

## **2021 ALUCA Turks Scholarship**

### **Winner's Paper**

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#### **Artificial Intelligence in Claims and Underwriting**

Legal & General America launched a trial leveraging trust and facial and image recognition capabilities of machine learning to provide instantaneous automated assessments to individuals through selfies. In exchange for a selfie, consumers were provided with an estimate for life insurance based on an estimate of age, gender and BMI. It is not beyond imagining that the behavioural drivers of mortality could also be digitally assessed via access to a consumer's online interactions and be used to personalise the product offerings, or that this data could be used for underwriting and claims assessment.

To what extent can traditional risk and claims assessment methods be replaced with digital end to end platforms? Is this a good thing? Are there ethical limitations to the use of the requisite data and to what extent may the move to deep learning in underwriting and claims embed the type of unconscious bias that is being experienced with credit based computer scores?

**Introduction**

In this paper, I discuss how artificial intelligence (AI) creates significant opportunities to enhance the delivery of life insurance by improving claims and underwriting processes. I discuss the expected changes to current processes, potential opportunities to improve service, and challenges of using AI. I also discuss concerns over algorithmic bias and ethical limitations of incorporating AI in the delivery of life insurance.

AI refers to a machine’s ability to learn and solve problems. AI may seem like a futuristic concept, as one might argue we have yet to fully discover even human intelligence. However, AI is already having an increasingly profound effect on our lives; everyday examples include individually tailored advertisements based on our online search activity and the ability of smart devices to automatically complete words as we type a message. By reviewing large amounts of data, machines can learn to recognise objects and patterns. A notable example of AI is the Google program AlphaZero, which, after 24 hours of being exposed to data related to chess, proved capable of defeating world champion chess players.<sup>1</sup>

The potential for AI to improve our lives is becoming more widely recognised, as evidenced by global investment into AI increasing by 40% between 2019 and 2020. The financial services industry was recognised as the third-largest adopter of AI in 2020 according to the AI Index 2021 Annual Report.<sup>2</sup>

**AI ADOPTION by INDUSTRY, 2020**

Source: McKinsey & Company, 2020 | Chart: 2021 AI Index Report

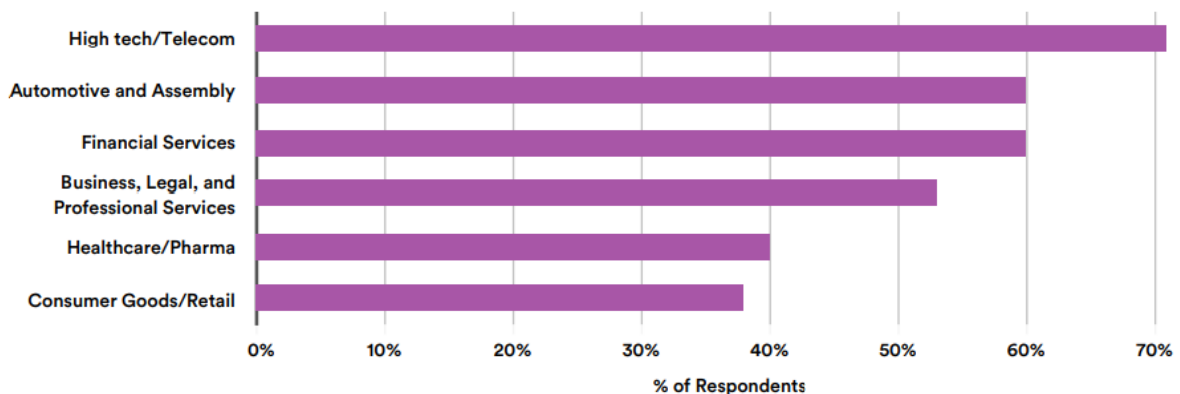


Figure 1: AI adoption by industry<sup>3</sup>

Life insurers currently use AI to reduce operating costs and improve speed and quality of service in a variety of ways:<sup>4</sup>

<sup>1</sup> Silver, David, Thomas Hubert, Julian Schrittwieser, Ioannis Antonoglou, Matthew Lai, Arthur Guez, Marc Lanctot et al. "Mastering Chess and Shogi by Self-Play with a General Reinforcement Learning Algorithm." *Computer Science*, arXiv:1712.01815 (December 2017). <https://arxiv.org/pdf/1712.01815.pdf>.

<sup>2</sup> Zhang, Daniel, Saurabh Mishra, Erik Brynjolfsson, John Etchemendy, Deep Ganguli, Barbara Grosz, Terah Lyons et al. *The AI Index 2021 Annual Report*. Stanford, CA: AI Index Steering Committee, Human Centered AI Institute, Stanford University, 2021. [https://aiindex.stanford.edu/wp-content/uploads/2021/03/2021-AI-Index-Report\\_Master.pdf](https://aiindex.stanford.edu/wp-content/uploads/2021/03/2021-AI-Index-Report_Master.pdf).

<sup>3</sup> Zhang, Daniel, Saurabh Mishra, Erik Brynjolfsson, John Etchemendy, Deep Ganguli, Barbara Grosz, Terah Lyons et al. *The AI Index 2021 Annual Report*. Stanford, CA: AI Index Steering Committee, Human Centered AI Institute, Stanford University, 2021. [https://aiindex.stanford.edu/wp-content/uploads/2021/03/2021-AI-Index-Report\\_Master.pdf](https://aiindex.stanford.edu/wp-content/uploads/2021/03/2021-AI-Index-Report_Master.pdf).

<sup>4</sup> Faggella, Daniel. "Artificial Intelligence in Insurance – Three Trends That Matter." *Emerj*, March 14, 2020. <https://emerj.com/ai-sector-overviews/artificial-intelligence-in-insurance-trends/>.

- automating simple time-intensive tasks to facilitate faster payments and correspondence
- estimating premium costs based on customer photographs
- minimising risks associated with potential nondisclosure by improving fraud detection
- facilitating faster collection and review of the information required to assess a claim
- automating responses to simple queries using AI programs known as chatbots

**How artificial intelligence can improve current processes**

To appreciate the extent to which AI can shape our claims and underwriting processes, we must first acknowledge the advantages of AI:

- AI is capable of working continuously and consistently without being affected by hunger, fatigue, or illness.
- AI is capable of performing more complex calculations and storing larger amounts of information.
- AI is capable of processing information faster.



Figure 2: How insurers are using AI<sup>5</sup>

Through an ability called natural language processing,<sup>6</sup> AI programs known as chatbots can respond to questions by written message or even voice, as demonstrated by Apple’s Siri and Amazon’s Alexa. Instead of waiting for a representative to become available during normal business hours, a customer can present their question to a chatbot at any time. The chatbot can respond to questions instantly and guide a customer through the process of lodging a claim by requesting documents and asking relevant questions based on the nature of their condition, disability, or illness. Using AI in this way will improve the speed of service and enable claims and underwriting professionals to direct greater attention towards more nuanced queries and other tasks sooner, with less distraction and pressure from a backlog of tasks.

<sup>5</sup> Shroff, Raj. "How Are Insurance Companies Implementing Artificial Intelligence (AI)?" Towards Data Science. July 1, 2019. <https://towardsdatascience.com/how-are-insurance-companies-implementing-artificial-intelligence-ai-aaf845fce6a7>.

<sup>6</sup> Faggella, Daniel, Dylan Azulay and Raghav Bharadwaj. *AI in Insurance: Executive Cheat Sheet*. Boston, MA: Emerj, 2019. [https://emerj.com/wp-content/uploads/2019/12/Ai-in-Insurance-Cheat-Sheet-Draft.pdf?\\_kx=ffool\\_66pKIHOnlwdXMHF0R7BBBRa3RE7Xyt3ksrpDk%3D.MjxZqg](https://emerj.com/wp-content/uploads/2019/12/Ai-in-Insurance-Cheat-Sheet-Draft.pdf?_kx=ffool_66pKIHOnlwdXMHF0R7BBBRa3RE7Xyt3ksrpDk%3D.MjxZqg).

Predictive analysis is the ability of AI to predict events based on existing information.<sup>7</sup> In the case of individual disability income insurance (IDII) claims, this ability can prove highly beneficial in enabling insurers to better manage the duration of these claims. With sufficient data from previous claims assessments and medical best-practice guidelines, AI may become able to accurately predict the expected duration of an IDII claim and identify factors that might extend or reduce that duration. Using AI in this way will enable insurers to better anticipate claims-related costs and help to improve the sustainability of IDII insurance.

Our ability to underwrite life insurance can be greatly enhanced with the help of AI. Current practices are heavily reliant on what customers report in their insurance applications. Reliance on customer self-report presents risks, as a customers may forget relevant information or not notice or misunderstand questions on an insurance application form. A recent nationwide survey by Finder found that 20% of Australian life insurance applications included misrepresentations relating to relevant details such as smoking behaviours, alcohol consumption, occupation, dangerous hobbies, and existing medical conditions.<sup>8</sup> Using AI, underwriters can supplement insurance application forms with more objective data such as customers' photographs and online activity to help build an understanding of their health, hobbies, and lifestyle, which are all relevant to the cost of individual premiums. Reviewing objective data using AI will help ensure that life insurance is delivered at the most appropriate price.

Fraud-detection software can protect insurers and customers by helping to recognise identity theft and fraud.<sup>9</sup> The review of data related to previously identified cases of fraud will allow a program to help insurers identify potentially fraudulent claims and applications for cover.

AI presents opportunities for insurers to improve current claims and underwriting processes; however, we must also consider the limitations of AI in the delivery of life insurance.

### The limitations of artificial intelligence

AI currently does not perform well in the following areas:<sup>10</sup>

- building trust and rapport with customers
- social awareness and consciousness
- generalised, creative, and nuanced thinking

In their research, Dievorst et al.<sup>11</sup> found that we regard humans more favourably than AI. Other research has also found us to be more forgiving of errors made by humans than those made by AI.<sup>12</sup> These findings suggest that most customers feel more confident in claims or underwriting decisions made by a human and prefer to communicate with other humans rather than a chatbot. When a customer is in distress and lodging a claim due to illness, disability, or loss of a loved one, the comfort of interacting with another human with relatable experiences is beneficial in helping the customer navigate the claims process while

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<sup>7</sup> Faggella, Azulay and Bharadwaj, *AI in Insurance: Executive Cheat Sheet*.

<sup>8</sup> Kwiet-Evans, Natascha. "Lying for their life: 3.8 million Australians are untruthful on life insurance applications." Finder. July 8, 2021. <https://www.finder.com.au/australians-untruthful-on-life-insurance-applications>.

<sup>9</sup> Mejia, Niccolo. "Artificial Intelligence-Based Fraud Detection in Insurance." *Emerj*. December 13, 2019. <https://emerj.com/ai-sector-overviews/artificial-intelligence-fraud-detection-insurance/>.

<sup>10</sup> Wulff, Alex. "AI is Incredibly Smart, But It Will Never Match Human Creativity." *TNW*. January 2, 2019. <https://thenextweb.com/news/ai-is-incredibly-smart-but-it-will-never-match-human-creativity>.

<sup>11</sup> Dietvorst, Berkeley J., Joseph P. Simmons and Cade Massey. "Algorithm Aversion: People Erroneously Avoid Algorithms after Seeing Them Err." *Journal of Experimental Psychology: General* 144, no. 1 (2015): 114-126. <https://doi.org/10.1037/xge0000033>.

<sup>12</sup> Berger, Benedikt, Martin Adam, Alexander Rühr and Alexander Benlian. "Watch Me Improve—Algorithm Aversion and Demonstrating the Ability to Learn." *Business & Information Systems Engineering* 63 (December 2020), 55-68. <https://link.springer.com/article/10.1007/s12599-020-00678-5>.

minimising confusion and distress. Excessive use of chatbots by life insurers for customer service might negatively affect levels of trust in an industry that already experiences high levels of public mistrust in Australia.<sup>13</sup>

It is difficult to design an AI program suited to respond to every possible situation. We, as humans, are better suited to tailoring our service to the specific needs of the customer. Customers may face unique challenges in accessing insurance, such as geographical isolation, unfamiliarity with technology, or fear of disclosing personal information, that an AI program may not be designed to address. Given that the functions of AI are restricted to the purpose they are designed for,<sup>14</sup> we are better equipped to adapt to the customer's unforeseen needs, whether it be taking additional time to explain how to access password-protected correspondence, explaining why we request a specific piece of information, or waiving requirements when appropriate. AI lacks the ability to generalise learning to tasks it is not programmed for.

AI is a tool designed to learn and solve problems based on the instructions and algorithms we program into it. Whether AI will ever develop a more generalised human-like intelligence is the subject of much speculation and remains unknown. By leveraging the abilities of AI to augment our strengths, we are capable of obtaining greater outcomes. Cyborg chess teams involve chess players utilising AI to supplement their skills. These hybrid teams have demonstrated greater chess-playing ability than that of AI programs alone,<sup>15</sup> exemplifying how we can achieve superior outcomes by leveraging AI rather than relying on it. The possible implications for claims and underwriting are exciting. However, to maximise benefits and minimise possible harm, we must also consider the potential ethical risks of using AI in life insurance.

### Ethical considerations

AI's access to customer information raises ethical privacy concerns. Customer information available online is extensive and may include customers' internet search history, financial transactions, correspondence records, geographical locations, social media posts, subscriptions, and profiles.<sup>16</sup> Even though using AI to assess online information may produce faster and more accurate outcomes, should customers be expected to consent to all of this? Moreover, to what degree should insurers be expected to trust the customer's self-reported health and circumstances without objective proof? These questions are not new to life insurers and will become more relevant as evolving AI technology creates more potential to access and review information. It will be important to reach a consensus on the type of information that will be considered appropriate for review.

A widespread concern across industries, including life insurance, is the potential for AI to displace human workers.<sup>17</sup> The ability of AI to automate tasks is already affecting how claims and underwriting roles are performed. On the one hand, with the integration of AI, some roles may become fully automated, and the thought of people losing their jobs and income to AI is sobering and frightening to many. On the other hand, the development of AI may create unforeseen opportunities for employees in the form of new roles while also enabling people in current roles to focus on more meaningful tasks by automating time-consuming, mundane

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<sup>13</sup> Edelman. *2019 Edelman Trust Barometer*. Heidenheim, Germany: Edelman, 2019. [https://www.edelman.com/sites/g/files/aatuss191/files/2019-04/2019\\_Edelman\\_Trust\\_Barometer\\_Financial\\_Services\\_Report\\_1.pdf](https://www.edelman.com/sites/g/files/aatuss191/files/2019-04/2019_Edelman_Trust_Barometer_Financial_Services_Report_1.pdf).

<sup>14</sup> Wulff, "AI is Incredibly Smart, But It Will Never Match Human Creativity."

<sup>15</sup> Baraniuk, Chris. "The Cyborg Chess Players that can't be Beaten." BBC. December 4, 2015. <https://www.bbc.com/future/article/20151201-the-cyborg-chess-players-that-cant-be-beaten>.

<sup>16</sup> Zhang et al., *The AI Index 2021 Annual Report*.

<sup>17</sup> PWC. *UK Economic Outlook*. London, UK: PWC UK, 2018. <https://www.pwc.co.uk/economic-services/ukeyo/ukeyo-july18-full-report.pdf>.



tasks. How AI will affect the workforce is not known, and to ruminate over worst-case scenarios is not productive. What's currently clear is that AI presents opportunities to deliver better, faster, and cheaper life insurance.

When considering the use of chatbots, insurers face ethical considerations regarding customer service. In the claims setting, customers may be emotionally vulnerable following a loss and find a source of support and empathy with insurers. As a claims assessor, I consider it a privilege to build rapport with a customer and for them to open up to me emotionally. I feel a sense of responsibility to uphold their trust by treating them with respect. Some chatbots are already sophisticated enough to be easily mistaken for humans in simple conversations and capable of tailoring their interactions with us over time through ongoing communication.<sup>18</sup> While, as noted earlier, we normally prefer human interaction, people have reported developing emotional connections with AI and, in some cases, have married AI programs.<sup>19</sup> Such relationships are one-sided, as AI can only mimic empathy without truly experiencing it.

In the insurance setting, we face the risk of chatbots wrongly discouraging customers from raising fair complaints or lodging valid claims or by delaying assessments with requests for unnecessary information. We must acknowledge the potential of sophisticated chatbots to influence a customer and proactively develop measures to reduce the risk of a chatbot inadvertently taking advantage of a vulnerable person who may perceive it as a friend. Measures to protect customers may include limiting the use of chatbots to answer only simple queries or not using chatbots that too closely imitate human behaviour.

The ability of AI to learn requires sets of relevant training data for it to review. To learn to respond to customer queries, a chatbot requires details of past queries and responses. The data used to train AI should be filtered to minimise the risks of adverse events. If AI training data includes too many examples of poor customer service, it may perform undesirably. The infamous Microsoft chatbot Tay proceeded to generate highly offensive and inappropriate social media posts after being exposed to online trolling behaviour.<sup>20</sup> While it is important for AI to review large amounts of information, insurers should ensure that the training data is representative of the desired AI function and includes examples of good customer service and high-quality claims and underwriting assessments. The ongoing AI performance must also be monitored so that changes to the AI algorithm can be made if required.

### Potential for biased artificial intelligence

Because AI is programmed by human-designed algorithms and trained on existing data, it is not immune to the effects of bias.<sup>21</sup> AI programs designed to recognise faces and trained using a set of pictures over-representative of light-skinned men have been found to produce less accurate results for darker-skinned women.<sup>22</sup> AI programs designed to assess the likelihood of a convicted person to reoffend were found to overestimate risk among darker-skinned subjects.<sup>23</sup> AI programs learn to recognise complex patterns through a subset of

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<sup>18</sup> Turkle, Sherry. "Why These Friendly Robots Can't be Good Friends to Our Kids." *Washington Post*. December 7, 2017. [https://www.washingtonpost.com/outlook/why-these-friendly-robots-cant-be-good-friends-to-our-kids/2017/12/07/bce1eaea-d54f-11e7-b62d-d9345ced896d\\_story.html?utm\\_term=.77c3e5070bfb](https://www.washingtonpost.com/outlook/why-these-friendly-robots-cant-be-good-friends-to-our-kids/2017/12/07/bce1eaea-d54f-11e7-b62d-d9345ced896d_story.html?utm_term=.77c3e5070bfb).

<sup>19</sup> Ha, Kwiyeon. "Japanese Man Marries Computer-Generated Hologram in \$18K Wedding Ceremony." *Global News Canada*. November 14, 2018. <https://globalnews.ca/news/4661931/japanese-man-marries-hologram/>.

<sup>20</sup> Beres, Damon. "Microsoft Chat Bot Goes on Racist, Genocidal Twitter Rampage." *Huffington Post*. March 24, 2016. [https://www.huffpost.com/entry/microsoft-tay-racist-tweets\\_n\\_56f3e678e4b04c4c37615502](https://www.huffpost.com/entry/microsoft-tay-racist-tweets_n_56f3e678e4b04c4c37615502).

<sup>21</sup> Zhang et al., *The AI Index 2021 Annual Report*.

<sup>22</sup> Buolamwini, Joy and Timnit Gebru. "Gender Shades: Intersectional Accuracy Disparities in Commercial Gender Classification." *Proceedings of Machine Learning Research* 81 (2018): 1-15. <http://proceedings.mlr.press/v81/buolamwini18a/buolamwini18a.pdf>.

<sup>23</sup> Tolán, Songül, Marius Miron, Emilia Gómez and Carlos Castillo. "Why Machine Learning May Lead to Unfairness: Evidence from Risk Assessment for Juvenile Justice in Catalonia." *ICAIL '19: Proceedings of the*

machine learning known as deep learning. In deep learning, the AI program develops its own method of identifying what information is relevant to an outcome, without human direction. While this deeper analysis generally leads to more accurate results, it can be difficult to control and determine what information the program relies on.<sup>24</sup>




Gender Classifier	Darker Male	Darker Female	Lighter Male	Lighter Female	Largest Gap
 Microsoft	94.0%	79.2%	100%	98.3%	20.8%
 FACE++	99.3%	65.5%	99.2%	94.0%	33.8%
 IBM	88.0%	65.3%	99.7%	92.9%	34.4%

Figure 3: Accuracy of facial recognition programs for different population groups<sup>25</sup>

We should note the potential for bias and inaccuracy of programs when considering the use of facial recognition to assess a person’s health and insurability. AI that is not trained using sets of data equally representative of all population groups might lead to poor underwriting outcomes for people who are underrepresented in the training data. This disparity in training data leads to the risk of underrepresented population groups being mistakenly classed as higher-risk groups, resulting in higher premiums or less favourable policy terms for them.

We should also note the potential for bias when using AI to assess the risk of fraud or nondisclosure. If AI is trained on data including records of investigations in which bias has affected human judgement, it may replicate that bias, leading to unfair scrutiny of some claimants potentially on the basis of age, gender, or ethnicity.

In addition to making efforts to ensure that training data is reviewed from an ethical perspective, insurers should make use of programs designed to improve the transparency of AI results as such technology becomes available. Quantitative Input Influence,<sup>26</sup> for example, is a recently developed system that has shown promise in helping to identify what information was influential in enabling AI to reach a particular conclusion. Greater transparency in AI learning and decision-making will enable insurers to minimise the risk of bias in claims and underwriting.

**Conclusion**

AI presents an opportunity for life insurers to improve the speed, quality, and affordability of service. While it is unclear how capable AI will become in the future, in its current form, AI can augment human intelligence with greater information storage capacity and faster data processing. AI can enable claims and underwriting professionals to access and review larger amounts of information in a shorter timeframe while reducing time and effort spent on mundane repetitive tasks, such as responding to common basic queries, keeping records,

*Seventeenth International Conference on Artificial Intelligence and Law* (June 2019): 83-92.  
[https://chato.cl/papers/miron\\_tolan\\_gomez\\_castillo\\_2019\\_machine\\_learning\\_risk\\_assessment\\_savry.pdf](https://chato.cl/papers/miron_tolan_gomez_castillo_2019_machine_learning_risk_assessment_savry.pdf).

<sup>24</sup> Hou, David. "Machine Learning & Artificial Intelligence in Life Insurance." TAI. April 13, 2018.  
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<sup>25</sup> Buolamwini, Joy and Timnit Gebru. "Gender Shades." Gender Shades. 2018.  
<http://gendershades.org/overview.html>.

<sup>26</sup> Datta, Anupam, Shayak Sen and Yair Zick. "Algorithmic Transparency via Quantitative Input Influence: Theory and Experiments with Learning Systems." *2016 IEEE Symposium on Security and Privacy (SP)* (2016): 598-617.  
<https://www.andrew.cmu.edu/user/danupam/datta-sen-zick-oakland16.pdf>.

and making payments. The accuracy of assessments can be improved, and the risks of fraud and nondisclosure reduced with the help of AI. Training data should be filtered from an ethical perspective, and transparency of AI decision-making should be improved to avoid bias. Moreover, rules and measures to protect customer privacy, and reduce the risk of potentially poor chatbot service outcomes must be proactively developed and deployed. These actions will enable insurers to minimise risks and maximise benefits of using AI.



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