HOW TO CODE ALGORITHMS TO FAVOR PUBLIC GOODS OVER PRIVATE ONES

Hugues BERSINI[1]

ABSTRACT

The world has become too complex to entrust management only to flesh-and-blood human governance, which such complexification disarms. By definition, the managing of our public goods (not rival and not exclusive) strongly attracts free riders from which it is hard to be protected. Facing this multiplication of threatening complexities, we are increasingly accepting to be helped by ubiquitous algorithmic assistances. Often these algorithmic assistances treat their users through dedicated focus, in a privileged way, as if they were the only ones in the world. While we might accept such algorithmic orientation and very focused targeting for some specific domains of our life, decisions that impact our public goods, such as the selective access to school, to cultural media or the complicated mobility in our cities, are of a complete different nature (like it is well-known for long in economic science). In this paper, to convey the idea and for sake of pedagogy, I will mainly use the example of GPS and automatic navigation systems that make an important use of the shortest path algorithm to connect the departure and the destination points in complex road networks and in a way that is supposed to maximally satisfy the users. Then I will sketch other algorithmic assistance such as the student assignment to schools and universities and the cultural and information recommendation. Taking for granted that most of these algorithms run in an individualistic manner, I will show how departing from an individualistic version of them, it is possible, through a succession of iterations and the definition of a cost function that takes into account the cumulated collective impact of the previous iterations, to gradually reach a much more satisfactory solution for the collective whole.

INTRODUCTION

The world has become too complex to entrust management only to flesh-and-blood human governance, which such complexification disarms. The heavy black storm clouds that threaten us, such as the globalized

1 IRIDIA – CP 194/6 - Université Libre de Bruxelles

economy and the crises that regularly follow, the explosion of inequalities, global warming and the accelerated degradation of the environment, the deterioration of the habitat, the urgent and unavoidable energy transition, agriculture intensifying in all except for health benefits, community fractures and the surge of terrorism, require a better understanding and interpretation of the phenomena, followed by in-depth research of the adequate regulatory solutions. We are being threatened by increasingly complex realities and clumsily pursue more and more antagonistic objectives: growth against environment, merit race against equality, freedom against security … There is no better definition of the complexity than a reassembling of local micro-realities, easy to handle when kept detached, but leading to surprising behavior, unpredictable and becoming almost unmanageable, when reassembled. The sum of individual interests in no way satisfies the collective interest (on account of the presence of free riders inspiring people around), just as the temporal sequence of short-term assignments does not meet long-term objectives.

What economists call public goods are the ones that appear hard to trace (not excludable i.e. hard to detect and follow who consume them) and not rival (the consumption of one economic agent has no impact on the consumption of another). Common goods, in contrast, become rival but, in this paper, I will make no essential difference between them. Because of their nature, together with the presence of positive and negative externalities, states and public administrations ought to play an important role in the way these goods are produced, managed and distributed to the potential consumers, but more and more abandon this role to the private sectors. These same goods also appear to be classically victims of free riders, who are eager to abuse them and try as much as possible to circumvent the prohibitions and the rules enacted by the public authorities. Among the examples that I will treat in this paper are the management of the collective mobility, the competitive and selective access to schools and universities and the access to cultural media by means of recommendation algorithms.

Facing the multiplication of threatening complexities these goods are victims of, public administrations are accepting more and more to be helped by ubiquitous algorithmic assistances. Trivial examples are lighting and automatic flushing in public toilets, more and more automated means of transport, equipped with automatic payments when needed, domestic appliances deciding about our energy consumption, taxes automatically deducted at the source, access to public educational establishments selected by algorithms, personalized filtering and ranking of the information sources by opaque search engines. As a matter of fact, more and more of these algorithmic assistances are being conceived, captured and written by private companies (such as the ubiquitous and monopolistic GAFAM (the acronym for: Google, Amazon, Facebook, Apple and Microsoft)) that, by principle and for profit, aim at a maximum satisfaction of their client, and in consequence favor the individualistic interest of the persons relying on them. These private companies, though incredibly efficient, have to treat their users through dedicated focus, in a privileged and personalized way, as if they were the only ones in the world. While we might accept such algorithmic orientation and very focused targeting for some specific domains of our life like medical treatment or most of the commercial product acquisition (the private goods) for which the impact of an individual decision is almost null on the rest of us, decisions that impact our public and common goods are of a complete different nature (like it is well-known for long in economic science). For them, the maximization of the individual interests can clearly not align anymore with the satisfaction of the whole, leading to the invasion of free riders or the classical so-called tragedies of commons. These days, some of the algorithmic presence in our daily lives, like the GPS or the student/university matching, because of their inherent individualistic nature, tend to increase the likelihood of these tragedies.

In this paper, to mainly convey the idea and for sake of pedagogy, I will essentially keep with the example of GPS and automatic navigation systems that make an important use of the shortest path algorithm to connect the departure and the destination points in complex road networks and in a way that is supposed to maximally satisfy the users. Taking for granted that most of these algorithms run in an individualistic manner, I will show how departing from an individualistic version of them, it is possible, through a succession of iterations and the definition of a cost function that takes into account the cumulated collective impact of the previous iterations, to gradually reach a much more satisfactory solution for the collective whole. I will then treat more briefly two further algorithmic assistances, either for accessing schools and universities or accessing cultural media. In all cases, an important facet is what kind of social cost should these algorithms try to maximize and who should be in charge of the coding of these algorithms once we accept to produce them in order to maximize our public goods. Who should decide about the algorithms making tax decisions, selecting access to educational establishments, limiting energy consumption, surveying our environmental impacts and constraining our public transportation choices? One possible answer is to engage much more the simple citizens in the production of these algorithms. Referring to the classical separation of powers, the unique efficiency of the executive power of these algorithms implies a deep change in the nature of the legislative power. Since, again, by their very nature, the cost of preserving and maximizing the public goods is hard to pass on to the beneficiaries, a new way of incentivizing and rewarding the code writers will also need to be worked out. We need to discuss and agree on a new form of algorithmic governance for the people and by the people. I will finally consider some ways to respond to this challenge.

A GPS SYSTEM CARING FOR THE COLLECTIVITY

Suppose an asymmetric graph of N cities connected by a set of roads of different lengths. This road graph is about to be circulated by a set of X drivers who wish to connect city A and city B by the shortest itinerary (the succession of cities to be crossed in between A and B). We will rely on older versions of automated navigation systems that just take into account the length of the roads with no consideration on the existing congestion on these roads. However, everything in the discussion that follows could easily be generalized to whatever modern types of GPS (such as “Waze”), more aware of the current traffic situation. For sake of facility, are generated randomly:

- The number of the cities in the graph (i.e. the nodes)
- The degree of the graph i.e. the number of neighboring cities for each node of the graph (a random number of cities and a random graph degree).
- The length of each road (i.e. the edge) to be randomly fixed in between a minimum and a maximum value
- The number of drivers and their departure and destination cities
- The speed of the drivers whenever they circulate on empty roads

A classical individualistic GPS system works by running a traditional AI shortest path algorithm such as Dijkstra or A*[2] for any individual driver. For this algorithm to run, every road should be associated with a cost, since what is being minimized is the sum of these road costs for each possible itinerary. In a first, still individualistic version of the algorithm, this cost is the length of the roads or similarly the time required to travel these roads and inversely proportional to the driver constant speed. This version of the algorithm attempts at satisfying every driver in turn, without taking into account the effect of such solution on all other drivers i.e. their mutual impact.

Obviously, once the drivers circulate on the roads, the traffic on each road (i.e. the number of drivers travelling this road) modifies the driving speed in a way that can be approximated mathematically:

RealSpeedOnRoad = InitialSpeed – Fct(DriversNumber/RoadLengh) for each road

The nature of this mathematical function "*Fct*" does not need to be fully specified here beyond saying that it ought to be monotonous and produce a resulting value of the final real speed in between zero and the initial speed. It is quite easy to understand the default of such an individualistic version of the algorithm (with only concern for the road length) since all short roads will be privileged by the algorithm, entailing ruinous traffic jams on each of them, and a far from optimal solution for all drivers trapped into these bottlenecks.

An obvious alternative for an algorithm aiming at the public good would be first to define a cost measure aggregating all individual costs, such as the sum of all driver costs or their average, and the running of an optimization method aiming at minimizing this aggregated cost. This method should optimally distribute the drivers over the graph and all along the roads so as to minimize the average travel time for each of them. Whereas this aggregated cost can easily be agreed on for such a trivial collective problem (much more delicate as we will see for other sociological realities), the optimization method turns out to be quite delicate to conceive.

2 Russel S.J. and Norvig. P. (2015): Artificial Intelligence: A Modern Approach – PE.

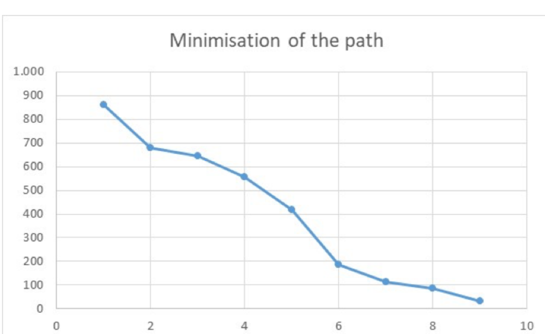
Nevertheless, one very simple and natural alternative could proceed as follows: to run successively the shortest path algorithm for every driver by, for each iteration, taking into account the impact of the previous solution for all drivers in a cumulative manner. For instance, it is possible to define a sort of cumulative estimate speed for each road such as:

CumulativeEstimateSpeed (i+1) = CumulativeEstimateSpeed(i) – Fct(DriversNumber(i)/RoadLength)*alpha

for each road

for which "*i*" indicates the ith run of the algorithm and "*alpha*" should be below one to gradually integrate the effect of the previous iterations. *DriversNumber(i)* is the number of drivers on that same road discovered by the *ith* running of the algorithm. Finally, the shortest path algorithm uses this "*CumulativeEstimateSpeed (i+1)*" for the *"i+1"th* next run. The rationale is to aim at achieving a very satisfactory compromise between the length of the roads and the impact of the traffic on them.

Let's see the experimental results obtained for the following simulated problem: a city graph composed of 50 nodes and exhibiting a degree of 5. There are 3000 drivers travelling through this graph with a constant speed (on empty roads) of 50 km/h. Each road has a length randomly comprised between one and twenty kilometers. For this precise problem, when running the shortest path algorithm just based on the road lengths, the initial average time to travel the graph for all drivers turn out to be 861 min. In the graph below (figure 1), one can see, departing from this initial 861 min, the successive decrease of this average length by adopting the shortest path algorithm described below, using the "*cumulativeEstimateSpeed*" as the cost to be minimized through the successive run.



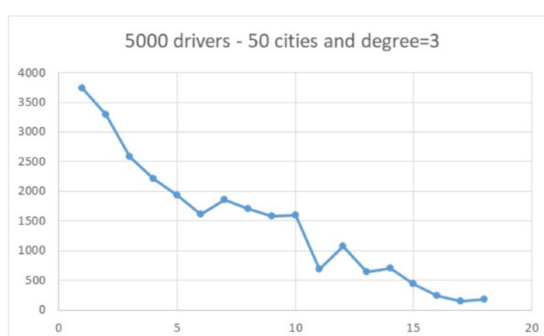


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Figure 1: On the left: Decrease of the average travel time of 3000 drivers after a succession of 10 runs of the shortest path algorithm integrating the mutual impact of all drivers. On the right, the same type of decrease for 5000 drivers, 50 cities and a degree fixed to 3.

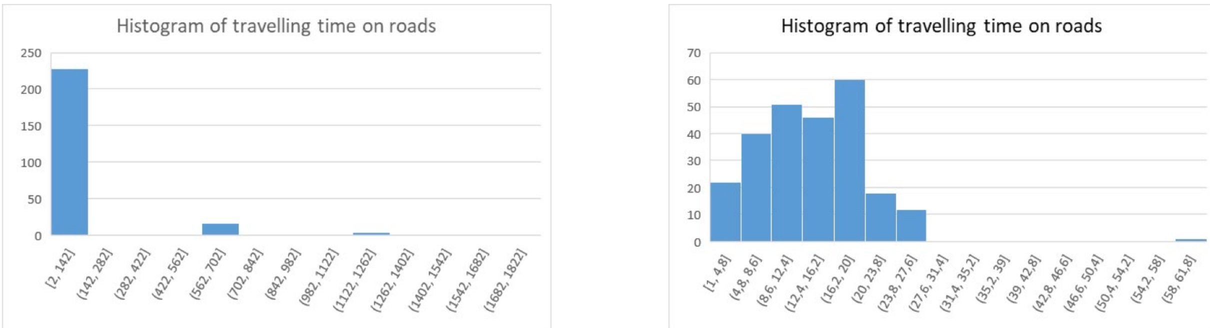

Figure 2: Comparison of the distributions of the travelling time on the road for the individualistic and the collective algorithm.

After just ten iterations of this new shortest path algorithm, the average travel time of the 3000 drivers turn out to be 33 minutes, so nearly twenty times lower. The value of "*alpha*" and the number of iterations are crucial in the success of the algorithm and are function of the size of the problem and the number of drivers. Experimentally, for the first problem (3000 drivers, 50 cities and degree = 5), we achieved very satisfactory results by adopting *alpha*=0.1 and around ten iterations of the shortest path algorithm. For the second problem, a bit more difficult (5000 drivers, 50 cities and degree = 3), best results were obtained (with a duration reduction from 4000 minutes to 150) with *alpha* = 0.05 and around 20 iterations. In the first case, figure 2 shows the two histograms of roads travelling time for the two solutions. The second histogram shows no road with travelling time above 60 minutes (and very few of them), while in the first histogram, some roads need 700 minutes to be travelled. Furthermore, the traffic seems to be much better distributed among the roads for the collective solution.

In a more general perspective, I tend to believe that, once in possession of the individual cost to minimize, a successive minimization of a modified cost that aggregates in a way or another the impact of all previous individual minimization achieved so far for all users, should twist the optimization of the private goods towards the public ones. However, many other optimization methods might as well be possible once users have agreed on the aggregated cost to minimize. And indeed a key issue would remain to establish who should be in charge of defining this collective cost and the nature of the optimization method to reach this satisfactory societal objective.

THE BRAESS PARADOX

Another even more pernicious example of antagonism between the private and the public interest in the case of mobility is given by the Braess Paradox nicely illustrated by the following figure.

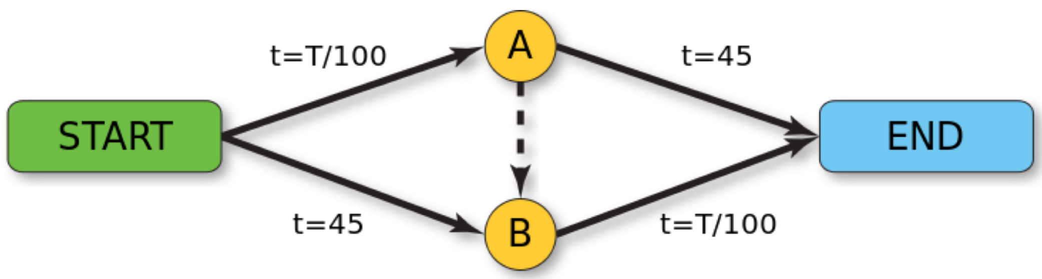

Figure 3: Illustration of the Braess Paradox

Imagine 4000 drivers having to connect the starting and the ending point in this graph. Initially there is no shortcut from point A to point B. The time to circulate on the road "Start-A" is the number of drivers divided by 100, the same to circulate on the edge "B-End." The two other roads need a duration equal to 45 (no time unit is necessary) to be crossed. In the absence of the shortcut, we can easily deduce that the drivers will equally distribute themselves on the two alternative "Start-A-End" and "Start-B-End." The first 2000 will engage on the "Start-A" since it will take them 65 to connect the two points, while the 2000 remaining ones will naturally engage on the second alternative. All drivers will need 65 to join the two ends.

Now the paradox pops up in the presence of the shortcut "A-B" whose duration to be crossed is supposed to be null. For any individual driver the best alternative seems to be "Start-A-B-End" since, all together, it will take "T/100 + T/100", always better than to engage on a 45 edge. As a matter of fact, in terms of game theory, the Nash equilibrium forces every driver to take the "Start-A-B-End" road while, for the social optimum, the distribution will be the following: 50 drivers on the path "Start-A-B-End" and 175 drivers equally distributed on the two more directed paths. For the optimal social solution, the average duration will turn out to be 64,6875 instead of 80.

Suppose that the individual cost for any individual driver to engage in a road is given by the following linear formula:

$C(x) = ax + b$ with x the number of drivers and a and b any value.

Again, like in the previous case, the most natural solution to avoid condemning all drivers to choose the non-optimal path is to substitute the individual cost of an edge by its "social cost" given as follows:

$$C(x) = C(x) + (x-1)(C(x) – C(x-1)$$

i.e. the individual cost + the impact of adding any new driver upon the drivers who were already engaged on that same road.

Then the iterative execution of any optimization algorithm of the A* family will distribute all drivers in a socially optimal way. In such a case, it will always be more profitable to adopt the socially better solution, since all individual drivers will finally benefit from it. Even if any driver would like to follow what appears to be at first its most profitable choice, we can all accept to be driven by a top-down supervision, a "benevolent Big Brother," who will decide for us what is naturally best for us. Now, such a collective optimal solution is not always the case like the two other algorithmic assistances will show.

ASSIGNMENT TO SCHOOLS AND THE GALE-SHAPLEY ALGORITHM

Access to public schools or public universities often suffer from the same complication: some of the establishments, the most wanted ones, cannot accept all students. They have to make a selection. In order to perform this selection, algorithms of the Gale-Shapley (GS) family are often called to the rescue. This family of algorithms have been conceived to resolve an old economic problem called stable matching. In its original version, which dates back to 1962,[3] this algorithm aims to achieve stable

3 Knuth, D.E. (1996): Stable Marriage and Its Relation to Other Combinatorial Problems: An Introduction to the Mathematical Analysis of Algorithms, English translation, (CRM Proceedings and Lecture Notes), American Mathematical Society.

matching or marriages. For instance, men classify women according to their preferences, while women classify men on their side. A matching is assumed stable when there does not exist any alternative match by which both parties would be individually better off. The goal of the algorithm is, by successive iterations, to get the best match satisfying at most each person's subjective preferences.

In our case, these algorithms have been transformed to associate two different kinds of agents: the schools and the students. Basically, the students are asked to rank the schools they would preferentially like to register to and, on their side too, the schools are asked to rank the students. This second ranking can be based on several criteria: preliminary results during their previous schooling, geographical location, family situation (if a family member is already in the same school). The algorithm then tries as much as possible to match the first choices from both sides i.e. to have the most preferred school accessed by the students they are the most interested in. In the US, and more precisely in New York and Boston, an important debate took place among the computer scientists, the administration and the citizen about two possible versions of the algorithm. In Boston, instead of the original GS pure version of the algorithm reigning in NY, they accepted to give as many people as possible their first school choice. This had a bad and unexpected consequence. If in a first round of the algorithm, most students were assigned their first choice, they subsequently could not be displaced (in a second round) by other students with a higher priority who, in the first round, could not access their first choice. Knowing that situation, many parents did not dare to reveal their real first choice, afraid to find themselves relegated to their very last choices. Finally, and following many round tables with the most concerned actors i.e. parents and students, the Boston algorithm was replaced by the original NY one. The citizens collectively finally decided about the best version of the algorithm.

In France, the “Admission Post Bac (APB)” that has become “Parcoursup” (https://www.parcoursup.fr/) algorithm has already received a lot of attention given the high sensitivity of the subject: the automatic assignment of the adolescents to the high school and universities that will host them for many years. This algorithm, which aims to connect two objects, on one side the academic institutions and on the other the students, is once again inspired by the famous algorithm of Gale-Shapley.

Referring back to the stable marriage problem, it should be obvious that if all men prefer the same women and vice versa, the most coveted will finish together. If preferences tend to become more and more objective and universal (like it is indeed happening with universities and student files), the algorithm aims to perform the matching between the highest bidder and the most coveted object. These days, Parcoursup automatically creates a match between what it perceives to be the best universities and the best students. It is therefore no exaggeration to say that this algorithm works to give everything to the most deserving, which, at the same time, reinforces original social and educational inequalities. In this sense, it reflects the ultra-meritocratic and utilitarian France of President Macron. It has then evolved from an original more egalitarian version to increase its utilitarian nature, so that surprisingly, even Al Roth,[4] Economy Nobel Prize for his developments on this type of "market design" algorithm, recognized the problem in his blog with a comment entitled: "*A cri de cœur against assortative matching for French college admissions.*"[5]

"The objection seems to be to assortative matching, which results when students largely agree on the desirability of universities, and universities largely agree on the desirability of students. As a result, few students from poor neighborhoods are matched to top college programs."

Parents who are normally moved by the fate of their children have rightly demanded more transparency, especially as, at the origin of the algorithm, a random choice was often referred to as a last resort, much to the chagrin of those same parents who were shocked that the sort of their offspring was entrusted to a die. Nonetheless, a random draw allows the cards to be rebalanced, to decrease the importance of past marks, of the reputation of the previous high school and the geographical location, of the family situation, etc. In response to these concerns, to the critics and misunderstandings, the first version of the algorithm (APB) was finally made public and modified, to substitute more and more randomness with meritocracy i.e. better universities would be easily accessed by adolescents having a good college history and file. This transparency is undeniably a step in the right direction, because such type of algorithm cannot escape to the public attention and full understanding indeed, as should all those impacting our social life in a considerable way. While the

4 Roth, A. (2016): Who gets what and why. William Collins.

5 http://marketdesigner.blogspot.com/2018/07/a-cri-de-cur-against-assortative.html

social cost to be minimized by a GPS (like the one discussed in our first chapter) can be easily agreed on (though some points of concern might still necessitate a majority suffrage, for instance: should some important people (politicians, firemen,...) reach their destination in a faster way, and how much faster? Should the algorithm minimize the cost, the time or the environmental impact? Or are there locations that should not be travelled too densely for possible environmental or esthetical reasons?), it is much more delicate for issues like energy consumption (for whom and at what cost?), water rationing, school and healthcare access, for which many different ways to aggregate individual interest (egalitarian, Rawlsian, utilitarian...) might still be the object of intense debates and, finally, of a majority election setting the main ideological orientation. Now that the "Parcoursup" algorithm is supposed to be open, the ideal next step should be to constitute the group of developers in charge of writing, maintaining and evolving the algorithm, composed of experts in computer science, experts in public education, together with interested and responsible citizens, parents for example, randomly selected.

RECOMMENDATION ALGORITHMS

A very last algorithmic assistance regulating a lot of our cultural choice is provided by the recommendation software. Most of these algorithms are based on their prediction ability, i.e. predicting which next cultural item the consumer might enjoy. It is quite questionable to base the quality of the recommendation on just this predictive ability (why to recommend what the consumer was anyway about to consume?), clearly restricting the horizons of this consumer and provoking what is usually designed as a filter bubble. We could imagine instead to propose to the consumer something that he or she is definitely not inclined to consume or even randomized propositions. In a recent work together with my colleague Robin Devooght,[6] we have applied recurrent neural networks to the session-based recommendation problem, as being part of a growing interest for collaborative filtering based on sequence prediction. This new approach to recommendations reveals an aspect that was previously overlooked: the difference between short-term and long-term recommendations. We have shown how recurrent neural networks can be steered towards better short or long-term predictions with a very interesting side effect. We have observed that steering our methods to

6 Devooght, R. and H. Bersini (2017): Long and short-term recommendations with recurrent neural networks. Proceedings of the 25th Conference on User Modeling - pp. 13-21. ACM.

privilege short-term prediction lead automatically to more diverse recommendations (in terms of item coverage) and fewer blockbusters. While it is possible to produce high recall using only very frequent items, reaching a very good short-term prediction rate requires to use less frequent items. In other words, optimizing short-term prediction puts more pressure on the capacity of the model to produce diverse recommendations. Again, the way such recommendation algorithms should work best for the society at a whole might be the result of a public deliberation.

DISCUSSION: WHO SHOULD BE IN CHARGE OF WRITING THE CODES?

There is urgency since this argument for the algorithmic efficiency in place of the systems of human governance finds its reason to be only in this urgency. We are under many drastic pressures: global warming, environment and agriculture at risk, explosive inequalities, community tensions, hyper-weakened economic systems. As a matter of fact, the law is much too slow in terms of algorithmic instantaneity. The law is much too flexible, much too interpretable, with regard to algorithmic coercion, despite the often apparent rigidity that the citizens blame to it. The GAFAM prove it to us every day and their technologies never stop to precede the laws, to replace the laws. In this race between invading algorithms and outmoded lawyers, an intermediate path is pleaded in this article: Give their proper place to these algorithms whose GAFAM show us the effectiveness every minute, provided that politics and the citizen keep taking hand on their design, their writing. There is a gaping chasm between ancestral political mechanisms that have aged badly, and the dazzling appearance of algorithms and telecommunications which are already redesigning the outlines of our living together: norms, reputations, communitarization, division of labor, market economy...

Very interesting experiences of big data and computer technologies by the public and politics are underway in cities such as San Francisco, Boston or Milton Keynes (in Great Britain). Boston is the place for algorithmic experimentation by a group of developers going under the "Code for America" label[7] and, among other achievements, they have included in their urgent mission the automated enrollment in public schools (the nature of the algorithm we discussed previously). This should be generalized in all cities, all countries. That the authors of future

7 O Reilly Tim (2017): What's the future and why it's up to us. Harper Business.

algorithms have access to a maximum of public data, including those held by the GAFAM (and which give them so much power and wealth), in order to design and calibrate the software to improve the way we share our social world. As an algorithm is not elected and its developers either, it becomes important to regain control on these algorithmic developments. For this, I would argue that three types of developers should ideally be involved. First of all, it is essential to integrate even more technocrats among those who govern us and who write the codes, ideally aware of the algorithmic writing and the domains that these algorithms are supposed to deal with (public transport, environment, taxation, education, health). And how to identify them? It is not the electoral process that does not concern them in any way, but the peer selection that must prevail, as for the literature prizes, as for the Nobel Prize, as for the Pope. But beware, there is no question here of creating an obscure sect of scheming geeks, remaining alone in charge of incomprehensible lines of codes to regulate our lives. Let's insist on this important aspect. Algorithms must remain open, entirely in the public domain such that, ideally, everyone can keep their word and their line of code to write. The Nobel prize Elinor Ostrom [3][8] finds in the open source algorithmic production the ideal of the commons that she had already explored and so much appreciated in ancient times, long before the property instinct took over the sharing of resources. Two acceptances of the notion of "common" here come together: the protection of rival and shared goods, but above all, a self-regulated mode of management of these same goods, in a creative dynamic, of bottom-up and not top-down hierarchy.

Everyone will not want to be entitled to this algorithmic chapter. The second group of participants in the production of these codes should be randomly drawn from among a group of people who would have applied for the deliberations and resolution of the problems in question. It would furiously resemble the constitution of the jury of trial composed from a small set of citizens drawn in a random way and sitting together with the legal experts. So that everyone can participate in this writing, programming languages today offer many modes of abstraction and easier reading,[9] which can capture the substance of the algorithms without having to clutter the technical details of optimization or of saving IT resources. This second group of contributors, as new as they are in

8 Hess C. and Ostrom E. (2011): Understanding Knowledge as a Commons: From theory to Practice. MIT Press

9 Bersini, H. (2012): UML for ABM – In JASSS – 15(1) 9

programming, will have sufficient understanding of the operation of these codes to participate in their development. It has been said and very often written that greater participation in the management of our societies reconciles the citizen with the political world, gives him faith in governance, makes him understand the complexity of the issues, the antagonisms and the desire for compromise. Access to the programming of algorithms would be the entry of artists for this new form of algorithmic democracy and this new form of citizen coding. The production of these open codes will be much like the today majority production of codes like, for instance, on the Github platform.

Finally, the last and third group of elected to the writing of these codes would really be so, and would remain the fact of a small group of politicians elected by universal suffrage, accountants for the major societal orientations: selection of the common goods to promote, arbitration and determining the weight to be given to each in the case their pursuit becomes antagonistic, the criterion of justice to be favored for each of these goods between: utilitarianism, egalitarianism or the best compromise. It will remain of these postures and oppositions, ideological, frontal, irreconcilable, and for which only the suffrage and a majority vote should be able to decide. Each of these social realities might lead to a particular election, because one can be left wing in the matter of education and right wing in economic matter. Moreover, the classical left-right alternation: harmonization of individualism followed by collectivist obligation and vice versa, is often out of sync between these different domains. The philosopher Michael Walzer[10] is right to keep distinct these many spheres of justice. Once these very high-level decisions taken, these moral arbitrations which escape the algorithms and could remain the stranglehold of a few politically legitimately designated for that by electoral means, the techno-scientists and the randomized citizens will take the relay, and collectively and transparently write software that requires each field actor to participate in these major projects. The curious, enterprising people, and the cream of our experts, will use their creativity and their talent to put the ultimate touch and to program these “algorithmic guides and drivers” in such a way that the interest of everyone finally aligns with the preservation and maximization of our common goods.

10 Walzer M. (1984): Spheres of Justice. Basic Books.

CONCLUSIONS

The idea that tomorrow's behaviors will be dictated, belted, guided by algorithms is enough to thrill the most libertarian of our thinkers. This short sight is questionable, because is there a law more acceptable than one that is neutral, disembodied, invisible, being confused with the walls, impervious to the arbitrary of the judges, and leaving to each this illusion that everything is still allowed ... between the barriers that software installs? Making good, without knowing it, by default, is the system favored, for example, by all countries where organ donation requires no consent and, therefore, allows many more people suffering to benefit from it. We can also include the defenders of the "nudge" in those thinkers, the ones believing that there are novel and interesting ways to shape people's behavior with no need for laws and police. Am I defending here a hybrid form of algorithmic nudge?

The laws must partly due their violence and the circumvention of much by the fact that they are dictated and exercised by people. The fading of the human figures behind the algorithms should contribute to an easier acceptance of these same constraining laws. Large areas of freedom will be preserved in this autonomous vehicle driving you to destinations by optimizing the journey of all. Any energy consumption will be guaranteed within limits that are in principle insurmountable, and any water rationing should be as easily adopted as the opening and closing of a tap. Your taxes will be automatically deducted. Your searches and visualizations on the Web will be very carefully monitored, but will be knowingly, by strictly anonymous eyes thanks to the software, and that will worry you only if such explorations in the past caused problems for the public order.

Despite strong criticism by very pertinent authors addressed against this algorithmic takeover of our existence and the GAFAM-like form of solutionism,[11] warning us about the vulnerabilities to hackers, the difficulties to modify software once in control and the weakening of our moral muscles for social deliberations, today we are unable to cope alone with the countdowns that our over-centered behaviors have triggered. I believe that these authors most of the time tend to throw the algorithmic baby out with the bathwater of how the GAFAM exploit these algorithms. And indeed, algorithms are already everywhere to help us dealing with

11 Morozov, E. (2014): To save everything click here. Public Affairs.

such an increasing complexity. They do it everywhere and at any time. The critics tend to confuse two forms of power: executive and legislative. Algorithms are good at execute and at strongly shape our behavior, but we should preserve all latitude to write and continuously modify them in the way we'd like this efficiency to be exploited. And indeed, we should not create them too much in our image, since they should not increase our vices and our greed, not increase the all-human propensity to divert the public goods or simply to turn away from them. It is rather in the service of the community that it becomes urgent to engage them, and their programmers too. As capable of pioneer algorithmic thinking and as convinced of the human duality that he was, Adam Smith perceived in the confrontation, the convergence or the simple spontaneous and paradoxical meeting of private egoism a possible social harmonization. But despite this premonitory genius, an essential ingredient was lacking in all his rhetoric, the computer did not exist in his days.