INFO510 Bayesian modelling and inference Fall2025

Homework 1

Total points – 20

Instructions:

- Please submit a single PDF file for all the questions. If you have used any scripting language to answer these questions, submit additional script files (.r, .rmd, .py, .pynb, etc) along with the PDF.
- Any code and written solutions **must be your own**. Do not copy code or written solutions. If you write scripts for any question, clearly note in your pdf which script file corresponds to which of the answers.
- Clearly label all the files, do not write generic labels for your file.
- The pdf file containing all the answers should be in the following format, <last name, first name_INFO510_homework1>

Q.1: A fair six-sided die is rolled once **(3 points)**

1. What is the probability of rolling a prime number?
2. What is the probability of rolling an even number or a number greater than 4?
3. What is the probability of rolling a number less than 3 given that the number rolled is odd?

Q.2: Two fair six-sided dice are rolled. Define X as the outcome of the first die and Y as the outcome of the second die, **(4 points)**

1. What is the probability that X+Y=8?
2. Given that X+Y=8, what is the probability that X=3?

Q.3: Consider two independent events A and B with P(A)=0.4 and P(B)=0.5; **(6 points)**

1. Compute P(A∩B).
2. Compute P(A|B).
3. If A and B were instead dependent, how would this affect the computation of P(A∩B) and P(A|B)?

Q.4: Simulate 5000 draws from a Binomial distribution with n=15 trials and success probability p=0.4, **(7 points)**

1. Compute and plot:
    - A histogram of the simulated outcomes.
    - A cumulative distribution function (CDF) plot for the simulated data.