculate $P(A^c \cap B^c)$:

$$P(A^c \cap B^c) = P(A^c) \cdot P(B^c) = \frac{1}{5} \cdot \frac{1}{3} = \frac{1}{15}$$

- Substitute into the formula:

$$P(A \cup B) = 1 - \frac{1}{15} = \frac{14}{15}$$

- The probability that the target is hit is $\frac{14}{15}$.

Reach PostNetwork Academy

Website

www.postnetwork.co

Reach PostNetwork Academy

Website

www.postnetwork.co

YouTube Channel

www.youtube.com/@postnetworkacademy

Reach PostNetwork Academy

Website

www.postnetwork.co

YouTube Channel

www.youtube.com/@postnetworkacademy

Facebook Page

www.facebook.com/postnetworkacademy

Reach PostNetwork Academy

Website

www.postnetwork.co

YouTube Channel

www.youtube.com/@postnetworkacademy

Facebook Page

www.facebook.com/postnetworkacademy

LinkedIn Page

www.linkedin.com/company/postnetworkacademy

Thank You!