

Final Project

Foundational Concepts of Computer Science (Summer 2021)

The final project involves you responding to three of the six items below. We recommend you outline responses to three or more of them, identify any questions you would like me to cover at the last meet-up (Wednesday, July 28th), and after the meet-up finalize and submit three responses by Friday, July 30 (by 11:59 PM – the end of the day).

We think one or two pages of 12 point single-spaced (with blank lines between paragraphs) is probably an appropriate length per response. You need not worry about citations and references—this is meant to be a communication of your understanding.

Plan to submit your responses in a single PDF document. Each response should start on a new page with your name and the item number at the top.

It may help you to think of this as developing instruction for your students rather than as an exam for this class. Our goal is that you be able to discuss such topics with your students.

Finally, please include the identification and explanation of any security, privacy, correctness, etc. issues that might reasonably arise in the situation presented.

1. Modern computers consist (mostly) of combinations of **and**, **or**, and **not gates** and represent *everything* using “bits” that we think of as zeros and ones (though they are actually different levels of electrical current). Indicate your understanding of this idea and its implications.

We suggest: Start by considering topics such as: a) what the bits represent and how many of each; b) limits arising from the structure of computers; c) implications of digital representation for accuracy of numerical calculation; d) some notion of how the basic logic gates can end up accomplishing tasks computers do; etc. Note, however, that better responses will go beyond just directly responding to the identified questions.

2. Develop an example of some relatively small computer task and use it to identify/explain activity in a computer at the level of the CPU and operating system.

We suggest: Start by identifying a task that mostly occurs in the CPU but has some element of input, output, or scheduling that triggers action by the operating system. Include in your discussion the involvement of appropriate components of the CPU, operating system, and hardware/software other than the CPU. Your example and your explanation of activity, as well as any additional general discussion will be considered when evaluating your response.

3. Develop an example of some internet process/task and use it to present your understanding of the operation of the Internet along with the identification and discussion of interesting (to you) elements of the structure and operation of the internet.

We suggest: Start by identifying a task involving Internet communication. Identify various steps and actors (clients, servers, routers, etc. in the communication and organize them according to the sequence in which they occur. Then prepare your discussion of the activity. Your example and your explanation of activity, as well as any additional general discussion will be considered when evaluating your response.

4. Recently, Capital One had a data breach in which data for over 100 million people was exposed. The perpetrator apparently was an ex-employee of Amazon Web Services, a cloud computing provider used by Capital One. Identify and discuss the concerns raised by this incident assuming only the information provided by the previous statement and your understanding of computer systems and data banks.

We suggest: Start by identifying possible concerns and reflecting on causes and effects of various actions. Consider the various actors/stakeholders and their responsibilities. Then select concerns for inclusion in your response, organize them, and flesh out the discussion.

5. Artificial intelligence is increasingly being used to make every day decisions. Select one of the following AI topics: perception, neural networks, and considering the consequences (topics in the text we labelled as important) that you think students (and adults) in our society should be able to discuss with some knowledge. Provide a discussion that communicates elements that should be known about the topic and communicates your understanding of the topic.

We suggest: Start by picking a topic. Identify important elements of the topic and what is needed to understand them. You may also wish to identify an example to help organize your discussion.

6. Identify an example of a societal or security or privacy issue that you believe would be useful for students (and adults) in our society to be able to discuss with some knowledge. Discuss the issue being sure to identify the major considerations that need to be addressed when examining the issue.

We suggest: Start by picking an appropriate issue with which you are familiar and set the context for it—not too broad or too narrow. Identify the considerations indicating in your discussion the possible conditions and their impact. Discuss potential positions on the issue with brief explanations of the support for each.