**Exam 3/Project3**

**Project Overview**

This project will be implementing a RGB addressable matrix to design patterns and display user images. The reason this relates to digital logic is that the addressable LED’s are fed data by the RTC hat in the form of communication from the GPIO on the Raspberry Pi -> Adafruit Hat -> Matrix.

**Approach**

Rain: Rain was accomplished by generating random numbers to create the rain. Lighting was generated by using probability to roughly have a 10% chance of creating a lightning bolt(vertical row of matrix) per cycle of the program.

Blizzard: The values are generated similarly to rain.

Scatter: The matrix is filled using randomly generated RGB values for an infinite loop.

Gif: A user image(in gif format) is converted into a pixel array of RGB values. Values are then read and transferred to the matrix. The program increments to the next frame of the GIF and repeats the process until the program is stopped.

Spiral: Spiral used 4 for loops to travel the perimeter of the matrix. The values of the current position of width and height were incremented at the end of each loop to create a spiral pattern.

Fireworks: Random values are chosen in the bottom row of the matrix. Then a bit is shifted to a randomly generated height and a small shape is generated at its end location to simulate fireworks.

**Implementation**

The project is implemented using a Raspberry PI 4 8GB , Adafruit Matrix RTC HAT, and a 32px by 32px (4mm span) addressable LED board.

**Difficulties**

The available documentation for RGB matrixes was very limited. The library suggested by AdaFruit was difficult to navigate. This was also the only library that I had found. The other libraries were designed for Arduino based systems.

DEMO LINK : <https://www.youtube.com/watch?v=mN9kdvvfdj4&ab_channel=SamuelJacobs>