

ECE3522 Practicum 1 : Tossing an Unfair Die

Receive 5 additional points by submitting before 9/29/18 11:59 pm

Penalty will be imposed after 10/6/18 11:59 pm (1 point each hour; 5 points each day)

The sample Matlab code in the appendix deals with a toss of an unfair coin. It has a 70% of probability to show head (denoted as $X=0$), and 30% of the probability as tail (denoted as $X=1$). The simulated probability mass function, the expected value, and standard deviation are evaluated using 1000 repeated trials.

Now consider an unfair die, which has a 20% of probability to show each face between 1 and 4, whereas it has 10% of probability to show each face of 5 and 6.

1. Analytically compute the expected value and the standard deviation (use the equations, not through simulations). Report these values.
2. Generate a data sequence of 5000 random integers, representing the outcomes of tossing the unfair die 5000 times. Plot the simulated probability mass function.
3. Print out the simulated expected value and standard deviation using 5000 repeated trials.
4. Compare to the analytical expected value and standard deviation, are the simulated expected value and the standard deviation close enough? How to improve the simulated results so that they would become closer to the analytical results?

Submit by e-mail to ece3522.temple@gmail.com

(a) A single Word or pdf file containing materials in the following order:

- Your name, TUID
- All the required values, figures, and observations
- Key references (website, book, paper, or student name) if any (particularly if you reused a substantial portion of the Matlab codes)
- Matlab codes

(b) All Matlab codes in .m format

Important: The Matlab code has to be included in the Word or pdf file report, AND as a separate attachment.

Requirement

For each plot, all axes must be properly labelled.

A student can seek help, but the report must be his/her work and thus he/she has to understand every word and every line of Matlab code reported. In-class Quiz may be taken place after the submission of the practicum report to verify whether the students understand what they described in this report.

Appendix

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%% ===== Matlab code sample for Practicum 1 =====  
% Simulation: Tossing a fair coin  
%  
clear  
  
n = 1000; % Number of tosses  
  
range_x = [0:1];  
  
for ii=1:n  
    x(ii) = (rand>0.7);  
end  
  
figure(1)  
hist_x = hist(x, range_x);  
bar(range_x,hist_x/n);  
xlabel('value of face')  
ylabel('relative frequency')  
  
mean_x = mean(x);  
std_x = std(x);  
  
fprintf('The mean value is %4.2f\n',mean_x);  
fprintf('The standard deviation is %4.2f\n', std_x);
```

Results:

The mean value is 0.28

The standard deviation is 0.45

