« How to properly use algorithms in a digital world »

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Institute of Actuaries and SCOR Group seminar

organized on December, 14th 2017

Good afternoon,

David Dubois, President of the French Institute of Actuaries asked me to speak about « the proper usage of algorithms ». I cannot but notice, with some relief, that we are not yet at the stage when the question would be asked by algorithms, wondering about the « proper usage of Actuaries ».

If we are not yet there, there is no doubt that *big data*, Artificial Intelligence – broadly speaking - are key technologies for digital finance, but only if security, transparency and consumer protection challenges are correctly met.

Before going deeper into the subject, I wish to stress the rather prospective dimension of this speech, causing that many risks as well as opportunities described linked to AI are not yet materialized, if ever. Also we will remain in the « weak AI » field, the conscious AI still being quite hypothetical at this stage.

Artificial Intelligence is based on huge and exponentially increasing data, as well as on the sophistication of algorithms used to crunch them, the usage being generally all the more disruptive as this is the case. These data are seldom available in a sufficient quantity and quality, making deep-learning type AI technologies mainly dedicated to Image recognition. Less sophisticated Machin Learning technologies already show strong potential for various use cases, even if a priori less disruptive than more advanced technologies.

The question of properly using these algorithms is in fact multifold:

- First, it raises the question of the relevance and efficiency of these algorithms. Is an algorithm efficient and relevant to price a risk, calculate a Best Estimate, or even be used in a consumer acquisition process?

- Then, there is the important question of the regulatory framework to be applied to this technology. On this topic, it is not the technology as such that is relevant – to the best of my knowledge there does not exist a list of banned algorithms methodologies - but the respect of regulatory obligations on: the legal possibility to use the data feeding the algorithm, the respect of data management rules associated – notably security rules for personal data – and then the need to meet consumer protection requirements.

- But it also raise the question, that probably an actuary audience is asking itself, of the use of complex algorithms for works affected by the prudential regulation.

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I – On the algorithms efficiency

If machine learning algorithms seem to bear very interesting capacities, they raise some new legitimate questions for supervisors, regulators and the companies wishing to use them.

a/ First, these tools use IT, mathematical and statistical techniques in order to learn and improve their performance by optimizing the analysis of huge quantity of data in order to extract the relevant information. Therefore it raises the obvious issue of data quality and relevance.

- This topic, strongly linked to Big Data, is frequently associated to the five V notions (Volume, Velocity, Variety, Veracity et Valor). More than the extremely important quantity of data, we also need to focus on its variety and the possibility to efficiently and rapidly analyses them. The accuracy and added value are also very important qualitative.

- Even if these algorithms can generally identify the data without predictive power, they could all the same be deteriorated by biased data endowed with a seeming predictive power. It is a responsibility borne by the undertaking to ensure that the data are not only accurate but also to justify that they do not generate any significant bias.

  o Compared to a traditional modelling work, the increased automation of data selection in the AI field will give less room to good sense compared to the case of a human statistician, whose judgement can also rely on extra-statistic criteria (knowledge of the insurance sector, ethics etc.).

  o By the way, this raises the issue of "bias reinforcement": if a population endowed with a given feature has been in the past priced excessively high – whatever the reason – it is probable that the worse risks bearing that characteristic would have been underwritten and a machine learning algorithm would then automatically weigh these features more excessively than it should have been.

b/ Identifying the appropriate methodology is crucial

  o As a foreword on that question, it is obvious that these tools are not magical– even if some would have us believe it – and cannot extract more information from the data than what is indeed present and usable.

  o Caution will therefore be required when meeting with sellers of tools showing extraordinary performances compared to usual techniques. It will also be necessary to check that these performances are stable, robust, and based on data that can effectively be used.

- A first task would be to identify the most appropriate learning technique in a given context, which would imply a regular update of the actuaries' knowledge in this rapidly evolving field.

- I would like to stress however that to do it one must beforehand identify clearly the issue at stake. Only when the goal is clearly defined can the specialist work on the most appropriate way to solve it.

- And finally, the right answer could also sometimes be that machine learning is not the most relevant solution to a given issue.

<u>c/ Finally, it will be imperative to assess whether the algorithm technique meets the actual usage conditions planned</u>

- For instance, some of these algorithms show a great potential with their ability to update almost continuously on the basis of new data collected. If it can indeed be interesting, it can be more difficult to use concretely in actual business : :

    o IT systems might not be ready to implement such tools, all the more so in production mode.

    o It can also be difficult in an UX perspective: a client might not understand why an answer given by the system has changed in a case where nothing in its profile has changed.

On all these questions, the actuary will obviously be asked to mobilize its competences in data science, but he will also need to use two less technical qualities: its good sense and business sense. Indeed these are the two qualities of which the algorithms will be the more devoid, and on which the added value of an actuary be highly welcome.

II – Even efficient, an algorithm must be used in compliance with various regulations

Indeed, one of the main points of these algorithms is that they enable an automatic treatment of huge structured and unstructured data, generally more quickly and efficiently than traditional statistical methodologies.

It is however to check beforehand that the usage of these data is compliant with GDPR (in force in May 2018), and potentially with other regulations that might affect them (for instance in the case of health related data).

Further than the legal right to use a data, it is fundamental that the security of this data should be ensured and this in an increasingly open IT environment.

The identification of devious behaviors of algorithms will also be imperative: as long as these tools are not endowed with an embedded moral code, the decisions they propose could be totally unethical.

- For instance, the bias reinforcement already mentioned can also raise ethical issues, on top of efficiency ones, if a discrimination were to be reinforced by machine learning techniques.

- I would like to share the following example: let's take the case of a credit institution confronted in the past to an organized fraud involving fake plumbers. It was the followed by an excessive distrust of the plumbers by credit analysts. As a result in the statistical database used by the algorithm the only plumbers present are either those of the fraud or atypical profiles. This can result if crunched by an algorithm to systematic and unfair refusal of loans to today's plumbers.

- This example illustrates the fact that an algorithm optimizing statistical criterias without business or human common sense could lead to discriminatory behavior. This actual case is rather a caricature as it focuses on one data, but one could imagine algorithms indirectly identifying categories of population – such as sex, religion…– and discriminating them, reproducing and automating unethical – and illegal – human biases in an algorithm. The fact that these populations would be indirectly identified would make these cases harder to prevent.

- Thus before using an algorithm in the real world, it is necessary to perform a wide array of checks aiming at being totally sure that the tool deployed does not show any discriminatory bias.

Beyond these essentially data protection issues, which are under the remit of the CNIL consumer protection rules also have consequences on the usage of algorithms. Hence, these technologies must provide a clear, loyal, transparent communication to the client, be it in the case of explanations, but also pieces of advice or decisions.

- First of all, and even before mentioning the regulatory requirements, there is the issue of acceptability by consumers of such tools. Consumers might not be ready to manage their most sensitive operations with algorithms. The proper usage of algorithms could therefore evolve with the consumer readiness to use them. A fine tuning between automatized advice and human advice should be put in place.

- In any case, loyalty and transparence towards the client require that he be informed of the nature of his interlocutor: the regulation requires that he accesses a human advisor whenever he needs to.

- Algorithms used for decisions affecting a client, or even a proposal made to him, should allow to explain the underlying motives of the result proposed, and show they do not participate in some kind of conflict of interest. This task is not easy for the most complex algorithms, but is imperative. We are aware of some work currently done by academics and startups to limit this Black Box effect.

- It seems that today one of the most interesting benefits of these algorithms could be in their added value for human employees, rather than in replacing them. They would therefore become somehow "augmented human beings" with higher skills to provide fair and relevant advice to the clients.

- Whatever the quality of an algorithm, it will be asked to comply with the same requirements that would apply to a human being when interfering with a client. An algorithm that would manipulate a client would for instance be totally unacceptable: for example an algorithm that would provide an advice based not on the needs of the client but on his wealth and willingness to pay would be improper. The fact that the deed would be performed by an algorithm would be no excuse whatsoever.

III – Even to optimize internal tools, without direct interference with the client – such as reserving tools - insurers should comply with some rules

Actually, those rules are the same as the ones applied to traditional techniques, and mainly those arising from Solvency 2. These should however be adapted in the new context of algorithms. One can find amongst these requirements:

- The quality of data used, as whatever the sophistication of an algorithm, low quality data will generate low quality reserves.

  o Certainly, some methodologies can be applied to manage truncated data for instance, and one could imagine algorithms integrating counter-measures for some kind of data issues.

  o But, in any case the quality of data would have to be appropriately assessed and the methodology used duly justified.

- Moreover, in the specific case of Best Estimate calculation the whole issue will be to adapt the usual requirements to the contemplated algorithms:

  o The technical documentation will of course be fundamental, and clearly justify on what basis the algorithms used are considered relevant. One difficulty could arise in this particular case when

externalizing some of the work, in their ability to provide the detailed methodological basis of the tools used.

o Likewise, using those tools requires an internal control system, including an audit trail, validation and back testing protocols, which can be harder to design for so evolutionary and opaque tools.

o The understanding of the behavior of the algorithms under any set of conditions (economical for instance) will be necessary, to avoid inefficient reactions in crisis situations.

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As a conclusion, the proper use of AI in a digital world implies to preserve and develop a great deal of human intelligence, at the same time to create, feed, deploy and control these tools.

In this regard, allow the supervisor in me to draw your attention on the risks arising from dependencies to external providers – data or technology: first of all a risk of business interruption or even reputation, and then financial risks for instance in case of data breach caused by insufficient cybersecurity measures in more open IT systems. The dependency to common providers could even be a new systemic risk.

Then the undertakings will have to address the strategical question of whether using such an algorithm is relevant: the answer to that same question can change over time, and will depend on the expected return but also on the risks generated. These risks can be cause either by discrepancy with the undertaking objectives, or risk appetite or even by the reluctance of the clients.

Whatever, aside from the issues of security linked to data collection, storage and use of more and more of them, the auditability of the algorithms and ability to explain their behavior are fundamental for both undertakings and supervisors.

These challenges must not conceal the expected benefits from AI, but should be a matter for constructive exchanges between undertakings and supervisors. That is what we are doing this afternoon and what we will keep on doing so that financial institutions and their clients gain the most from this technological revolution.

I thank you for having invited me.