**3460:435/535 Algorithms - Project 2**

This programming project is for you to learn and implement a variant of the compression algorithm LZW. Your tasks for this assignment are to (1) run LZW as it is and (2) modify LZW to incorporate the advantages of variable length coding algorithms as described in class. To facilitate the grading, you must use Python. Use the A_P2_LZW_template.jpynb

Part I: LZW using code length 12

- Download Python LZW from A_P2_demo.jpynb or directly from; https://rosettacode.org/wiki/LZW_compression#Python and run the program;
- Understand how LZW works and how it's implemented;
- Modify the program so you could use it to compress any file you are given;

You are expected to use **A_P2_LZW_template.jpynb**. Name your notebook **A_P2_LZW.jpynb**: After we run the cell of your jupyter notebook's that has "def LZW_compress(fname):" function, your program should save the compressed file as: filename+".lzw". And when we run your notebook's cell that has "def LZW_expand(fname):", your program should expand the compressed file filename+".lzw" and save the expanded file as: filename+".2". You know your file with filename+".2" should be identical to the original file. Use function "compare_files(file_path1, file_path2)" in A_P2_demo.jpynb to double check.

Part II: Modified LZW to allow the length of LZW codes to increase gradually as described in class.

- Your algorithm will increase the length of the code words from 9 to 16 bits.
- Do nothing with the dictionary when the length reaches 16 bits.

Name your modified LZW program "**A_P2_LZW_M**.jpynb". After we run the cell of your jupyter notebook's that contains function "def LZW_modified_compress(fname):" your program should save the compressed file as: filename+".lzw2". And when we run your notebook's cell that contains "def LZW_modified_expand(fname):", your program should expand the compressed file filename+".lzw2" and save the expanded file as: filename+".2M". You know your file with filename+".2M" should be identical to the original file. Use function "compare_files(file_path1, file_path2)" in A_P2_demo.jpynb to double check.

**Pay special attention to synchronize the compression and expansion to make sure they work correctly. Test your program thoroughly.**

**What to submit.**

- Two jupyter notebooks: A_P2_LZW.jpynb and A_P2_LZW_M.jpynb
- Be sure to electronically submit your working solution before the due date! Do not submit non-working programs. The electronic submission time will be used to assess late penalties (if applicable).

**Grading.** Your code will be graded on **correctness**, efficiency, clarity, and elegance.