Artificial Intelligence and the Future of Clinical Care

The last 12 months have seen enormous technical strides in the field of artificial intelligence (AI) with innovative tools such as ChatGPT (language generator) and stable diffusion (image generator). Despite widespread worries about the rapid development of AI, this technology has a significant clinical potential to find ways to identify and diagnose diseases more accurately, select the best treatment options, monitor patient progress, and predict and prevent adverse outcomes.

Before talking more about contemporary AI as a clinical support tool, let us go back to the beginnings of AI. AI originates in the early 1940s but was fully established as a discipline in the 1950s (see Buchanan, 2005), with the most famous example being Alan Turing's proposal on whether *machines can think* (Turing, 1950). To this day, the definition of AI is centred around computers mimicking human behaviours. As seen in Figure 1, AI has broad definitions that encompass a range of computing techniques, e.g., machine learning, deep learning, and large language models (Pedersen et al., 2020). This intrinsically means that lots of *things* are 'AI', and can consequently lead to misconceptions about what AI is, and what AI can do. In clinical practice, including physiotherapy, AI is therefore likely to be implemented in a range of processes from computer software, phone apps, general equipment, and decision support. Specific examples include a wearable technology (Burns et al., 2018) combined with a motion analysis system for a home exercise programme that monitors accuracy and range of movement (Zsarnoczky-Dulhazi et al., 2024), or an inertial sensor that could predict injury risk through biomechanical patterns (Kianifar et al., 2017).

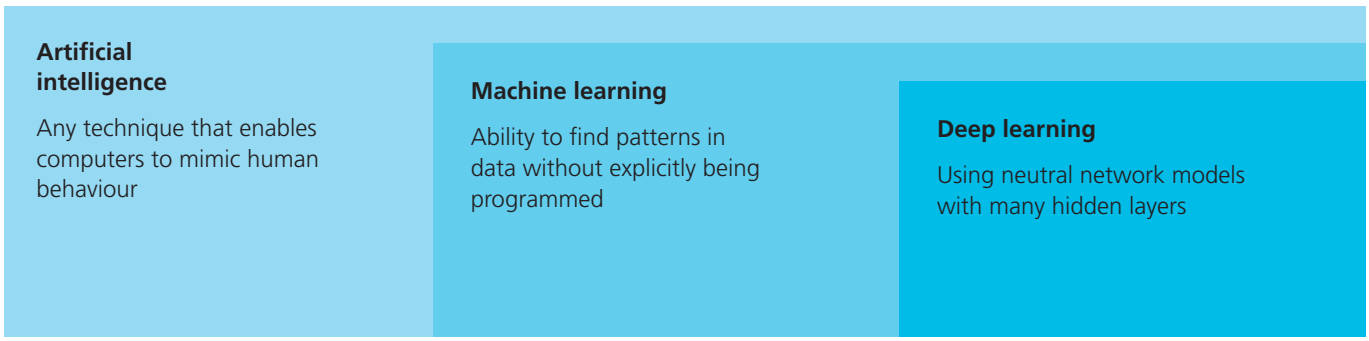
In the remainder of this editorial, I will focus on two issues believed to be important if we are to bring AI into clinical care: (a) how we can achieve 'augmented intelligence' rather than 'artificial intelligence', meaning that people and machines work together for the best possible outcomes, and (b) how we can establish better ethical frameworks for AI, particularly when working with clinical and often sensitive data.

Several applications of AI have algorithmic 'black box' properties, meaning we don't fully understand the inner workings of the algorithms and how the algorithm reaches its conclusion. This can be problematic in the clinical domain. A shift towards augmented intelligence is a good solution to this issue as it aims to transfer power from machines to people with domain-specific expertise. Augmented intelligence means that humans and machines should work together to reach the intended goals (Bazoukis et al., 2022). In other words, people with domain-specific skills should be a major part of the development and outcome of an AI model, meaning we have a greater chance that AI models will become support tools that make our jobs more accurate and effective. Not so long ago, physiotherapy practice faced a momentary ontological dilemma associated with a lack of adequate clinical data for accurate diagnosis and decision-making during the emergency response (Haines et al., 2023). Augmented intelligence offers the potential to advance clinical practice and patient access by assisting with health monitoring and feedback, clinical decision support, and data management and administration. Developing AI skills in clinics and hospitals will take time, but it is likely to become a vital skill for our future workforce. AI models also often require large amounts of data and extensive computational resources to provide reliable and generalisable predictions (for example, training ChatGPT required approximately 1 trillion parameters). In other words, the full introduction of AI in the clinic is likely to be stepwise and take time. Future-proofing our data governance policies and investing in secure data management infrastructure can help us become AI-ready.

For many people working in the field of AI, one of the main priorities is to ensure a safe introduction of AI into clinical care, as there are several ethical concerns (Pedersen et al., 2023). For example, if we fully rely on AI to make clinical decisions, who is then responsible for the potential implications clinical decisions have? Who owns clinical data used in large AI models? Can we

Figure 1

An Overview of Artificial Intelligence, and Approaches Such As Machine Learning and Deep Learning



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fully explain the outcome of AI models? Are there biases in the inherent data we are using to train AI algorithms?

In the end, these questions are non-trivial and require careful ethical consideration of what AI is and what it is not, and emerging research is needed to further understand its clinical implications (Braun et al., 2020). Beyond fields such as radiology (as AI is ideally suited to work with images) (Liu et al., 2020), there is currently little evidence to suggest that machines can do work to the level of, or better than, human experts. I do believe AI will improve our clinical care and hopefully make our work more effective so we can spend more time with patients. This may be needed, as a recent study shows that patients found ChatGPT 41% more empathetic than doctors (Ayers et al., 2023).

AI is developing, and it is exciting. With careful research and training of an AI-minded workforce, we can ensure AI makes a safe entrance in clinical care, to the benefit of our patients.

Mangor Pedersen

Department of Psychology and Neuroscience, Auckland University of Technology, Auckland, New Zealand

Email: mangor.pedersen@aut.ac.nz

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