

CALIFORNIA STATE UNIVERSITY, LONG BEACH
EE 381 – Probability and Statistics with Applications to
Computing
Laboratory Projects

Project on
Random Numbers and Stochastic Experiments

0. Introduction and Background Material

0.1. Simulating Coin Toss Experiments

As mentioned in class, there are many ways to model stochastic experiments. The following two programs simulate the toss of a fair coin N times, and calculate the experimental probability of getting heads (p_{heads}) or tails (p_{tails}). Both programs provide the same results, but they differ in the way the models are coded.

- The first model is programmed in Python using "for loops".
- The second model makes use of the arrays, and it is computationally very efficient.

MODEL 1

```
import numpy as np
def coin():
    coin=np.random.randint(0,2)
    return coin

def CoinToss(N):
    heads, tails = 0, 0
    for k in range(0,N):
        toss=coin()
        if toss==1:
            heads=heads+1
        else:
            tails=tails+1
    #
    p_heads=heads/N
    p_tails=tails/N
    print('probability of heads = ', p_heads)
    print('probability of tails = ', p_tails)
```

MODEL 2 – MORE EFFICIENT CODE

```
import numpy as np
def MultCoinToss(N):
    coin=np.random.randint(0,2,N)
    heads=sum(coin)
    tails=N-heads
    #
    p_heads=heads/N
    p_tails=tails/N
    print('probability of heads = ', p_heads)
    print('probability of tails = ', p_tails)
```