WHAT SHOULD AN ACTUARY KNOW ABOUT ARTIFICIAL INTELLIGENCE?

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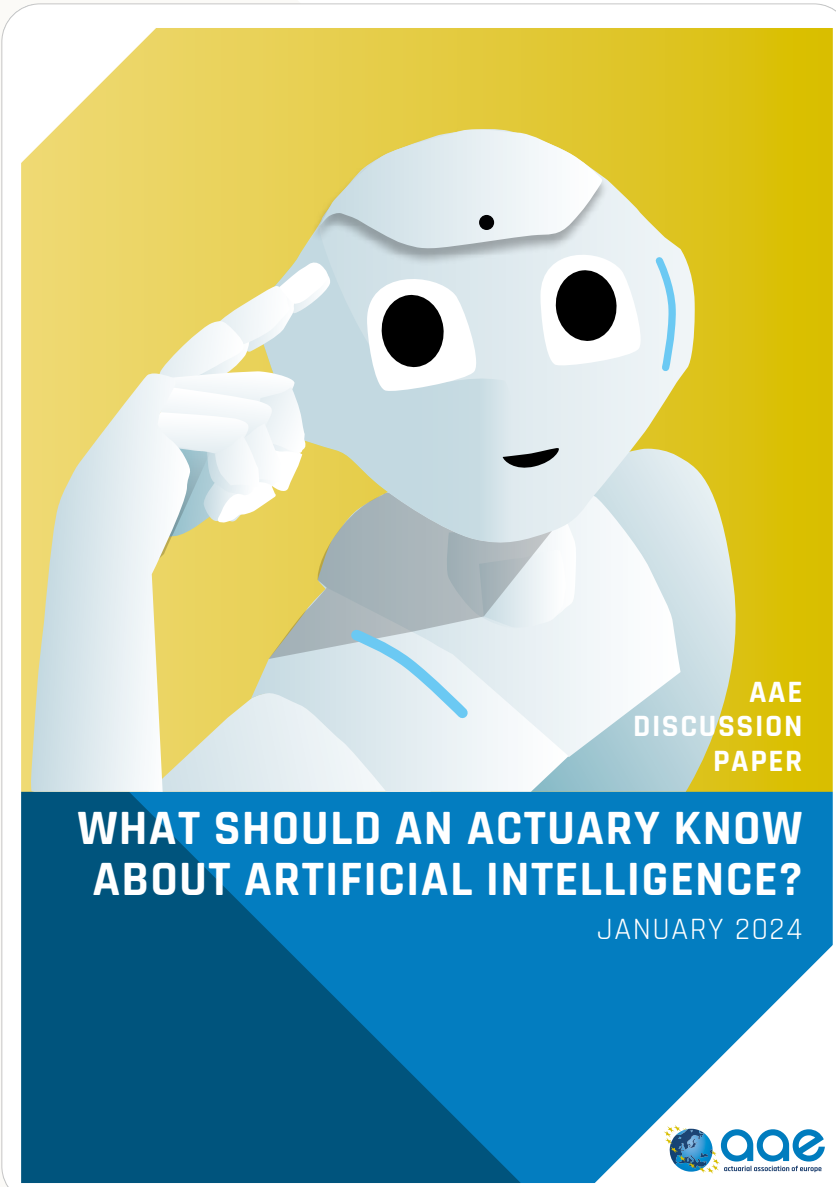
The AAE published recently a paper under the title What Should and Actuary Know of AI. The paper was based on the discussions in the AAE Artificial Intelligence and Data Science Working Group, operating under the Professionalism Committee of the AAE. The main authors of this paper are Jonas Hirz, Esko Kivisaari, Philipp Miehe, Claudio Senatore, Bogdan Tautan and Francesco Toraldo.

Actuaries are there to serve the common good, to serve our societies. The paper tries to help our profession with new tools in the domain of data science. Actuaries need to use them responsibly. Actuaries need to understand how they can, based on their long experience with complex models, bring their expertise to this novel area, and also warn of the possible dangers with models that might be used when assumptions they are based on are not valid or when the tools are used in areas where their validity has not been tested.

AI AND DATA SCIENCE APPLICATIONS

The evolution of AI and its surrounding technologies has recently been accelerated through Generative AI and is now impacting the insurance industry much more profoundly than a few years age. This technological leap extends beyond the obvious enhancements of computational power and data processing, reaching deep into every segment of the insurance value chain. For instance, AI applications are now used >

not only to automate isolated tasks, but can be employed in much more complex settings, considering a much broader set of input data, and can operate in real-time. As competitive pressures mount, insurers are rapidly adopting AI to enhance their offerings and operational efficiencies. However, they also face the complexities of emerging AI-related risks, such as algorithmic biases, data security vulnerabilities, shifts in customer behaviour, and ethical concerns. These issues necessitate the development of innovative risk assessment frameworks and robust governance structures. Consequently, the increasing regulatory focus on AI presents a significant opportunity for actuaries to play a pivotal role in shaping and adhering to standards that ensure the ethical, transparent, and effective use of AI in insurance. This evolving landscape calls for actuaries to not only adapt but also lead in the responsible implementation of AI technologies.



EXPLAINABILITY AND TRANSPARENCY

Actuaries along with other professions need to understand what the definition of an AI system is. On a global scale, we should all adapt definitions that align. In essence AI systems are a representation of the real-world we live in. They are adaptive, have a certain degree of autonomy and influence virtual or physical environments. Under such circumstances model **bias** is inevitable. This can relate, for example, to gender or ethnicity. The truth about AI systems is that they are trained on large data sets shaped by human interactions. An algorithm can easily inherit those biases from the training material – often seen in applications such as covered by Large Language Models. Similarly, as a consequence of bias, we get to deal with **direct** or **indirect discrimination**. Especially, actuaries that are dealing with insurance pricing and risk assessment exercises using AI will need to be careful on how unfavourable treatment towards individuals can be formed. There are protected characteristics of individuals, that are very clear and easy to exclude from data. However, there might be also other >

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factors, or proxy variables, representing non-protected characteristics. When those are used, they can indirectly relate to protected characteristics – putting individuals at disadvantage. The important aspect here is the adaptiveness of algorithms, seen through feedback loops and dynamic data collection. Algorithms can alter their behaviour, turning from a non-discriminatory to being discriminatory. It might sound counterintuitive, but it is our role as actuaries to use sensitive information in the experimental implementation phase, such that in the end, we ensure that all potential links between factors that might lead to discrimination are excluded. Such practices will help us deal with the concept of **fairness.**

There exists a vast array of principles proposed within the realm of AI ethics, with over 160 identified according to the *AI Ethics Guidelines Global Inventory*. This abundance may prove misleading due to potential fragmentation or redundancy. They are essentially distilled into four core tenets: **beneficence, non-maleficence, autonomy** and **justice**. Recently a fifth one has been added, **explainability**, given its importance. There is an entire research field dedicated to explainability named Explainable Artificial Intelligence (XAI). Explainability involves not only making AI intelligible in terms of its epistemological understanding but also ensuring accountability from an ethical standpoint. To ensure that AI contributes positively and avoids exacerbating or introducing new challenges, it's crucial to comprehend its impacts and implications thoroughly.

GOVERNING AI RESPONSIBLY

Globally, there are constant developments on building appropriate governance frameworks. Notable efforts include the European Commission's[1] development of the Ethics Guidelines for Trustworthy AI, and the Monetary Authority of Singapore's earlier principles aimed at promoting Fairness, Ethics, Accountability, and Transparency[2], or the recent OECD3[1] recommendations to further shed light on the definitions related to AI systems. >

[1] **Ethics guidelines for trustworthy AI, 2019**

[2] Monitoring Authority of Singapore, Principles to Promote Fairness, Ethics, Accountability and Transparency (FEAT) in the Use of Artificial Intelligence and Data Analytics in Singapore's Financial Sector

[3] OECD, May 2024, Recommendation of the Council on OECD Legal Instruments Artificial Intelligence

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As part of a horizontal legislation, the European Union developed the AI Act. The basic objective is to protect fundamental rights when AI systems are used. The act sets guard rails when placing on the market different AI systems. Some are outright forbidden, while others are deemed to be high-risk systems with more requirements compared to systems in the low-risk category. Ultimately, this should make the EU a pioneer in professionally managing the risks of AI while creating a leading environment for innovation and growth.

We believe there can be no real artificial intelligence for the benefit of our sustainable future without a profession that combines technical excellence with a strong ethos of responsibility. Regulatory environments changing at a fast pace and technological advancements will require our profession to keep up to date with the advancements in the fields of **data analytics, predictive modelling**, and **reporting practices**. AI algorithms, which thrive on data, require actuaries to master topics of advanced data modelling, alternative data sources, and to deal with concepts of synthetic data. Moreover, technical modelling is becoming increasingly complex, as seen in deep learning models like convolutional or recurrent neural networks, which process spatial or sequential data. Complying solely to traditional risk management frameworks could lead to underdeveloped practices and work ethics, resulting in the inexplicable, opaque, and irresponsible use of AI. While already including data, systems and neural networks topics, our education syllabus undergoes a change as well. From 1.1.2024 the CPD guidelines became compulsory for all full members associations, with further developments to address the topics of AI and data science. Given our code of conduct, standards of actuarial practice and industry wide professional recognition, we believe that actuaries bear significant responsibility in remaining **fit and proper** in the context of AI. Actuaries have built a reputation for trustworthiness and reliability in their analyses and predictions, which is pivotal in fostering public trust in AI applications. We believe that , what we would call '**actuarial intelligence**', is needed to foster innovation and support the appropriate use of Artificial Intelligence. <