On the research Trends in Artificial Intelligence and Machine Learning

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There is, and has been, a growing skepticism expressed by different artificial intelligence trends to the remaining, meta-theoretically unrelated or at least seemingly so, trends. I find this a disturbing turn of events when we have been repeatedly proved, time and again that there exist, as far as we have discovered, no single solutions to AIs questions and quests. Let me temporally develop the cause of my uneasiness.

In the very beginning, since the birth of a notion of AI, there has been noticability ambiguity on what it means to be intelligent. The post-World War two era saw the compression of hardware components and machines that could perform crypt-analytical calculations at staggering speeds, of course within the limits of the computable hardness of crypt-analytical problems. John McCarthy introduced, in a logical empiricist tradition, formal definitions of knowledge and common sense. Marvin Minsky, around 1956, wrote his dissertation on neural computational models. We saw, post undeniable-above-mentioned-creativity, logical formalisms of intelligence and neural networks as ways to create intelligent software. The excitement expressed for the former is the stimulating link between philosophical logics, logical positivism and empiricism, and the notion that we can have consistent reasoners. The excitement expressed for the latter stems from an innate, almost primordial, sentiment that we have finally understood our core, or at least a poor but a computable twin of it, and can finally use our model to recognize faces, objects, patterns and the rest of the visually appealing crap we encounter in daily lives. Ironically, it was Marvin Minskys book, Perceptrons, and further discussions that hinted at how we might terribly falter if we assumed our current neural models as learning techniques since there were many trivial functions (such as XOR and possibly, provably, more) that simply couldnt be learnt.

The book and succeeding reports, from Edinburgh, Stanford and MIT, saw the growing skepticism that the enthusiasms held were arguably going to be let down. Although AI research continued, with Hearsay among others, the work was more restrained and the progress slower. Funding ceased with many projects and we saw the AI Winter. Meanwhile, perhaps driven by the apparent failure of AI models, there was a slow move of researchers to the statistical analysis of data and use this analysis to arrive at decisions, what can be termed as statistical

decision theory. Pattern recognition, again perhaps fearing a sudden inflow and then subsequent outflow of enthusiasm, made it clear from the start that their intentions were completely different - they just wanted to recognize patterns. Statistical and Mathematical properties such as Mean, Eigens, Euclideans, were used to identify and recognize patterns. A perspective that, in fact, pattern recognition is implicitly AI research, consider Douglas Hofstadters, Seeing As and Seeing As.

The Eighties saw multiple fields of AI existing in harmony, neural computation was still existent, firm logical foundations was being discovered with notions of belief and obligation drawn from Epistemology was used in the development of abstract intelligent reasoners, algorithms was modeled as intelligent behavior, Reinforcement learning - a technique that uses the notion of rewards and feedback - served as a non-inductive way of behavior learning, and firm research in Inductive learning continued in the field of Machine Learning. Which of these models are our answers? The Nineties saw Bayesian modeling (although this was already introduced in the Eighties), Markov decision process (from Operations research), Game theoretical models etc. Bayesian models were used for analysis of Biological data and to this extent, intelligence was ubiquitous. Map building, guiding cars, character recognition with Machine Learning algorithms were widespread. Which of these models are our answers?

With an equal prior probability, probably everything and probably nothing! The point is that there is no discovered single solution to AI. The field is ripe, the problems are numerous. We do not know how our brain works. How can we know which model is the closest copy? How can we know that the brain uses only a single model? If the brain was using a single or multi model framework, how can we guarantee ourselves, at this point in time, that a computational twin is the necessarily the solution? It is easy to see that, a la Douglass article and Semiotics, seeing abstract patterns in art strikes new patterns and types which may not be necessarily logical (consider reading Kant and the Platypus by U. Eco)? It is easy to see that if a sharp object is moving towards your eye, you move away - this is not because there were times when you stayed and watched and turned blind in one eye and then learnt that it was a stupid thing to do - but simply because its your reflex, its built into your body compositions. As is your reaction to get food when you are hungry. On the other hand, if you, like hundreds of Karl Lagerfeld models, are on a diet then you reason, quite intelligently, that you should put up with this pain and stay hungry (this is not a sexist note but simply one that allows you to keep your job with Lager and Co.). Similarly, Game theory, has proved time and again, than they can be predictable models for guess working your way through economics (there is a reason game theory is taught at business schools - Joe Halpern), and game theory is perfectly logical. So, on one hand, we see the need for robust pattern recognition models and on the other hand, we see the need for logic. Who is to say we dont, quite intelligently which possibly could lead to meta-theoretical alternatives, use both at the moments that it is convenient? Why are we continuing to insist that one way of doing AI is wrong and another is not? Has 50 years of AI research taught us NOTHING?

On a positive and lighter side, the current research of AI is extremely satisfying, where rather complex reasoners and intelligent creatures can and have been constructed. Without jumping the gun, we must allow and encourage all branches of AI research to see where it takes this. This is the philosophy of SCIENCE!