Matlab Assignment 2: Fun with Functions

I've given you a datafile on Canvas called ECE2523_Project2_Data.mat. You are going to manipulate this dataset. This assignment is due **Friday, September 10, 2021,** at ***5:00 PM***. It will be turned in electronically using Canvas.

Project To-Do List Summary

To summarize the long description below, do these following steps:

1. Write a main script called "LastnameFirstname_Project_2.m" that
    a. Loads a data file with an eSports team information
    b. Calls the function "CalcProbWin" to calculate the probability of the team winning a game
    c. Prints the number of games played and the probability of the team winning each game
2. Write a function "CalcProbWin" that
    a. Takes a data vector of 0's and 1's *with any length* as an input where zero represents a loss and a one represents a win
    b. Calculates the number of games won
    c. Divides that number by the total number of games played to find the probability of winning
    d. Returns that probability as the output of the function
3. A ***brief*** report that describes your conclusions on the data. What games is the eSports team best at? How confident are you in the probabilities you have reported?
    a. At the top of the report make sure to include your name, the date, and your student ID.
    b. You only need a few short sentences on your conclusions.
    c. Make sure to include the answers that you printed out to the command window in your script!

For further description, see the individual sections.

Part 1: Loading the data

Create a new script in Matlab. Name it "LastnameFirstname_Project_2.m". Save this file, and in the same directory download the file "ECE2523_Project2_Data.mat" from Canvas. At the very top of your "LastnameFirstname_Project_2.m" script, put your name and the date as comments. Below those comments, on a single line, use the command "*load ECE2523_Project2_Data;*". This will load the data stored in that file into your workspace.

Hint: If Matlab can't find the data file, then that means that you didn't save it in the same directory (i.e. file folder) as your script is saved.

Part 2: Manipulating the data

Now there are three new variables in your workspace! These vectors represent data collected by an eSports team. The three variables are vectors that correspond to the team's performance in the games League of Okays, Overhear, and Call of Responsibility. Each entry in the vectors corresponds to matches the team played. An entry of 0 means that the team lost that match, and an entry of 1 means that the

team won the match. For this first assignment, you are going to use the relative frequency approach to calculate the probability of the team winning each game.

In a ***new file*** named "CalcProbWin.m" make a function whose first line is "function [pWin] = CalcProbWin (gData)", where gData is a data vector (that can be **any length**).

Recall from the relative frequency definition of probability, that if there are N samples and a number a occurs m times, then the *relative frequency* of a is $\frac{m}{N}$. Your function should be able handle any value of N (hint: check out the "length()" function).

Therefore, your function must count the number of times the team won and divide that number by the total number of matches played. It then must assign that final number (i.e., fraction) to the variable "pWin".

In your main file (i.e., "LastnameFirstnameMatlab_2.m") you will call the CalcProbWin function to calculate the probability of the team winning each of the three games.

Hint: If you get the error "not enough input arguments" make sure that you are calling the function from the file LastnameFirstnameMatlab_2.m. If you hit run while the file "CalcProbWin.m" is active in your editor, then Matlab won't know what to put as your input argument!W

There are MANY ways to program the function CalcProbWin – I can think of several right off the top of my head. Therefore, write the function so that it mimics how you would solve this problem if you had to solve it by hand. As long as you get the correct answer, you will get full points – I'm not looking for a particular solution.

Part 3: Print Data to Command Window

Use the fprintf command to print the answers to the following questions to the command line when your script is run:

1. How many times did the team play each game? (Remember: there are three games!)
2. What is the probability of the team winning each game?

Note that if you want to print an integer you would use the command:

fprintf(1, 'Text I want to print out: %d\n', variableName);

For this command, the 1 in the beginning is telling it to print to the command line. Anything enclosed in the single quotes will be printed to the command line. The %d is called a "conversion character". So that says there is a variable there, which will be defined after the enclosing single quote. The 'd' in '%d' means to format whatever value is in that variable as an integer. The '\n' tells the command line to put in a carriage return (i.e. hit 'enter' on your keyboard). If you ran this command, and you had set variableName=2;, then this command would print (seriously, copy and paste and try it!)"

Text I want to print out: 2

Now, if you want a float – as in a number with a decimal point – use the command:

fprintf(1, 'Text I want to print out: %f\n', variableName);

See the only thing I did was change the '%d' to a '%f'. This just tells the fprintf command to interpret whatever number is stored in variableName as a decimal number. Swap out your own text into those commands to answer questions 1 and 2.

Hint: try typing "help fprintf" or "doc fprintf" in the command line.

Comment all of your code. Comments will be a portion of your grade.

Make sure to have the commands to print out all answers in your file. If you have the commands to print out probabilities for just one of the three games in the file (because you just changed the variables to get the answers but didn't save them) you will lose points.

Part 4: Report

Write a ***brief*** report that describes your conclusions on the data. Include the information that you printed to the command line (i.e., how many times did the teams play each game and what was their probability of winning each game). What games is the eSports team best at? How confident are you in the probabilities you have reported?

Save your report in **PDF** format.

Turn in checklist:

3 separate files:

1. Main script called "LastnameFirstname_Project_2.m" (using your last name and first name)
2. A function file called "CalcProbWin.m"
3. A report named "LastnameFirstname_Project_2_Report.pdf"

Please **zip** all files together (i.e. compress both files into a single .zip file called LastnameFirstname_Project_2.zip). and submit **electronically** using Canvas. The submission will **close at 5:00**, so please turn this in on time! Note: please do not .rar the files – make sure to use zip files.