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Insurance by algorithm

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Abstract

Artificially intelligent algorithmic systems have the potential to transform large sectors of the economy, and the insurance sector makes no exception. Although the insurance industry might have been slow in recognizing and exploiting the value of artificial intelligence at first, today the applications of intelligent machines in insurance are growing. This paper considers the role that artificial intelligence and machine learning can play in insurance. It discusses some current uses and also focuses on the possible application of artificial intelligence to smart contracts. Some of the main issues related to artificially intelligent algorithmic systems are also touched upon, highlighting the need to ensure transparency and accountability of automated decision-making.

Key words: Insurance, algorithm, artificial intelligence, machine learning, smart contracts, blockchain, regulation, law, data, privacy

1. INTRODUCTION

"Can machines think" and act as humans? This issue was addressed by the English mathematician Alan Turing in his seminal paper *Computing Machinery and Intelligence* published in 1950, that is commonly considered as the foundation of artificial intelligence (Turing, 1950, 433 ff.). The affirmative arguments made by Turing seem to be supported more and more by current reality. "Artificial intelligence" generally refers to the capacity for a machine to have human-like abilities such as reasoning, learning, decision-making, and the fact that today machines are able to perform ever more tasks that normally require human intelligence is undisputed. The examples are many: automatic translation services, face recognition systems to unlock smartphones or for criminal investigations, medical diagnosis, self-driving vehicles, machines playing games, machines that are able to create paintings or musical compositions (Reillon, 2018, 4). And lots more. Also, recently, an artificially intelligent human-like robot, "Sophia", was granted full citizenship by Saudi Arabia, becoming the first robot in the world to be recognized with a citizenship (Stone, 2017). The use of artificial intelligence has recently increased, especially due to the large quantity of data available and improvements in algorithms (Tällt, 2017, 10). The algorithms behind artificial intelligence identify statistical correlation in the data they analyze, thereby enabling machines to perform tasks that would require human intelligence (Reillon, 2018, 1; Bambauer & Zarsky, 2018, 1 ff.).

Artificial intelligence combined with machine learning – that is algorithms that allow machines to self-learn from data and make predictions – has the potential to transform large sectors of the economy (Coglianese, Lehr, 2017, 1147), and the insurance sector makes no exception. Although the insurance industry has been slow in recognizing and exploiting the value of artificial intelligence at first, today the applications of intelligent machines in insurance are growing (Tällt, 2017, 9).

This paper considers the role that artificial intelligence and machine learning can play in insurance. It discusses some current uses and also focuses on the possible application of artificial intelligence to smart contracts – that are among the major innovations taking place in the insurance sector, as they imply the possibility of insurance contracts becoming self-executing. The prospect that future developments in artificial intelligence and machine learning might fully automate insurance contracts is emphasized. Some of the main issues related to artificially intelligent algorithmic systems are also touched upon, highlighting the need

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to ensure transparency and accountability of automated decisions.

2. ARTIFICIAL INTELLINGENCE AND MACHINE LEARNING IN INSURANCE

Artificial intelligence is having a growing impact on insurance companies, and also the investments made by venture capitalists demonstrate a rising interest in artificial intelligence tech ventures within the insurance sector (Tällt, 2017, 13). Insurers mainly use artificial intelligence in the underwriting and claim processing. Artificial intelligence is applied, in fact, to predict premiums and losses and to permit fast settlements and targeted investigations. In particular, as artificial intelligence allows to go through a large number of claims and select those that require further investigation, it can be used to curb fraud, which is clearly a severe problem for the industry, considering, for example, that in 2016 in the U.S. insurance companies lost more than $50 billion due to fraud (Sengupta, 2017). Other uses of artificial intelligence and machine learning in insurance mainly include direct marketing and predicting litigation, customer assistance through automatic chatbots and assistants, driver performance monitoring, and insurance market analytics (Sengupta, 2017; Sennaar, 2017). For instance, Progressive Insurance applies this technology to predict claims by using telematics and geospatial data, Zurich Insurance uses it to support marketing, fraud detection and claims management, and Transamerica recommends products to customers through machine learning (Sengupta, 2017). In this connection, it is also worth mentioning that robot advisor services are emerging in insurance and in the other financial services sectors, providing automated investment services at a lower cost compared with traditional financial advisors, and potentially increasing transparency and the quality of financial advice for consumers (Baker, Dellaert, 2018, 713). Robot advisors can match prospective policyholders to insurance products on a personalized basis, by understanding the client needs and proposing a relevant policy (OECD, 2017, 23).

For the sake of considering more specific and concrete examples of the applications of artificial intelligence and machine learning in insurance, it can be noted that Liberty Mutual is engaged in developing automotive apps with artificial intelligence capability and other products to improve driver safety. In particular, a new app should help drivers involved in a car accident to assess the damage to their car in real-time using the camera of a smartphone. The app uses anonymized claims photos to make a comparative analysis of the user's damage and provide a specific repair cost estimate. In the longer term this might result in a reduction of the costs of claim adjustments and possibly in more efficient claim processes (Sennaar, 2017). Also, another interesting example is the one offered by Allstate that recently launched a new division, Allstate Business Insurance. As Allstate agents had only sold personal lines before and the launch of the new division implied new products, new procedures and underwriting requirements, Allstate developed, in collaboration with Earley Information Science, a virtual assistant called ABIe to provide step-by-step help for quoting and issuing the new products, thereby assisting Allstate agents seeking information. The innovation allowed the agents to obtain information promptly even in front of customers, thereby avoiding to overload Allstate call centers with questions that would have resulted in long wait times and in slowing down underwriting activities made both by the agents and the call centers (Sennaar, 2017; Earley Information Science, 2018).

A large number of start-ups are also engaged in developing artificial intelligence innovations for the insurance industry, aiming at improving, among other things, claims handling, customer experience, and compliance with laws and regulations. GetMeIns, for example, combines artificial intelligence with behavioral analytics and link analysis to detect and predict fraudulent insurance claims. It generates an initial risk score at the point-of-sale by associating customer profiles with open source data, and it is able to detect fraudulent signs like behavioral anomalies. Another illustrative example is Neos that uses smart sensors to alert homeowners policyholders to problems via a smartphone app. Also, artificial intelligence and machine learning have been applied to facilitate the review of insurance policies. The start-up RiskGenius created an algorithm that permits to compare commercial policy options for customers and to identify potential gaps in coverage. It instantly recognizes key clauses in the policies and allows underwriters to insert generic policy language from a clause library in order to edit new policies. Finally, artificially intelligence can have an important role in facilitating compliance by insurance companies with laws and regulations, thereby reducing costs and possibly making the administrative and regulatory processes performed by insurers more efficient. This seems particularly important, as it is a well-known fact that today insurance companies and more generally financial services firms have to comply with an increasing number of regulations. The start-up CoVi Analytics, for example, offers services designed to help insurers to interpret and comply with regulations. It automatically extracts only the relevant regulatory documents, and

utilizes artificial intelligence to draw attention to issues relevant to the specific situation of the client, making compliance more efficient (Tällt, 2017, 27).

3. AUTOMATING THE INSURANCE CONTRACT

Artificial intelligence and machine learning might also play an important role in insurance when combined with smart contracts. From a legal perspective, smart contracts refer to the possibility of representing a legal contract in programming code that gets automatically executed on a blockchain or other distributed ledger technology. In principle, the contract becomes self-executing, since once a pre-programmed condition is met, the relevant action is performed.

Smart contracts have the potential to automate underwriting and claim processing and payouts based on external data that can be provided by Internet of Things devices or third-party oracles, and even social networks as in the case of Dynamis, a start-up that has implemented a smart contract for peer-to-peer insurance that provides supplementary unemployment insurance by using data from LinkedIn to automate underwriting and claims handling. Several projects are currently being implemented in the industry, such as that piloted by Allianz Risk Transfer and Nephila aimed at automating contract management processes for catastrophe swaps and bonds, or the one developed by the start-up InsurETH that permits to automate the payout of claims for flight insurance. Although current pilot projects are mainly focused on property and casualty insurance, the prospect of smart contracts in life insurance is also relevant as the insured event is capable of being represented into a binary data form.

The connection between automation – the hallmark of smart contracts – and insurance is intriguing for its possible impact particularly in terms of operational efficiencies and certainty in the implementation of transactions, but also as regards the legal challenges that it poses as smart contracts have the potential to transform how transactions are carried out. The impact of smart contracts in insurance can be extraordinary for example in terms of higher efficiency, reduction in costs and human errors, fraud detection; they also have potential for disintermediation, as the contract would be executed on a distributed ledger and this may lead to direct underwriting in some cases. Moreover, from a more theoretical and systematic perspective, it is worth noting that smart contracts bear on the essence of an insurance contract – the insurer's promise to pay. By automating processes and ensuring the payment of claims once the relevant conditions are triggered, smart contracts can reinforce the insuring agreement and transform the relationship between the insurer and the insured.

The very idea of smart contracts, however, needs to be confronted with the theory on the intrinsic incompleteness of contracts and the consequent necessity of standards to take into account the specific circumstances of a case. Automation traditionally hinges on rules, especially rules that can be expressed in a conditional logic, but rules can prove to be either too broad or narrow in scope, unlike standards. Standards, in fact, are flexible and can be adjusted to a specific context. A good example is the reasonableness standard that is relevant to several issues in insurance, ranging from duty-to-settle cases, where insurers are required to settle reasonable claims within the policy limits, to the duty of disclosure, where the omission of information that is not material to the decision of a reasonable insurer to enter the contract or to do so on the terms agreed should not alter the relationship between the insurer and the policyholder.

For their inherent nature, standards can hardly be coded and this poses limits on the possibility of automating the entire legal contract. It is possible, however, to envision a world where smart contracts, combined with future developments in artificial intelligence and machine learning might challenge traditional views and change contracting behavior, reducing to code the entire contractual relationship of the parties (Casey & Niblett, 2016, 429 ff.; Casey & Niblett, 2017a, 1401). For sure data-driven automation already has a major role in legal practice and scholarship, as e-Discovery or the several algorithms used to summarize and classify the law demonstrate (Talley, 2018, 183) As artificial intelligence and machine learning continue to develop, then it might be possible to assume that the creation and interpretation of contract terms and their enforcement will be automated in the future (Casey & Niblett, 2017b, 1).

4. CONCLUSION

Artificial intelligence and machine learning are having a growing impact on insurance, as the discussion above indicates. In principle, this should bring benefits for the insurance companies as well as for the policyholders mainly in terms of higher efficiency and accuracy in underwriting risks and managing claims, better compliance with laws and regulations, and customer engagement. Even the insurer's promise to pay, that is at the core of the relationship between the insurer and the policyholder, might be strengthened when combi-

ning smart contracts with intelligent machines, thereby automating the insurance contract and ensuring the payment of claims.

The increasing reliance on artificial intelligence and machine learning, and on the algorithms behind them, however, also causes potential concerns. As mentioned above, artificial intelligence systems build on a large quantity of data, and therefore there is obviously a need to ensure that the collection and use of data for artificial intelligence applications do not put at risk the privacy of the end-users. Another concern regards the quality of data since bias in the data used by artificial intelligent systems might result in bias in the decisions that these systems take (Reillon, 2018, 6). Moreover, to the extent that humans cannot control how algorithms combine data (Coglianese, Lehr, 2017, 1167), it is crucial to determine whether artificial intelligence systems are permitted to make autonomous decisions or if human intervention is necessary. In this perspective, it is worth noting that the European General Data Protection Regulation grants the data subject the right not to be subject to a decision based solely on automated processing, including profiling, which produces legal effects concerning him or her or similarly significantly affects him or her, except if the decision is based on the data subject's explicit consent (Art. 22, also providing for other exceptions).

More generally, a regulatory framework for artificially intelligent algorithmic systems seems needed to promote transparency and accountability of automated decision-making, without undermining innovation, as acknowledged in the European Parliament resolution on Civil Law Rules on Robotics of 16 February 2017, that also proposes to consider the designation of a European Agency for Robotics and Artificial Intelligence. Law has a crucial role to play in determining the appropriate room for automation and innovation in insurance and society at large. Although, in light of the technology neutrality principle, this does not mean, at least not always, that law has to set the conditions in order for automation and innovations to operate, it is clear that innovation never takes place in a legal vacuum, and therefore to consider the legal implications of technology innovation is central to ensuring financial stability and policyholder and investor protection, and also fostering innovation itself.

SUMMARY

Artificial intelligence and machine learning are having a growing impact on insurance companies. Insurers mainly use intelligent machines in the underwriting and claim processing to predict premiums and losses and permit fast settlements and targeted investigations to curb fraud. Other uses of artificial intelligence and machine learning in insurance mainly include direct marketing and predicting litigation, customer assistance through automatic chatbots and assistants, driver performance monitoring, insurance market analytics and robo advice. Future developments in intelligent algorithmic systems may prove to be disruptive when combined with smart contracts, as insurance contracts potentially might become fully automated. In principle, the use of artificial intelligence and machine learning in insurance should bring benefits for the insurance companies and the policyholders mainly in terms of higher efficiency and accuracy in underwriting risks and managing claims, better compliance with laws and regulations, and customer engagement. There is also cause for concerns, however, as the privacy of the end-users of artificial intelligence applications has to be ensured, and there is a need to avoid bias in the data used. Moreover, it is crucial to determine whether artificial intelligence systems are permitted to make autonomous decisions or if human intervention is necessary. A regulatory framework for artificially intelligent algorithmic systems seems needed in order to ensure transparency and accountability of automated decision-making, without undermining innovation.

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