“How might your work on this project contribute to unintentional harm?”

As society becomes increasingly dependent on technology [1], it is important to consider the effects of this technology both on society as a whole and on an individual level. I am currently working on a system where University of Edinburgh students can place lunch orders to be delivered by drone during their lunch break. In this essay I will discuss the ways my work on this project could contribute to unintentional harm, and how these harms can be properly mitigated or prevented.

In the system, details of orders placed by students will be stored in a database. At the beginning of each lunchtime, the drone will receive information on these orders, then collect and deliver each order to and from preset locations near the university campus. Since the drone is autonomous, it will follow a route which is calculated at the beginning of its operation time and will not be piloted by a human. The movement of the drone has been restricted to a small “drone confinement area” near the university campus.

Unfortunately, some parties have already expressed concerns over the project and have requested that certain buildings on the university campus are designated as no-fly zones. One likely reason for this would be that employees who work in these buildings are worried that the drone delivery system could result in collisions. This is an understandable concern: hot drinks or drones with sharp blades falling from the sky would certainly be a safety risk, and it is our responsibility to minimise the likelihood of this happening. As a programmer tasked with implementing the movement of the drone, it is my responsibility to properly program and test the drone so that it does not breach these no-fly zones. Although I will not personally play a part in designing the hardware of the drone, Majd et al. believe that their drone technology “is able to manage challenging routing conditions, and guarantees safety while introducing only a small overhead to achieve it” [2]. I should ensure that my colleagues developing the hardware use a similarly safe drone in order to execute the instructions given by my algorithm with minimal risk of causing unintentional harm to members of the public or nearby structures.

Another obstacle to the success of the project is that the drone which will be used for deliveries has a limited battery power and consequently, has a limited time during which it can make deliveries before it must be recharged. Since it may not be possible for a drone to deliver all the orders it receives, I have been instructed to implement an algorithm which prioritises deliveries that will maximise profit. The algorithm that I design and implement will therefore negatively impact certain users who may miss out on lunch if deliveries are in-demand. In the 2020/21 academic year, 13% of University of Edinburgh students had declared a disability, ranging from mental health issues, to Autistic Spectrum Disorder, to visual or mobility impairment [3]. I would suggest that these users would be more reliant on the system due to difficulties interacting with shop staff or physically accessing shops, and that we as the developers have a responsibility to

these more vulnerable and dependent users. While user disabilities are not information that I have access to, and my current instructions are to maximise profits, ensuring these vulnerable users are not negatively affected by our system is a factor I would like to take into consideration before deployment. I would do this by speaking to my management, and to the university's Student Disability Service, and pending the results of these discussions, I could modify my program to guarantee that users registered with the Student Disability Service would have their orders prioritised.

One of the features of the system that I have been involved in implementing is the interaction of external systems. The software I am creating must be able to connect to a website which stores the locations of the no-fly zones and shops; retrieve order details from a database, and finally, export details of successful deliveries and drone movements to a database server each day. As a result, the system must be able to connect to the internet, however this will leave it vulnerable to security issues. If a hacker gained access to this system, they may be able to access student details stored on the website and use these for malicious purposes such as identity theft. Under Section 40 of the UK Data Protection Act 2018 (DPA), personal data must be "processed in a manner that ensures appropriate security of the personal data, using appropriate technical or organisational measures" [4]. Furthermore, we also have a responsibility to members of the public that the drone is protected from hackers since everyone in the area would be affected if hackers were able to gain control over the drone and use it for surveillance or deliberately crash it. Security is not in the scope of the instructions I have been given, however since it is a legal requirement for our system, either I or somebody else in the project should ensure that any sensitive data stored by the system is encrypted and kept secure using up-to-date anti-virus software and firewalls. In addition to this, we must not allow any third parties access to user data without explicitly informing users as this would be a breach of Section 36 of DPA. [5]

To conclude, there are a number of scenarios in which my work on this project could contribute to unintentional harm and I, along with my colleagues on the project, are responsible for considering these. However, I believe that I have provided viable solutions to minimise the risk of these events occurring, or to minimise harm if they do occur, in order for the project to have no negative influences on the users of the system or those around them.

References

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