

Instructions: Each assignment will include a PDF file (like this one) with the assignment questions and an Excel file, with an Answers sheet and any data or models that we provide you with. You must download both the PDF and Excel files. You have to enter your answers in the Answers sheet of the same Excel file you have downloaded, then save and upload the Excel file. You must upload the same Excel file you downloaded. Further instructions are provided in the Online Assignment Tools Guide (see **Assignments** in eClass).

Put your answers in the appropriate cells (salmon-colored cells) in the **Answers** sheet. Use paste special ... values to for all numerical answers. The other cells in the Answers sheet are locked, which means you won't be able to enter values into those cells. Do not change the format of cells in the Answers sheet. Save your file with the appropriate name and in the appropriate format ("HW#_ID.xlsx").

Marking will be based on the answers in the Answers worksheet of the file you upload. We will only look at the rest of the file if there is an appeal (and even then, the answers in the Answers sheet take precedence.) If you wish to appeal a mark, then the file you uploaded must include your supporting work for each question. It is a good idea to make one worksheet for each question.

Total points: 29, of which 1 point is for following the submission instructions provided above.

Forecasting the number of service requests for Edmonton 311

The "Sample" worksheet has a random sample of 1,081 rows from the data on the municipal service requests made to the City of Edmonton through the 311 contact number. Use this data to answer Questions 1-5.

Data exploration (5 pts.)

1. (1 pt.) How many requests are about "Dead Animal Removal"? Answer this based on the "Service Category" column.
2. (1 pt.) Which ward has the most service requests?
3. (1 pt.) What proportion of the requests were made through a "Phone Call"? Answer this based on "Ticket Source" column.
4. (1 pt.) How many requests were received between 2017-07-01 and 2018-02-20 (inclusive)? Use the "Date Created" column.
5. (1 pt.) What is the average number of requests received in June, based on the sampled data?

Note 1: You may find some of the following Excel functions useful: COUNT, COUNTIF, AVERAGE, AVERAGEIF, YEAR, MONTH, DAY, MIN, MAX. You may also find filtering and pivot tables useful.

Forecasting using simple methods (23 pts.)

The "Daily" worksheet shows the number of calls (number of requests received) for every day in 2022 (that is, from 1 January 2022 to 31 December 2022). Use this data to answer the remaining questions, in which we will guide you through some steps in forecasting Call Volume using simple time series forecasting methods.

Note 2: It will be easier to answer Questions 6, 7, and 8 if you think carefully about how to organize the calculations. One possibility is to have one worksheet for each forecasting method with all of the calculations (forecasts, errors, absolute errors, etc.) for that forecasting method.

6. (14 pts.) Use the following methods to compute forecasts for the Number of Permits:
 - AVG = The Average method
 - WMA-3 = Weighted Moving Average with weights 0.15, 0.35, and 0.5 (0.15 for the oldest data point in the window)

- SES = Simple Exponential Smoothing, with $LS = 0.6$

Report forecasts of all methods only for the first seven days of 2022, the last seven days of 2022, and the first seven days of 2023. Leave answer cells blank for forecasts that cannot be computed.

7. (3 pts.) Compute errors, absolute errors, and absolute percent errors for all of the methods from Question 6 and for every day for which you have both data and a forecast. Report the following:
 - a) The error of the AVG method for 5-Jan-2022
 - b) The BIAS of the WMA method, **including every day in which WMA forecast can be calculated**
 - c) The date for which the SES method had the smallest absolute error
8. (6 pts.) Compute MAPE and RMSE for all methods in Question 6, for the last seven days of 2022.

Comment on Question 8: It is important to be able to compute performance measures for different time intervals. Sometimes we want to compute a performance measure for separate time intervals for a single forecasting method to see whether the forecast accuracy is changing over time. Other times we want to compute a performance measure for a single time interval for multiple forecasting methods, to see which method would have been most accurate, for that time interval.