Winter Break Projects

This following document outlines a set of small to medium sized projects you can tackle while on break. They can be done using things covered through the duration of the course (Term 1).

Project 1: Single Input Calculator

Want to make a very easy but cool deployable project? This is the easiest one in the list. This is a calculator that takes a single string line as an input e.g. “22/2” and return the result “11”. This can be done by analyzing the string using the materials from the Week 4 slides.

What you need to do is to check the string and if it contains an operator split the string at the operators and do the operation. How to do this? Just iterate through an array of the operands (‘+’, ‘-’, ‘*’, ‘/’, ‘%’) etc. Using the boolean expression *operator in string* we can check for this and then split. It is recommended you use Jupyter for this. Once you have split the string you can save the operand that was present and do the operation using a set of if-elif statements.

All Operands can be found here

You can find a completed version of this program in the folder. For any further hints emails us.

Difficulty: Easy
Length: ~40 lines

Project 2: Contact Book

Using the final code we created in week 3 it is possible to create a savable contacts application in Python. In week 4 we discussed how we manipulate files. As such we can read from (and save in) a txt file where each line is structured as such:

First_name,last_name,phone,email,other_field

By reading the file line by line and splitting each line at the commas (,) we can effectively create an array of lists where each list is one ‘contact’ object. Then by parsing each of these lists (and their entries) into a dictionary we can use ready-made code from week 3.

Difficulty: Advanced
Length: >150 lines

Project 3: Frequency Analysis & Brute Force Decoder for Caesar Cipher

We saw how to encrypt using the Caesar Cipher, however, a more interesting application would be a program that brute forces and/or uses frequency analysis to extract the key. Frequency analysis is a process in which we analyse the times each letter appears in the ciphertext and draw conclusions as to what each letter is. This is possible since the english language has a distribution of letter appearances with ‘e’ being the most common.

To do this you must break the ciphertext into letters and see how often they appear as single chars. Then using some assumptions (i.e. that e is the most common letter of plain-text) decode the ciphertext. For those brave enough to try, you can also use the dual letter sequence ‘LL’.

This application can also be worked to brute force the cipher by just saving into a file the decoding using all possible keys, after all there aren’t that many.

Frequency Analysis
Brute Force
Caesar Cipher

Difficulty: Expert
Length: ~200 lines