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Diploma Programme
Programme du diplôme
Programa del Diploma

Digital society
Standard level
Paper 1

6 November 2024

Zone A afternoon | **Zone B** afternoon | **Zone C** afternoon

1 hour 30 minutes

Instructions to candidates

- Do not open this examination paper until instructed to do so.
- Answer two questions.
- The maximum mark for this examination paper is **[40 marks]**.

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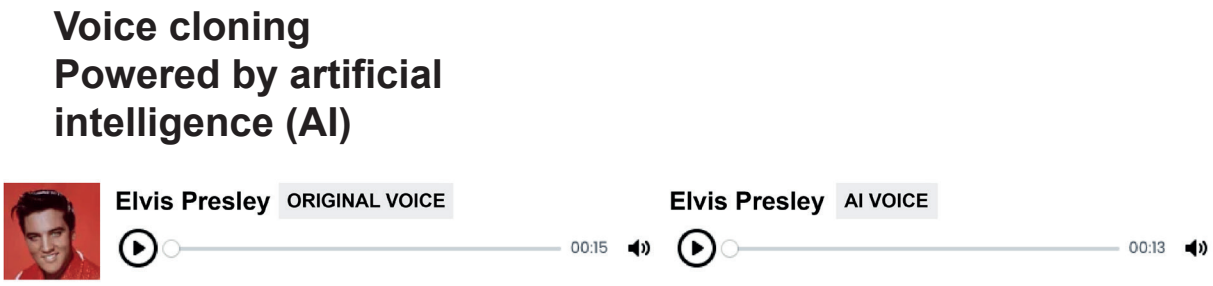
Answer **two** questions. Each question is worth [20 marks].

1. Synthetic voices

Respeecher is voice cloning software that can be used to speak like a famous person, such as Elvis Presley (see **Figure 1**). Respeecher was used to clone the voice of actor Mark Hamill for the television series *The Mandalorian*.

Figure 1: An example of Respeecher



To create the synthetic voice, Respeecher captures recordings of the voice of the famous person and stores them in a database. Respeecher then uses neural networks to create the synthetic voice so it can replace the original voice.

(a) (i) Identify **two** characteristics of a database. [2]

(ii) Identify **two** ways in which the integrity of the data in a database can be maintained. [2]

(iii) Identify **two** characteristics of a neural network. [2]

(b) (i) Explain **two** reasons why it may be difficult to clone a person's voice. [4]

(ii) Explain **one** way of verifying that the synthetic voice produced by voice cloning software is that of the famous person. [2]

(c) Discuss whether it is acceptable for a movie production company to use dialogue generated by voice cloning software from an actor who has not been involved in the production of the movie. [8]

2. Experimental earbuds for detecting infections

A Japanese technology company, *Tekunoroji*, has been working on wireless earbuds that can detect possible infections and other conditions (see **Figure 2**).

Figure 2: An example of earbuds

Tekunoroji earbuds emit a sound that produces unique echoes as it moves through the ear canal. These echoes are captured by a microphone.

The captured echoes are sent to an app in a connected smartphone. They are then uploaded to a database. Neural networks then use algorithms to generate a profile of the wearer's inner ear, which includes changes in temperature and levels of moisture in the ear canal that may suggest the wearer has a condition in the ear.

The earbuds can be used to diagnose three different conditions: earwax blockage, ruptured ear drums, and inflammation of the middle ear caused by colds or sore throats.

(a) (i) Identify **two** sensors needed for the earbuds to collect data. [2]

(ii) Identify **two** ways in which data can be shared between the earbuds and the app. [2]

(iii) Identify **two** characteristics of an algorithm. [2]

(b) Explain **three** concerns about the algorithms used in the earbuds. [6]

(c) Evaluate the impacts that wearable devices may have when used for medical diagnostics and care. [8]

3. Smart glasses help police track criminals

Police departments are considering equipping police officers with smart glasses. The police believe these smart glasses can help monitor human behaviour and support law enforcement.

The smart glasses include software that can scan a person's face. The software can then search the police database and provide information about that person (see **Figure 3**).

Figure 3: An example of smart glasses

Civil liberty groups have concerns about the possible misuse of these smart glasses. They are concerned that the smart glasses may be used as a form of surveillance.

(a) (i) Identify **two** appropriate uses of smart glasses in policing. [2]

(ii) Identify the steps in the process by which facial recognition software can help the police identify a person. [4]

(b) Data about citizens is captured by the smart glasses and is added to the police database.

To ensure this data is not misused, policies are required for data collection, data storage and any data sharing.

(i) Explain **one** policy that is required for the ethical **collection** of citizens' data. [2]

(ii) Explain **one** policy that is required for the ethical **storage** of citizens' data. [2]

(iii) Explain **one** policy that is required for the ethical **sharing** of citizens' data. [2]

(c) Discuss the advantages **and** disadvantages of using smart glasses that can recognize faces in law enforcement. [8]

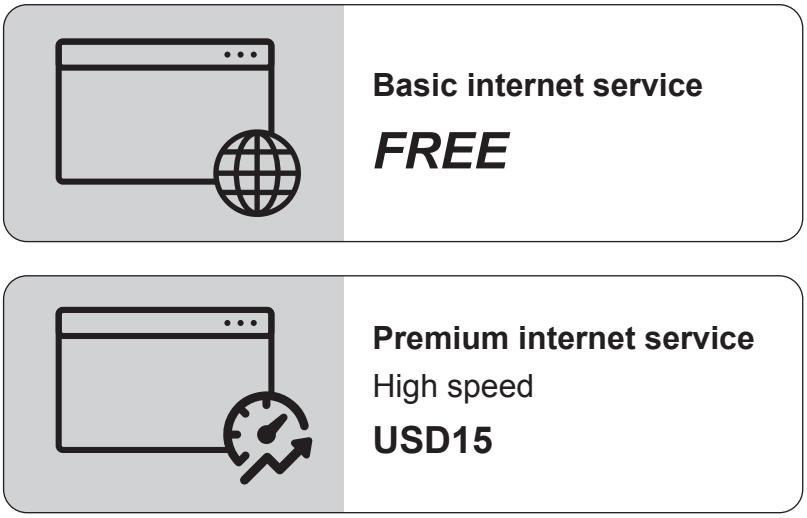
4. Equal access to the internet

Administrators at EC University have received complaints from students about videos buffering when they are being streamed and files taking too long to download. This is because there is a limit on the bandwidth available to students.

As a result, students and staff often need to work outside of the university's network. Students have used other internet service providers (ISPs) and public internet access to complete their studies. University staff have found that working from home and not using the university's virtual private network (VPN) allows for their work to be completed more quickly.

EC University is considering implementing a premium internet service. This is a paid subscription that offers staff and students full access to their ISP's bandwidth (see **Figure 4**).

Figure 4: EC University's proposed premium service



(a) (i) Identify **two** services provided by an internet service provider (ISP). [2]

(ii) Identify **two** characteristics of bandwidth. [2]

(iii) Identify **two** features of a virtual private network (VPN). [2]

The IT team at EC University were asked to monitor the internet usage of the students.

(b) (i) Explain **two** reasons why EC University decided to monitor the internet usage of its students. [4]

(ii) Explain **one** measure, **other than** limiting the bandwidth, that EC University could take to manage the bandwidth. [2]

(c) Discuss whether EC University should introduce a premium service that allows students and staff who pay an additional fee to have increased bandwidth. [8]

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References:

Figure 1 With permission from Respeecher.

Figure 2 yunava1, n.d. *Wireless earphone in the girl's ear – stock photo*. [image online] Available at: https://www.gettyimages.co.uk/detail/photo/wireless-earphone-in-the-girls-ear-royalty-free-image/1314954738 [Accessed 6 July 2023]. Source adapted.

Figure 3 Drazen_, n.d. *Mature man working remotely on laptop from café – stock photo*. [image online] Available at: https://www.gettyimages.co.uk/detail/photo/mature-man-working-remotely-on-laptop-from-cafe-royalty-free-image/1387520816?phrase=man+in+cafe [Accessed 23 May 2023]. Source adapted.

CocoSan, n.d., *People enjoying coffee in modern unrecognizable café – stock photo*. [image online] Available at: https://www.gettyimages.co.uk/detail/photo/people-enjoying-coffee-in-modern-unrecognizable-royalty-free-image/1407730635 [Accessed 23 May 2023]. Source adapted.

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