M-sequences

Description

This is a take-home challenge designed to evaluate your programming skills and ability to learn new things. Please spend no more than a few hours working on this!

M-sequences are a way to generate one-dimensional structured noise. Often, they are used in applications where many large “frames” of noise are presented in quick succession, while some kind of signal (e.g. some kind of neural data) is recorded at the same time. Analysis is done later to correlate features that appear in the noise to the recorded data. M-sequences are well-suited to this kind of experiment because each frame is easily regenerated from very little information (usually an offset within the sequence).

Your task is to write a Python program that takes some basic arguments (length of M-sequence, image size in pixels, length of time to show each frame, etc.) and pops up a window showing the corresponding visual noise frames. You should additionally write a data file during each run that includes precise timestamps corresponding to each frame shown, along with whatever parameters are needed to regenerate each frame later.

Feel free to use any libraries that you would ordinarily use to accomplish a task like this, such as scipy or numpy.

Deliverables

Please send the following to us:

1. Your Python code
2. Instructions for how to get your code up and running. You can assume we’ll start with a fresh Ubuntu 20.04 install, with apt and pip available, but without any non-standard Python packages.
3. A few paragraphs of discussion about tradeoffs you made, any known issues, how you might productionize your solution given more time, and anything else you’d like us to know about the problem, your solution, or tools you used!