

- **Appreciate the emerging trend of computing that led to the advancement of human computer interaction.**

Many disciplines, such as bio-informatics or physical chemistry, are hyphenated combinations. However, human-computer interaction (HCI) covers a broader range of topics than most. As a result, HCI researchers frequently use multiple research methods in a single paper. Furthermore, HCI is maturing into a larger field that is becoming necessary for new ideas in business, education, healthcare, community safety, energy sustainability, and environmental protection in a world where technology plays an increasing role (Lazar et al., 2017).

The emerging computing trend has led to significant advancements in human-computer interaction (HCI). HCI studies how people interact with technology, including computers, mobile devices, and other digital interfaces (Lazar et al., 2017). For instance, the following are some of the emerging trends in computing that have contributed to the advancement of HCI:

1. **Artificial Intelligence (AI):** AI is a rapidly expanding field that entails creating intelligent machines capable of performing tasks that usually require human intelligence. AI has enabled the development of voice recognition, facial recognition, and natural language processing technologies, significantly improving human-computer interaction (Mohammad, 2020).
2. **Augmented Reality (AR) and Virtual Reality (VR):** AR and VR technologies enable users to interact more effectively and naturally with digital content. These technologies have enhanced training programs, created virtual simulations, and improved communication and collaboration in various industries (Wang et al., 2018).

3. **Wearable Technology:** Wearable devices such as smartwatches, fitness trackers, and augmented reality glasses are becoming more popular. These devices allow users to interact with technology more seamlessly and naturally (Yang & Liu, 2016).
4. **Internet of Things (IoT):** IoT is a network of devices connected to the internet that can communicate with each other. The proliferation of IoT devices has enabled new ways of interacting with technology, such as controlling devices with voice commands or using intelligent sensors to monitor and control environmental conditions (Jabbar et al., 2019).
5. **Natural User Interfaces (NUIs):** NUIs are interfaces that enable users to interact with technology in a more natural way, such as through touch, gestures, or voice commands. These interfaces are becoming increasingly popular and are being integrated into a wide range of devices and applications (Aliprantis, 2019).

In summary, the emerging computing trend has led to significant advancements in human-computer interaction. Technologies such as AI, AR/VR, wearable technology, IoT, and NUIs have enabled new and more natural ways of interacting with technology, making it more accessible and user-friendly. As these technologies develop, human-computer interaction will become more intuitive and seamless.

- **Identify the fundamental technologies deployed to support emerging computing technologies.**

Emerging computing technologies rely on various fundamental technologies that enable their development and deployment (Gill et al., 2019). For instance, here are

some of the essential technologies that are deployed to support emerging computing technologies:

1. **Artificial Intelligence (AI):** AI technologies, such as machine learning and natural language processing, are used to develop intelligent machines that perform tasks that typically require human intelligence. AI relies on various fundamental technologies, including big data, cloud computing, and high-performance computing.
2. **Cloud computing** provides a platform for delivering computing services over the internet. It enables users to access a shared pool of computing resources, such as storage, processing power, and software, on-demand and at a lower cost. Cloud computing is the backbone of many emerging technologies, including AI, IoT, and big data.
3. **Internet of Things (IoT)** is a network of connected devices that collect and exchange data. It relies on a range of technologies, including sensors, wireless networks, and cloud computing, to enable the collection, analysis, and use of data.
4. **Edge computing** is a distributed computing model that brings processing and data storage closer to the location where it is needed, rather than relying on centralised data centres. It benefits applications requiring real-time data processing, such as IoT and autonomous vehicles.
5. **Blockchain** is a distributed ledger technology enabling secure and transparent data sharing. It is beneficial in applications that require secure data exchange, such as finance, healthcare, and supply chain management.

6. **5G Networks:** 5G networks provide high-speed and low-latency connectivity, enabling the development of new applications and services that require real-time data exchange. 5G networks benefit applications requiring high bandwidth, such as AR/VR, autonomous vehicles, and remote surgery.

In summary, emerging computing technologies rely on various fundamental technologies that enable their development and deployment. These technologies include cloud computing, edge computing, IoT, AI, blockchain, and 5G networks. As these technologies continue to evolve, they are expected to drive innovation and transform many aspects of our lives.

Reference: (Gill et al., 2019)

- **Identify the risks and threats associated with emerging technology and suggest guidelines to mitigate those risks.**

The digital revolution, which began more than four decades ago, is driving technological advancements. These breakthroughs focus on gathering, processing, and analysing massive amounts of data generated by the information sciences, with implications for numerous areas of research and development. These advancements promise significant social and economic benefits, efficiency, and productivity across multiple sectors (Kavanagh, 2019).

While offering significant benefits, emerging technologies also come with various risks and threats that organisations must consider. For instance, some of the principal risks and threats associated with emerging technology include:

1. **Cybersecurity risks:** Emerging technologies often create new attack vectors for cybercriminals. These risks can be mitigated using strong encryption and

authentication methods, secure coding practices, and regular auditing systems for vulnerabilities.

2. **Privacy risks:** Emerging technologies can collect and store large amounts of personal data, which can be misused or stolen. To mitigate these risks, companies should adopt privacy by design principles, minimise the amount of data collected, and give users transparency and control over their data.
3. **Ethical risks:** Emerging technologies can have unintended consequences, such as reinforcing biases or infringing human rights. Companies should conduct ethical impact assessments to mitigate these risks and involve diverse stakeholders in developing and deploying new technologies.
4. **Regulatory risks:** Emerging technologies can challenge existing regulatory frameworks, creating uncertainty and legal risks. Businesses should engage with regulators early and often and proactively address potential legal and regulatory issues to mitigate these risks.

To mitigate these risks and threats associated with emerging technologies, here are some guidelines that companies and organisations can follow:

1. **Adopt a risk-based approach:** Companies should identify and prioritise the most significant risks and threats associated with emerging technologies and develop a risk management strategy accordingly.
2. **Invest in cybersecurity:** Companies should invest in solid cybersecurity measures, including encryption, multi-factor authentication, and regular security audits.

3. **Incorporate privacy by design:** Companies should incorporate privacy by design principles into developing new technologies, including minimising data collection and providing users transparency and control over their data.
4. **Conduct ethical impact assessments:** Companies should conduct evaluations to identify and mitigate potential ethical risks and unintended consequences of emerging technologies.
5. **Engage with stakeholders:** Companies should engage with diverse stakeholders, including regulators, customers, and civil society, in the development and deployment of new technologies.
6. **Maintain compliance:** Companies should maintain compliance with existing legal and regulatory frameworks and proactively address potential legal and regulatory risks associated with emerging technologies.

In brief, companies and organisations can effectively mitigate the risks and threats associated with emerging technologies by following these guidelines, ensuring that new technologies are developed and deployed responsibly and ethically.

Reference: (Kavanagh, 2019).

References:

- Lazar, J., Feng, J.H. & Hochheiser, H. (2017). *Research Methods in Human-Computer Interaction*. [online] *Google Books*. Morgan Kaufmann. Available at: [https://www.google.co.uk/books/edition/Research Methods in Human Computer Interaction/hbkxDQAAQBAJ?hl=en&gbpv=1&dq=The+emerging+trend+of+computing+has+led+to+significant+advancements+in+human-computer+interaction+\(HCI\).+HCI+is+the+study+of+how+people+interact+with+technology](https://www.google.co.uk/books/edition/Research_Methods_in_Human_Computer_Interaction/hbkxDQAAQBAJ?hl=en&gbpv=1&dq=The+emerging+trend+of+computing+has+led+to+significant+advancements+in+human-computer+interaction+(HCI).+HCI+is+the+study+of+how+people+interact+with+technology) [Accessed 25 Mar. 2023].
- Mohammad, S.M. (2020). *Artificial Intelligence in Information Technology*. [online] *papers.ssrn.com*. Available at: https://papers.ssrn.com/sol3/Papers.cfm?abstract_id=3625444.
- Wang, P., Wu, P., Wang, J., Chi, H.-L. and Wang, X. (2018). A Critical Review of the Use of Virtual Reality in Construction Engineering Education and Training. *International Journal of Environmental Research and Public Health*, [online] 15(6), p.1204. Available at: <https://www.mdpi.com/1660-4601/15/6/1204/pdf>.
- Yang, Y.B. and Liu, Y.X. (2016). Analysis of the development trend of wearable devices. *DEStech Transactions on Computer Science and Engineering*.
- Jabbar, W.A., Kian, T.K., Ramli, R.M., Zubir, S.N., Zamrizaman, N.S., Balfaqih, M., Shepelev, V. & Alharbi, S. (2019). Design and fabrication of smart home with internet of things enabled automation system. *IEEE access*, 7, pp.144059-144074.
- Aliprantis, J., Konstantakis, M., Nikopoulou, R., Mylonas, P. & Caridakis, G. (2019). January. Natural Interaction in Augmented Reality Context. In *VIPERC@ IRCDL* (pp. 50-61).

Gill, S.S., Tuli, S., Xu, M., Singh, I., Singh, K.V., Lindsay, D., Tuli, S., Smirnova, D., Singh, M., Jain, U. & Pervaiz, H., 2019. Transformative effects of IoT, Blockchain and Artificial Intelligence on cloud computing: Evolution, vision, trends and open challenges. *Internet of Things*, 8, p.100118.

Kavanagh, C., 2019. *New tech, new threats, and new governance challenges: an opportunity to craft smarter responses?*. Carnegie Endowment for International Peace.