Montana State University Computer Science Department

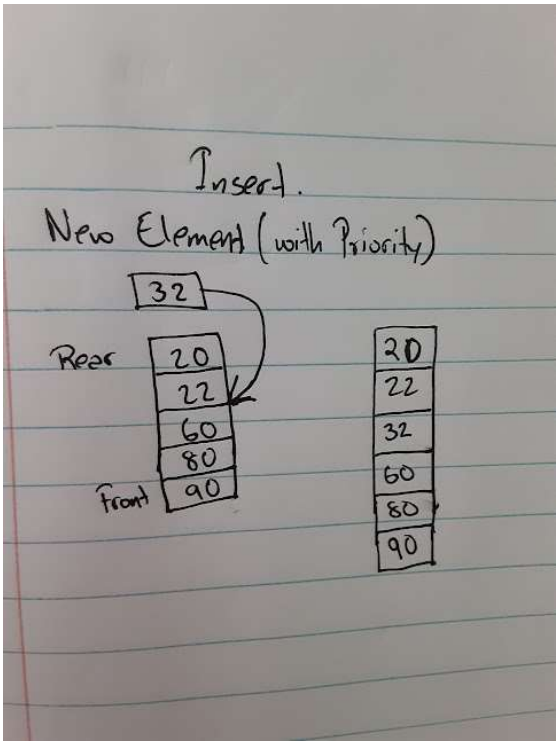
Graduating Senior Exam

Fall Semester 2021

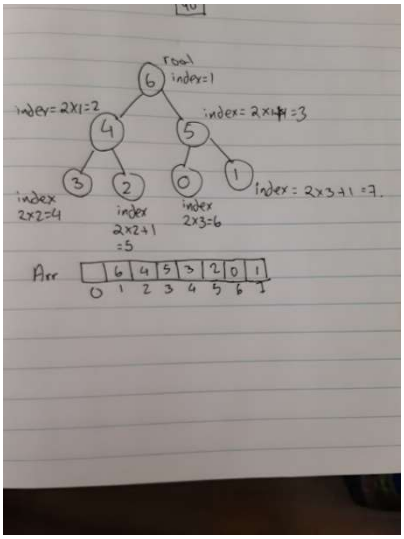
Rania Ehsan

1a: For this particular scenario I would suggest using Priority Queue. The reason for this is because with priority queues first it has to check if the queue is empty or not. If the queue is empty then an element is added to the queue with an associated priority. It then pulls the element with the highest priority and then returns it.

1b:



1c: Another way to do this is by implementing heaps. A heap is a tree-based data structure, and all the nodes of the tree are in a specific order. So, the nodes can be arranges based on how urgent it is.



In the above diagram we can see that the value of a parent node is greater or equal to the value of child node in the tree. The node with the highest value is the root node of the tree.

2: Language: Java

```
Public int countCharacter(String s, char c)

{

Int count = 0;

For(int j=o; j<s.length(); i++)

{

If(s.charAt(j)==c)

Count++;

}

Return count;

}
```

3: Best case scenario: O(k)

If n is ascending order and all elements on k is less than all elements of n with k in descending order them elements of k will be added to the beginning of the list n making on the order of k operations.

Worst case scenario: O(nk)

If n and k are in ascending order with all elements of k>n then for each element in k one must iterate through n and previous elements of k.

4:

Organization	Main Activities	Hours Spent
Bozeman Mosque	My first two years at MSU I used to voluntarily clean the mosque and have it ready for patrons to come and pray in comfort whenever. I used to also keep the fridge and pantry at the mosque stocked since one of the biggest purposes of the mosque is that if someone were to come in hungry that they would find at least some form of nourishment there.	20 hours per week
Drag Shows at MSU	Since coming to MSU I have attended at least one drag show every year. During that time, I used to help out a lot of performers on the day of their performance with their hair and make-up.	~45 hours in total.
Family Style Meals	Since having my own apartment from the summer of 2017, I have been hosting family style dinners during special events like Thanksgiving, Eid, Christmas etc. During these I opened up my own home to anyone who wanted a warm meal to come join me and enjoy a warm meal. I made public announcements on my social media letting people know that I was arranging such a thing so that anyone in need of a warm meal could come join my fiancé and I.	~120 hours

5a: Over the last several years algorithms have replaced decision making in various levels of a lot of businesses. Algorithmic bias is when there is discrimination because of these algorithms. One of the most notorious examples that comes to mind is the incident where Amazon drivers and warehouse employees got fired right before Christmas because an algorithm determined that those employees were doing sub-par work.

5b: Lets consider the ways that an algorithm can determine admission status and scholarship eligibility of students. The way that students apply for colleges are determined on SAT/ACT scores, their college essay, high school transcript, and IELTS and TOEFL exams for international students. The algorithm can easily determine quantitively based on scores which students are more deserving of scholarships or getting accepted to the college. What the algorithm will not take into factor is that a lot of times lower scores on any of the above-mentioned tests and high school transcript relies on other factors like socio-economic backgrounds. A student is more likely to have higher score if they come from families who are of higher socio-economic backgrounds, given that while they were in school or giving these tests they probably didn't have to worry about where their next meal is going to come from or how they were going to pay any fees at all. Some of these students may even have to work part-time to help their own families pay bills. These are factors that an algorithm in my opinion won't entirely be able to pick up. A college essay is a great tool for these students to explain their situation. If a human oversees the college essay part of it and the final decision, then students from lower-socio economic groups will have a fairer chance at getting college admission or be able to qualify for scholarships. When it comes to algorithms making these decisions, the quantitative parts of it (that being high school GPA, test scores) would have higher priority than the essay where the students get a chance to explain themselves.

6: Chosen side to win: Oracle

First possible impact: Oracle is the company that paid their employees and gave recognition to their employees for this code. If Oracle wins it is a win for individual engineers who wrote that code too. They put in their hard work to accomplish that task and Google just taking someone else's hard work. If Oracle wins the first impact is that individual engineers who work hard will experience the appreciation that they deserve. This is a great morale boost for anyone who is within this industry and it would encourage all engineers to want to come up with ideas that that advances us technologically.

Second possible impact: These 11,500 lines of code didn't happen for free. Oracle had to spend good money for that quality code to be written. Should Google get away with this, makes it look like anyone can con their way through this industry. Oracle winning is indication that hard work is recognized.

Third possible impact: If google is to win in this scenario that means that the industry will start heading towards a future where there will be a huge lack in originality. If new ideas stop coming, then the industry will become stagnant and ultimately at a certain point won't be as profitable as it is now.

7: First type of harm: An autonomous self-driven car has the potential to check its status. One of the first things that come to mind is, it could order parts for itself if it detects that a certain part is needed. The owner of the vehicle may not get a chance to make the decision of if they are in a financially stable enough state to make this purchase at that time. The first harm that I can think of is financial in this scenario.

Second type of harm: A lot of people have car hobbies. That being, they themselves like to see the cars environment and determine for themselves what parts need a little polishing or changing. An autonomous system would eliminate the option for the user to have that kind of creative control over their own vehicle.

Third type of harm: In the case of an extreme accident, let's say the car rolls off a cliff in the middle of nowhere. The car would at that point be using up whatever power source it has to diagnose what is wrong with it at that point. That kind of resources should be saved as much as possible during that time to keep the survivors of the accident alive till help arrives.

8: I have applied to so many companies that at this point I have lost track of trying to race all my peers for a high paying job. A list of some of the companies that I have interviewed for are Raytheon, Club Wealth, Wells Fargo, Amazon, Niksun and Pet Smart. My one-year plan following graduation is unconventional but one that I know is necessary for my long-term wellness. My one-year plan following graduation is to take care of myself; physically, mentally, and emotionally. The entire time that I have been at MSU I have been working full time and going to school full time for the most part. I feel like if I don't take things slow and easy I will burn out very fast as soon as I join the industry. So the first year right out of MSU I will prioritize my mental health and I will embark on a journey to find inner peace. I will keep applying for jobs, but I will not let that be the only thing that defines me. While at MSU I have had to neglect my personal relationships too, my one-year plan also includes fixing those relationships as well.

9:

Organization Name	Hours Spent
Bangladeshi Student Association	~200 hours (playing soccer)

10:

Activity Description	Hours Spent(Estimated)
EGEN 310. It is a class where I had to work with students from different engineering backgrounds to design and make a remoter control car with my group members.	~80 hours

11: The most sophisticated version control system I use is Git.

Non-trivial feature 1: When I push my code, Git shows how many changes I have made since the last push. This helps me keep track of my progress a little better.

Non-trivial feature 2: When pushing new code, Git asks that I add a message to it. For those messages I sometimes write where I ran into a roadblock with regard to the code that I wrote. So when I go back to it I get a reminder of where I struggled in the past and how I can make that better for myself.

Non-trivial feature 3: When working in groups, Git also helps to keep track of what my group members are doing. That way I can be aware of where exactly my team members are at and it helps me organize better mentally on being able to set my own personally deadlines.

12:

Activity Description	Hours Spent
Teaching myself to use Virtual Machine	~100
Teaching myself to use C++	~100