CS 2316 - **Homework 8 – Data Merge**

Due: Thursday, March 12 before 11:55 PM

Files to submit:

1. HW8.py

This is an INDIVIDUAL assignment!

Collaboration at a reasonable level will not result in substantially similar code. Students may only collaborate with fellow students currently taking CS 2316, the TA's and the lecturer. Collaboration means talking through problems, assisting with debugging, explaining a concept, etc. You should not exchange code or write code for others.

For help:

-TA Helpdesk—schedule posted on class website
-Email TAs or use Piazza

Notes:

• **Don't forget to include the required comments and collaboration statement (as outlined on the course syllabus).**
• **Do not wait until the last minute to do this assignmen**t in case you run into problems.

Introduction

Reynholm Industries is a large and successful corporation with many customers who order its products. However the company is missing some important data about customer orders from some cities in the past two years. You have been hired to write a program that downloads customer data from the internet and compares it to a CSV file provided by the company.

The CSV file contains data in the following form:

Last Name, First Name, City, 2013 Units Ordered, 2014 Units Ordered

(Keep in mind that there is a header so the actual data starts in the second row.)

The website contains data in the following form:

Full Name, 2013 Units Ordered, 2014 Units Ordered, City

NOTE: The website contains FULL names while the CSV file contains two separate columns—one for the last name and one for the first name.

Things to plan for:

1. Reynholm Industries has customers from different cities. After merging all the data you will be required to calculate the average order size for each city. There are five (5) cities: London, Manchester, Birmingham, Leeds, and Liverpool.
2. Reynholm Industries is a little disorganized, so for some customers, order data is only available in the CSV or only available on the website. If this happens, include whatever information is available. If a customer doesn't have data for a certain year, the final CSV should have a "-" in place of the units ordered for that year.
3. Fortunately, there won't be a case where the order quantity for a particular customer differs between the CSV and the website.
4. Some customers that appear in the CSV file do not appear in the website, and vice versa. All customers that appear in either source should be included in the output CSV file.

Objective

You will have to read in the data from the provided CSV file and also webscrape data off the HTML table on the given website. You must analyze both pieces of data and return a CSV file that looks like the following:

Name	City	2013	2014
Last Name, First Name	**City**	**Order for 2013**	**Order for 2014**

In order to make the Reynholm Industries order data more organized, you must write out this CSV data in a particular order.

1. You must first sort the customers according to how much data they have. Customers with order data for both years come first, followed by those with order data for 2013 only. Last will be customers with data for only 2014.
2. Next, you must sort the customers **alphabetically within each category of data availability**. Alphabetize by last name, and if two or more people have the same last name, sort those people by their first names. See the solution CSV file if you need clarification on how customers should be sorted.

Note: If a customer does not have order data for some year, remember to include a hyphen "-" to denote that there is no data for that category.

Smaller Test Files

To test your code, you want to check your solution against a small sample file first to make sure everything seems to working correctly. If and only if you get things working smoothly on the smaller test file should you move on to the larger test files. You can find the small test file and website on T-Square.

Larger Test Files

Once you get your code working properly for the small test files, you should check your code with the large test files to ensure that your code works with all test cases. Keep in mind that running large test files may take longer than the small test files. Your program must be able to complete the large test file in less than ten (10) minutes running on a TA's laptop.

Web Table Scraper

You will need a function or method that will retrieve the table of data at the URLs found in the class webpage and convert it into a list of data. You may use regular expressions, write your own data extractor, or make use of the following HTML table parser from the DMSI notes:

http://www.summet.com/dmsi/html/readingTheWeb.html#parsing-html-tables

If you use this HTML table parser, you must indicate the source of the function with comments in your code. If you modify the function but still use the foundation of it, be sure to comment on which parts you modified and why.

Informational GUI

Create a simple GUI that will allow the user to choose which CSV file they want to read in. Once the file is selected, your code should download data from the website (the URL will be defined by the user in an entry). The left side of the GUI should contain two buttons, one to read in the input CSV file and another to read data from the website and process the output data. There should be entry boxes for the input CSV file name, the output CSV file name, and the website's URL.

The right side of the GUI should display labels with the name of each city and the average order quantity per customer for each city, as well as total counts for the number of units ordered in 2013 and 2014. The labels should initially display a hyphen "-" in place of a number until both the CSV and website data have been read in. (See the suggested problem solution below for an image of what the GUI should look like.)

Before reading in any data, the “Input CSV File” entry box should be populated with the complete path of the input CSV file, the “Website URL” entry box will contain the website URL that is specified by the user as input, and the “Output CSV File” entry box should be populated with the output CSV file’s complete path. Notice that **the input and output file path entry boxes are in readonly state**. Also note that the “Process Data” button is “grayed out” or **disabled** UNTIL the user successfully loads a CSV file! Only after the user successfully loads a CSV file should they be able to click the “Process Data” button.

Suggested Problem Solution

The following is the suggested way to solve this homework assignment. If you’d like you can use different functions and/or add helper functions.

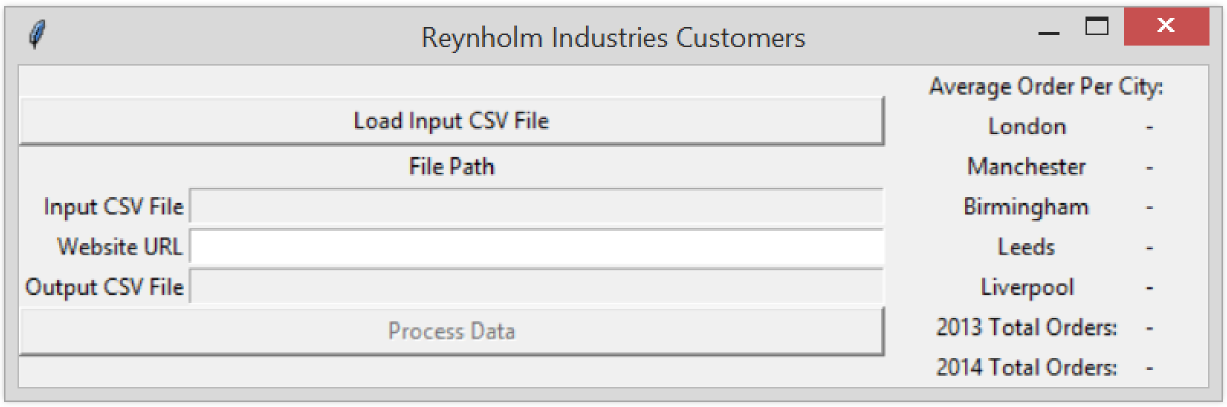
Note that if you use a class for your GUI, each function should have the self parameter.

__init__

This function will set up the GUI. The GUI should have 3 labeled entries of width 60 (Input CSV File, Output CSV File, and Website URL). Only the Website URL entry should allow user input; the other two should be “readonly”. The GUI should also have two buttons (Load Input CSV File and Process Data). The Load Input CSV File button should be enabled by default, but the Process Data button should be disabled (grayed out) until the user loads CSV file data.

The right side of the GUI should have labels for each of the cities in the data and the calculations of average orders per customer in each city. There should also be labels for the total number of units ordered in 2013 and 2014. The labels will be updated when the data is processed. It is highly recommended that you use the **grid** layout manager!

Before reading in data, the GUI should look something like this:
(note that there might be more or fewer labels on the right side depending on how many unique cities exist in the data.)

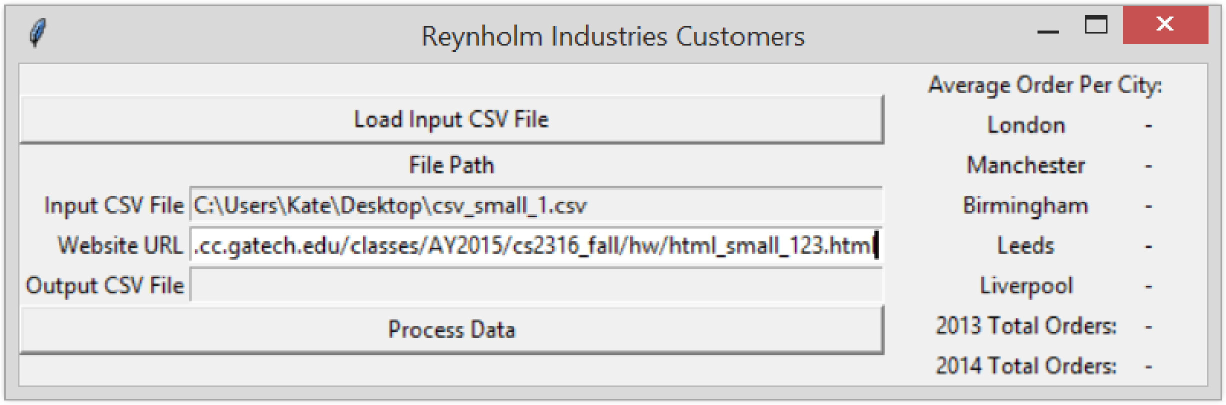


loadCSVclicked

Input: None

Output: None

This function should be called when the user clicks the “Load Input CSV File” button. Prompt the user to select a file using a file dialog (askopenfilename). Then call “loadCSVFile” giving it the name of the CSV file. If the loadCSVFile method returns a list of data, store it in an object variable of your choice. Place the name of the loaded CSV file into the correct entry in the GUI so the user can see it. Finally, enable the “Process Data” button so the user can now click it!



Input CSV File	C:\Users\Kate\Desktop\csv_small_1.csv
Website URL	.cc.gatech.edu/classes/AY2015/cs2316_fall/hw/html_small_123.html
Output CSV File	

London	-
Manchester	-
Birmingham	-
Leeds	-
Liverpool	-
2013 Total Orders:	-
2014 Total Orders:	-

If instead the loadCSVfile method returned a None (indicating that the file was invalid), you should **pop up an error dialog message to the user**, and leave the input CSV file entry blank and the Process Data button disabled.

loadCSVfile

Input: A string representing a filename

Output: CSV Data as a list, or None (if the file is invalid).

This method will open the specified file and load the CSV data from it. If you are successful, you should return a list of lists, where each inner list is one row from the CSV file. If the file does not exist, or is not a valid CSV file, you should return None. The method that calls **loadCSVFile** (**loadCSVClicked**) will issue an appropriate warning to the user.

PDclicked

Input: None

Output: None

This function should be called when the user clicks the “Process Data” button. If the Process Data button is enabled, it means that the user has already successfully loaded the contents of a CSV file into the object variable of your choice. This function should check the URL entry in the GUI and get the URL that the user has (hopefully) typed into the entry. It should take this URL and pass it as an argument to the downloadData function. If the download fails (for example, if the URL entry is blank), you should show a warning message (e.g. “URL or Data Invalid!” and return. Because buttons that call command methods do not actually use the return value, what you return is immaterial. The point of returning on an unsuccessful download is to prevent the PDclicked method from continuing to execute more code. The best return value in this case would be a None.

If, however, the download was successful, the PDclicked method should then call the **convertHTMLtoCSVFormat** function, using it to convert the data. Once the data is in the right format, pass it to the **mergeData** function. Finally, PDClicked will call **saveData** to save the output data to a CSV file. PDClicked will also call **calculate** the average order quantity per city and the total units ordered in each year (these numbers should all be displayed in labels in the GUI). Again, because the button which “called” PDclicked doesn't care about the return value, you may return None.

downloadSalaryData

Input: String representing the URL

Output: A list of data from the website, or None if the download/extract failed.

Given the URL, this method will attempt to download the HTML data from the specified website. You may use regular expressions, string.find(), or the parse table method from the course notes to extract the data. Your method should return the data (see convertHTMLtoCSVFormat for an example of the format the data should be in). If you run into a problem (website/url does not exist, etc.) return None instead.

convertHTMLtoCSVFormat

Input: Downloaded HTML data list

Output: A list of converted HTML data

This helper function will take in the HTML data (a list of lists in the following format: full name, salary, department) and return it in the CSV data format (last name, first name, city, 2013 orders, 2014 orders). You may find the use of regular expressions extremely helpful, although not required.

For example, the downloaded HTML data will look like the following:

[[‘Name’, ‘2013 Units Ordered’, ‘2014 Units Ordered’, ‘City’], [‘Maurice Moss’, ‘139000’, ‘-‘, ‘London’], [‘Jen Barber’, ‘50000’, ‘34000’, ‘Manchester’], …]

You must convert this data into the following form:

[['Last Name', 'First Name', 'City', '2013 Units Ordered', '2014 Units Ordered'], ['Moss', 'Maurice', 'London', '139000', '-'], ['Barber', 'Jen', 'Manchester', '50000', '34000'], …]

After converting the downloaded HTML data into the aforementioned format, you should return that list.

mergeData

Input: Converted HTML data list and CSV data list or none (if both are class variables)

Output: A dictionary of merged data

This method will take each employee record from the input CSV file and put it into a dictionary. Then, it will take each record from the HTML data and add it to the dictionary. Keep in mind that there may be some employees that only exist in either the CSV file or the HTML data, but not both. So when adding the HTML data, you may need to update an existing record, or you may need to add an entirely new record.

Hint: the keys for this dictionary could be the customers' names, and the values could be their city and order data as a list.

Also remember to follow the guidelines described above in the "things to plan for" section.

saveData

Input: The dictionary returned from **mergeData**

Output: None

This method will use an asksaveasfilename file dialog to ask the user for a filename to save the data to. It should update the GUI by adding the file name to the correct entry, and then write out the updated records as a CSV file. **Keep in mind that the output CSV file has a format different from that of the input CSV file and HTML data as specified above.** The data in the CSV file needs to be should be sorted in the format mentioned previously in this document.

calculate

Input: The dictionary returned from **mergeData**

Output: None

This method will count the average number of units ordered for each city in the merged data. It will also add up the total number of units of product ordered from Reynholm Industries for each of the years 2013 and 2014. The calculated numbers will be displayed in labels on the GUI when this method is called.

Grading

You will earn points as follows for each element that works correctly according to the specifications.

Basic functionality: 60 points

Code is easily readable and understandable with good comments	**10**
Successfully loads the input CSV file	**5**
Successfully downloads the webpage HTML	**5**
Correctly parses the HTML table to extract records	**10**
Correctly converts the HTML data to CSV format	**10**
Process Data button is disabled until CSV Data is successfully loaded.	**10**
Information about the input and output file names is displayed correctly in the GUI	**10**

Matching Accuracy: 40 points

Dictionary of merged data is completely correct	**15**
Output CSV file is completely correct	**15**
Average orders/customer/city and total order calculations are correct	**10**