Brain games
Our brain journey

by Karin Mont

Karin Mont, MARH, ARH Chair

The human brain, complete with its complex and highly sophisticated neural structures, has taken millions of years to evolve. By examining fossil remains of the skulls of our predecessors, it is clear that certain key developments occurred in stages.

For example, around six to two million years ago, our brains began to increase in size. This growth process started to speed up between two million and 800,000 years ago and then peaked from around 800,000 to 200,000 years ago. It is believed that several factors triggered the evolutionary benefits of developing a larger brain; our ancestors started to move around more and explore new habitats, which required the ability to adapt to different environments and climates.

In fact, the time of peak brain development (both size and function) largely coincided with significant environmental upheaval, when the earth's climate was highly variable, and oscillated between extreme periods of glacial cold and warmer interglacial periods. An unpredictable climate would have impacted upon the food supply, and other factors essential to survival, so in all likelihood we developed a larger and more complex brain simply in order to survive.

From larger brains to smaller, better organised brains

The human brain almost quadrupled in size over a period of around six million years, but it seems that as the human species developed enhanced communications through language, and we learned how to process information and share experiences with others via the use of abstract or symbolic artefacts, our brains actually began to shrink. Anthropologists and others working within this field continue to debate when this started to happen, but we know that the skull size of the average human today is just under 13% smaller than that of *Homo sapiens* living during the great ice age.

One explanation for this occurrence is that as our social, cultural and technological skills evolved, our brains became better organised, establishing more neural pathways to enable increasing complex functionality, so actual mass was no longer so relevant. Bearing in mind the fact that our brain requires lots of energy and heat to function – it weighs roughly 2% of our body mass, but consumes over 20% of our resting metabolic energy – a smaller, more efficient brain makes perfect sense. Basically, how our brains are 'wired' is far more important than our actual brain size.

The original intelligence

Our overall intelligence and our cognitive abilities are determined by the complex and dynamic interactions of countless neurones working within our brain. We have become 'intelligent' beings, thanks to the establishment of highly efficient neural pathways, which have been programmed and fine-tuned by millennia of genetic, environmental and lifestyle factors.

Now our world has changed radically. Most of us no longer need to rely on our cognitive skills for basic survival, so this begs two important questions: Is our capacity for greater intelligence actually shrinking, along with our brain size? Will the rapid advance of artificial intelligence (AI), a creation of that advanced intelligence, cause our brains to shrink further and thus herald a decline in our mental acuity?

The New Age intelligence

Right now, AI is rapidly emerging as a major global player. Left to continue in its current trajectory, AI has the potential to deconstruct and reshape the very fabric of our society, and influence nearly every aspect of our lives – it's already heading that way. We are told that AI presents us with remarkable opportunities, will revolutionise industries, and transform how we learn and interact with technology. This may well be true, but a world increasingly controlled by AI carries significant social and ethical implications. Damage limitation requires us to have a basic understanding of the 'nature' of AI.

So, what is AI?

Simply explained, AI is a field of computer science which focuses on creating systems which can perform tasks that would usually require human intelligence to complete, such as assimilating facts, solving problems and making decisions based on what has been learned.

To function, AI depends upon vast supplies of data, either written, numeric or visual, so it can learn, identify patterns and synthesise information. Human activity, some of which can be traced back to the beginning of recorded time, is responsible for creating each and every fragment of data used to prime an AI database. Processing and interrogating the data is determined by algorithms, a set of instructions programmed into a powerful computing system. The instructions are designed to perform specific functions, such as identifying repeating patterns within a dataset in order to predict likely future behaviours.

AI requires massive amounts of data from which to learn and improve performance, and our modern world is awash with new data. From digital transactions and social media, to 'smart' devices which can communicate with each other remotely, such as mobiles, security cameras, lights, speakers, thermostats, sensors, fitness trackers etc – there is an explosion of data available with which to fuel the insatiable appetite of AI.

Energy-greedy

Rather like large brains, AI data centres use up vast amounts of energy to operate. The powerful hardware required to run the specialised computers and keep them cool, already accounts for 1.5% of global electricity consumption and that figure is projected to rise significantly. There are suggestions that, by 2027, AI's annual electricity needs will equal that of a small country such as the Netherlands.

This means we are going to have to generate a lot more electricity to ensure that AI remains in continuous operation. This, combined with the fact that keeping the data centres cool requires significant amounts of water, will inevitably impact upon the environment, something very few people seem willing to talk about right now.

Who owns AI and the content it generates?

No single entity owns AI, but it is controlled by a limited number of powerful big tech companies which include Microsoft, Meta, Amazon and Nvidia. Nvidia is the company which currently holds a near monopoly on supplying the graphics processing units (GPUs) essential for training large AI models. On 29 October 2025, Nvidia broke world records by becoming the first company to reach a market value of $5 trillion (£3.8 trillion). The companies who drive AI development basically own the hardware, and dictate how it is applied – they invest vast amounts of money into the industry but, as Nvidia has demonstrated, they can also reap very rich rewards.

AI-generated content

When it comes to the ownership of AI-generated content and inventions, things are more complex – there are different laws covering intellectual property rights in different countries and, in the USA, jurisdiction can even vary in different states.

An example of global differences is that the US Copyright Office generally considers content created primarily by AI to be exempt from copyright; yet, in the UK, AI generated content is subject to copyright. Broadly speaking, specific AI applications are owned by the companies which developed them, but other aspects of AI, such as intellectual property rights, ethics and governance, are all matters of ongoing debate.

The rival tech giants

It is worth reminding ourselves that although the USA seems to have been the primary driver of the AI revolution, China is a very close rival. The Chinese government has made AI a national priority, and has invested heavily in building the infrastructure necessary to take the global lead in AI innovation. Their achievements in the development of large language models, robotics for manufacturing and search and rescue, and surveillance and control, are already astounding.

More concerning, though, is China's mandating of AI education in schools for children as young as six. Add this to the integration of AI into other aspects of Chinese society (such as healthcare), all overseen by one of the most sophisticated surveillance networks in the world, and you have the recipe for an increasingly deconstructed, dehumanised society, totally controlled by the inventions of their own creation. How will people adapt to living in a world where high performing AI robots displace humans in much of the workforce? This is already happening in China, and it will begin to infiltrate other countries very soon. How should we prepare for this eventuality?

AI in healthcare

AI is set to revolutionise healthcare by providing swift and accurate predictive analytics, new and efficient diagnostic tools, and by conducting robotic surgeries which match the skills of the most highly trained surgeon. We are told that the future of medicine rests with AI – it will be able to detect diseases before they get out of hand, work out personalised treatment plans for every condition, and help us to live longer, healthier lives.

This may be an overly optimistic assertion, but there are definitely some areas where AI can be usefully applied in healthcare. For example, AI algorithms can be used to interpret medical images with considerable accuracy, enabling radiologists and other clinicians to (for example) quickly identify cancerous lung nodules on a CT scan, or eye abnormalities on a retinal scan.

However, there is a fundamental problem with relying on AI for analytical or diagnostic purposes: AI can only learn from the data that has been used to 'train' it, and the algorithm used to interrogate that data may not have been designed to prioritise the dataset under current scrutiny – this can lead to a skewed or biased outcome.

Bias in AI

Given that AI depends upon the inputting of mega amounts of data sourced from countless different locations, it is inevitable that inaccuracies or biases will occur from time to time. If AI is trained on data containing inaccuracies or biases, it can amplify and reinforce them. Likewise, if the algorithms have been developed using incorrect or inaccurate assumptions, they may contain biases.

To try to minimise the occurrence of bias in AI, the training data used for systems needs to be as diverse and representative as possible, and developers should be held to account if biased outcomes are identified. Unsurprisingly, we can find a classic example of AI bias if we do a search on the word 'homeopathy'. The AI overview shown below was taken from a Google search and demonstrates bias 'in full flow'.

> Homeopathy is a system of complementary or alternative medicine that uses **highly diluted natural substances** to treat various health conditions, based on the principle of 'like cures like'. Mainstream science considers homeopathy a **pseudoscience**, as there is no good-quality evidence that it is effective for any condition beyond the placebo effect.

AI can fake anything

Using highly sophisticated technology known as 'deepfake', AI can create synthetic media such as a video or audio recording, which accurately imitates a real person, but is in fact totally fake. Deepfake technology is extremely clever. It uses machine-based learning which mimics the human brain in order to create deep learning algorithms. Usually, two of these learning algorithms are set up to compete against each other – one creates the fake, the other tries to detect if it's real or fake. Both fake creation and fake detection improve with each new attempt, which results in a product that is extremely convincing.

Deepfake can be trained to compose music in the style of a particular composer, or paint a picture in the style of a particular artist, and the results are impressive. In fact, deepfakes can be so realistic, it is becoming increasingly difficult to differentiate between fact and fiction. If you choose to fake your coursework, or plagiarise someone else's hard work, deepfake will provide you with the required results – the potential for deepfake to be misused and abused should sound numerous alarm bells – it will be virtually impossible to regulate.

Facing up to reality

AI is here for the foreseeable future, and we must learn to live with it. Impartially applied, it can become a valuable asset, which enables us to deepen our knowledge and understanding of the world in which we live. However, the AI overview of homeopathy shown earlier, reminds us that AI can be used selectively and manipulatively.

We must never lose sight of all those important qualities which define us as humans: Caring, kindness, compassion, empathy, honesty, integrity, generosity, the ability to cooperate with others, a willingness to take responsibility, courage, problem-solving, abstract reasoning, creativity, resilience and a higher purpose.

And, unlike AI, humans have the potential to innovate, something which requires a combination of creativity, vision, adaptability, original thinking and an overwhelming desire to explore new frontiers. □