Using Three Different Approaches to Solve a Probability Problem

EE 381 – Project 2, 5 Points

Date Due: 2-15-21

Introduction

Textbooks often have the answers to the problems in the back of the text. The student uses the answers provided in the text to verify the correctness of their answers to problems. If you attempt to solve a problem and the answer is not provided, you may not be able to verify whether you got the correct answer. Assuming there does not exist an answer for the problem you have solved, how do you know your answer is correct? To know that you have solved a problem correctly (or at least have confidence in your answer) you need to solve it several different ways and then see if the answers are consonant. Each approach to solving the problem must have a fundamentally different paradigm to support the argument that the answer is valid.

You will both from the standpoint of theory and from the standpoint of computer simulation address the following probability problem.

Problem: You have a coin with the probability of heads being p. Toss the coin until a head comes up for the first time. What are the chances of that happening on an odd-numbered toss?

Exercise 1: Repeated Independent Trials

Exercise 2: Total Probability

Exercise 3: Frequency Simulation

Write a program in Python that solves the problem using simulation. Simulation in this context means that you will write a computer program that models the probability experiment and then repeat this experiment a large number of times. Correctly evaluating the results of the simulation will make it possible to determine an approximate answer to the probability problem. Use the pseudorandom number generator provided by Python.

Use the theoretical result to determine the probability for a fair coin, also, do the simulation for a fair coin.

Instructions: During the laboratory meetings of 2/3, 2/8, and 2/10 the problem above will be solved in the three different ways stipulated.

Deliverables: A copy (picture) of the work done by hand, a PDF version of the programs with the output (fair coin), and the Python file all with name and ID # to dropbox.