DS2030 Data Structures and Algorithms for Data Science
Lab 1 (Take Home) Due on September 4, 11.59pm

Instructions

- You are to use Python as the programming language. Use may use Visual Studio Code (or any other editor you are comfortable with) as the IDE.
- You have to work individually for this lab.
- You are not allowed to share code with your classmates nor allowed to use code from the internet. You are encouraged engage in high level discussions with your classmates; however ensure to include their names in the report/code documentation. If you refer to any source on the Internet, include the corresponding citation in the report/code documentation. If we find that you have copied code from your classmate or from the Internet, you will get a straight fail grade in the course.
- The submission must be a zip file with the following naming convention - rollnumber.zip. The Python files should be contained in a folder named after the question number.
- Include appropriate comments to document the code. Include a `read me` file containing the instructions on for executing the code. The code should run on institute linux machines.
- Upload your submission to moodle by the due date and time. Do not email the submission to the instructor or the TA.

This lab will improve your understanding of linked lists.

1 Extended Integer Arithmetic (10 points)

The integer type in Python supports integer values between -32768 to 32768. While one could use the long type to perform operations on numbers that can be represented by 4 bytes of storage, this is insufficient to represent numbers with 100 digits or more. Design and Implement a new data type called ExtendedInt that can represent an integer with over 100 digits. You will have to use a linked list to store the digits of the numbers and implement the following standard operations $+, -, *, /, <, >, ==, \leq, \geq$. The input to your program will be of the following format `ExentdedInt1 op ExtendedInt2`. Your program should output the result of the operation `op` performed on `ExtendedInt1` and `ExtendedInt2`.

Input
number1 operation number2
Output
result

2 References

1. M Goodrich, R Tamassia, and M. Goldwasser, "Data Structures and Algorithms in Python", 1^{st} edition, Wiley, 2013.