Consciousness and AI

Ralph Abraham

University of California Santa Cruz

This is an update of my Poetry Science Talk on Consciousness and the Quantum Vacuum. I greatly appreciate the invitation from Gerd Stern and Neal Goldsmith to join their PST program, and to Al Kelley, Michael Beeson, Pablo Viotti, and Brian Steensma for sharing their experiences with ChatGPT, and to Deena Metzger for spurring me on.

1. THE PST TALK, 2009.

In 2009, I was invited by Gerd Stern and Neal Goldsmith to speak in their Poetry Science Talks series in Manhattan. At this time I had been working since 2006 with Professor Sisir Roy, a theoretical physicist at the Kolkata branch of the Indian Statistical Institute, on an atomistic model for consciousness. We had published articles on this work in 2006 and 2007.

It seemed a stretch for the poetry and science audience, but I decided to present it there. This turned out to be a very encouraging experience, which led to my preparing a book on the atomistic model with Sisir Roy. *Entitled Demystifying the Akasha: Consciousness and the Quantum Vacuum*, it was published in 2010.

The model is a dynamical cellular network, or DCN, an extension of the idea of an artificial neural network, or ANN. An ANN is an electronic simulation of a biological

neural network, or BNN, such as a brain. Digital-computer-based ANN research began with an artificial neuron (a computational model of a biological neuron) published by McCulloch and Pitts in 1943, the perceptron (a network of artificial neurons that learns) created by Frank Rosenblatt in 1958, and the Hopfield network popularized by John Hopfield in 1982.

An ANN comprises a finite number of passive nodes, some of which are connected by links, directed pathways for the transfer of information. Each link has a weight, a real number which may be interpreted as an excitation or inhibition on the activity of the node to which the link is directed. ANNs are trained by changing the weights to perform a task. Artificial intelligence, or AI, refers to the science and application of ANNs. Practical applications of ANNs exploded in the 1970s and 1980s.

A dynamical cellular network, or DCN, is an ANN with added features: nodes and links may have multiple states, and may appear and disappear. States change in time according to rules, which are part of the model. Roy and Requardt proposed specific rules for the quantum vacuum, which is a dynamical phenomenon in which elementary particles appear and disappear in pairs, and my book with Roy speculated on DCN rules for consciousness. This atomistic model incorporated ideas derived from Kashmiri Shaivism, and from psychedelic experiences.

All this was discussed in my PST talk of 2009.

2. THE SUDDEN GROWTH OF AI

In the intervening years, the main ideas of the atomistic DCN model have evolved, along with many new applications to different branches of science, including neuroscience,

social networks, time series analysis and prediction, pattern recognition, data processing, and AI. My intention in this short note is to report on one of these developments, artificial intelligence, or AI. , Born around 1956, AI has been dominated since about 2000 by machine learning or ML, in which an ANN is trained to perform tasks by the modification of the weights on its connecting links. By now, AI systems abound in products around the world. The ultimate application is artificial general intelligence, or AGI, the goal of which is to perform any task that a human can do!

Several companies are devoting extensive research to achieving AGI, such as OpenAI, Google DeepMind, and Microsoft Research. OpenAI developed its first foundation model, a large language model (or LLM), GPT-1 (GPT for Generative Pre-trained Transformer), in 2018. This was followed by GPT-2 in 2019, GPT-3 in 2020, and GPT-4 in 2023. These are trained on very large data sets to predict the next token in a sequence of such tokens. GPT-4 is multimodal, that is, it can process images as well as text.

ChatGPT is an application of GPT-4, in which a human can chat with GPT-4 using a webpage as interface: https://openai.com/blog/chatgpt. Many of my math colleagues have carried out extensive chats with ChatGPT, creaating proofs of math theorems, computer codes to create text, images, animations, and webpages, preparing lectures and drafts of essays, and so on. The results are amazing.

3. THE BENIGN FACE OF AI

The development of the GPTs is the main project of OpenAI, Inc. of San Francisco. Their website, openai.com, presents the mission statement of the firm, including:

> OpenAI is an AI research and deployment company. Our mission is to ensure that artificial general intelligence benefits all of humanity.
>
> ...
>
> Our vision for the future of AGI ... is to ensure that artificial general intelligence (AI systems that are generally smarter than humans) benefits all of humanity.
>
> ...
>
> OpenAI's mission is to ensure that artificial general intelligence (AGI) — by which we mean highly autonomous systems that outperform humans at most economically valuable work — benefits all of humanity. We will attempt to directly build safe and beneficial AGI, but will also consider our mission fulfilled if our work aids others to achieve this outcome.
>
> ...
>
> We are committed to doing the research required to make AGI safe, and to driving the broad adoption of such research across the AI community.

4. THE DANGERS OF AI

AI experts have expressed numerous fears of AGI running amok. These culminated in March 2023 in an open letter from the Future of Life Institute, which is devoted to reducing existential risks to humanity, calling for a pause in AGI research programs for six months. Fears are based on the extraordinary speed of AGI evolution, and the likelihood of unexpected behaviors resulting from blind evolution.

The letter said: "recent months have seen AI labs locked in an out-of-control race to develop and deploy ever more

powerful digital minds that no-one — not even their creators — can understand, predict, or reliably control".

The extensive and accelerating growth of network theory since 2010, especially in the fields of social networks, biological neural networks, and AGI, and the fact that these are based on mathematical models having a common structure for all three fields, as well as for consciousness as described in my PST talk of 2009, is highly suggestive for the questions:

> *Can artificial neural networks, be conscious?*
> *Can they existentially challenge humanity?*

These questions are currently being discussed with some urgency on the frontiers of science and philosophy, as the underlying science and engineering are evolving at terrifying speed.

REFERENCES

Abraham, Ralph and Sisir Roy.

Planck Scale and Agent Based Simulations of Quantum Spacetime, 2007. Intl Journal of Pure and Applied Math, vol. 39, no. 4 (2007), pp. 445-458

A Digital Solution to the Mind/Body Problem, 2007. *Integral Biomathics: Tracing the Road to Reality*. Plamen L. Simeonov, Leslie S. Smith, Andree C. Ehresmann, eds. Heidelberg: Springer, pp. 213-225.

Demystifying the Akasha: Consciousness and the Quantum Vacuum, Epigraph Books, Rhinebeck, NY, 2010.