**University of Kent**

**May/June 2020**

# **Examination Answer Document**

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| Exam Paper Release Date and Time | * 16.05.2020 * 12:00 British Summer Time (BST) |
| Exam Paper Submission Date and Time | * 17.05.2020 * 17:35 British Summer Time (BST) |

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| Question Number: | 1 |

1A) Provide three examples of intellectual property rights, and their respective area of application.

One example of an intellectual property right is a **patent**. Patents are used to protect new/inventive ideas and processes. A patent is a government licence/authority that are used to give the owner of the patent the legal right to stop others from making, selling, importing and using the invention for a set number of time. For something to be patented it must satisfy one of the three criteria: it must be new, it must be unlike things done before or have a practical application. The area of applications for patents is products/processes that have a functional or technical effect. An example of something that can be patented could be a shirt for pregnant women with special cut-outs to allow breast-feeding whilst retaining heat.

Another example of an intellectual property right is **copyright**. Copyrighting refers to the process of granting the exclusive legal right to publish, print, perform, film, or record literary, artistic, or musical material. The area of application for copyrighting is artistic or literary works. An example of something that could be copyrighted is a new song recorded by a music artist.

Finally, another example of intellectual property rights is **trademarks**. Trademarking refers to protecting words, images, phrases, sounds, smells, symbols, etc. that identify or distinguish goods, brands and services. An example of a trademark would be Nike’s “Just do it” slogan or the Nike “swish” logo.

1B) Let’s assume that while working on your final year group project, your group came up with an excellent algorithm for identifying fake news on social networks. After the enlightenment, one of the group members suggests that they should seek support from the University's Kent Innovation and Enterprise (KIE) for patenting the algorithm. Describe what would be your reaction towards this idea of applying for a patent for an algorithm? Justify your answer by providing some solutions that could allow the patenting of the software.

My reaction towards having our algorithm patented would be that it is not possible. I would argue that because algorithms are an abstract idea that it wouldn’t be possible to acquire a patent. I would suggest that if the algorithm has a specific application and purpose in the software, which it sounds like it does, then we could apply for a patent on the software as a whole. I would also argue that our software solves a specific technical problem (fake news on social networks, which is a huge issue that is only growing) which we would be able to discuss in detail which could qualify us for a patent on the software. It is difficult to prove that software qualifies as an invention and not an abstract idea but this would be the course of action I would suggest as it would be impossible to patent just our algorithm.

1C) In your future professional career, do you envisage yourself suggesting to apply for a trade secret in order to protect software? Justify your answer by explaining what you understand by a trade secret.

A trade secret is information you/your company has that others do not that provides an advantage. I would **never** envision myself applying for a trade secret for protecting software or suggesting an application for a trade secret in any capacity as trade secrets are never applied for. Instead reasonable measures are taken to keep the software secret, such as having employees sign NDAs (non-disclosure agreements), keeping the software away from the public eye, etc.

1D)

Again, let’s assume that while working on your final year group project, your group came up with an excellent algorithm for identifying fake news on social networks. After much discussion and guidance your group decided that they would like to encourage commercial adoption of your code. Which open source licence would you suggest to your group? Justify your answer by providing the key characteristics of the licence that you would suggest.

There are many open source licences available and many of them are very similar with only slight differences. For our group, I would suggest choosing the Apache licence to encourage commercial adoption of our code. The Apache licence is similar to the BSD licence in that redistribution is allowed and using the code is allowed as long as there is a warranty disclaimer present and if any changes have been made to the code the source version must be freely accessible and available from their network server. The main difference between the Apache licence and the BSD licence is the Apache licence features a patent retaliation clause. This means that it is explicit that when using the software a licence is granted to use the patents required for the software, rather than implicitly with some of the other licences. This would be important for commercial adoption of our code as it would protect us from being sued for patent infringement as we could revoke the licence and sue them back. This patent retaliation clause also means that smaller companies/entities would be able to adopt our code for their use as they wouldn’t need to apply for these patent licences which can be expensive or worry about not having the correct patents as the licences would be granted automatically. This would allow a larger market for our code to be commercially adopted.

1E) What is the circular effect of the UK common law? In your answer provide an example of key court case related to Computer Misuse Act, and briefly discuss its effect.

UK common law refers to the system where a judge determines the outcome of a case based on the legal precedence of prior cases, common sense, new circumstances and analysing the facts. The circular effect of UK common law refers to the process of establishing similarities between current and prior cases, identifying key laws in the first case and applying these laws to the second case.

The 1990 Computer Misuse Act can be defined in 3 different categories: 1) Unauthorised access to computer material, 2) Unauthorised access to computer material with intent to commit further offences and 3) Unauthorised modification of computer material.

A key case related to the computer misuse act was R v Gold & Schifreen. This case involved Gold & Schifreen gaining access to sensitive data by observing the log-in information for a sensitive Prestel account. This let the pair access highly sensitive information and would have allowed them to launch nukes if the primary military computers were down. They were initially convicted under the Forgery and Counterfeiting act of 1981 but this was overturned. This case led to the lack of laws surrounding computer misuse and hacking to be highlighted, which led to the introduction of the 1990 Computer Misuse Act. I chose this case as a key court case that relates to the CMA (Computer Misuse Act) as it was the case that led to the inception of the law.

1F) Agile development creates new challenges in identifying and protecting intellectual property in software compared to other more traditional software development processes, like the waterfall. Identify five techniques that can be used for identifying and protecting intellectual property while using an agile development process.

There are a number of techniques that can be used for identifying and protecting intellectual property when using an agile development process:

* Identifying IP: Submit a provisional patent application allowing time for a patent to be filed whilst the sprints continue.
* Protecting IP: Have an NDA in place with a feedback clause that allows any feedback the client produces to be used in the product whilst protecting the IP.
* Identifying IP: Any code written must include a clear label of who wrote/contributed to its creation
* Protecting IP: Have a personal agreement with any contractors forbidding any work being taken away once the contract expires.
* Protecting IP: Marking files with copyright notices to explicitly show that the files contain company intellectual property.

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| Question Number: | 2 |

2A)

Discuss the arguments for and against the following claim: “Computer ethics is a unique area and new ethical principles should be developed for computing applications”

Computer ethics are the moral standards that govern the use of computers as well as societies views about the use of the software, hardware, etc. It is a rapidly developing area of ethics and is undeniably a hotly debated area of ethics. Whether new ethical principles needs to be developed for computer ethics is a widely discussed topic.

There is a plethora of new technology that has been introduced in the last two decades has led to new human actions that were not economically viable or possible before now, e.g. someone can write a computer virus that harvests personal data or that crashes systems. It can be argued that that new ethical principles are needed to deal with these new issues. However, descriptive ethics which focuses on what people think is right and wrong could be used to evaluate these new actions made available by computers. This could mean that new ethical principles would not be needed as the existing principles could be used in conjunction to encapsulate computer behaviour and user actions.

An argument can be made that the existing ethical principles are either too broad (meta-ethics, normative ethics, etc.) or too specific (medical ethics, business ethics, etc.) to be applied to the very distinct nature of computer ethics. This would support the argument that new ethical principles should be developed for these computing applications. Although, this could be countered by arguing that if there are specific guidelines and codes in medical and business ethics then there should be an equally robust set of principles for computer ethics without having to create an entirely new set of ethical principles.

It could be argued that even with the new technology available there is still nothing new under the sun. Even with this new tech, the basic ethical issues remain the same, there are still privacy issues, there are still freedom of speech issues, etc. The age of computers has increased the efficiency of the user but the basic tasks and issues remain the same, meaning new ethical principles need not be developed. Just because we live in a cyber-age where privacy is a huge concern and the right to privacy needs to be re-evaluated, doesn’t mean that the right to privacy and the right to control information about oneself hasn’t always been a huge concern in society. This can be applied to all ethical issues in society, even though computers can heighten these problems or Furthermore, if you evaluate computer ethics under the descriptive-ethics principle which seeks to understand what people think is right or wrong then the complex computer ethical problems can be broken down to a societies moral beliefs on the issues.

One of the main arguments for new ethical principles for computing is AI. As AI develops and potentially becomes sentient and capable of free-thought then the less our current ethical principles and ideologies will apply. We would need new branches of computer ethical principles to help understand and protect both the AI and ourselves.

The general public know very little about how computers work and how computers ‘make’ the decisions they do. This public incomprehension would grant credence to the argument of implementing new ethical principles. If there is little knowledge of how computers function and how computer users complete the tasks they do then surely some ethical guidelines and principles to regulate this ‘unknown’ world would be a beneficial thing. However, there are thousands and thousands of jobs, techniques, etc. that the public know very little about that do not have their own set of unique ethical principles.

It could be suggested that many existing ethical and moral guidelines can be applied to computing applications. The majority of computers are operated by a human or overseen at a broad level by a human. This would imply current ethics should and could be extended to the person using said computers. Normative ethics, which is the study of the questions that arise when considering how someone ought to act, could be relevant. It wouldn’t be unfounded to suggest that how a person acts should not change when they’re using a computer. However, a user could have their moral beliefs and virtues changed when exposed to certain areas of the internet. This can be evident when looking at internet communities that perpetuate damaging ideologies in a vacuum, creating an almost cult-like effect. An example of this is the ‘red pill’ misogynistic ideology that rose to infamy on reddit. These communities would imply that there is a need for a new branch of ethical principles because the existing moral and ethical considerations do little to help these damaged individuals when they are subjected to like-minded individuals on the internet.

In conclusion, computer ethics and ethical principles is a widely debated subject. There are some who believe that there are no new ethical issues and considerations that can appear as the principles we have in place are a catch-all approach. There are others however who believe that as computers develop further that we need to have a focused area of ethics as our technology further develops.

2B)

What would you ask your potential employer to understand the legal, privacy, and ethical implications of the application? Discuss extensively by making references to applicable data protection regulations and code of ethics whenever relevant

When creating any online application there are always many legal, ethical and privacy implications to consider. This is especially important when there is sensitive data being stored or accessed. Because of this it is especially key to ensure that every aspect of these implications is understood **before** development on the project begins. For this reason, I would make sure to cover all of these areas in detail.

I would begin by asking about the privacy side of the application. I would make sure to question the integration with ‘Fakebook’. I would definitely question and make sure that this connection to Fakebook is secure and the user was taken to Fakebooks own page to log-in and we did not store any of their log-in information. I would also inquire as to whether the user is aware that our application would have access to their friends, age, pictures, etc. because this level of access would require the users explicit permission, as specified under GDPR (General Data Protection Regulation). I would also ask if we would keep a copy of the photos and videos that our web technologies and AI algorithms scanned to calculate compatibility ratings. If this information is going to be kept then I would ask how this data is going to be stored. The user would need to be able to access any of the stored information, have the ability to have the data erased, be able to stop the processing of data or object to how it is being processed, etc. under the Data Protection Act of 2018 and GDPR.

On the ethical side of our application I would begin with questioning the scanning of photos and videos. I would ask whether it is the most sensible and ethical way to gather this information. What if our algorithm gets it wrong and a user who looks much older than they are is only matched with people 10 years older than them, or vice versa. This could potentially offend individuals or exacerbate any insecurities they could have about appearance. This should be a big ethical consideration and one I would make sure to question. I would also ask whether the user would have the option to overwrite the age the algorithm has set for them. Under the Data Protection Act of 2018 the user should have the right to have any incorrect data corrected and updated, which would include having the incorrect age listed as a result of the algorithm. Furthermore, I would question whether there is a minimum age required to sign up and use our application. It could be unethical to allow minors to use the site as they could become subjected to predatory behaviour. This would be a huge ethical concern and I would be sure to raise this issue. Another ethical concern I would raise is the compatibility rating. If this rating is displayed to the user then it could easily create unrealistic expectations which could be a cause for concern. If a user matches with someone who they have a 100% compatibility rating with and it then proceeds to lead nowhere then it could be damaging for their health. They could be a fragile, lonely user who feels that if it can’t work out with their ‘perfect 100% compatible match’ then it won’t work out with anyone. I would suggest hiding the ratings to avoid such a scenario.

There would be a few legal concerns I’d be sure to question. Firstly, I would raise concerns with the name ‘Hinder’. I would question whether this name and the functions this application performs would be too close to its real-life counter-part ‘Tinder’. I would question whether these similarities would infringe on Tinder’s trademarked name which could leave us vulnerable to a lawsuit. Our application appears to have a very unique selling point with the AI integration so I would question whether we planned to patent our software as a whole. I am not entirely sure whether this would be possible as I’m not sure which specific problem our application solves but I would ask nonetheless. Another legal concern would relate back to the issue of underage users and whether we would have checks to determine whether a user was of age. If there were no checks to determine if a user was a minor then we could face legal action if the minor were to fall under any harm as a result of using Hinder. The legal issues and privacy issues overlap so I would also reiterate once again that our application would need to comply to the data protection act of 2018 and GDPR to ensure that all information stored and used is handled correctly.

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| Question Number: | 3 |

3A)

Describe what sustainable development is, explain its multiple dimensions according to the "United Nations - Agenda for Development (1997)", and give two examples about how computing can help achieve each dimension.

Sustainable development as defined by the UN (United Nations) is development that meets the needs of the present without compromising the ability for future generations to meet their needs. Sustainability can be split into ‘weak’ and ‘strong’ categories. Weak sustainability is the idea that the next generation should inherent a stock of man-made and environmental assets that is no smaller than the previous generation inherited. Strong sustainability is very similar but this ideology does not believe that man-made assets are interchangeable with environmental assets. As such, strong sustainability is defined is the next generation should inherent a stock of environmental assets that is no smaller than the previous generation inherited.

Sustainable development contains multiple dimensions with each of these dimensions being independent and beneficial for society and the planet as a whole. The first of these dimensions, as defined by the UN, is environmental protection. This dimension aims to protect the natural environment, conserve natural assets and to repair damage done to the environment. One way in which computing can help achieve this environmental protection dimension is by leveraging the incredible power of AI. An example of this would be OceanMind which uses Microsoft’s AI and Cloud services to tackle illegal fishing. OceanMind can view and identify ships in the ocean in real-time, meaning it is possible to locate shipping vessels that are unlicensed and fishing illegally. These ships can then be reported to the necessary authorities. The aim of OceanMind is to reduce the amount of illegal fishing taking place, meaning that the only fishing occurring is licenced. This would hopefully mean that fishing quotas aren’t exceeded, leading to more sustainable long-term fishing. Another method in which computing can help achieve this dimension is by helping tackle the problem of poaching through the use of unmanned aerial vehicles (UAVs) to provide an overwatch in conservation parks to keep watch over the animals, spot poachers as they try to hunt and to deter future poachers. This would hopefully lead to a decrease in the number of endangered animals being illegally poached which could lead to a rise in their populations now they are no longer under constant threat.

The second dimension is social development. This dimension aims to better the life of every individual in our society without having a negative impact on any of the other dimensions. A possible way in which computing could help achieve this dimension aim is through using machine learning and remote sensing data to predict crop yield several months before it is ready to harvest. This could be an extremely impactful and societal-changing project as it could be used to achieve the UN goal of zero world hunger as any excess crops from a bountiful area could be shipped to areas where their harvest is predicted to underperform or there is no sustainable food source present. Another way in which computing could be used to aid sustainable social development could be through the use of machine learning and other AI to create more intelligent transport systems. This could be attained by using a connected autonomous car system with a route optimisation system built-in. This could provide a great benefit to mental-health in society as it would drastically reduce the amount of time spent in traffic and shorten commute times in general. This system would also be much safer than ordinary human-drivers which would reduce the number of road fatalities which would be another perk to society.

The third and final dimension is economic development. This is the focus on helping grow a healthy, sustainable economy that doesn’t nullify the aims of the other dimensions. Computing and technology-based jobs are both hugely growing industries that are always requiring more and more workers, this is one of the ways in which computing could have a positive effect on this dimension through the creation of many, many thousands of jobs. In the previous examples listed there would be new jobs created, e.g. UAVs requiring engineers, the crop yield needing the necessary data analysts or more crop-pickers, etc. Creating new job opportunities for ‘skilled’ and ‘unskilled’ workers will always have a positive effect on the economy and society. Another way in which computing could aid sustainable economic development is through using various technologies (machine learning, data analysis, pattern matching, etc.) to monitor the stock markets and other financial sectors. These programs could be created to spot any anomalies or negative trends to aim to avoid financial disasters like the financial crisis of 2008. These would be mammoth programs that would require an extremely large amount of work and upkeep, thus creating more jobs. If these measures could be successfully implemented then it could have a huge beneficial effect on the economy as an early warning system could help avoid future financial disasters.

3B)

Describe the three stages regarding the EU regulations for managing electronic waste.

Stage 1:

The first stage is Restriction of the use of certain hazardous substances. This act prohibits/restricts the use of substances that have a negative effect on the environment such as lead, mercury, certain flame retardants, etc. This makes the devices safer and more environmentally friendly when they’re disposed of.

Stage 2:

The second stage is Recovery and Recycling. This stage aims to reduce the amount of electronic waste that is disposed of e.g. in landfills, incineration, etc. This improves the environmental performance of the products over the course of their lifespan, as they are disposed of in environmentally friendly ways which offsets some of their negative environmental effects. Disposing actions such as the collection, treatment and recovery of electronics is encouraged under this stage. An example of this would be the wide range of options available to consumers when wish to dispose of electronic devices, e.g. device collection services, recycling services, etc.

Stage 3:

The third stage refers to the movement of hazardous waste. This stage outlines some guidelines when moving and storing hazardous waste: they state that hazardous and non-hazardous waste should be stored separately, hazardous waste should be stored securely and safely to minimise pollution and that the waste is treated at an authorised treatment facility that is certified to handle hazardous waste before being disposed of. These guidelines are in place to ensure that all hazardous waste is handled safely to reduce the impact this waste can have on the environment.

3C)

How can connected autonomous vehicles help improve sustainability? Discuss by presenting three advantages over existing transport solutions.

Connected autonomous vehicles are significantly safer than ordinary vehicles with a human driver as they are more likely react to any dangers in time. Fewer accidents means there would be less traffic and closed roads because there would be less road accidents causing these build-ups. This would mean that fewer vehicles are forced to idle on the road or take long diversions which would reduce greenhouse gas reductions. These cars often feature route and traffic optimisation which would also reduce greenhouse gasses as there would be no unnecessary mileage and they also tend to feature eco-driving algorithms which would also reduce these gasses.

Connected autonomous vehicles could also be used in autonomous ride-sharing services which would reduce the number of cars on the road. This would help reduce the number of greenhouse gasses being expelled.

Autonomous vehicles can also be optimised to reduce the energy used by programming the cars to drive in a smoother way than humans tend to. Slower and more controlled acceleration and deceleration is more fuel efficient than faster acceleration and deceleration. An autonomous car can do this consistently, unlike an ordinary human driver. This would lead to a reduction in fuel and energy usage, which is much more sustainable than human-drivers. This much smoother ride is likely to be greatly more comfortable than other transport options, e.g. ordinary cars, busses, etc.