

BDA Probability Recap - 2023/4

List 1 for 9 or 10 November

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II. Simple Probability

1. Simulate 20 rollings of a biased dice (i.e., the face with 6 dots is twice more probable than other outcomes).
2. Choose 10 numbers from the set $\{5, 6, \dots, 100\}$ without replacement.
3. Generate 2000 Bernoulli trials with success probability equal $p = 0.5$ (fair coin tosses). Compare the number of successes with the expected value.
4. Generate 10^i samples from a normal distribution with parameters $\mu = 0$ and $\sigma = 1$. Draw histogram for each $i \in \{0, \dots, 8\}$.
5. Generate 2000 Bernoulli trials with success probability equal $p = 0.15$.
 - Find the number of successes.
 - Find the maximal number of consecutive successes (i.e., sequences "1" in a row)
 - Find the probability of getting less than 250 or more than 350 successes.
 - Approximate the minimal p such that we will get at least 30 consecutive with high probability.
6. We toss a coin 1000 times. Let X be the number of heads. Find the probability that X is a number divisible by 11.
7. Assume that the height of a male is normally distributed with a mean equal to 177 cm and a standard deviation equal to 8 cm.
 - Find the probability that a randomly chosen man is higher than 200 cm.
 - Find the probability that a randomly chosen male is between 160 and 180 cm.
 - Approximate the probability that in a random group of 20 males, no one is higher than 165.
8. Generate a V_1 : vector with 2000 random natural numbers from the set $\{50, \dots, 100\}$. Generate V_2 - a vector such that for every entry in V_1 , we add an independent random number from a normal distribution with mean 0 and variance 20. V_3 - a vector such that for every entry in V_1 , we add an independent random number from a normal distribution with mean -1 and variance 100. Find the correlation between
 - V_1 and V_1 ,
 - V_1 and V_2 ,
 - V_1 and V_3 .