Data Analytics in Python
COMP 2800
Spring 2024

Assignment 2

1. **Read the Wikipedia page on Conway's Game of Life:**
    - https://en.wikipedia.org/wiki/Conway%27s_Game_of_Life
2. **For this assignment we will assume that a NumPy 2D matrix of binary (0 & 1) values forms the space of the game. We will also adopt the convention that this space is *toroidal* (it represents a torus, or donut shaped geometry). What this means is that as things move off the top of the matrix, they come back in at the bottom, or move off the left wraps around to the right, etc. This should be a familiar idea from many video games.**
3. **Create a Python file, life.py, that will contain all of your code for this assignment. At the top, import NumPy using the conventional idiom.**
4. **Write a method, `random_space`, that produces an *m*-by-*n* array that is initialized with random bits. The dimensions of the space should be parameters of your method.**
5. **Write a method, is`_valid`, that takes an *m*-by-*n* array as an argument and returns a boolean that is True if and only if the space is represents is a valid space (a 2D array containing only 0 & 1).**
6. **Write a method, `glider`, that is parameterless and produces a 5-by-5 array containing a glider. When represented as a black and white image, with 0 being white and 1 being black, a glider looks like this:**

7. **Write a method, `next_generation`, that takes a valid space as an argument and returns a numpy array with the same shape that represents the next generation that results from applying the rules of the Game of Life to each cell. Use vectorization methods to do this rather than for loops. THINK CAREFULLY about your strategy/algorithm.**

8. **Finally, produce a main method that first creates a 20-by-20 space and places a glider in the upper left corner of the space. Then it should print the first 5 generations of the space to the console. Next it should create an 10-by-16 space that is random and print the first 5 generations.**

9. **Email your file as an attachment to prof. Stucki. Change the extension to .txt before attaching it.**

Due: Friday, 1/26/2024 by 11:59pm