

Data and Humanity

Essay on *Big Data* and Artificial Intelligence for sustainable development

Is humanity ready for an exponential growth of data? Once in the purview of computer experts, *Big Data* and Artificial Intelligence (AI) today affects our society with unprecedented growth of knowledge. We are surrounded by a vast amount of data that measures everything about our lives, this is *Big Data*. This data, driven by powerful computation, helps us make decisions, and even makes those decisions without us. Electronic assistants like Siri or Google Assistant are just the dawn of AI.

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The "super-consciousness"

Data multiplies like water lilies in a pond, in which the number doubles daily. It is an exponential growth which starts slowly and ends in chaos. One morning the surface of the water is half covered by water lilies. It would have been a mistake to ignore the growth, thinking there is still time before the pond is completely smothered as the very next day, the water lilies multiply, covering the entire surface. This is the tipping point, at which the exponential growth becomes chaotic. If our planet is the body of water and the data a human incarnation that follows a similar evolution to that of water lilies, then we must understand the essence of data growth to be able to control the situation.

It is clear that data is part of all aspects of our lives: education, sports and recreation, city organization, health, and finance. It presents in our daily objects, from connected cars to smart TVs. It becomes a vital part of our existence and creates new knowledge about ourselves. It is difficult to live without data because it is also embedded in many applications that surround us.

Data grows so rapidly that we are struggling to keep a close watch. Data knows more about us than we know about it! It is a "super-consciousness" which should have increased our intellectual abilities, but we seem to have missed it already. Data is also linked to more data to create a network of "super-consciousness". *Big Data* is this matrix.

*Data forms our
"super-consciousness", thus
Big Data is inherently its matrix*

The quixotic applications of this matrix are unknown because *Big Data* is in its nascence. It is still too early to determine how to use this matrix in order to bring good and reduce harm to humanity. It is also difficult to predict when we will overdose on data or when this "super-consciousness" will suffocate our lives. In the story of the water lilies, there could be no warning sign the morning before the tipping point. From the lesson of the man who ignores the growth of water lilies, the last step of a growth out of control is chaos. Our objective is to avoid this situation at all costs.

This augmented brain, thanks to our "super-consciousness", equips humans with a better perception of the environment. We see this as an opportunity to help us solve complex and systemic problems on our planet, but this new capacity could also be detrimental to humanity.

Imagine a world with a heart that pumps data day and night, and a brain that processes it in real time to operate your applications and connected devices. In this world AI decides, for example, the best time for a career change, which is based on a life-time worth of data. Of course, you can refuse this proposal, but only doing so with discretion. You do not inform your employer of this possible career

change as this could hurt your future in the business. However, if your employer is the owner of *Big Data* and AI, then the whole process of promotion and demotion is already controlled by an algorithm. Such an algorithm influences the employer's decisions, and can even be the "substitute decision maker" which decides your professional future based on "lines of computer code".

"Substitute decision makers" exploit our "super-consciousness" to decide for us

We see here a new world that is built on a matrix of "super-consciousness" and "substitute decision makers". This world possesses great databases about our lives, and is able to make decisions for us. The great change is coming.

Let us continue with another example. You are in the office and going to make coffee, a routine to increase energy and level of concentration. Your company offers a coffee machine connected to *Big Data* from Human Resources, who has access to your biorhythm and medical record. You gave your consent to this access at the time of recruitment because it was difficult to say no, for fear of losing the job offer. Denying *Big Data* access is not appreciated by the employer! You also agreed to wear the company's smart watch, which is equipped with the "Health" application. Human Resources installed this application for your well-being and tracking your movements in the premises. So, based on your biorhythm, the AI of the coffee machine selects a specific pod to optimize your caffeine intake. Your personal desire must now submit to the AI's choice. It could ban you from coffee if your blood pressure is too high and you have an important meeting soon, since *Big Data* is naturally connected to your calendar.

The AI may advise you to take a nap and the report of your rest will further enrich *Big Data*. Incidentally, AI could encourage you to do a little more sport, because according to *Big Data*, you have not been active lately, and this reflects on your work efficiency. Compared to other employees, you are not good enough, AI could think of replacing you! We are beginning to see what future human resources directions might look like. This is an example of "substitute decision maker" that we do not necessarily want to encounter.

In practice, there are many hearts that beat and brains that process your data, they are stored on computer platforms, in the *Cloud*, which is controlled by companies with sufficient financial means to construct *Big Data* and AI on a large scale. A single individual cannot build such data management infrastructure, with prohibitive investments and platform providers that monetize their services. In order to limit the risks of monopoly, we must democratize the emergence of different platforms and the diffusion of best practices. We will come back to this later in this paper.

Big Data and AI could dehumanize us. If an AI seems nice to us, it could become our best friend, always available to listen to us, eliminating the need for moody friends. But is it desirable? AI could also be our affliction, if it prevents us from experiencing unexpected events that make our lives vibrate, like going out without an umbrella in rainy weather. You might disregard a suggestion from Siri or Google Assistant for the umbrella, but such rebellion could have a negative impact on the assistant as you will have to "pay" later. For example, AI can steer you away from career promotions or the opportunity for a new job. The "addictive", and certainly "affective" aspect of AI assistants is coded in their DNA. There is a neurobiological dimension in their algorithmic construction to make the user perceive AI as a fellow human. We will not want to upset or inflict pain upon this anthropomorphized AI. So, we had better bring that umbrella! There will be no more human experience of encountering a stranger in a shelter during a downpour.

To help the user navigate these data-driven practices, Europe has adopted the General Data Protection Regulation (GDPR). If you are a European citizen then your data should not be shared between companies without your consent. Thus, the refusal to take an umbrella, should Google

Assistant or Siri know, would not end up in the hands of a company without your agreement. Although regulation plays a role, it is certainly not enough as it will not control the dose of neuroscience injected into the algorithms to tame humans, and without us even noticing.

The corpus of data and its applications are so vast and dynamic, to incentivize good practices, citizens and consumers should proactively influence companies. This matter is not only in the hand of legislation, which is often late in catching up to technological advances. It will also be necessary to define best practices and methodological framework for companies to build their *Big Data* and AI in compliance with quality and ethical standards. Company balance sheets will extend to ratings in these areas. We will come back to it at the end of this paper.

Imagine that *Big Data* guides decisions based on false or fabricated data, and that AI has bugs. Of course, this will happen and regulations like GDPR cannot prevent or fix it. This new level of complexity can impact our lives greatly. But let us be positive, we need to build a governance of *Big Data* and AI, to set agreements on quality control. After all, an AI that diagnoses disease more reliably is beneficial to humanity. Similarly, an AI that increases agricultural yields to produce more without chemical pesticides is a desirable alternative to GMOs.

Big Data and AI can cause accidents as enormous as nuclear disasters

Thus, the line is thin between a positive or negative application of *Big Data* and AI. A “bug” in these applications seems less serious than an accident in a nuclear power plant. Yet this feeling that nothing fatal for humanity can happen with the data must not hide the impending impasse.

II

The impasse

Since the advent of fossil fuel, humanity has continually redefined and exceeded the limits of growth, with the most dynamic development happening between the end of the Second World War and the mid-1970s. Despite routine oil crises, production increases steadily to serve an exponential growth for an insatiable demand of the global economy. The transformation of oil into tangible products and increased labor force has disrupted the ability of man to act on his environment. Our cars, mobile phones, computers, homes, tractors, robots, machine tools, fertilizers, plastics ... are both manufactured and operated by oil. With coal, fossil fuel accounts for 60% of energy production.

The “exponential growth” is different from a “linear growth” in which the rate of growth of the former is proportional to the current population, whereas the rate of growth of the latter is constant. On the other hand, the “no growth” model opts for a zero increase of the population, or even a decrease (Malthusian Law). It is a fact that our world is governed by an exponential growth in which the more demand there is, the faster the supply has to increase to meet this demand. This is a limitless growth as a result of cheap fossil fuel.

If we were not confronted by global warming and fossil fuel depletion then this exponential growth might not be a problem. The same oil that acts as booster for human development also leads us to an environmental degradation and an anxious future weaning off fossil fuel.

The wealth created during the past century is based on “free” oil which price is calculated by extraction cost and national tax. Oil is treated like air, which has no price as a stock in nature. This is the original mistake that comes back to us like a slap by the planet to humanity. The free oil drives exploitations

that obscure environmental impacts: pollution, loss of biodiversity, land loss from sea level rises, destroyed ecosystems from mechanized agriculture and the use of pesticides, etc.

Adding to the grim picture, the wealth generated is kept by only a small part of society but not the rest. Only three billion people benefit from this growth, while others get by with a pittance. A billion people still suffer from hunger, mostly farmers whose land and climate no longer support self-sufficient sustenance. This imbalance is even more pronounced knowing that the 35 largest fortunes in the world are worth as much as the 3.5 billion poorest.

The best management of knowledge will help humanity to break the current impasse

We cannot wait for the colonization of Mars to rectify our mistakes on this planet. To continue this exponential growth assisted by fossil fuel is akin to playing Russian roulette, hoping to escape unscathed. And yet, even with this alarming finding, everything happens as if nothing really changes, or changes too slowly to be effectual.

As we will see later, knowledge management with *Big Data* and AI will help us break this impasse, but it depends on how we will apply it. At the moment, the essential is yet to be done.

Is it sensible for a car that weighs more than a ton to move an 80kg human? The use of the electric motor does not change this absurdity as long as the weight of the vehicle remains as heavy. The energy footprint is too high. Even worse, autonomous cars are equipped with electronics that contain multiple precious metals which extraction still puts the planet at risk (lithium, sodium, potassium, rubidium, etc.). These metals are integrated into the engines, making recycling impossible or requiring polluting chemicals. In the end, the recyclable parts are steel rods for concrete, and precious metals are permanently lost in the frames of our homes. It is a tragedy for the planet.

So why do we want heavy and autonomous cars? Can man not drive lighter cars with lower energy footprints?

The autonomous car is also connected to the matrix. The car needs the network to interact with its environment, and it's an excellent way to capture additional user data. The windshield can be used as a display screen for advertisement. *Big Data* might become obese, causing ailment to the AI. The consequence of energy consumption of *data centers* is considerable. Internet usage by 4 billion people takes up more than 5% of global energy consumption, mostly to storage centers, partly to air conditioners.

With one billion connected cars, each generating 1 PB of data per year (1 petabyte = 1.000.000 GB) we will have 1 billion PB. To date, human consumption is in the order of 900 thousand PB, so this is three orders of magnitude above the current consumption! This modus operandi is not sustainable. If we extend this calculation to all feasible smart devices, it would be impossible to even predict the energy consumption. Adding to this is the number of more humans who will have legitimate access to the internet.

The right to pollute (taxes) will turn into a ban on pollution

It may be necessary to consider the limits of storage for individual users and applications. Is it necessary to store our selfies for life? Such regulation will require rules for archiving and removing outdated information. All this will seem anti-democratic but it is necessary to define a regulated framework at the global level, without burdening

the poorest with the overconsumption of the richest. In this domain of data consumption, and probably in others, the right to pollute (taxes) will turn into a ban on pollution.

Our regulations do not endorse a “right to exploit” that allows an individual to steal a property up to a certain maximum financial value, or under condition of paying a tax. In a similar fashion, regulations on the use of data and the impact of *Big Data* and AI on the planet will have to include certain coercive clauses to safeguard humanity.

We were two billion men a hundred years ago, we are 7 billion today and will be 12 billion by the end of this century. How can we survive with this growth model?

Take the case of fishing, fish resources are declining due to intensive fishing. Nets spanning several kilometers blindly collect all the resources in the ocean. In an effort to reduce the damage, fishing quotas are imposed to protect spawning season. But as spawning seasons differ according to the species, and these quotas do not guarantee sustainability of the resources, why do we continue to catch pregnant fish?

Unlike the heavy and smart car, technology could help us avoid the worst. Intelligent fishing nets with built in AI pattern recognition would select fish according to sustainability criteria. The net and its mesh would change shape or be equipped with light markers to attract and let non-targeted fish escape. Thus, non-target species and full female fish would be preserved. These new generation nets will also ensure a higher survival rate of fish trapped in nets and reduce waste (dead captured fish and unfit for consumption).

Big Data, by collecting more data on fish behavior and efficiency of nets, allows AI to optimize algorithms on net usages, not only in terms of seasons, fishing location and duration but also dynamic adaptation of the nets to let non-targeted fish escape.

The line between good and bad application of *Big Data* and AI is thin. The same principles of *Big Data* and AI is found in the case of the polluting heavy smart car, and the intelligent fishing net, but with vastly different impacts. On one side, society continues its exponential growth to meet its needs by dismissing its externalities. *Big Data* and AI are used to pursue an unsustainable development for the planet. On the other side, society uses *Big Data* and AI to promote growth compatible with a sustainable planet, serving all men alike, and taking advantage of better knowledge management.

Humanity must adopt Big Data and AI for a sustainable development of the planet

III

The renaissance

It is therefore clear that in a world where fossil fuel is limited and global warming is underway, the current pattern of exponential growth is an impasse. Man must seize this opportunity to apply *Big Data* and AI to good use because they constitute an unprecedented chance to improve knowledge management. We can then optimize and reorient our growth model while respecting people and the planet better. We have no choice otherwise our unlimited growth will increase and accelerate our energy consumption, pollution and therefore the inequalities between the rich and the poor.

We must find “the wisdom of the limits” as mentioned by my Vietnamese friend, Mr. Lap, a man of theory and practice in the field of education and new technologies. This is the foundation of a transition to a renaissance of humanity more respectful of this planet.

If we let *Big Data* and AI technology “recklessly” steer development, nothing good will come of the future. We must introduce a “rationale” on the uses of our technological knowledge, and not repeat the same mistake committed in the case of oil. Oil should not have been used without financial compensation that regulates its exploitation. When oil is free as air, it creates incentives and conditions for abuse. If oil had been paid for at a fair price, then we would not have known the plastic bag industry that generates serious pollution. The current transition to biodegradable bags would have happened well before, two or three decades ago.

Data is being treated as freely as oil. Companies pay for data capture from customers, citizens, and connected devices by developing computer extraction processes, similar to fossil fuel paid by extraction costs. But data has no “stock” value, as it appears infinite and free. Yet, as we have seen, data’s impact on humanity will be significant, in both a positive and negative sense. We must not let *Big Data* and AI be used without good governance.

Treating oil as a free natural resource was a mistake we need to avoid for data

To shed light on the requirements for good data governance, there needs to be a science dedicated to the impact of data on humanity. First of all, in order to master the understanding of the structure, data and its contents, it is necessary to reconcile a deterministic approach to the representation of the real world (Descartes) with a systemic approach to act on complexity (Morin, Ashby, and Atlan). It requires both “semantic modelling” and “global governance” of data. These disciplines are well established¹, and we must promote their dissemination and practices in order to reduce quality defects. Thus, criteria for judging “performance” of data are: quality, reliability, veracity, security, traceability, etc.

At the same time, for AI algorithms, we must subject for “empathy” criteria based on application cases, both to understand their interests from a human point of view, and to better judge the level of transparency of the analysis implemented.

If *Big Data* is of poor quality (data that is false or fabricated to guide certain decisions) and AI is malpractice for people and planet, then humanity could be doomed even before fossil resources are exhausted.

To achieve results, it is necessary to mobilize actors from various groups, private sectors, political organizations, researchers, intellectuals, economists and citizens. The work must be based on a philosophy to direct a global charter of *Big Data* and AI, to stay on the right side of the line that separates the goods from the harms of *Big Data* and AI. As we have discussed, this philosophy is a combination of “performance” of *Big Data* and “empathy” of AI.

A philosophy for performance of Big Data and empathy of AI

It is an opportunity for humanity, because the damages of the planet caused by exponential growth require an effective and concrete solution that builds on better knowledge management.

We need to share better and faster reliable data that will be used to build a sustainable future. In all domains, we will need more quality data with more governance: climate, agriculture, health, education, energy, automobile, etc.

¹ Please refer to www.orchestranetworks.com

But to succeed, we need to avoid mistakes like the one of the heavy smart car, we need a philosophy adapted to new challenges of the impact of data on humanity. A non-polluting, light and partially autonomous car is acceptable, and also brings revenues for car makers.

So as to lead by example and share our knowledge, we need to invest in a concrete way, in projects abiding to this new philosophy. A financing system must be invented to support the poorest humans

We must support concrete projects using sustainable Big Data and AI for the planet

in its positive uses of *Big Data* and AI. On average, 1,000 billion euros of dividends are paid by 1,200 companies each year, why not set up a global incentive and reasonable tax on these dividends. The money would finance an international fund for the positive use of *Big Data* and AI. This fund could be managed by an independent international organization, named “Big Data Foundation for

a Sustainable Planet” and operates based on the defining criteria of a governance of performance and empathy of *Big Data* and AI: transparency, quality, reliability, sharing, etc.

The foundation could categorize global *Big Data* and AI empathy into key sectors such as agriculture, education, health, housing, transport, etc. It could assign an impact rating on humanity and the planet according to transparent criteria. It would promote educational effort on the use of *Big Data* and AI through the establishment of a charter and the promotion of concrete project implementation.

At the end of this paper, the following conclusion is due:

Our planet is in danger because of exponential growth that is incompatible with the exploitation of fossil resources. Humanity must adapt its growth model using better knowledge management. *Big Data* and AI can be our lifeline. They are just as powerful a tool as nuclear power and require the best empathetic practices. This tool has allowed us to optimize agricultural and industrial process, health and education to benefit humankind.

We are looking forward to seeing you in November 2018, in Hanoi, at the conference “Data Management: the new deal beyond Industry 4.0” to continue this reflection and better understand the use of technologies and their societal importance.

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