



# Insurability and artificial intelligence

According to actuaries and risk professionals, the risk's impact on policyholders is constantly changing. On one hand, the trend of digitalization and data analytics has transformed the way (re)insurance is dealing with risk. On the other hand, the policyholder's risk appetite changes as well. It is already clear that the technological trends impact the insurance value chain, and affect the way products are being sold, the underwriting, claims management or the predictive risk modelling space. It is believed that by 2035, more than 80% of the insurance policies will be sold digitally. A digital environment for both the policy holder and the insurance industry will eventually reshape the ways policy covers are being treated. The digital evolution will provide more risk coverage options, resulting in a new definition of the insured risks. Artificial Intelligence systems are currently heavily investigated for their impact on the insurance sector. As discussed in the recently published paper 'AI and the opportunities and challenges it presents to insurability'<sup>1</sup>, Artificial Intelligence (AI), as part of a digital world, will play an important role in challenging the concept of insurability.

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Insurability as a concept refers to the understanding of the risks that affect the individuals that are to be insured, the premium level that corresponds to their risk level and the compensation they receive for the losses that might occur. A risk is insurable when it meets different criteria, such as being part of an insurance pool containing a large number of similar exposure units, has a definite and calculable loss, is affordable in premium terms and it is limited of catastrophically large losses.

## THE CONTEXT OF AI

Various research shows that AI has been so far largely positive for society, reshaping the way financial institutions work, while focusing on data usage and process optimization. For example, M. Eling et. al. (2019)<sup>2</sup> show that most common forms of AI are applicable to image detection, fraud detection, claims management, natural language processing and predictive analytics using actuarial pricing models.

The High-Level Expert Group, set up by the European Commission, states that:

*"Artificial intelligence (AI) refers to systems that display intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals."*

Software-based AI systems commonly include applications under the name of machine learning. Where human intervention is needed and examples of input-output behavior are being provided to an algorithm, we call them supervised learning techniques. If algorithms analyze unlabeled datasets and identify hidden patterns in the data, therefore with no human intervention required, they will be referred to as unsupervised learning and reinforced learning. Hardware embedded AI systems are found in autonomous cars, robots or Internet Of Things applications.

AI tools achieve a certain degree of rationality by perceiving the environment they are part of, processing information and deciding the best course of action. AI has become an important tool in the value chain of insurance companies, specifically the AI systems that are implemented to execute specific tasks, helping customer interaction, product development, underwriting and claims management. Some examples of InsureTech companies include Lemonade, Wefox, among others, which use AI within the property and casualty insurance space, providing improved claims analysis and more dynamic and customer-centered product propositions.

## HOW AI CAN IMPACT INSURABILITY

Insurance companies assume that the risks they group are independent but similar, acting via the law of large numbers. We believe AI applications are capable of assessing the risks with more accuracy at an individual level, assigning bespoke risk-based premiums. The insurability criteria will change once AI will capture the dependency between risks better and will help insurers distribute the premium levels specifically to individuals' needs.

The affordability of the premium should, however, be kept. Policyholder's perception of risk differs from an insurer's. When generalizing and pooling risk together, the premium may not represent the underlying risk of the insured. AI can help in dealing with premium optimization problems. Policyholders may face risks that are unbearable from the insurance value perspective. In such a case, a disproportionately high premium will be in place. This will challenge the AI systems by creating and isolating risks that are uninsurable.

Claim frequency and severity is another part where AI will add value through better predictions. The loss definition will change, once an AI system is able to predict claims and help design new insurance products. The products could be transactionally more efficient, more cost effective and cover risks that were previously uninsurable. Potential new types of risks will result in different ways losses occur. However, an accurate loss prediction and definition might be at the expense of the policyholder, with insurance companies taking advantage when designing the policies and the risk cover in place. This will also help insurers transfer their risks more adequately when potential large catastrophic losses are identified.

## THE OPPORTUNITY TO ENRICH PREVIOUSLY AVAILABLE DATA WITH MORE SOCIETY-RELATED INSIGHTS

With good intentions and sustainable risk governance, insurers have the opportunity to create customer profiles using large amounts of data, identify insurance gaps, and provide adequate risk cover. They will have the opportunity to enrich previously available data with more society-related insights, for example, by making use of natural language processing techniques or availability of web data (Common Crawl<sup>3</sup>). High costs of data administration and claims handling may also push them to adopt concepts like the Pan-European Personal Pension Product<sup>4</sup>, reducing costs, providing higher insurance access.

## ASPECTS TO CONSIDER WHEN DEALING WITH NEW TRENDS

More insurance companies rethink their business operations, optimize their products, and try to be more relevant to their clients. They use new technologies, such as AI, when adopting and following new opportunities. The insurance value chain will be affected structurally in the future. The start of the chain will involve new product propositions. Embedded insurance is one to name here, with insurance products being embedded directly within cars, by the manufacturers themselves. As a technological trend, within such applications, the concept of API (Application Programming Interface) has become more common within the insurance industry in the last decade, and remains a relevant term when it comes to integrating different systems, and extracting more value from data. Similarly, the underwriting part can better distinguish the frequency and the severity of the risks, resulting in products based on the needs of the client and the strategy of the insurer. Additionally,

Natural Language Understanding and Processing already plays a role in claims management and involves new understandings of the data that underwriters receive from brokers, or third parties.

## WHILE THE POLICYHOLDER WILL BENEFIT, THE ORGANIZATIONS MAY FACE DIFFERENT CHALLENGES

As a consequence, AI systems will shed a new light on the organizational complexity of an insurance company. While the policyholder will benefit the reduced complexity and costs of an insurance product, the organizations may face different challenges. There will be a higher need of interdisciplinary work, covering key specialism functions from different departments at the same time. The skills of the actuaries, IT professionals, data scientists, underwriters etc., will be collectively involved. Effectively designing AI systems will help in reducing miscommunication between departments and the human-error factor when handling data flows within the organization. This will help reduce existent operational risks and provide transparency on data usage. Undoubtedly, the failures of IT infrastructures, algorithmic liability or performance issues involving risk predictive algorithms will have to be considered.

A digital ecosystem should also help in achieving better risk differentiation through advanced modelling. Here, some insurers might tend to be selective in covering certain risks, potentially, socially excluding policyholders. An important aspect here, especially when we talk about AI, is the transparency of the systems. The algorithms behind a new technology were not understood well from the beginning by all involved, creating the so-called "black-box" effect. To overcome this technical barrier of AI, to begin with, any financial institution should make use of validation techniques, document and benchmark the algorithms against traditional methods (see Henckaerts et. al. (2019)<sup>5</sup> and Molnar<sup>6</sup>). Actuaries should consider developing the models in a responsible manner, test them by avoiding methodological and technical errors and make sure they will not cause any harm to vulnerable groups, respecting social inclusion.

With a cooperative and healthy governance landscape, up-to-date actuarial education and optimized business operations, AI will help improve insurability and provide new cover for risks that were previously uninsurable. ■

1 – AAE Discussion paper: <https://actuary.eu/memos/aae-discussion-paper-ai-and-the-opportunities-and-challenges-it-presents-to-insurability/>

2 – M. Eling et. al., 'The impact of artificial intelligence along the insurance value chain and on the insurability of risks', 2019, The Geneva Papers on Risk and Insurance – Issues and Practice

3 – Common Crawl, <https://commoncrawl.org>, offers high-quality crawl data by collecting huge amounts of web data centrally and making it freely available to the public.

4 – [https://www.eiopa.europa.eu/browse/regulation-and-policy/pan-european-personal-pension-product-pepp\\_en](https://www.eiopa.europa.eu/browse/regulation-and-policy/pan-european-personal-pension-product-pepp_en)

5 – Roel Henckaerts, Marie-Pier Cote, Katrien Antonio, Roel Verbelen, 2020, Boosting insights in insurance tariff plans with tree-based machine learning methods.

6 – Christoph Molnar, Interpretable Machine Learning, <https://christophm.github.io/interpretable-ml-book/>