ADJ - Problem Set

1 ADJ Ruleset 1

In this assignment, you will construct two ADJ-style solutions to engineering problems. The goal of the assignment is simple: it is a way to practice your ability to soundly solve problems in an optimal way and communicate your ideas.

1.1 Basic Requirements

As a base expectation, your submissions must demonstrate both attention to instructions, and professionalism. Specifically (and exhaustively), we require the following to assign a non-zero grade to a submission:

1. Answer subsections must be clearly labeled as analysis, design, or justification.

2. Solutions must be in the spirit of the problem. Do not submit solutions to some "clever" edge case of the problem(s).

3. Proper spelling and grammar. Assignments must not have more than three spelling errors per page, or more than one major grammar error per page (which distracts from readability).

Failing to following any of the basic requirements will result in an automatic zero grade. If you are concerned that your solutions do not met the above requirements for grading, you may bring them to office hours for a pre-check to confirm that they are ready to submit.

1.2 Further Requirements

1. Any assumptions you make in analysis should be both explicitly stated to be assumptions, and reasonable from the prompt.

2. **Use paragraphs as appropriate, if you give nothing but bullet points then your solution is likely a summary, not a solution, and will not be worth much credit.**

3. Do not submit anything that you do not understand, or which you do not think actually works. Your explanation must convince the reader that you know and understand what is happening.

4. (new from M4) You must build on the information provided in K - do not contradict it. If you need additional information in K, please reach out to the instructor.

2 Problem (40 points)

1. [Acuña] Design an algorithm to identify and list the "peaks of interest" during a video. **Analyze** the problem, **design** an algorithm for finding the peaks, and **justify** the algorithm's design. [15 points]

   - A "peak of interest" is a point in a video that might be interesting to a viewer. If we identify it, then we would be a step closer to an algorithm for automatically building thumbnails.

   - **Assume that you have the intensity data (an array) for a video already available as an input to your algorithm.** A video of length S (in seconds) is represented by an array called *data* which has S indices. Each index stores the intensity of the content on screen (typically indicating high levels of motion or color contrast, the specifics aren't too important).

- The "interest" is a value from 0 to 100, with 100 being the most interesting and 0 being the least interesting.
- For example:
  - data=[0,0,0,0,0] would represent a video that is five seconds and contains nothing of interest. The algorithm would list nothing.
  - data=[0,50,100,50,0] would represent a video that is five seconds and contains one point of interest in the middle. The algorithm would list index 2.
  - data=[75,0,0,0,75] would represent a video that is five seconds and contains two points of interest on either side.The algorithm would list indices 0 and 4.
- Since K only contains PQ content, it is not applicable to this question.

2. [Acuña] Design an efficient algorithm to merge two priority queues. **Analyze** the problem, **design** an algorithm for merging the priority queues, and **justify** the algorithm's design. [25 points]

- Answer must use K!

3 Submission

The submission for this assignment has one part: a write up. The file should be attached to the homework submission link on Canvas. **The author of the submission must be listed on the first page.**

Writeup: Submit the ADJ answers in PDF format. Please name your file as "LastNameADJ2.pdf" where the last names are given in alphabetic order (e.g. "AcunaADJ2.pdf").