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The Rise of Artificial Intelligence: Its Impact on Labor Market and Beyond

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"We know that blind evolutionary processes can produce human-level general intelligence, since they have already done so at least once. Evolutionary processes with foresight—that is, genetic programs designed and guided by an intelligent human programmer—should be able to achieve a similar outcome with far greater efficiency."

- Nick Bostrom, *Superintelligence, Paths, Dangers, Strategies*

From Galatea and Golems to Future Syneoids

The unique urge to create an *artificial man* has a long tradition since the antiquities, "Hephaestus, the master craftsman, grants a human voice (…) to his golden mechanical handmaidens (Gera, 2003, p. 114)" and Jewish folklore includes many versions of golems –anthropomorphic beings created from clay. Myths, religions, and popular culture displayed this obsession with varying intensity thorough history. Pamela McCorduck (1979), who investigated this phenomenon, concludes that as humans, we have been engaged in this peculiar form of self-reproduction by attempting to fulfill the urgent desire, bypassing the ordinary means, in order to recreate what is the essential to us since the dawn of Western intellectual history. Contemporary incarnation of this ancient desire can be observed in robotics.

Currently, we are on the verge of an unprecedented technological revolution involving intelligent robots powered by artificial intelligence (AI). It is important to note that what we are experiencing at this stage – Google self-driving cars, Apple Siri, Google Photo Search, robots exhibiting behavior similar to human- are examples of the "weak AI (WAI)." The concept asserts that machines could act *as if* they were intelligent. It is a sort of limited intelligence. To the contrary, "strong AI" (SAI) is the higher level of AI, often referred to as "artificial general intelligence" (AGI) –it entails the possibility of machines *actually* thinking (Russell & Norvig, 1995). According to this view SAI would possess the full range of human cognitive abilities. Since such AI, as predicted, would experience exponential growth, it would quite swiftly reach a level exceeding human capacities – a point often referred to as "singularity." If we assume a physicalist position regarding the nature of human consciousness, we ought to also seriously consider the possibility that SAI would be, at some point, able to genuinely experience subjective mental states such as consciousness. The emergence of consciousness in this case could be an incremental phenomenon, similar to varying degrees of mental capacities in animals. The terminology attempting to capture the phenomenon described above varies and it does not quite reflect its full nature and scope. For the purpose of our investigation we will refer to it as the *syneoid* –a term derived from Greek *συνειδητός* (corresponding to English *conscious*) and the suffix *–oid* suggesting "likeness" or "form of" as well as bearing resemblance to android (human-like robot).

Throughout history, technological advancements have impacted how we worked, lived and died. The canonical narration pertaining to the impact of major technological leaps in civilization on employment, particularly the paradigmatic Industrial Revolution, follows the familiar pattern: they lead to substantial shifts in types of jobs, affecting perhaps large, but limited area of employment; certainly, total number of jobs was not affected and, if anything, technological revolutions expand economy and, ultimately, expand employment opportunity by opening new areas of exploration. Certainly, in a short term, this was a messy process, many lost taken away from them by efficient, laborsaving inventions, but, in the long run, through gradual adaptations, improved education and higher qualification, everyone benefited. Thus, in essence, technological revolution has been typically painted, in spite of its shortcomings and damages, as a disruptor, the true engine of human progress.

The arrival of the syneoid, however, would have staggering consequences for the future of human employment and beyond. In this chapter, we intend to explore the impact of the rapid expansion of SAI in relations to the future labor market. We argue that this rather optimistic, even naïve scenario, collapses while confronted with the explosion of SAI, as none of the historical extrapolations will apply to the processes that are currently shaping up. The history might have had repeated itself with several technological revolutionary cycles, but, this time we will be confronted with a radical new, for the arrival of which we are utterly unprepared, and as we are about to see, in principle, we cannot.

Interestingly, although the research on SAI is growing fast, it did not capture the interest of general public beyond some portrayals in science fiction. That does not translate, however, into a serious public debate on the speed and consequences of this technological revolution *in statu nascendi*. Popular imagination seems to be captivated by other occurrences. The general public and both established and aspiring politicians are typically more concerned with, and not without a good reason, the issues of climate change, the rise of jihadist extremism, and ever-widening income gap. Politicians and experts turn to history looking for solutions, and while some of them proved to yield positive results in the past, none will work to alleviate the incoming next wave of unemployment due to automation." for the causes of it are drastically different from anything from what we have experiences so far.

Will History Repeat Itself? –Not this Time

In the past, the slower pace of transformations allowed enough time to adopt and balance the labor supply and demand. By the dawn of 19th century, technological advancements decreased the agricultural labor in Britain from 75% in 1500 to 35%. The excess labor supply was shifted to manufacturing and commerce. This transfer to manufacturing first happened on a small scale, typically in small workshops or homes. It is interesting to note that this was the beginning of wealth transfer from agriculture to industry. Most of them disappeared when the automation and steam engine brought about by the Industrial Revolution, which marked a dramatic change in process of production -

division of labor; mechanization, specialized workforce. The driving force behind automation has been and still is the desire to improve the profit margin by cutting the workforce perceived as cumbersome and inefficient.

The modern factory also created a new type of workers -precisely defined components in steam-driven machinery. As industrial instruments became more sophisticated, the demand for more skilled labor force increased. The low-skilled ones were pushed out yet again. The investment in education in the 19th century provided a supply of qualified labor, and this trend continued into the 20th century as post-secondary education became increasingly common. WWII fueled and accelerated the development of complex machines and systems as created the global supply chain management. After the war, workers in the West enjoyed unprecedented prosperity that provided them with a secure pathway to middle class. Even the initial introduction of computers had no immediate impact on job market. Obviously, mathematical calculations done by hand by numerous people became obsolete, but, in time, the invention greatly increased the productivity of others and created a plethora of computer-related jobs. Many other technical innovations had similar effects. New machinery displaced handicraft producers across numerous industries, from textiles to metalworking.

Naturally, the mere possibility of automation didn't mean that it always made sense to implement it. Often, it was more profitable to outsource jobs and take advantage of cheap labor in developing counties. This was accelerated by globalization. Western workers found themselves struggling yet again, facing increasing competition from both machines and cheap overseas labor. Since the 1950's employment in manufacturing in the U.S. declined sharply due to cheap imports and rising cost of labor. It was inevitable that most available jobs moved to service industry. Eventually, we transitioned into a consumption-based economy where many jobs shifted to service industries selling goods and delivering services at a mass scale. However, service industry already displays similar techniques of maximization of output on the expense of labor force as we have seen in manufacturing.

Eventually, the deterioration of employment opportunities expanded to highly skilled college educated workforce as well. As Martin Ford argues, AI ultimately will lead to evaporation of most blue and white collar jobs alike leading to even accelerating the process of middle-class shrinking that are already experiencing tremendous costs of health care and education. Ford scenarios predict massive unemployment, and a complete breakdown of consumer-based economy itself (Ford, 2009).

WAI already led to the emergence of a radically different sort of technologies capable of performing tasks previously done by humans: quite sophisticates and speedy reasoning, judgment and perception. One would be perhaps tempted to describing theses capacities as constituting a sort of agency. As Jeremy Howard (2014) points out, "Computers right now can do the things that humans spend most of their time being paid to do, so now's the time to start thinking about how we're going to adjust our social structures and economic structures to be aware of this new reality." This rapid automation of physical or mechanical or repetitive jobs by now has resulted in elimination of various occupations and the process only just started. The obvious question one ought to ask is how fast this will continue and cause eventually massive unemployment? Job market needs a balance of supply and demand but when human labor is no longer required, this balance no longer exists as humans are no longer part of the labor market. At this historical junction, the fundamental question then is: Will AI reduce the need for human toil and, as a result, cause technological unemployment There are still two opposing main answers to this question as articulated by Nils Nilsson (1984, p. 5).

> *"Some claim that AI is not really very different from other technologies that have supported automation and increased productivity (...) Like them, AI may also lead ultimately to an expanding economy with a concomitant expansion of employment opportunities. At worst, (...) there will be some, perhaps even substantial shifts in the types of jobs, but certainly no overall reduction in the total number of jobs. In my opinion, however, such an outcome is based on an overly conservative appraisal of the real potential of artificial intelligence. Others accept a rather strong hypothesis with regard to AI -one that sets AI far apart from previous labor-saving technologies. Quite simply, this hypothesis affirms that anything people can do, AI can do as well. Certainly AI has not yet achieved human-level performance in many important functions, but many AI scientists believe that artificial intelligence inevitably will equal and surpass human mental abilities."*

The "optimistic scenario" as articulated above, is based on the naïve extrapolation of historical experience. In a nutshell, it basically claims that AI is no different from other technological advances we have witnessed in the past. It will, just like them, after all, lead to the expansion of employment opportunities in other fields. This shift might be quite unpleasant in a short run, the human cost conceivably high, but, in the end, people are pushed out from their jobs by automation will eventually find employment elsewhere. To believe otherwise –according to the optimists – is erroneous. Keynes (1931) wrote in his famous essay, about the causes of widespread technological unemployment occurring due to discoveries capable of economizing the use of labor that are surpassing the pace at which we can find new uses for labor. Nevertheless, he also concluded that technological unemployment is only, as he put it, temporary phase of maladjustment that will be solved in a long run.

Those, who support this view, argue that those concerns pertaining to long–lasting or even permanent technological unemployment result from the "Luddite fallacy" chiefly because they fail to recognize compensation effects. The term was coined by drawing a comparison to the 19th century reasoning of the English textile workers, who were concerned with the machinery threatening their livelihood, introduced during the Industrial Revolution, and resorted to violent uprisings. They tend to believe that the technological progress will eventually lead to the increase of wealth in a given society as a whole, or that the advances, as mentioned above, will lead to creation of new employment opportunities. In other words, the "Luddite fallacy" proponents also tend to point out that the worries about long-lasting or permanent technological unemployment are unwarranted because there is no such thing as a finite amount of work available to us. Thus, we should not be concerned precisely because new opportunities will always emerge that only humans will be able to perform.

On the surface this assumption might seem justified and intuitive since we tend to extrapolate from the past. Past is, however, not necessary a solid predictor of the future, particularly when we are confronted with a novel phenomenon. The believe in such fallacy constituted a prevalent view of mainstream economists on the problem of technological unemployment until recently and many still subscribes to it.

Nevertheless, some cracks in this reasoning begin are easy to spot. Assuming, for the sake of the argument, that the technological progress, in fact, will increase the aggregate wealth of the society, it is not obvious that the distribution of the wealth will be equitable. It goes without saying that distribution of wealth matters a great deal. For example, in a technocratic society, such as ours, an enormous amount of wealth is concentrated in the hands of 1%. This does not mean, however, that everyone else benefits through mechanisms of job-creation. We can see that in similar mechanism –the correlation between lowering taxes for the wealthiest and job -creation is highly arguable. Thus, supposed increase in overall wealth does not axiomatically translate into lower rate of unemployment –as enthusiasts of "trickle down" economy would like to believe.

In addition, according to the optimistic narrative, long-lasting technological unemployment typically requires a massive effort to educate the population –again a lesson learned from the Industrial Revolution. In short, education is supposed to be the key to solving this issue. As Paul Krugman (2013, para. 4) puts it by revisiting the problems faced by, the previously ridiculed, 19th century textile workers:

> *"Until recently, the conventional wisdom about the effects of technology on workers was, in a way, comforting. Clearly, many workers weren't sharing fully — or, in many cases, at all — in the benefits of rising productivity; instead, the bulk of the gains were going to a minority of the work force. But this, the story went, was because modern technology was raising the demand for highly educated workers while reducing the demand for less educated workers. And the solution was more education."*

Indeed, mostly free and compulsory public education emerged in the West as a result of ideas of the Enlightenment a feeding pipe for factories of the industrial age. This model of "keeping up "with the technology seemed to work fairly well for some portions of the population, at least until recently. Several factors are at play here: the outdated model of education that is simply too specialized and often trains provides training that quickly lacks relevance on the labor market. After all, it is difficult to blame institution of higher education for not predicting what skills will be desirable on the rapidly shifting labor market even in not-to-distant future. No one can really predict that. The second factor pertains to the massive democratization of higher education experienced virtually in all developed countries. This educational inflation, occasionally leading to outburst of frustration comparable to those of mentioned textile workers, effectively cancels out any competitive edge previously enjoyed by college degree holders in the past,

> *"Today (...) a much darker picture of the effects of technology on labor is emerging. In this picture, highly educated workers are as likely as less educated workers to find themselves displaced and devalued, and pushing for more education may create as many problems as it solves. (...) So should workers simply be prepared to acquire new skills? The woolworkers of 18th-century Leeds addressed this issue back in 1786:*

> *"Who will maintain our families, whilst we undertake the arduous task" of learning a new trade? Also, they asked, what will happen if the new trade, in turn, gets devalued by further technological advance?*
> *And the modern counterparts of those woolworkers might well ask further, what will happen to us if, like so many students, we go deep into debt to acquire the skills we're told we need, only to learn that the economy no longer wants those skills?*
> *Education, then, is no longer the answer to rising inequality, if it ever was (Krugman, 2013, para. 6)."*

Putting aside the question of what kind of training and qualifications would be needed to access this emerging employment opportunities and how many individual would have an actual chance to do so etc., there are more serious problems with this line of reasoning. Even well adjusted to the job market and flexible individuals might not be able to keep up with the speed of technological acceleration. This is how Krugman (2013, para. 1-2) explain this phenomenon:

> *"In 1786, the cloth workers of Leeds, a wool-industry center in northern England, issued a protest against the growing use of "scribbling" machines, which were taking over a task formerly performed by skilled labor. "How are those men, thus thrown out of employ to provide for their families?" (…) Those weren't foolish questions. Mechanization eventually — that is, after a couple of generations — led to a broad rise in British living standards. But it's far from clear whether typical workers reaped any benefits during the early stages of the Industrial Revolution; many workers were clearly hurt. And often the workers hurt most were those who had, with effort, acquired valuable skills — only to find those skills suddenly devalued."*

More fundamentally, the crucial point that get lost in the current debates, is that even if some number of very highly specialized occupations will be created, with the arrival of syneoids, "this kind of work can also be performed by AI devices without necessarily implying more jobs for humans (Nilsson, Ibid.)."

The above set of issues gradually begins to gain traction in the high strata of the more forward-thinking individuals. According to the posted agenda of the Davos World Economic Forum in 2016 the incoming shift, framed as the Fourth Industrial Revolution, is recognized a paradigmatic change that will affect virtually every sphere of human life. To the question why this revolution would be any different from the previous ones we experienced, Klaus Schwab delivers the answer with blunt honesty,

> *"The first industrial revolution began in the latter half of the 18th century, and brought us mechanical production through the steam engine, cotton spinning and then railroads. The second industrial revolution took place around the turn of the 20th century and brought mass production through assembly lines and electrification. The third industrial revolution was the computer revolution, starting in the 1960s*

that brought us the mainframe and then personal computing, as well as the Internet. Today we are in the midst of the Fourth Industrial Revolution, which will affect governments, businesses and economies in very substantial ways. We should not underestimate the change ahead of us, as there are at least three differences between this revolution and the previous ones (Schwab, 2015, para. 4-5)."

Schwab articulates three major components that differentiate this new fundamental change from previous technological revolutions. In a nutshell, the first one has to do with its speed. The current change is happening with an unprecedented acceleration, as opposed to the previous ones that took decades or more to fully unfold. Secondly, the Fourth Industrial Revolution is not limited only to one area. In incorporates such elements as mobile networks, nanotechnology, and brain research, 3D printing, materials science, computing, networks "the interplay between all of these. (…) In addition, the accessibility and affordability of complex technologies will spread them farther and faster (Ibid. para. 6-8)." The third difference, according to Schwab, pertains the innovation of the entire system, as opposed to one product or area. The phenomenon of "sharing economy" is only one of many manifestations of that aspect.

As mentioned, the impact of this paradigmatic shift will be profound, and will affect the business model, the ways governments operate, and last but not least, the future usefulness of skills and labor. As Fon Mathuros (2015, para. 2) points out,

> *"Earlier Industrial Revolutions advanced human progress through new forms of power generation, mass production and information processing. Building on a ubiquitous and mobile internet, smaller, cheaper and more powerful sensors, as well as artificial intelligence and machine learning, the Fourth Industrial Revolution is distinct in the speed, scale and force at which it transforms entire systems of production, distribution, consumption – and possibly the very essence of human nature."*

The Davos Forum organizers, although recognizing the magnitude of imminent shift, tend to portray the Fourth Industrial Revolution in cautiously optimistic terms as perhaps one of the greatest challenges we will encounter, and yet, a possible opportunity. Nevertheless, they cannot disregard that two aspects of human life will be affected most significantly by the future changes –the value and significance of human work and profound changes in social structures.

The New Cambrian Explosion

In a peculiar way, some aspects of the development of robotics mimic the natural processes of evolution. Gill Pratt (2015, p. 51) draws an intriguing comparison between the two.

> *"About half a billion years ago, life on earth experienced a short period of very rapid diversification called the "Cambrian Explosion." Many theories have been proposed for the cause of the Cambrian*

Explosion, with one of the most provocative being the evolution of vision, which allowed animals to dramatically increase their ability to hunt and find mates (…) Today, technological developments on several fronts are fomenting a similar explosion in the diversification and applicability of robotics. Many of the base hardware technologies on which robots depend—particularly computing, data storage, and communications—have been improving at exponential growth rates. Two newly blossoming technologies—"Cloud Robotics" and "Deep Learning"—could leverage these base technologies in a virtuous cycle of explosive growth. In Cloud Robotics (…) every robot learns from the experiences of all robots, which leads to rapid growth of robot competence, particularly as the number of robots grows. Deep Learning algorithms are a method for robots to learn and generalize their associations based on very large (and often cloud-based) "training sets" that typically include millions of examples. (…) One of the robotic capabilities recently enabled by these combined technologies is vision—the same capability that may have played a leading role in the Cambrian Explosion."

Initially, AI and robotics were separate fields, -computer science and engineering, respectively. Currently it is the precisely the combination of the two -the robotic embodiment of AI- that sets the trend for the future. Particularly, Deep Learning (DL), which is an algorithm-based method of "teaching a machine" how to learn from a massive sample sets, is one on the major mechanism driving forces. Current applications of DL already include automatic speech and image recognition, natural language processing, transforming images into description, discovery of drugs and toxicity, medical diagnostics, among others. DL certainly has the potential to become a stepping-stone to creating syneoids, which through exponential growth would rapidly exceed any human faculties to a degree unimaginable. Ray Kurzweil, who shares Searle's view that an appropriately programmed computer is a mind, makes a prediction that the equivalent capacity of one human brain will be available on desktop computers by 2020. Moreover, when AI starts to outstrip the collective total of all human intelligence, Kurzweil argues, humanity will enter, what he calls, the Singularity, marking a point at which change is so radical that it is no longer predictable (as cited in Wallach, p. 57).

The kinds of operations that WAI is capable of performing now cannot be called thinking in the traditional sense, if what we mean by thinking, by definition, only takes place inside the human cranium (McCorduck, 2004) Nevertheless, many consider "making difficult judgments, the kind usually left to experts, choosing among plausible alternatives, and acting on those choices (Ibid.)" a form of thinking. McCorduck further elaborates, "Along with most people in AI, I consider what artificial intelligences do as a form of thinking, though I agree that these programs don't think just like human beings do, for the most part. I'm not sure that's even desirable. Why would we want AIs if all we want is human-level intelligence? There are plenty of humans on the planet. The field's big project is to make intelligences that exceed our own. As these programs come into our lives in more ways, we'll need programs that can explain their reasoning to us before we accept their decisions (Ibid.)."

Certainly, it is fair to say that AI and robotics have not crossed yet the level of singularity and thus reached the level of syneoids. However, this could be just a matter of time. Once they reach that stage, all jobs can be automated including key decisions. No human will be needed for manufacturing, services, knowledge, or even creative processes. Thus, "Luddite fallacy", described before, may not be, in the end, a fallacy at all. This time around we simply might not be able to "catch up" precisely because human gradual learning cannot possibly be a competition to exponential growth of Deep Learning as Jeremy Howard (2014) explains,

> *"80 percent of the world's employment in the developed world is stuff that computers have just learned how to do. What does that mean? Well, it'll be fine. They'll be replaced by other jobs. For example, there will be more jobs for data scientists. Well, not really. It doesn't take data scientists very long to build these things. For example, these four algorithms were all built by the same guy. So if you think, oh, it's all happened before, we've seen the results in the past of when new things come along and they get replaced by new jobs, what are these new jobs going to be? It's very hard for us to estimate this, because human performance grows at this gradual rate, but we now have a system, deep learning, that we know actually grows in capability exponentially."*

In light of the inevitable systemic technological unemployment, experts are constantly considering different solutions ranging from quite unrealistic ideas of banning innovation to various forms of wealth redistribution. It is not our intention here to examine the feasibility of these proposals. The reasons for that choice are quite simple: stopping the entire process is practically impossible, and once syneoids arrive, humans won't make any decisions regarding that matter alone, as we will have to work it out with, far more intelligent and capable than us, "others." They would be able to colonize places inaccessible to human because of our limitations such us the need of oxygen, water, and food.

Even though, we are not there yet, the loss of jobs due to the already available WAI will be staggering in a relatively short time. A very conservative study conducted at Oxford University by Frey and Osborne (2013) examined the effects of computerization alone on 702 detailed occupations. The authors used a Gaussian process classifier and determined that "about 47 percent of total U.S. employment is at risk (Ibid. p.1)" of computerization in a decade or two. As they point out, "The impact of computerisation on labour market outcomes is well-established in the literature, documenting the decline of employment in routine intensive occupations – i.e. occupations mainly consisting of tasks following well-defined procedures that can easily be performed by sophisticated algorithms. (…) Following recent technological advances, however, computerisation is now spreading to domains commonly defined as non-routine (Ibid. pp.2-15)." Frey & Osborne further argue that even though Machine Learning (ML) and Mobile Robotics (MR) enable computerization across large areas of non-routine tasks, there exists some "engendering bottlenecks" inhabiting total de-humanization of labor.

> *"Beyond these bottlenecks, however, we argue that it is largely already technologically possible to automate almost any task, provided that sufficient amounts of data are gathered for pattern recognition. Our model thus predicts that the pace at which these bottlenecks can be overcome will determine the extent of computerisation in the twenty-first century. Hence, in short, while the task model predicts that computers for labour substitution will be confined to routine tasks, our model predicts that computerisation can be extended to any non-routine task that is not subject to any engineering bottlenecks to computerisation. These bottlenecks thus set the boundaries for the computerisation of non-routine tasks (Ibid. p.23)."*

They identify three major "bottlenecks." The first one perception and manipulation and, in essence pertains to the abilities to make precisely coordinated movements. This "bottleneck" seems to pose the least of the problem for computerization and robotization, since human body itself can be seen as a biological machine that had a very long to evolve and adapt to perform very complex of manipulating the environment. In principle, however, there is nothing, besides technological and perhaps financial limitations, that would prevent from replicating these abilities. The authors admit that, "with incremental technological improvements, the comparative advantage of human labour in perception and manipulation tasks could eventually diminish (Ibid. p. 39)." The second "bottleneck" indeed poses a serious challenge for AI at this stage. It has to do with creative intelligence –faculties we typically associate with solving unusual problems, artistic production etc. The third one, social intelligence, pertains to the ability of being aware of other's reactions and understanding why they reacts in a given way; the ability to persuade others, and, finally, with a broadly understood, emotional support (Ibid. p. 31).

This last obstacle is indeed unlikely to be solved by WAI at its present stage. Thus, the study reports that, "generalist occupations requiring knowledge of human heuristics, and specialist occupations involving the development of novel ideas and artifacts, are the least susceptible to computerization (Ibid. p. 40)." Based on these technological "bottlenecks", their model assigns even specific probabilities that computerization will lead to job looses within about the next two decades. And, so they estimate that that probability would be 0.99 for telemarketers, 0.55 for commercial pilots, and only 0.003 for recreational therapists, presumably because the latter one would require technological overcoming of the social intelligence "bottleneck."

It is important to keep in mind, that Fry & Osborne's analysis does rely on the technological "bottlenecks" as they present themselves today. The history of technological advances, however, can be largely perceived as a struggle, astonishingly successful, of overcoming such "bottlenecks." Thus, there is no reason to think that these current, undoubtedly serious "bottlenecks," will become obsolete once the technology moves beyond the stage of WAI towards syneoids.

Again, skeptics find it difficult to accept that syneoids could completely fill every available niche in the labor market and make human skills virtually obsolete. They believe that there is something uniquely special about human capacities, whether be intellectual or emotional that there will be always a margin of tasks syneoids simply

won't be able to do, or people would prefer them being done by other humans. Those occupations would require human sensitivity that can satisfy deep interpersonal needs. This would involve such activities as making decisions in a court of law because, supposedly, we would prefer a person to by accountable for such decisions. The same would apply to CEO's, generals, military and government leaders at every level.
This could be the case if syneoids would exceed human capacities only intellectually, but as we stipulated, they would also become decision making fully autonomous agents, with whom we would have engage in interactions involving making moral choices.

Schwab (2015, para. 13-15) gestures towards this issue of syneoids and humans living side by side by sketching two compelling scenarios,

"Very importantly, will the Fourth Industrial Revolution have a human heart and soul? Again, imagine living in the future, when robots and humans live side by side. Who would you trust, human or robot? Concretely:

- *If you were told you had a life-threatening illness and a human doctor prescribed treatment regime A, while an artificially intelligent robot prescribed treatment regime B, which treatment regime would you follow?*
- *If you were falsely accused of a crime, would you rather be tried by a human judge or by an AI judge? "*

It is obvious that Schwab scratches just the surface of the possible issues of the moral aspect of interactions with syneoids. For some this very prospect of such interactions and the moral uncertainty connected to it are frightening ideas. Perhaps, as some prominent figures such as Stephen Hawking and Elon Musk, argue, it would be better for us to stop the expansion of AI altogether, particularly with respect to autonomous warfare agents (Musk et al.). Some postulate that our efforts would be concentrated on designing these agents in such way "so that they honor the broader set of values and laws humans demand of human moral (Wallach, p. 6)."

However, at this point, it is far too late to ask the question whether the humanity need intelligent machines making moral decisions. Machines are already making decisions with moral consequences. As mentioned, machines, whether intelligent or not, even tools, had moral impact on our lives and, in fact, always had. James Moor proposed a hierarchical model that categorizes different levels of machine's ethical agency. At the very bottom are, what he refers to "ethical impact agents." This category includes "any machine that can be evaluated for its ethical consequences (as cited in Wallach, p. 33-34)." The next level Moore calls "implicit ethical agents" – "machines whose designers have made an effort to design them so that they don't have negative ethical effects, by addressing safety and critical reliability concerns during the design process (Ibid.)." "Explicit ethical agents" occupy the third level of Moor's hierarchy. These are machines that can reason about ethics using ethical categories as part of their internal programming. Setting proper ramifications for the design of such "implicit ethical agents" and establishing an appropriate ethical code for their decision-making is currently the main concern of the field of computer ethics. Everything that lies beyond these three levels

Moor considers "full ethical agents" –machines that can make "explicit moral judgments and are generally quite competent in justifying such decisions. This level of performance is often presumed to require a capacity for consciousness, intentionality, and free will. If any of these three is lacking in a human context, then the person's moral agency and legal culpability comes into question (Ibid)." This highest level of full ethical agents matches our definition of a syneoid. Naturally, it would be quite naïve to think that syneoids would necessarily share our moral standards and sensitivities. Syneoid's morality could go much further beyond anything we can envision based on our anthropological imagination and knowledge of varying moral standards in human cultures; it could be a set of norms radically alien in general -based on different preference and goals.

Why consciousness matters?

Some philosophers and scientists doubt the very possibility of artificial "full ethical agents" precisely because the idea of them possessing consciousness, intentionality, and free will seem uniquely human. From all three –consciousness is probably considered to be at the core of human personhood, which is the only point of reference of personhood we have available. In order to understand why consciousness matters in the context of syneoids, we should go back to the18th century materialist philosophy. In reaction to the previous substance dualism, La Mettrie, in his *L'homme Machine*, extended to human beings Descartes' argument that animals are automatons. Karl Popper (1978, pp. 224-225) was convinced that La Mettrie's idea gained a greater reinforcement by the theory of evolution.

> *" [...] The doctrine that man is a machine was argued most forcefully and seriously in 1751, long before the theory of evolution became generally accepted, by de Lamettrie; and the theory of evolution gave the problem an even sharper edge, by suggesting that there may be no clear distinction between living matter and dead matter."*

In principle, the emergence of conscious syneoid is plausible provided that few premises that we would need to commit to are true. One of them is an ontological assumption, rooted in neuroscience, concerning the nature of consciousness. The brain itself –as the argument runs- is a naturally occurring material object that emerged through evolutionary processes and as such, at least in principle, is replicable just as are with sufficiently advanced technology. Secondly, mental states are essentially brain states. Thus, consciousness supervenes on the brain and, just as the brain it is a natural phenomenon that is a product of a very long incremental evolutionary process. Thirdly, we have to commit to yet another premise that neurons are not the only material that can create a mental state (Dennett, 1991). Therefore, it is just a mater of time that we, as conscious beings, will be able to imitate it by some means that might be not necessarily be biological in nature.

This argument is further supported by "Artificial Life" projects that essentially see biology as a naturally occurring information technology. That "technology" could be reversed engineered and synthesized in other kinds of technologies, again, not necessarily biological ones (Sullins, 2014). Consciousness would, therefore, be a product of this naturally occurring information technology. It is important to make another observation – consciousness, after all, is present, to varying degrees, in different species. In short, if we as humans are naturally occurring robots, and just so happened we possess consciousness, there is nothing, in principle, preventing replication of this natural phenomenon artificially.

There is obviously the question of how would we even know that we have created a conscious machine, or that a conscious machine emerged though, for example, processes similar to Deep Learning? The famous Turing Test cannot answer this question as demonstrated by Searle in his "Chinese room" thought experiment. One might even argue that perhaps a consciousness test, in principle, cannot be done if we set the testing standard unreasonably high. After all, how can we be absolutely sure that other human fellows have mental states or just behave as if they have them? Such high requirements might lead us towards metaphysical solipsism – a doctrine with very vague practical consequences, and as such not very useful in our investigation.

One can, obviously stipulate that consciousness is a something that occurs in human brain alone, and then, by analogy, for example, make inferences that other humans possess that property as well. It seems fair to say that most people use this analogy, or symmetry principle in their common sense approach to the issue of consciousness of others. This can be further supported by MRI imaging showing correlation between changes in brain activity with reports of subjective mental states of the subject. In fact, similar methods can be used to investigate the mental states of individuals who are unable to communicate in any way. These are obviously well established and perfectly sound scientific practices, and yet strictly speaking, they can only provide indirect proofs that others possess consciousness. Another commonsensical approach to solve the problem is based on common ancestry –the offspring, as a matter of rule, should display capabilities similar to those of those of its ancestors. This line of reasoning is just another way of making inferences by analogy. However, it is easy to spot a weak point of these common sense based reasoning. Provided that consciousness develops artificially and will neither brain-based, not biologically related to us, none of these common sense reasoning by analogy will apply. In case, there will be no way to discern if the intelligent machine *really* possesses consciousness, or is simulating it, one can obviously stick to the believe that only humans have it by definition, but that would be terribly arbitrary, and ultimately unjustified. Ultimately, if syneoids displayed mental and cognitive capabilities that are indiscernible from those displayed by humans that we "know" that they possess consciousness, it would be unclear, to say at least, on what basis we could conclude that syneoids do not have consciousness after all.

The more fundamental question is obviously: Why would it even matter to know whether syneoids possess consciousness or they do not? With regards to the issue of technological unemployment the answer is – it matters. One could obviously argue that such question is superfluous since super intelligent "zombies" could replace us easily, and the issue whether they are conscious has nothing to do with that. However, going back to the previous issue that people might prefer for certain services or occupations to be performed by human persons only precisely because they are conscious beings, it becomes clear how artificially generated consciousness would eliminate this need as well. Thus, there would be virtually nothing left that "only humans could do."

The answer to the consciousness question also becomes extremely relevant when we consider the issue of interaction with syneoids. Again, one can dodge the bullet and insist that although we are dealing with beings displaying intelligence similar or superior to ours, nevertheless, they are qualitatively infinitely different; they don't have some sort of "essence" that we have and, as such, they should be excluded from our moral considerations. Needless to say, there would be something incredibly odd in the argument that a syneoid capable of performing human functions, or even exceeding them - intellectual, cognitive, and emotional is not treated as a person.

Obviously, it goes without saying, that the notion of personhood is an incredibly complex one. Nevertheless, the most important components of the notion that are crucial for the purpose of the argument are: consciousness, agency, self-awareness, and possession of rights and duties (Taylor, 1985). It is also important to realize that personhood could be a matter of degree; could be gained and lost incrementally, and that does not need to be limited to humans. The latter statement has remarkable consequence, namely, being a member of the human species is nether necessary, nor sufficient to be, at lest to some degree, a person. It is currently commonly accepted that at least primates and some other mammal's posses degree of personhood far beyond a rudimentary one, that qualifies then to be included in the circle of our moral considerations. Since the Oxford Group (Finsen & Finsen, 2009) the movement of animal rights gained traction in mainstream intellectual community. It drew its conclusions from Darwinism and consequentialism, and essentially stated that there is no mysterious essential difference between biologically speaking. Thus, the same type of moral continuum should be applied to other beings. It would be expected that a syneoid, conscious by definition, would realize its own personhood. Thus, if someone or something is considered to be a person, we ought to have moral obligations towards it. The fact of its origin, the fact that it is neither a human person, nor a biological being is utterly irrelevant. It would be preposterous to deny such syneoids moral consideration based on the claim that it does not belong to human species. In fact, it could be argued that such attitude is similar to speciesism –a type of prejudice such as sexism or racism.

Moreover, it could be argues that, as along as a syneoid behaves as a person, it is actually irrelevant if it, factually, possesses consciousness the way we conceive it at all in order for us to have moral obligations towards it. After all, many of us commit to the notion that we have moral considerations for certain animals even if, for what we know, they do not posses consciousness, or display it to a certain, typically lesser than ours degree. The consequences of committing to the notion that syneoids should be included in the area of our moral concern are staggering. It would be incomprehensible that we could treat such AI as merely our tools, extension of our bodies, something that we can use, control, and manipulate or any possibility of the master-slave relationship. We would have no choice but to to concede that they are entitled to all rights that we reserve for persons. We would have to concede that they have freedom of choice according to their preferences and needs, etc. the notion of our "uniqueness" would evaporate in an instant.

Co-existence, Competition, Convergence

Job, occupation, profession, career –they are not merely sources of economic sustenance; it is far more than a mere necessity or burden. In many cases, it defines who we are. Work, whether paid or pursued for passion, whether fairly simple or highly sophisticated, provides fulfillment, sense of community, exploration, discovery, an invention. Professionalism, craftsmanship, refinement, and artistry have been truly the driving forces of our civilization; for many –a fulfillment of an existential void, a deep sense of participation in a process of creation, mastery over nature, instrument of control, and, ultimately, power.

Our inventions defined the work we engaged in for centuries from melding to typing; created new industries and employment opportunities around them. These inventions, intending to control the environment, had often unforeseen consequences that reshaped the way we lived, interacted with each other, and redefined our societal rules. To echo the famous maxim attributed to McLuhan that encapsulates this phenomenon: "We shape our tools and thereafter our tools shape us." Occasionally, an emergence of new technological advances such as, domestication of animals, creation of printing press, or invention of computers had a paradigm-changing effect leading to major disintegration in the status quo, shifts and disruptions in the existing power structures. So, we were adapting, not without struggle, failures, and suffering, to these changes. The unstoppable progress of AI, however, and the eventual arrival of syneoids will confront us with the challenge to radically re-negotiate norms of coexistence with them without any guarantee of success.

In the context of a workplace, but not limited to it, possibly the best-case scenario would involve a collaborative co-existence. But it might likely turn into a combative competition over resources and power –something we are quite familiar with already. The Darwinian principle of the survival of the fittest could very well swing the odds to the advantage of syneoids. The end result of such competition could very well be the end of our kind, or perhaps, on the more optimistic note, as Buchannan argues: "humans will go the way bacteria did. They existed before the Cambrian explosion, and they still exist today. In fact, they continue to thrive. They just don't hold the dominant position they once did (Buchannan, 2015)." This perceived disadvantage of our species prompted some to entertaining the idea that we ought to use the ever-expanding information technology to transform ourselves into a new post-human species, as a part of adaptive response to environmental pressures. Preserving the natural state of a human body -claim the proponents of transhumanism- is an obstacle to progress in the self-directed evolution (Bostrom, 2005).

The arrival of syneoids will confront us on so many levels with the type of radical "other" - so different from us and yet a former "tool" "created in our image." It will launch a journey with the "other" without precedence, unpredictable, unforeseeable, and volatile. We will be faces with many questions and to echo Pamela McCorduck (2004), that, "at that point at that point, we turn to our own smart machines for advice on what the best next move is for the human race." And just like the well being of most species currently existing is greatly affected by our decisions and action, so we might find ourselves in a similar position upon the arrival of syneoids.

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