Modeling Problem – Choosing a Mode of Travel
Part 3 – Developing your Computational Model (Coded Solution)

Problem:

If you did not complete either of the first two submissions for this problem (Part 1 – Developing your Mathematical Model or Part 2 – Developing your Algorithm), please refer to those assignments for more details about this problem.

The Parking Committee has provided you with more survey results. They have provided the results for a different data set consisting of 100 students; the included Excel file has the survey results for 100 ERAU DB campus students about their mode of transportation to class from home and back. Your job is to use this data to revise your model as you see necessary and develop your code.

As you develop/revise your model and code, document the changes you make and why you made these changes. (*Note: You should be improving your model as you run your code and try to run different inputs to improve the overall accuracy of your model in predicting students' modes of transportation. You may want to try making new excel files from different portions of the provided excel file to test your code and ensure it works for data sets with any number of students.*)

You must write code that allows the Parking Committee to run your code with an excel file that has all of the same inputs for any number of students and outputs the predicted mode of transportation for each student based on your model and the accuracy of the model based on their actual mode of transportation. *Note: your model is your logic/decisions of how to decipher what students will do based on their circumstances and your code is the syntax written to run this model.*

Reminder about accuracy of the model: You will compare your predicted outcomes to the actual survey results to determine the accuracy of your model. (EXAMPLE: If your model output the same mode of transportation for 82 out of 100 students, then your model/code would be 82% accurate.) *Note: If you get 100% accuracy, I bet you did not develop an efficient model; I bet you have far too many specific scenarios and conditions that go through each student individually and does not identify patterns in the data.*

Submissions:

Please note that the submission for this assignment is different than any of your homework assignments. The modeling problem is worth 10% of your grade. This submission is worth 4% of your final grade (recall the written model submission previously submitted was worth 4% and the algorithm was worth 2% of your final grade). This assignment will be due in about two weeks and you will complete this individually (refer to Canvas for exact dates). This is the last assignment for this modeling problem.

You must submit your program (MATLAB script file – .m), a comment with the output based on the provided data (i.e. the predictions for the 100 students and the accuracy of your model), and comments throughout your code about the decisions you made in developing your model (*the decisions are sometimes referred to as your rationale or justifications for steps in your model, for*

example why did you make an assumption or why did you decide to look at different subsets of the data differently).

Use the below example to better visualize how your code should be structured and as an example of a bad computational model.

```
% Peter Porker

% This code will take a given data file containing student information and
% provide a predicted mode of transportation. The accuracy of the model
% with then by determined by comparing the predicted results with the
% actual survey results.

% Code line for accepting data from excel file.
% Rationale: It is important to allow for other files to be used in case
% more students are included later. Because of this, the code runs for
% however many students are in the data file.

% Look at each student to see if on or off campus using a loop.
if strcmp(student_ON_OFF(1), 'ON') == 1 % Check to see if student is living on campus.

    studentTransportation = 'walk'; % The student will walk if living on campus.
% Rationale: Anyone on campus will always walk to class because that is
% what I do.

else % Student is living off campus instead.
    studentTransportation = 'drive'; % Then the student will drive to school.
% Rationale: In all other cases (the student lives off campus), they will
% drive. People I know off campus drive, so everyone else must.
end

% Code method to compare a student's actual mode of transportation versus
% the predicted one and then print/ output the results.

% Rationale: I want to show the committee the predicted results for the
% students' modes of transportation. Additionally, I want to showcase the
% accuracy for this model to help the committee.

% Sample output using provided data that was copied from the command window and pasted below:

% According to my calculations, my model has achieved 85% accuracy!!
%
% Check below to view where the model varied:
%
% Student|  Actual Mode |   Predicted Mode
%   1           walk            walk
%   2           drive           walk
%   3           drive           drive
%   4           walk            walk
%   5           walk            drive
%   6           drive           drive
```

Solution:

For more details on the 7 Steps of the problem solving process refer to the previous submission (Part 1 – Developing your Mathematical Model). Some information for the steps is provided below, but there are more details in the first document.

1. **Decipher Problem Statement**
   Givens *(inputs)*:

The updated data set that now has 100 students with 11 different pieces of information about their living situation and access (Excel file). Again, note that there are NO user inputs.

Finds *(outputs)*:

(1) The resulting predictions based on your model for the given data set and (2) the accuracy of the model.

2. Draw a Diagram

3. Identify Relevant Theory

Some of the background information needed for this problem is the survey data provided by the Parking Committee (see the provided data set of the 100 students in the provided Excel file).

4. Assumptions

5. Solution Steps

6. Identify Results and Verify Accuracy

You must include the prediction for each student and your model's accuracy based on code's output in this submission. This should be a comment at the end of your script file.

7. Algorithm and Code

Your solution steps will lay out the process that you will need to code. In complex problems that require conditionals and/or repetition, it may be beneficial to draw out a flowchart, concept map, etc. or write out bullet point or numbered steps. Doing this step can ensure you understand the flow of your code before you start writing code in MATLAB.

For this submission you are only submitting your code (script file/s) with the comments as specified above. When you code your solution, keep this seven-step process in mind and revisit any steps that may help you in further developing your solution. Keep in mind that you may improve your original idea as you develop your code; this is a good thing. If at any point you reach a step in your model that you cannot figure out how to code, do not overly simplify your model – rather go visit your professor and ask for help to develop the code to create the model you designed. Be sure to follow good coding practices, but beyond this there are no requirements for the types of codes you must use. The requirements for this project are more based on the quality of the model you develop, which should drive the coding techniques you choose to utilize.