Risk and Decision-Making for Data Science and AI

Week 2 Lab 1 Exercises

Question 1:
Calculate the following probabilities:

a) Consider a fair six-sided die. What is the probability of rolling an even number?
b) In a deck of cards, what is the probability of drawing a queen given that the card drawn is red?
c) In a manufacturing process, the probability of a defect is 0.2. What is the probability that a randomly selected product is defect-free?

Question 2:
A company is developing two new products, A and B. The probability of success for A is 0.6, for B is 0.5, and the probability of both succeeding is 0.3. What is the probability that either A or B succeed?

Question 3:
Consider a project with three critical tasks: A, B, and C. The probability of task A being completed on time is 0.8, task B is 0.7, and task C is 0.9. The tasks are independent. What is the probability that all three tasks are completed on time?

Question 4:
In a manufacturing process, a company produces two types of products, A and B. The products may be defective (D) or non-defective (ND). The company has historical data on the occurrence of defects for each product type. The probabilities are as follows:

- Probability of a defective product given it is of type A is 0.03
- Probability of a defective product given it is of type B is 0.05
- Probability of selecting a product of type A is 0.6

What is the probability of selecting a product of type A and it being defective?

Question 5:
Identify the below cognitive biases:

a) Choose a particular smartphone brand simply because it's popular.
b) Imagine a person who strongly believes that a specific dietary supplement is effective. When researching its effects, they focus only on articles and studies that confirm its benefits, ignoring any conflicting information.
c) Someone with little knowledge of a subject might believe they are an expert
d) After hearing news about a plane crash, individuals may become more fearful of flying despite statistically higher risks in activities like driving.
e) "Save 20£" may be more attractive than the same discount framed as "20% off" for a product costing 100£