Project Report 1

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0.1 It's still about coin toss

We have to find the bias of a coin for given set of experiment.

Procedure followed to Calculate Bias of Coin...
We are given with first 1000 samples of zeros which are merged with noise. For first 1000 samples, let's assume that:

$$E[X] : \text{Expectation value of zero}$$
$$E[N] : \text{Expectation value of Noise}$$
$$E[C] : \text{Combined expectation value}$$

Now, the relation between three will be:

$$E[X] + E[N] = E[T] \tag{1}$$

Since, x will be zero, and expectation associated with zero will be zero, we will get,

$$E[N] = E[T] = \frac{\sum_{n=1}^{1000} n}{1000} = 1.9618916895206362 = 1.96 \ \{\text{Bias of coin rounded to second decimal}\} \tag{2}$$

where n is value of given samples.

Now, for next 10000 samples lets assume:

$$E[X] : \text{Expectation value of Coin Toss}$$
$$E[N] : \text{Expectation value of Noise}$$
$$E[Z] : \text{Combined Expectaion value(Noise plus Coin Toss)}$$

Thus, because of linear relation between all three variables we will get

$$E[X] + E[N] = E[Z] \tag{3}$$

Since, coin toss is a example of bernaulli trials, if we assume probabilty assciated with head is p, probabilty associated with tail will be $1 - p$.

$$X[x] = \begin{cases} p & x = 5, \\ 1 - p & x = 0 \end{cases}$$

Hence, expectaion value associated with coin toss i.e. $E[X]$ will be

$$E[X] = 5p + 0(1 - p) = 5p \tag{4}$$

we will get value of $E[N]$ from equation (2) and for $E[Z]$

$$E[Z] = \frac{\sum_{n=1001}^{10000} n}{10000} \tag{5}$$

Now substituting all three values of $E[X], E[N], E[Z]$ we will get value of p:

$p = 0.2126331708929948 = 0.2$ {Bias of coin rounded to first decimal}