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DISCUSSION

Artificial Intelligence: Mind, Computer and the Dance of the Wu Li Masters

Theses on the Future of AI

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Abstract
In these days of exuberant fantasies about the future development of artificial intelligence—mostly written by people who have never in their lives developed an AI program—the GFFT (Society for the Promotion of Technology Transfer) has also unleashed a competition on future AI scenarios to honour Wolfgang Bibel. Because I was allowed to give the laudatory speech for Wolfgang, I was also asked to contribute something to the pen. And because, despite everything else, it is not reprehensible to think about the future, I could not refrain from doing so. Here is my somewhat expanded contribution.

Keywords Future of artificial intelligence · History of AI · Conciousness · Quantum physics

The birth of AI—as a science—is generally assumed to be the meeting at Dartmouth College in 1956 and the founding of the Metamathematical Research Group in Edinburgh in 1963, although the actual development in England began earlier than that.

However, the most exciting period intellectually, which only made these two meetings possible, occurred decades earlier, when interesting analogies between computation in "the wet brain" and on artificial devices were discovered. These correspondences stimulated and motivated the Dartmouth meeting and British developments in the 1960s.

At that time two different developments came together: The "neuron hypothesis" (going back to Santiago Ramon y Cayal around 1900, finally confirmed in 1950) of the neural structure of the brain acting as a computational mechanism as pioneered by McCulloch and Pitts in their seminal paper. The other was the explanation of rational thinking that emerged out of logic over many centuries and was manifested for example in the Vienna Circle.

It took a little more than a 100 years for our field to develop to its present heyday: The scientifically interested public has been following the more spectacular developments—say in natural language processing as epitomized by SHRDLU and in robotics—since the 1970s. And only since the turn of the millennium, this technology and its impact on society have become as popular in the media as we know it today.

This long time span from first ideas—mostly coming from outsiders—to their acceptance as an acclaimed scientific discipline until finally their findings became common knowledge among an educated middle class is not untypical for other basic research areas as well. Classic examples are the theory of evolution, the theory of relativity, cosmological models and quantum theory: they all have fundamentally reshaped our understanding of the world.

Quantum theory, with quantum field theories in particular, has fundamentally changed our worldview with concepts such as non-locality, non-determinism and entanglement with subject/object unity. It has been enormously successful, but lacking a coherent interpretation, we still do not know what it "means".

The realization that quantum physics and much older spiritual philosophies of man and nature (such as inter alia philosophia perennis, Hinduism, Buddhism and others) are much closer than we originally thought has formed a new generation of scientists, whose worldviews are

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essentially shaped by physics and also by insights inspired by spirituality.

But what has all this to do with AI and theories of the mind?

These thoughts will probably not unduly worry most of today's technicians and scientists working in one of the AI fields, which are shaped by the rhythm of the coming and going of the next funding periods. But scientists working in the future on basic research problems in AI will without doubt be influenced by such general assumptions about the world (and the mind).

Our generation of scientists is certainly no less intelligent or less curious than those a 100 years ago. So what are their fundamental ideas today about the nature of intelligence and cognition that will have a similar impact in the next 100 years to come?

So what comes after AI, neural computation and AgI?

While the technological consequences of AI are only now really becoming apparent to everyone and amaze or frighten the sociologists seeing its impact on society, it is becoming apparent that the explanation of mind and thinking as *computational* was only a first step on the ladder of knowledge.

> At the end of the century, the use of words and general educated opinion will have changed so much that one will be able to speak of „machines thinking“ without expecting to be contradicted.
> (Alan Turing, 1950)

Today, no one will seriously question that the technical intelligence as investigated and developed in AI is in many areas comparable or even superior to our own.

But what about mind (“Geist”), which is unconceivable without the notion of consciousness?

This disturbing problem—not only discussed in psychology and the philosophy of mind—has led to a wealth of literature, see: https://plato.stanford.edu/entries/consciousness/. Hence can today's scientific circles in various disciplines, often led by philosophers, quantum physicists and Buddhists, play a comparable role to the generation of scientists who pondered such questions before 1950 when they couldn't sleep at night?

A science that seeks to understand the reality behind wave and particle and takes entanglement of particles even over great distances as given—could this science provide an understanding of even more far-reaching abilities of the mind, such as mystical or parapsychological phenomena that we cannot explain today? These are mental abilities that are closely connected with “consciousness” and are not only characterised by the distinction between “conscious” and “unconscious”, but also with what is discussed in philosophy of the mind as “qualia”, using the famous red rose as the drosophila melanogaster in the discussion. Mental abilities, moreover, that are not only important in these esoteric situations, but also in everyday thinking and in creativity—and thus they fall into the area of “strong AI”. A point of view, that is typical in Hinduism and Buddhist philosophies.

This new research paradigm is characterised by the assumption that we are inseparable from space: the cognising, the cognisor and the cognised are one. In deep meditation, mystical experience, but also within immersion into a scientific problem, we can gain access to this information given enough practice and perseverance. How this works, that is, how exactly the neurons of our brain have access to this information in space, is largely unknown. But it seems to be that thinking as done by an isolated brain (the computational brain), locked in the dark chamber of the scull—“The brain happens to be a meat machine” (Marvin Minsky)—cannot be explained alone by computation and contemporary neurology.

And if all this sounds too strange to you: think of the scientists before and after the Second World War, whose ideas went far too far for contemporary science, but whose sleepless nights made today’s AI possible.

There are initial attempts to explain such a connection between brain and space via quantum physical effects, and the search for the receptors in the brain has begun. Do individual neurons have this ability or do neural assemblies play this role? Are there fractals in the microtubules within the neurons that account for this ability? And how does the transmission of information from there into the neural network work?

1 Here is my thesis

In coming years, we will see a widespread realisation that today's basic assumptions in AI (as well as in cognitive science) for an explanation of thinking as neural computation and its simulation on a computer cannot explain higher mental abilities associated with consciousness, that is, they can not really explain “thinking”.

Growing from today's approaches, we will see on the 19th of June in 2056 the first workshop *GWAI-Quant* that investigates mental abilities including consciousness by using scientific methods from quantum physics, neuroscience and information-processing in computer science.

2 Caveat

Suppose we have this understanding: should we then try to implement it with the help of the new quantum computers in the robots of the future? Apart from doubts in principle as to whether this is possible at all, because so far only living beings have these capabilities -- but machines?

The first physicists who succeeded in nuclear fission wanted to prevent its use in practice and thought that mankind was not ready for such capabilities. I would like to agree in both cases, AI of the future and atomic weapons, but knowing the world and how the history of science has gone so far, I fear—we will.

3 Annotation

The title refers to one of the most beautiful books on modern physics that gives a Buddhist view of quantum theory: "The Dancing Wu Li Masters". My title is a tribute to its author Gary Zukav, who—like myself—tries to live in both worlds, the Western natural sciences and the Hindu/Buddhist worldview.

And lo and behold: this time the German scientists are not 20 years behind their English and American colleagues as they were in 1976 with GWAI-1976 and AI research in Germany after the Second World War, but we are there right at the very beginning. See for example.

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