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**Social and Ethical Impact of Machine learning:**

As our world expands through the growing abilities and applications of computers in our everyday lives, it seems that the role of the computer has been reversed. Before we knew that the computer only understood what we programmed it to understand; however, now most of our society is learning more from computers than they can input into it.

**History**  
The human aspiration to create intelligent machines has appeared in myth and literature for thousands of years, from stories of Pygmalion to the tales of the Jewish Golem.

It’s all well and great to ask if androids dream of electric sheep, but science fact has evolved to a place where it’s beginning to coincide with science fiction.  No, we don’t have autonomous androids struggling with existential crises, yet Sophia is a social humanoid robot developed by Hong-Kong-based company Hanson Robotics. Sophia was activated on April 19, 2015 and made her first public appearance at south by southwest festival (SXSW) in mid-March 2016 in Austin, Texas, United States. She can display more than 62 facial expressions.

Machine Learning is a sub-set of artificial intelligence where computer algorithms are used to autonomously learn from data and information. In machine learning computers don’t have to be explicitly programmed but can change and improve their algorithms by themselves.

Today, machine learning algorithms enable computers to communicate with humans, autonomously drive cars, write and publish sport match reports, find terrorist suspects and Brain-computer interface (BCI) which is a collaboration between a brain and a device that enables signals from the brain to direct some external activity, such as control of a cursor or a prosthetic limb. The interface enables a direct communications pathway between the brain and the object to be controlled. I firmly believe machine learning will severely impact most industries and the jobs within them, which is why every manager should have at least some grasp of what machine learning is and how it is evolving.

In this post I offer a quick trip through time to examine the origins of machine learning as well as the most recent milestones.

1950 — Alan Turing creates the “Turing Test” to determine if a computer has real intelligence. To pass the test, a computer must be able to fool a human into believing it is also human.

1952 — Arthur Samuel wrote the first computer learning program. The program was the game of checkers, and the IBM IBM -2.25% computer improved at the game the more it played, studying which moves made up winning strategies and incorporating those moves into its program.

**Social and Ethical Issues Associated with Machine Learning**  
Is machine learning in human society a utopian dream or a Faustian nightmare? Will our descendants honor us for making machines do things that human minds do or berate us for irresponsibility and hubris?

**Part I Social Impact of Machine Learning**

It is an important factor that the public and politicians of today know as much as possible about the effects for good or ill of Machine Learning in our society.  
  
Clearly Machine Learning has potential advantages and would be very useful in aiding many professions however there are many that would argue it would be used not for the good of all men. Like many recent Hollywood films exploring AI and Machine Learning its application has ended in disaster films like Transcendence, I, Robot, Bicentennial Man.

In the coming years, as the people encounters new Machine Learning applications in domains such as transportation and healthcare, they must be introduced in ways that build trust and understanding, and respect human rights. Rather than being a threat to our existence or plotting to take over the rule of the world, according to the Stanford report in the coming decades we can expect AI and Machine Learning systems to increasingly being applied in transportation; service robots; healthcare; education; low-resource communities; public safety and security; employment and workplace; and entertainment. The implications of these advances in Machine Learning for jobs, social interactions, privacy and war where discussed between researchers and policy makers were discussed in The Hague. As the Stanford report indicates: “The frightening, futurist portrayals of Artificial Intelligence and Machine Learning that dominate films and novels, and shape the popular imagination, are fictional. Machine Learning is already changing our daily lives, almost entirely in ways that improve human health, safety, and productivity.” The debate in The Hague concluded quoting leading Machine Learning expert Pedro Domingos: “computers are really, really dumb and they’ve taken over the world. The world cannot function without computers anymore. It would be better if they were smarter”. Yes, AI and Machine Learning may soon take over our jobs and drive our cars but there is a lot to be positive about. Currently, over a million persons die annually in traffic accidents, more than half of which are caused by human error. Even if intelligent self-driving cars will inevitably cause accidents and deaths, forecasts show a sharp decrease on road casualties associated to increase in self-driving cars. Similarly, jobs will be lost, but maybe repetitive, monotonous, demeaning jobs should be lost, freeing people to more meaningful and joyful occupation. Most importantly, Machine Learning developments will contribute to a needed redefinition of fundamental human values, including our current understanding of work, wealth and responsibility.

**Work**. As Machine Learning systems replace people in many traditional jobs, we must rethink the meaning of work. Jobs change but more importantly the character of jobs will change. Meaningful occupations are those that contribute to the welfare of society, the fulfilment of oneself and the advance of mankind. These are not necessarily equated with current ‘paid jobs’. AI and Machine Learning systems can free us to, and be reward for, care for each other, engage in arts, hobbies and sports, enjoy nature, and, meditate, i.e. those things that give us energy and make us happy.

**Wealth**. Technological developments in the last century led to mass production and mass consumption. Until very recently, having is the main goal, and competition the main drive: “I am what I have”. Digital developments, including Machine Learning, favour openness over competition: Open data, open source, open access, … The drive is now quickly shifting to sharing: “I am what I share”. Combined with the changing role of work, this novel view on wealth, requires a new view on economy and finance.

**Responsibility**. As Machine Learning moves from a tool to teammate, perhaps the most important result of AI and Machine Learning advances is the need to rethink responsibility. In the debate in Hague, the role of ‘slave’ was proposed for Machine Learning systems, fully under the control and responsibility of its owner. Developments in autonomy and learning are rapidly enabling Machine Learning systems to decide and act without direct human control. Greater autonomy must come with greater responsibility, even when the notions of machine autonomy and responsibility are necessarily different than those that apply to people. Machines are already making decisions, the chain of responsibility is getting longer, and the definition of responsible agent is being extended to include e.g. corporations. Explanatory capabilities are needed for accountability and to justify decisions. Moreover, social interactions with Machine Learning systems require trust. Where our trust on other people is partly based on our ability to understand their ways of doing (putting ourselves on their place), this does not go for machines. Trust on machines must then be based on transparency. Algorithm development has so far been led by the goal of improving performance, leading to opaque black boxes. Putting human values at the core of AI and Machine Learning systems calls for a mind-shift of researchers and developers towards the goal of improving transparency rather than performance, which will lead to novel and exciting algorithms. Turning Deep Learning into Valuable Learning.

**We** **are** **ultimately** **responsible**. As researchers and developers, to take fundamental human values as the basis of our design and implementation decisions. And as users and owners of Machine Learning systems, to ensure a continuous chain of responsibility and trust encompassing the acts and decisions of the systems as these learn and adapt to our society.

**The areas where we need to consider:**

**Who has the skills to develop and benefit from machine learning? Are there any groups without the necessary skills to benefit from it?**

I believe the good news is that the talent pool is steadily increasing, and the skills are becoming more available. The challenge in any market where demand outstrips supply is that only those with sufficient economic resources are likely to attract the necessary talent to ensure success of their project. This poses specific problems to society.

ML technology achieves two significant results. Those who successfully deploy it develop an ability to ‘anticipate’ or ‘predict’ the future based on patterns encoded within their data; and they can potentially perform tasks with a game-changing degree of time-leverage than previously possible. The combination of these two results give a level of competitive advantage that could lead to rapid dominance in their given market. An example of this is how Uber uses predictive analytics to suggest which parts of town might be a good ‘hunting ground’ for drivers looking for jobs. By being more efficient with traffic routes, mean a greater number of jobs can be completed per driver. The combination of both these factors (along with a positive User Experience, and a positive Viral Marketing co-efficient) leads to rapid and complete market dominance.

**Is it important to ensure open-source access to data and open-source access to machine learning algorithms?**

It’s clear that the Royal Society’s focus for this evidence gathering workshop was on skills and access to technology, but in my view, this is not the area of greatest concern. To me, it doesn’t really matter whether a cabbie who has lost his or her livelihood because of Machine Learning (Uber/ Self-Driving cars) can download an Open-Source library of machine learning algorithms, or indeed has the skills to understand them. What matters is how wealth is redistributed from the cabbie or local taxi firm, and consumers like the rest of us – to an oversees company owned by high-net worth investors outside of the purview of domestic regulation or taxation.

To me what’s important is to ensure open-source access to capital created thanks to the use of machine learning algorithms. If we’re influencing policy decisions, then can’t we somehow incentivize the cabbie to invest in crowd funded machine learning projects so that he or she at least has a hedge against their income being lost in the near term? Shouldn’t the state be finding ways of ensuring capital created by this technology stays within its control?

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