**CMPSC 413 – Lab-5** (25 points)

**Huffman Coding**

**Due date: 3/17/2022**

**Lab Exercises:**

**Task 1:** Design, analyze and implement the algorithm of computing Huffman code.

Input: text containing any of 26 English characters. Example: ABAAABCBCCCDEFFFEE

Output: Huffman codeword of each character.

**Task 2:** First encoding, and then, decoding a text file using the Huffman codeword (the output of the Task 1).

Input: a text file consists of the characters in Task 1

Output: Encoded the text file and decoded it back.

**Requirements**

* Design the algorithms for Task 1 and Task 2.
* Two data structures must be used in the algorithm for Task 1. priority queue Q and binary tree.
* Analyze the time complexity of each algorithm using O-notation. Note that the time

complexity depends on the implementation of the data structures.

* Implement the algorithms using python or java.
* The user can input the set of characters and output the Huffman code of each character. Also, they can encode and decode a text file.

**Huffman Algorithm:**

create a priority queue Q consisting of each unique character.

sort then in ascending order of their frequencies.

for all the unique characters:

create a newNode

extract minimum value from Q and assign it to left Child of newNode

extract minimum value from Q and assign it to right Child of newNode

calculate the sum of these two minimum values and assign it to the value of newNode

insert this newNode into the tree

return rootNode

**Submission**

Algorithms, Algorithm analysis, Experiment output, Code.

**References:**

https://medium.com/analytics-vidhya/what-is-huffman-coding-ea36379da63e