2023/2024 (Sem II)

CST434 – WIRELESS NETWORK AND MOBILE COMPUTING

Assignment 1

Name	Matric Number
Mohammed Hammad	154434
Kalvin Joshuaa	154766

"Intelligence isn't gauged by the breadth of one's knowledge, but rather by the capacity to continually learn," said Francesca Zappia. Each day offers new learning opportunities, allowing us to process thoughts and ideas. Throughout life, our brains can reorganize themselves by forming new neural pathways. As humans, our essence lies in our rational and emotional nature, shaping decisions based on past experiences and emotions.

With machines increasingly surpassing humans in various tasks, it prompts reflection on what distinguishes human intelligence. Is it the ability to adapt to change, comprehend abstract concepts, or engage in reasoning and problem-solving? Psychologists and philosophers have pondered this question for centuries, yet no definitive definition exists. However, our humanity inherently embodies intelligence. What sets us apart from machines and animals is our adept use of language, a potent tool enabling effective communication, idea-sharing, and collaboration.

Additionally, personality serves as another hallmark of human uniqueness, comprising enduring patterns of thoughts, feelings, and behaviors. Like a fingerprint, it defines individuality, fostering social bonds and companionship, which are integral to human existence. Unlike machines which are devoid of emotional intelligence and social connections, humans thrive on interpersonal relationships.

The advent of Artificial Intelligence, particularly Generative AI, has revolutionized the world. Machines can now get insights from vast datasets inaccessible to any human within a lifetime. With their exponentially increasing processing power, machines surpass humans computationally. While machines excel in solving highly specific problems, humans adopt a more holistic approach, drawing on past experiences to navigate challenges.

Griffiths suggests that the set of human computational problems all share three important characteristics:

1. Humans have a limited amount of time. Nature may only provide limited opportunities to learn behaviors relevant to survival and the length of human lives imposes an upper bound on the amount of available data.
2. Humans have access to a limited amount of computation. Each human being has a single brain with fixed computational capacity.
3. Human minds have limited communication. Human beings have no way to directly transfer the contents of their brain to one another **[1]**

So, how can human intelligence be converted into machine intelligence?

Before replicating human intelligence in machines, it's imperative to comprehend its workings. This necessitates delving into cognitive psychology, neuroscience, and various intelligence theories. Human intelligence often relies on extensive data, encompassing both explicit sources like books and videos, and implicit sources such as personal experiences. For machines to learn

effectively, they require access to similar datasets. Artificial intelligence aims to provide machines with the capacity to emulate human behavior, particularly cognitive functions.

Examples of this emulation include facial recognition, automated driving, and mail sorting based on postal codes. Machines have sometimes surpassed human capabilities, such as sorting thousands of postal mails in seconds, while in other areas, we have only begun to explore their potential. Learning plays a pivotal role in human capability, extending to various other living organisms.

Machine learning can either be considered a sub-field or one of the tools of artificial intelligence, providing machines with the capability of learning from experience. Experience for machines comes in the form of data. Data that is used to teach machines is called training data **[2]**.

Once these machines are trained using the right data, they may be used in real world scenarios after evaluation of their accuracy. These models go through the process of using a trained model to make decisions on new, unseen data. The models are then improved iteratively based on feedback.

As machines become more intelligent, ethical considerations become increasingly important. It's crucial to ensure that AI systems are used responsibly and ethically, considering issues like bias, fairness, and safety.

The future of machine intelligence is an exciting and evolving field, it has its upsides and downsides. As our understanding of machine learning algorithms grows, we can develop more sophisticated models capable of mimicking human intelligence. However, we will need access to vast amounts of high-quality data for training intelligent machines.

A recent paper titled ‘No “Zero-Shot” without Exponential Data: Pretraining Concept Frequency Determines Multimodal Model Performance’**[3]**, in which the researchers are trying to see if these models can learn and apply their knowledge to new situations just like humans adapt to new situations based on past experience, even if they haven't been specifically trained on those situations. The authors find that multimodal models require a much larger amount of data than previously thought to achieve good performance on zero-shot tasks. Zero-shot tasks are basically asking a machine learning model to do something it hasn't been clearly trained on before. This finding is concerning because it suggests that the current way of training these models is not very efficient. This suggests that these models are not truly generalizing to new tasks. The authors call for further research into how to improve the generalization capabilities of these models, so that they can be more useful in real-world applications.

Neuromorphic computing is an emerging field in which elements of a computer are modeled after systems in the human brain and nervous system **[4]**. By mimicking the processing and

synaptic connections of the brain, neuromorphic chips could potentially enable machines to perform complex cognitive tasks more efficiently and with lower power consumption. Synaptic connections of the brain could be mimicked through the help of distributed computing where nodes act as synapses and together help solve computational problems by dividing the task. These nodes could be connected together in a network wired or wirelessly. Improvements in NLP will also allow machines to understand and generate human language more effectively.

Another area where machines are mimicking human behavior is in the field of Embodied AI. Embodied AI involves integrating artificial intelligence with physical robotic systems, enabling machines to interact with and perceive the physical world much like humans do. Advances in robotics, sensor technology, and machine learning algorithms are driving progress in this area, allowing robots to perform tasks ranging from simple manipulation to complex decision-making in dynamic environments. A recent development in this area is the ‘Figure 01 general-purpose humanoid robot which brings the dexterity and reasoning of humans **[5]** . The robot can perform ‘mental’ and physical tasks simultaneously while providing justification on why it did what it did. The cognitive function of this robot are of particular interest to Open AI and they want to power the ‘brain’ of this robot.

As machines become more intelligent and autonomous, addressing ethical and regulatory concerns becomes more important. Ethical AI frameworks, transparency in algorithms, and regulations governing AI development and deployment help ensure that intelligent machines are developed and used responsibly. In fact, OpenAI CEO Sam Altman says some jobs are “definitely going to go away”, he also says that “AI advocates are fooling themselves if they think the technology is only going to be good for workers” **[6]**.

By combining advancements in these and other areas, machines have the potential to become increasingly intelligent and capable of mimicking human-like behaviors and cognitive abilities in the future. However, it's essential to approach the development and deployment of AI technology with caution and foresight to ensure that it benefits society as a whole.

Overall, converting human intelligence into machine intelligence is a multidisciplinary endeavor that requires expertise in fields such as computer science, cognitive science, mathematics, and ethics. While machines can replicate certain aspects of human intelligence, they still lack many qualities that make human intelligence unique, such as consciousness and emotions.

References

[1]

Griffiths, T. L. (2020, September 29). *Understanding Human Intelligence through Human Limitations*. arXiv.org. https://arxiv.org/abs/2009.14050

[2]

Dasgupta, A., & De, R. K. (2023). Artificial intelligence in systems biology. In *Handbook of statistics* (pp. 153–201). https://doi.org/10.1016/bs.host.2023.06.004

[3]

Udandarao, V., Prabhu, A., Ghosh, A., Sharma, Y., Torr, P. H. S., Bibi, A., Albanie, S., & Bethge, M. (2024, April 4). *No "Zero-Shot" without exponential data: pretraining concept frequency determines multimodal model performance*. arXiv.org. **https://arxiv.org/abs/2404.04125**

[4]

Barney, N., & Lutkevich, B. (2023, April 24). *neuromorphic computing*. Enterprise AI. https://www.techtarget.com/searchenterpriseai/definition/neuromorphic-computing

[5]

Figure. (n.d.). FigureAI. https://www.figure.ai/

[6]

Zinkula, J. (2023, July 26). ChatGPT creator says AI advocates are fooling themselves if they think the technology is only going to be good for workers: "Jobs are definitely going to go away." *Business Insider*. https://www.businessinsider.com/chatgpt-sam-altman-jobs-replaced-ai-openai-2023-7