

# ADJ Problem Set 1

## 1 Warm up (16 points)

[Acuña] *You have been contracted to develop an algorithm that automatically generates thumbnails for YouTube videos. Your employer wants to reduce the time it takes to get videos onto the platform by having software that processes a video file, and then produces a thumbnail that captures the content of the video and encourages people to click the video. They definitely don't want just a random screen shot, they want something with multiple elements that are composed together, like a graphic artist would produce.*

Based on this scenario answer the following questions and perform the following tasks. This question represents the initial brainstorming and **analysis** of a problem as you begin to apply ADJ. This is a complicated problem, and our first step is get a sense of that complexity and how we need to start thinking with real-world problems. These questions are open-ended, and there are many possible answers. We grade on the usefulness and soundness of your answers, rather than looking for something specific. For some questions, there are specific techniques that are applicable and which you learn in future classes. Clearly, you don't need to use those advanced approaches. Use your current knowledge and answer to the best of your ability. This is actually ideal - complex work is done incrementally, it doesn't spring into existence.

1. Give three screenshots of thumbnails of different videos on YouTube with the same general topic. Feel free to pick any topic (e.g., "funny cat videos", "Japanese cooking"), perhaps a content area that you like and are knowledgeable about. Be sure to look for interesting, human designed, thumbnails! [1 point]
2. For each of the three thumbnails you have given in #1, answer the following: what aspects of the thumbnail encourages or discourages people from clicking it? [2 point]
3. This is outside of ADJ, but to make the following questions more interesting: what topic of videos will your algorithm process? It can be the same as the videos in #1, but please describe it. (Here we are being nice and letting you pick the type of work you have been contracted for... not realistic!) [1 point]
4. What should be the "elements" and theme of the thumbnail that you generate? (Give at least two elements.) [1 point]
5. The input to this proposed algorithm is underdefined ("video" doesn't mean much!). What might you assume the input contains? [1 point]
6. For each of the two elements you identified, how would you extract those elements automatically from the input in #5? General ideas! You don't know enough to do this in detail... yet. [2 point]
7. For each of the two elements you identified: what makes you certain that both your employer and potential watchers would find them engaging? [2 point]
8. How realistic would it be to actually construct a solution to this problem? Or is it impossible? (Try to envision solving this problem in a couple of years when you have your degree.) [2 point]
9. List at least three different google queries you would use to start learning more about how to solve this problem. (Realistically, you would need many more! Just give some solid examples here.) [1 point]
10. What questions would you ask your employer about this problem before proceeding with the contract? Give at least three. Consider parts of the problem that are ill-defined and/or open-ended. [2 point]
11. Lastly: do you think having this algorithm would actually help your employer with the goal they implicitly described? (Sometimes the consumer doesn't actually know what they want!) [1 point]

If in answering the above questions, you need to make assumptions, please indicate them. (Assumptions are also good material for #10 above!)

## 2 A First ADJ Problem

In this part, you will construct an ADJ-style solution to a simple problem. The goal is to practice your ability to soundly solve problems in an optimal way and communicate your ideas. When completing a solution, you will need to follow the rules below. They are intended to ensure clear and professional solutions.

### 2.1 ADJ Ruleset

#### 2.1.1 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.

#### 2.1.2 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.

### 2.2 The Problem (14 points)

[Acuña] *Consider designing a program where you need to store information about every student at ASU. You need to be able to quickly determine which undergraduate students have a GPA of at least 3.5 so that you can add them to the Dean’s list. Would you use an array or linked list? **Analyze** the problem, **design** a choice, and **justify** the choice. [15 points]*

Solutions to this problem typically run one to two pages, depending if your document is single or double spaced. And yes, those three lines are the entire problem. This does not mean you answer will be short, rather it means the opposite! Consider: this problem is very incomplete. Luckily, you are a student at ASU! You understand the domain very well and can fill in the blanks! A lot of analysis will be you writing down (in a sense, “formalizing”) things like students, semester, GPA, and the goal of the program. All these details need to be explained - do not assume that your reader knows it already. And also: part of the purpose of a proper analysis to be sure that all information is clear and there are no hidden assumptions that differ between readers. Minor hint: your design will literally be the words “array” or “linked list”... there should be no code! (Although: your should probably discuss how the data needs to be generally accessed in analysis.)

## 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 "LastNameADJ1.pdf" where the last names are given in alphabetic order (e.g. "AcunaADJ1.pdf").