Hello Calum, I have left specific comments on your TMA below, all of which are highlighted in green. I have also left overall comments and feedback on your PT3 form.

**Question 1.a)**

1. The uncanny valley effect is when a person will question themselves if they believe a robot is an actual person or close enough to an actual human being. This leads to an uncomfortable feeling from the person, for them to feel the uncanny effect the robot has to at least look 65% like a human to activate this weird effect.

3 marks

1. Eventually yes but not for at least five years. I do believe they will be able to blend into society and no one would be able to know that they were a robot. I can also see this causing worldwide suspicion as countries will think they’re being spied and listened on. So, it will spiral out of control later on in the years.

3 marks

**Question 1.b)**

The point it becomes a “mobile autonomous intelligent robot” is when it's able to fully act on its own without the homeowner ever having to interact with it. If they do at all interact with it then no, I don’t think it is, but it’s still close to being one. “Autonomous,” meaning that it acts on its own doesn’t fully apply to it because at certain points the homeowner will have to change a setting or turn it off. “Intelligent,” means that it's smart, which it very much is. The fact that it can read the temperature and be able to adjust it accordingly is very impressive. The extent to which I think it’s a “mobile autonomous intelligent robot” is when no input is required.

6 marks

**Question 1.c)**

1. Semi-autonomous operation means that tiny amounts of human input is required, and the machine does mostly all work on its own. Supervised autonomous operation means that humans are made to look after the robots and partially control them or give them set tasks. Finally autonomous operation means that the robot in question is allowed to control itself without any parenting from humans and it can run on its own accord.

3 marks

1. It has to be supervised or semi, definitely not autonomous else a war would start and go beyond our control, like something out of terminator. In terms of not ending the world, supervised I think would be the most ethical because at least if something got out of hand then we as humans can step in and take over. There’s good and bad to it, a bad way is that if it were fully autonomous then say a countries own airship was hacked and it was then recognised as an enemy airship then things would seriously escalate and cause a rise in tensions between countries. Whereas if it were supervised then we could tell that it was hacked and take control of the defensive weapons ourselves.

5 marks

Good work for Q1

**Question 2.a)**

1. One difference is that deontology looks at the way something will be conducted and then judges whether it's good or not, and for consequentialists this debates whether something is good or not until after it has happened.

2 marks

1. One way it could be problematic is the size difference in California compared to Wales, the vehicles will be suited for finding the quickest possible route from locations on opposite ends of the state. So, if these vehicles were to travel through Wales on the quickest route, then every car would meet in the centre as it recognises that it is the fastest route, causing traffic jams. California is massive compared to Wales with many long and dead roads, whereas Wales isn't exceptionally large.

3 marks

1. If the company wishes to record all data with the drivers agreeing to it then that's fine, no problems there. However, say the buyer of the car quickly skimmed past these pages and didn't realise what they were doing, then they would be upset at that, even though it's their fault. For safety reasons this is really good because if the driver were to be in an accident or something that's bad and be falsely accused then the recorded data could help them in court to prove their innocence. So, yes, I do believe it's ethical as long as the buyer of the car knows full well that their data is being recorded and monitored.

5 marks

**Question 2.b)**

1. The only way in which they can maximise their pay-off is if they also choose to cooperate along with Sam. Leading to the fairest pay-off of six each.
2. Sam could compete with them, and MoTo also competes, therefore leading to Sam scoring 3 and MoTo scoring 1 which benefits Sam more whilst also minimising the pay-off for MoTo.
3. If MoTo always cooperates then they receive the maximum pay-off that's equal on both parties, anything other than cooperating results in them getting less. So, either Sam competes, and they have a score of 2 or Sam cooperates, and they both have a score of 6.
4. One reason a structured search is better than a brute force search is that it doesn't take as long, because in a brute force search the outcome will be revealed but it may not happen for a long time as it calculates every singles route possible, and the best route may be one of the last searches. Therefore, structured search is more time efficient.

Good - 8 marks

**Question 3.a.i)**

1. %%sim\_magic\_preloaded --background Coloured\_bands -R
2. # Program to count the bands aloud
3. # Start the robot moving
4. tank\_drive.on(SpeedPercent(50), SpeedPercent(50))
5. # Initial count value
6. count = 0
7. # Initial sensor reading
8. previous\_value = colorLeft.reflected\_light\_intensity\_pc
9. # Create a loop
10. while True:
11. # Check current sensor reading
12. current\_value = colorLeft.reflected\_light\_intensity\_pc
13. # Test when the robot has entered a band
14. if previous\_value==100 and current\_value < 100:
15. # When on a new band:
16. # - increase the count
17. count = count + 1
18. # - display the count in the output window
19. print(count)
20. # - say the count aloud
21. say(str(count))
22. # Update previous sensor reading
23. previous\_value = current\_value
24. # Stopping condition on black line
25. sample = colorRight.rgb
26. if (sample[0]==0 and sample[1]==0 and sample[2]==0):
27. A picture containing text

    Description automatically generatedbreak

Graphical user interface, application

Description automatically generatedExcellent – 10 marks

**Question 3.a)**

1. When I change the background to the “Rainbow\_bands” the code runs the same way where the robot will start then stop on the black band. However, the counting of the bands is slightly broken, it will only count red, blue, and black. Leaving out the other colours in between. This is due to there not being any white bands to separate the colours therefore the counting stops working correctly. So, to fix this issue in the code I’d need to remove the part where it registers the white background so that it correctly counts the colours next to each other colour.

6 marks

1. With Python the general script of code is simplified in comparison to others such as JavaScript. As the code is easier to understand and write this makes it a great option for beginners to use. Me for example, I was a complete beginner with python and as I learned what it takes to write correct code, it wasn’t hard or confusing. So, when writing longer lines of code, it can be done quicker and with less code.

A function used to write ‘Hello World’ is:

* 1. def sayHelloWorld():
  2. print ('Hello World’)
  4. sayHelloWorld()

2 marks

**Graphical user interface, text, application

Description automatically generatedQuestion 3.b)**

From the screenshot of the robot’s movement, we can see that it creates the desired pattern shape, with one continuous loop from start to finish. The loop is closed.

1. %%sim\_magic\_preloaded -x 1300 -y 700 -b Empty\_Map -a 0 -p -C
2. # This turns the robot to the left in a circular path.
3. TIME\_IN\_S = 3.331
4. LEFT\_MOTOR\_SPEED\_PC = 0
5. RIGHT\_MOTOR\_SPEED\_PC = 50.1
6. tank\_drive.on\_for\_seconds(SpeedPercent(LEFT\_MOTOR\_SPEED\_PC), SpeedPercent(RIGHT\_MOTOR\_SPEED\_PC), TIME\_IN\_S)
7. # This makes the robot move in a straight direction.
8. TIME\_IN\_S = 1.5
9. LEFT\_MOTOR\_SPEED\_PC = 50
10. RIGHT\_MOTOR\_SPEED\_PC = 50
11. tank\_drive.on\_for\_seconds(SpeedPercent(LEFT\_MOTOR\_SPEED\_PC), SpeedPercent(RIGHT\_MOTOR\_SPEED\_PC), TIME\_IN\_S)
12. # This turns the robot to the left in a circular path.
13. TIME\_IN\_S = 3.331
14. LEFT\_MOTOR\_SPEED\_PC = 0
15. RIGHT\_MOTOR\_SPEED\_PC = 50.1
16. tank\_drive.on\_for\_seconds(SpeedPercent(LEFT\_MOTOR\_SPEED\_PC), SpeedPercent(RIGHT\_MOTOR\_SPEED\_PC), TIME\_IN\_S)
17. # This makes the robot move in a straight direction.
18. TIME\_IN\_S = 1.5
19. LEFT\_MOTOR\_SPEED\_PC = 50
20. RIGHT\_MOTOR\_SPEED\_PC = 50
21. tank\_drive.on\_for\_seconds(SpeedPercent(LEFT\_MOTOR\_SPEED\_PC), SpeedPercent(RIGHT\_MOTOR\_SPEED\_PC), TIME\_IN\_S)
22. # This turns the robot to the left in a circular path.
23. TIME\_IN\_S = 3.331
24. LEFT\_MOTOR\_SPEED\_PC = 0
25. RIGHT\_MOTOR\_SPEED\_PC = 50.1
26. tank\_drive.on\_for\_seconds(SpeedPercent(LEFT\_MOTOR\_SPEED\_PC), SpeedPercent(RIGHT\_MOTOR\_SPEED\_PC), TIME\_IN\_S)
27. # This makes the robot move in a straight direction.
28. TIME\_IN\_S = 1.5
29. LEFT\_MOTOR\_SPEED\_PC = 50
30. RIGHT\_MOTOR\_SPEED\_PC = 50
31. tank\_drive.on\_for\_seconds(SpeedPercent(LEFT\_MOTOR\_SPEED\_PC), SpeedPercent(RIGHT\_MOTOR\_SPEED\_PC), TIME\_IN\_S)
32. # This turns the robot to the left in a circular path.
33. TIME\_IN\_S = 3.331
34. LEFT\_MOTOR\_SPEED\_PC = 0
35. RIGHT\_MOTOR\_SPEED\_PC = 50.1
36. tank\_drive.on\_for\_seconds(SpeedPercent(LEFT\_MOTOR\_SPEED\_PC), SpeedPercent(RIGHT\_MOTOR\_SPEED\_PC), TIME\_IN\_S)
37. # This makes the robot move in a straight direction and connects to the starting line.
38. TIME\_IN\_S = 1.77
39. LEFT\_MOTOR\_SPEED\_PC = 50
40. RIGHT\_MOTOR\_SPEED\_PC = 50.45
41. tank\_drive.on\_for\_seconds(SpeedPercent(LEFT\_MOTOR\_SPEED\_PC), SpeedPercent(RIGHT\_MOTOR\_SPEED\_PC), TIME\_IN\_S)

Text

Description automatically generated

This is a very good attempt, however you could have made better use of loops to make your program more efficient.

5 marks

**Question 4**

One agricultural robot is Harvest Croo, which specialises in harvesting and packaging of specialty crops. A second agricultural robot is Seeding Drones, this specialises in planting various seeds across a field or specific area. A third agricultural robot is Dino, this robot specialises in hoeing and weeding tasks.

For Harvest Croo, one element for this robot is the level of autonomy, because it has 360-degree cameras, this allows it to be fully autonomous so that it can move on its own. A second and third element of the robot is the sensors and the level of intelligence, when checking and picking for berries the machine uses sensors to check if the fruit is ripe enough to be picked. This shows that the robot is highly intelligent and can read a fruit's level of ripeness from a sensor.

For Seeding Drones, one element is the sensors used, it uses a series of photos to create a model of the landscape. By doing this it calculates the number of drones that might be needed to plant the seeds. A second element is the intelligence of the robot, once the robot has collected the information on the landscape, then by itself it creates “a seeding plan.” The drone creates a movement to go along where it will plant the seeds in the best location. A third element is the level of autonomy, once the seeds are in the drones it’s fully autonomous. It doesn’t require any interactions with humans whilst out doing their jobs.

For Dino, one element is the level of autonomy. Dino is a fully autonomous robot that can check the levels of water in crops and remove the surrounding weeds, whilst following a path that it constantly tracks on its own. A second element is the sensors used on the robot, it’s “equipped with computer vision” meaning that it can know what the crops are and how to collect them. A third element is how it’s powered. Dino uses an electric battery that can be charged when it’s not in use, “it can operate for eight hours without stopping” showing that it can complete huge tasks across large distances on only one charge which is very impressive.

One social impact is that it could result in the loss of jobs across various areas in farming, as the robots can perform more efficiently and faster, humans just aren’t needed. So, this impacts how people live and survive. A good impact on the environment and also helping socially is that it can help with dry seasons in farming. The robots can sense when a dry season is approaching and so the farmers will be notified. Therefore, helping them to prepare and collect water supplies.

Over the next three years more jobs will be lost, and the farming industry will be close to completely automated. It will help rinse the atmosphere of carbon dioxide that would’ve be produced from manual farming.

Excellent work. You easily identify technologies as well as their use. You provide good references below, but there are no citations in your text.

24 marks

Links:

Harvest Croo. Available at: <https://www.harvestcroorobotics.com/technology> (Accessed 14/03/2022)

Automate. Available at: <https://www.automate.org/blogs/robotics-in-agriculture-types-and-applications#:~:text=Agricultural%20Robot%20Applications&text=Harvesting%20and%20picking,Phenotyping> (Accessed 14/03/2022)

Richard Van Hooijdonk. Available at: <https://blog.richardvanhooijdonk.com/en/top-10-agricultural-robots-that-automate-the-business-of-growing-food/> (Accessed 14/03/2022)

Wired. Available at: <https://www.wired.com/brandlab/2015/07/re-planting-forest-one-drone-time/> (Accessed 14/03/2022)

Clover Coex Tech. Available at: <https://clover.coex.tech/en/seeding_drone.html> (Accessed 14/03/2022)

Pinduoduo Available at: [https://stories.pinduoduo-global.com/agritech-hub/robots-in-  
agriculture-and-farming](https://stories.pinduoduo-global.com/agritech-hub/robots-in-agriculture-and-farming) (Accessed 14/03/2022)

Worldsupporter. Available at: <https://www.worldsupporter.org/en/blog/66292-how-automation-helps-fight-climate-change-and-protect-environment> (Accessed 14/03/2022)

Research Mgt. Available at: <https://researchmgt.monash.edu/ws/portalfiles/portal/342553024/324307954_oa.pdf> (Accessed 14/03/2022)

**Question 5.a)**

**Evidence for e-Portfolio Week 2, Activity 1.3.1**

Graphical user interface, application, Word

Description automatically generated

LEFT\_MOTOR\_SPEED\_PC = 0  
RIGHT\_MOTOR\_SPEED\_PC = 50

I changed the numbers to make the robot spin around in a circular path, by increasing the speed the robot will create the same circle but start to overlap the original. Decreasing the speed makes an incomplete circle. If the zero speed is changed to a higher number, then this creates a circle of a larger diameter.

**Evidence for e-Portfolio week 7, Activity 4.4**

Part A: Since the autonomous vehicle is the main cause of the crash or accident then it’s either the vehicles code malfunctioning or that the producers of the vehicles didn’t conduct proper tests on the vehicles intended purpose. The responsible party is the manufactures and people who code the script of the cars, clearly if something went wrong then it inevitably falls on them and their ability to create a fully functioning autonomous vehicle. As well whoever assesses the vehicles haven’t done their job correctly on pushing the vehicle to the limits.

Part B: The only viable way to make them ethical is to reduce the number of accidents by 100%. Only after this achieved this and no harm is brought on humans then yes, they can become ethical. I think that in ten years this can be achieved as our coding abilities will fully understand how to create an ethical autonomous vehicle, but until then no.

**Question 5.b)**

An aspect of the e-Portfolios that was interesting was in the first activity where you can get to code a robots movement, this was pretty fun to play about with and experiment with different speeds. I also took interest in the wordier questions where I get to think about the behaviour and level of autonomous vehicles because in the next decade robots will be even more intelligent than today, hopefully in safe way. Thankfully there wasn’t really any major challenges or problems that stopped me, it was more to do with remembering certain bits of code and making sure it all works correctly. Before doing this module, I had no past experience on Python so by completing this I now have a better understanding of coding and how the code controls robots. Across this module as a whole, I learned important skills ranging from coding AI movements to understanding various levels of autonomous machinery.

Good work

10 marks