Machine Learning or the class struggle Relearned.

Technology in the hands of the capitalist class in pursuit of profit is always used against the working class. In the past, workers built palaces for the rich and prisons for themselves. These days workers are primarily building and programming machines to replace themselves. This will continue as long as workers allow the capitalists to claim products of labour to be their own private property.

Recently the OECD provided an analysis of potential job losses due to the digitisation of production, distribution and services. (Source: Nedelkoska, L. and G. Quintini (2018), "*Automation, skills use and training", OECD Social, Employment and Migration Working Papers*, No. 202, OECD Publishing, Paris. http://dx.doi.org/10.1787/2e2f4eea-en) They dismissed the earlier figure of a potential loss of 47% of jobs in the US and the EU within twenty years (Frey and Osborne 2013). Instead the study provided a new figure of 14%. This figure of 14% is based on a more comprehensive investigation of engineering bottlenecks covering a broader range of countries and occupations. The newer study covers the 32 countries participating in the PIAAC survey.

To arrive at this figure of 14% the threshold was set at a 70% probability that current and imminent automation could replace humans. While the figure of 14% captured the headlines, the secondary figure of a further 32% loss, based on a probability higher than 50% but below 70%, was hardly mentioned. If we use the same methodology, then the fall in the number of jobs will be less than 32% but more than 14%. The study concedes probabilities <70% will still lead to fundamental changes to the nature of work in this sub-group. In this group workers will be augmented by IT or OT (Note 1.) rather than directly replaced, meaning that if one worker can now do the job of two or even three, then an additional 16% of jobs will be lost.

However. on this point the study remains silent. This is understandable if the object of the study was to underplay the consequences of digitisation and move the discussion away from the earlier 47%. But on its own assumptions about engineering bottlenecks, the more probable figure is not 14% but at least 30%, and not 66 million job losses but 180 million job losses. 180 million job losses clearly represent a fundamental challenge to capitalist stability.

The OECD goes to great lengths to claim that technological advances have in the aggregate increased the number of jobs, not reduced it. (More later under Discussion). In part 3.2.3. of the cited study and titled: *Innovation vs. Diffusion*, paragraph 41, the case of ATMs and bank openings are cited. The conclusion drawn was that by substituting cheaper ATMs for bank tellers, the running cost of bank branches was reduced to the point where it was economical to increase the number of branches.

This is the problem when an association is being used to prove cause and effect. The real reason why banks expanded from the 1980s onwards into retail, was globalisation which restructured the relationship between financial and industrial capital. To profit from the retail sector the range of services had to increase. From counting and dispensing money, bank tellers were turned into salesmen and saleswomen selling everything from loans, through insurance, to mortgages and pensions. This would have happened with or without ATMs. All ATMs did was to reduce the cost of this strategic reorientation within the retail sector.

When set against the current levels of employment in the US and UK discussion about potential job losses seems out of phase. After all, unemployment is at a historical low. However, the matter is not clear cut. The nature of today's workforce is different to the past making historical comparisons difficult. Many more workers are no longer counted as working at their place of employment but for the agencies that have hired them. This has distorted the picture. As the Bureau of Labour Statistics

in the USA says in its methodology notes at the end of its report on JOLTS (Job Openings and Labour Turnover Statistics April 2018) "*Employees of temporary help agencies, employee leasing companies, outside contractors, and consultants are counted by their employer of record, not by the establishment where they are working."* This creates a significant sampling error because the number of job openings can be vastly inflated by the nature of agency work which tends to be shorter term contracts. It explains why the second biggest increase in job openings, 20% of the total, is to be found in the field of Professional and business services, where consultancies and contractors predominate. Conversely it also explains why job openings are lowest in industries where agency work is at a minimum.

Returning to the study, one of its highlights is the polarisation of the workforce. While the middle has been hollowed out, the only growth in employment has been at the top and bottom extremes. The growth in the top end is most interesting. Traditionally, capitalism has broken down the production process into a majority of unskilled and semi-skilled steps held together by a minimum number of skilled jobs. The advent of computerisation and accelerated automation is changing this simple division of labour.

Unskilled and semi-skilled humans do not need to be built, programmed and repaired. Management only requires them to be supervised. A complex automated piece of machinery on the other hand does not require supervision but complex maintenance. Hence supervisors are replaced by programmers and engineers. Consequently, the emerging work process can now be described thus: the production process is being broken up into a range of automated steps held together by an enlarged skilled workforce, whose increase is due to the need to expand the technical supervision of the production process. Hence at the top, the number of skilled positions is increasing though not in proportion to the loss of less skilled occupations.

Turning to the growth of unskilled jobs. The purging of workers because of automation in traditional industries has enlarged the reserve army of labour which in turn has depressed wages significantly. The study finds that the loss in wages since 1973 in the USA is concentrated here. The growth in the well-paid layer of skilled workers together with rising inequality has provided the revenue for an enlarged serving and servant class. While automated production processes produce coffee machines, cheap displaced workers (baristas) serve the coffee.

It is likely that this serving and servant class will become the largest layer of workers and most of them will be in precarious employment. The proliferation of jobs in this field expresses the polarisation in society between the two ends. The future is already here.

Finally, one interesting development highlighted by the study was when it examined trends in the UK and the USA covering jobs requiring physical strength. It found some of the sharpest contractions in employment here. The advent of forklift trucks, mechanical aids, power tools and power steering shows that muscle power is becoming increasingly irrelevant. As a result, the physical differences between workers, particularly between the sexes, has become less important.

This has important programmatic implications as I pointed out in *In Defence of Consumer Led Planning* (https://theplanningmotivedotcom.files.wordpress.com/2017/12/comprehensive-planning-article-pdf.pdf) Marx discussed the difference in physical abilities in his *Critique of The Gotha Programme* to underpin the equal right that each producer receive back from production in proportion to her/his contribution. One hundred and fifty years later the big division is no longer that of muscle, but of brain, the division of skill.

A change in direction.

It is important to understand what is and what is not meant by engineering bottlenecks. The mass migration of jobs beginning in the late 1970s from high wage to low wage countries, or from the US to China, was not due to the elimination of an engineering bottleneck, in this case an inhibitory communication function. During periods of falling profitability, capital has always been exported to low waged countries as a means of improving profitability. Indeed, the migration of jobs preceded the comprehensive introduction of the internet or the information age, which occurred only towards the end of the 1980s (though it must be recognised that the prior introduction of fax machines immeasurably improved communication between plants/branches and head office). Indeed, much of world shipping still relies on fax machines.

An engineering bottleneck refers specifically to processes, to the possibility of automating a job, not exporting it. The threshold is lower for those tasks that are repetitive, predictable and require the lowest amount of interaction with end users. The study employs three criteria to define a bottleneck. Cognitive, routine and manual operation. The most manual, repetitive and least cognitive processes and tasks have the lowest bottleneck and are therefore most easily automated.

The threshold is higher when tasks are not repetitive, less predictable, require more imagination (cognition) and interaction. Of all the criteria, repetition is the one most attacked by machine learning. However, what was considered non-repetitive today may become repetitive tomorrow. Data mining can turn jobs, previously considered non-repetitive into repetitive tasks. For example, in the legal sphere, the downloading of all case law and the subsequent connecting up of cases and case law, especially precedent, means a computer can do the research formerly undertaken by a legal clerk which previously would have appeared non-repetitive. This applies to many fields of clerical work. McKinsey (2016) concluded that *"…about 50 percent of the overall time of the workforce in finance and insurance is devoted to collecting and processing data, where the technical potential for automation is high. (https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/where-machines-could-replace-humans-and-where-they-cant-yet)*

Machine learning thus reaches upwards. Its whole purpose is to raise the threshold at which engineering bottlenecks occur. Here the question of opportunity costs arises. Whereas many unskilled jobs may be easy to automate, the low wages that populate this sector around the world may make automation uneconomic. The same cannot be said for higher skilled occupations with higher wages. With the growing sophistication of automation, it is precisely these white-collar office jobs that are most vulnerable. That is why automating clerical jobs has become the holy grail of machine learning.

Of course, this has profound social and political implications. Traditionally, one of the most effectively cultivated divisions in the working class has been the one between white and blue-collar workers. Encouraged by the capitalist employers and mocked by comedians, blue collar workers have been presented as inferior to white collar workers, even second-class citizens. The result has been a divide exploited by capitalist bosses especially when blue-collar workers went on strike.

And not only on strike. As the often-quoted study by Michael J. Hicks and Srikant Devaraj found, 87% of job losses since globalisation in manufacturing has come from automation and those are mainly focused on the factory floor, not the office. (*The myth and reality of manufacturing in America*. https://projects.cberdata.org/reports/MfgReality.pdf) This is why political anger is deepest amongst blue collar workers and why many of them bought into Trump's message that it was cheap foreign labour, not greedy American bosses, that was responsible for their poverty.

Support for capitalism in the working class often lay with better paid white-collar workers, the very ones now threatened by the upward reach of machine learning. CNBC quotes and comments on Peter Norvig, a leading artificial intelligence scientist and a director of research at Google, who thinks the real worry is how to prepare for the mass elimination of jobs that is surely coming. Although he comments that this process is well underway with manufacturing jobs, more and more, it's going to creep up the value chain, altering or eliminating any number of jobs in law, finance and even media. "*The pace may be so fast that it [will] cause disruptions*" (CNBC *Here's how one of Google's top scientists thinks people should prepare for machine learning.* 30th April 2017) And again: "***many fear that this time the change may be so fast and so vast, and its impact so uneven and disruptive, that it may threaten not only individual livelihoods, but the stability of society itself.***" (Boston Globe *Transformative automation is coming. The impact is up to u**s.*** 10th November 2017.) Mark Carney opined in December 2016: we are "*in the midst of a technological revolution*" that will "*destroy jobs and livelihoods well before new ones emerge*".

Universal basic income.

Returning to the theme of the division between blue and white-collar workers. The working class is further divided, this time economically rather than socially, between workers who produce commodities and circulate them, and workers employed by the capitalists to sell, market, account for, physically protect and legally fight over these commodities. The former are productive workers engaged in the production and realisation of profit while the latter are paid out of these profits to administer, account, protect and sell these products In other words they represent the costs made necessary by the fragmentation of production based on private property. Profits going to capitalists can thus be increased in two ways, firstly, by forcing productive workers to produce more profits, or, secondly, reducing the deductions from this mass of profit.

As workers have become more productive at producing commodities over the last few decades, so the physical volume of these commodities has swelled. This has resulted in a greater number of workers being employed to administer, account and sell them. Any reduction in their ranks will add to profits because it will reduce the deductions from profit these expenses represent. Hence it is not in the factories that most of the bunches of fruit now ripe for automation hang, but in offices. Unfortunately, it is now the turn of clerical workers to feel the full brunt of automation.

Sensing what is about to unfold the capitalist class are both discussing and more importantly, entertaining the notion of a basic universal income. They have never discussed this seriously nor consequentially before. They sense that the magnitude of job losses this time around, maybe on a scale that structural, rather, than cyclical unemployment, is inevitable and that it will embrace many more layers of workers.

However, capitalists are bosses not charities. They know universal basic income turns a potential reserve army of labour into a cocooned section of society no longer linked to production but living off it. Such a privilege the capitalists reserve only for themselves. Hence it is unlikely that the capitalists will tolerate an unconditional basic income for to do so will mean forsaking control of this section of society. Instead whatever scheme is introduced will be conditional, requiring certain activities to be performed in return for this income. It should never be forgotten that the capitalists only conceded unemployment benefits in the 1930s because conditions were added to them.

Nor will it be universal. It would be uneconomic to extend it throughout society to the higher paid and the capitalists themselves. So, it will be limited. But what will distinguish it from previous forms of benefits is that it will be a streamlined and long-term benefit mirroring the structural nature of this

new unemployment. In the end of course, its final shape and scope will be determined by the class struggle itself.

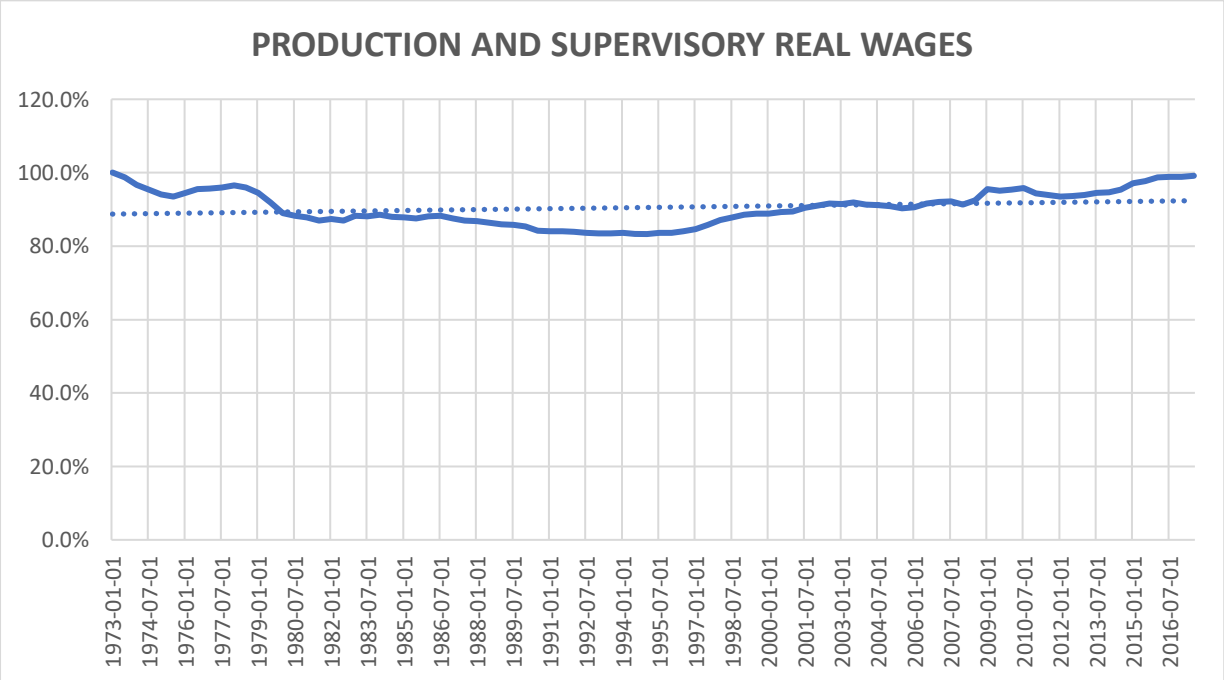
Meanwhile the soft left will continue to idealise Universal Credit in all its forms as something progressive, which it is not. A future where the capitalist class owns an automated means of production which consigns large parts of society to permanent unemployment is certainly not an advance nor in the interest of the working class.

Discussion: Why this time it is different.

The authors of the study maintain that machine learning will displace workers but create new opportunities for work, some known, most unknown. They point to the sharp contraction in agricultural employment over a century ago due to mechanisation, which did not lead to mass unemployment. Instead it led to mass industrial employment, especially to mass assembly line production which had not been anticipated. This is true but what is often overlooked is that the movement from agricultural employment to urban employment resulted in the movement from lower pay to higher paid employment. What is happening now is that there is a movement from higher pay to lower pay, the opposite to what happened with earlier migrations of labour, at least in the developed capitalist world.

Since 1973, in the USA, there has been no improvement in the average wage, as the graph below shows (Graph 1). It is derived by dividing average hourly wages for production and supervisory workers (FRED Table AHETPI) by the Urban Consumer Price Index (FRED Table CWUR0000SA0) to determine the real movement of average pay. Data points are half-yearly and are indexed to 1973 in order to show the relative movement in wages.

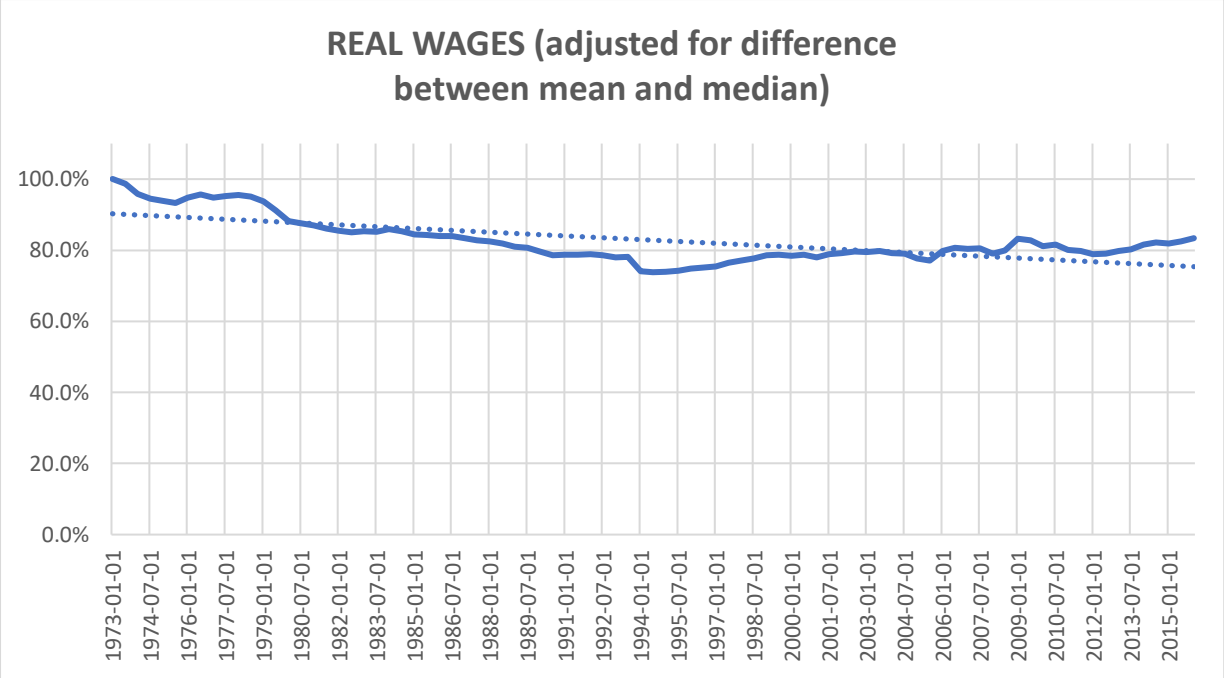
Graph 1.



Despite an increase in pay over the last 4 years, pay currently stands at 99% of the value found in 1973. However, the average pay can be misleading as it has been dragged upwards by the rapid increase in the top 1% of wage earners. This has also caused the long-term trend to rise. The median

wage would be a better illustration of the longer-term trend. Unfortunately, the Labour Bureau only provides only mean pay, not median pay. However, a different department, the Census Bureau, provides a series examining mean and median family incomes. The difference between these two incomes can serve as a proxy converting mean into median pay.

Graph 2.



(Source: FRED Table MAFAINUSA672N for mean family income and MEFAINUSA672N for median)

Once adjusted, the scale of the fall in real wages becomes real and the picture changes. The figures are only available up to 2016 but over this time the fall is around 16% rather than 1% resulting in a long term trend which instead of rising is falling. It can be expected that as machine learning reaches upwards, more jobs above the middle range will be eliminated and that, in the long run, the median wage will continue to fall.

This fall has human consequences. As *Medscape* reported on the 31st May *"The United States was one of only five countries, along with Somalia, Afghanistan, Georgia and Saint Vincent and the Grenadines, where healthy life expectancy at birth fell in 2016, according to a Reuters analysis of the WHO data, which was published without year-on-year comparisons in mid-May*." (Quoted in the China Overtakes U.S. for Healthy Lifespan - WHO Data, Medscape 31 May) The richest country in the world with third world conditions for many of its people.

It is generally recognised by several studies that it is entry level jobs that are most at risk as these are the simplest, therefore easiest jobs to eliminate. This means that the loss of jobs will fall most heavily on the young adding to already high youth unemployment.

Paradoxically, one of the factors holding back the introduction of automation is the lack of skilled workers to install, maintain, programme and protect this equipment against cyberattack. *"Prediction 4: Robotics Talent Crunch. By 2020, robotics growth will accelerate the talent race, leaving 35% of robotics-related jobs vacant while the average salary increases by at least 60%."* (*IDC FutureScape: Worldwide Robotics 2017 Predictions*, *Dec 2016)* Clearly, what will be needed is a fundamental re-organisation of the working class to achieve the rapid introduction of clever automation. While this

will increase the demand for labour in one part of the labour market, it will not make much of a dent in the job losses following automation.

What is different this time is the division of labour that machine learning will make possible. Previously the production process was based on either conserving labour power, or amplifying it, or accelerating it, or extending it. Accordingly, when workers left the farms for the factories and worked on the assembly lines, their labour power was conserved by immobilising them in front of a belt carried the work to them and past them. Or in other parts of production, the rapidly falling price of pneumatic and electrical engines extended the range of mechanical aids available to amplify labour power.

But machine learning is different. Its purpose is not to augment labour power, to amplify it, to extend it or even to accelerate it, instead its purpose is to void labour power. While its initial inception will have elements of augmentation, Its growing sophistication will allow for the replacement of labour power altogether. Technicians, programmers and engineers will now supervise whole lines of integrated machines with minimal intervention by labour power except in the field of maintenance and reprogramming.

Once installed and running these machines will be generating their own data through Operational Technology, something akin to Information Technology. Here the inputs will be machine and equipment sensors. This is what the internet of things is all about. OT is already in place with expensive capital goods like jet engines. As the costs of sensors and associated communications fall so OT will be extended to cheaper machinery and equipment. Over time these machines will build up sufficient data to allow for mining patterns which gauge optimum performance or anticipate a failing component.

This means that the technicians, programmers and engineers will be able to tune performance, know how often to service the equipment or to intervene before serious damage is done to any piece of equipment, and, even which components need to be re-engineered because they represent a weakness in the system. Of course, in time robots could be doing the repairs, but before that, OT will reduce the number of skilled workers by minimising the need to repair or service the equipment.

In every way possible, capitalism seeks to minimise labour input. This applies at all levels. As the Financial Times reported on the 5th May, software companies like" Outsystems" have developed software that allows individuals to write software using a minimum of code. (*KKR and Goldman take software platform stake*.) This is reminiscent of what happened with companies like Adobe and Quark in the 1980s which reduced typesetting from a highly skilled profession into a task that could be performed clerically in an office. This resulted in the closure of tens of thousands of typesetting departments and the firing of hundreds of thousands of skilled operators. Systems developed by companies like Outsystems will allow lower skilled programmers and managers to replace higher skilled programmers.

In summation, automation is not new. Mechanical automation has been around for two centuries allowing many machines to mimic basic human actions like hammering, stretching, screwing, inserting, folding and so on. Digital automation has been around for over half a century. But what is new about machine learning is that it has speeded up and extended the reach of automation. As a result, it will reduce the number of jobs not increase the number of jobs, through as yet unimagined occupations.

Automation is seen as a threat, only because it is privately owned in pursuit of profit. Were it to be collectively owned and used in the pursuit of society's best interests it would both reduce the working

day and void difficult and monotonous work. It would not threaten society with mass unemployment where the only work on offer is serving or servant.

Marx spoke eloquently about the forces of production coming into conflict with the relations of production. The outstanding example of this must be machine learning. Machine learning requires a new form of society where the relations of production harmonise with the forces of production. Such a society is a socialist society. Workers must fight for such a society and not be diverted into the cul-de-sac of arguing for universal basic income. Instead our slogan should be "share out the work without any loss of pay". If the capitalists want to introduce new technology then it will be on our terms, not theirs, shorter hours not fewer workers. Machine learning poses the question of who controls production in the sharpest terms. The answer to machine learning is relearning the class struggle.

Machine learning is not Artificial Intelligence.

Even experts in the field argue over the correct terminology. What is data mining, or deep mining, or machine learning, or artificial intelligence? Where does one begin and the other end especially when it comes to the distinction between machine learning and artificial intelligence. This author rejects the term artificial intelligence. Mimicking human instructions is not intelligence. The reason why artificial intelligence is impossible for the foreseeable future is that computers are digital while our brains are analogue, and whereas computers are inorganic, our brains are organic (biological).

They work differently. Computers can do mathematical calculations that dazzle us, but they are bad at most things even infants can do. Above all computers cannot write fiction, and until they can, they will never be able to be classified as intelligent, because fiction is not based on inputs or the mining of data, it is based on imagination, on something which is invented, and, which is only loosely related to data or facts. Fiction represents a fundamental leap.

The human brain and its associated nervous system is structurally different to a computer. *"The same interconnected areas, linked by billions of neurons and perhaps trillions of glial cells, can perceive, interpret, store, analyse, and redistribute at the same time. Computers, by their very definition and fundamental design, have some parts for processing and others for memory; the brain doesn't make that separation, which makes it hugely efficient. The same calculations and processes that might take a computer a few million steps can be achieved by a few hundred neuron transmissions, requiring far less energy and performing at a far greater efficiency. The amount of energy required to power computations by the world's fastest supercomputer would be enough to power a building; the human brain achieves the same processing speeds from the same energy as is required to charge a dim lightbulb."* https://www.scienceabc.com/humans/the-human-brain-vs-supercomputers-which-one-wins.html

In addition, the brain is plastic. It re-organises itself, it adds to itself, something a computer cannot. New connections between neurons are being made and broken with each new experience of the outside world. *"Neurons connect us together to create networks that allow us to think, remember and predict. It is not the number of neurons we have that makes us clever but the number of connections between neurones and the complexity of the patterns they form. This is what gives the brain its immense processing power.* Each of the brain's 80 billion neurons can have up to 10,000 connections. *This means that the human brain has more than 500,000 times as many connections as even the most advanced computer chip.* (The Brain Bank. The Royal Institute Christmas lectures.) Within the first few months after birth, most of the neurons that populate the brain during our life are in place with the exception of the Hippocampus where memories are made. During our lives we will lose neurons at ten times their replacement rate. So, becoming more intelligent and aware of the outside world is not

due to the additions of neurons but to the making and breaking of connections between neurons and the glial cells (which are more numerous than neurons and who role in intelligence is only now being understood).

Furthermore, while electrical activity has been well researched, we do not know what is happening in the Dendrites that receive these nerve impulses. Clearly their interiors are changed by the receipt of chemical messages in ways we do not understand or can investigate yet. The fact that the discharge end of every neuron, the synapses are kept away from the Dendrites by an Axon tail would suggest that the neuron needs to keep its electrical discharge away from its Dendrites to avoiding these discharges affecting its own Dendrites, rendering the knowledge and memories fixed therein, unstable.

Furthermore, computers are based on a simple binary code whereas our brains are based on a complex interaction of chemical coding and electrical coding. While lower vertebrates and invertebrates are closer in function to computers because they have predominantly electrical synapses, higher life forms have a combination of both, and whereas chemical synapses are unidirectional, electrical synapses are bidirectional.

What this adds up to is the following. Computers need inputs, and data mining is merely computers tasked with detecting connections and therefore patterns within the body of data, their results will always be recorded indirectly as a series of ones and zeros. Our brains on the other hand, being analogue, will make direct imprints of the world as we experience it through our senses, which while imperfect and not as durable, are nonetheless sufficiently useful to make us functional. And it is precisely because the world is analogue and our brains, built from this world, are also analogue that we can think and imagine, something out of reach of a binary brain which records the world indirectly.

That is why the brain is continuously remoulding itself in the image of the world. These direct patterns result in a specific re-ordering of connections and changes within the Dendrites. It is likely that the pattern of this re-organisation and changes to Dendrites, creates a physical imprint which mirrors the outside world. A good analogue analogy would be the pattern of grooves in vinyl records, which directly and physically records specific sounds. All an amplifier connected to a record player does is to amplify the sound made by the record needle. In contrast, CDs record sound digitally, and these digits have then to be converted back into sound electronically before they can be amplified.

This does not mean that machine learning cannot achieve formidable results. It is known that both the US and Russian have killer robots which have been programmed to kill all intruders in a specific area. It is known that computers with cameras are capable of scanning thousands of faces in a crowd looking for known faces. It is known that computer programmes in the world of medicine are emerging with the capacity to make differential diagnoses better than most doctors, because they incorporate the knowledge of thousands of the most experienced doctors.

If human intelligence is the product of communication, then it is clear that integrated computers communicate at a higher level than humans can, but this communication will always be limited to what is, what they have been programmed to intercept and what they have been linked to. If the internet was one connected brain, with all the fibre optic and copper wires the axons, its combined output will achieve both more and less than a single human brain. Its inputs will exceed our sensory inputs, and its computing power will vastly exceed ours, but what will be missing is that single element that makes us exquisitely human, the idea. The idea or set of ideas for example, which gave birth to the computer in the first place, when the technical conditions for its birth were emerging.

In summation. Yes, machine learning will destroy more jobs than is being admitted to. No, they will not surpass human intelligence as long as they are digital. Further, as long as we know how they operate, for example in terms of population control, we can always outwit and outguess them. It all depends on how many programmers and system designers join the rebellion.

Note 1. OT represents data derived, not from human interaction on the internet, but data derived from machine interactions, that is machine sensors linked to computers. The data from these sensors can then be mined and patterns extracted regarding performance, breakdowns, durability of parts and so on. This provides the information needed to maximise the use of this equipment while minimising break downs.

Brian Green. June 2018.