

WEEK 3 HOMEWORK

INSTRUCTIONS

- Every learner should submit his/her own homework solutions. However, you are allowed to discuss the homework with each other (in fact, I encourage you to form groups and/or use the forums) – but everyone must submit his/her own solution; you may not copy someone else's solution.
- The homework will be peer-graded.
- The homework grading scale reflects the fact that the primary purpose of homework is learning:

Rating	Meaning	Point value (out of 100)
4	All correct (perhaps except a few details) <u>with</u> a deeper solution than expected	100
3	Most or all correct	90
2	Not correct, but a reasonable attempt	75
1	Not correct, insufficient effort	50
0	Not submitted	0

Question 1

Using crime data from <http://www.statsci.org/data/general/uscrime.txt> (description at <http://www.statsci.org/data/general/uscrime.html>), test to see whether there is an outlier in the last column (number of crimes per 100,000 people). Is the lowest-crime city an outlier? Is the highest-crime city an outlier? Use the `grubbs.test` function in the outliers package in R.

Question 2

Describe a situation or problem from your job, everyday life, current events, etc., for which a Change Detection model would be appropriate. Applying the CUSUM technique, how would you choose the critical value and the threshold?

Question 3

1. Using July through October daily-high-temperature data for Atlanta for 1996 through 2015, use a CUSUM approach to identify when unofficial summer ends (i.e., when the weather starts cooling off) each year. That involves finding a good critical value and threshold to use across all years. You can get the data that you need from the file `temps.txt` or online, for example at <http://www.iweather.net/atlanta-weather-records> or <https://www.wunderground.com/history/airport/KFTY/2015/7/1/CustomHistory.html>. You can use R if you'd like, but it's straightforward enough that an Excel spreadsheet can easily do the job too.
2. Use a CUSUM approach to make a judgment of whether Atlanta's summer climate has gotten warmer in that time (and if so, when).