The Transformational Potential of AI in Insurance

Abstract

The insurance industry is unique: it is the only industry that must price its products before the actual costs are known. Given the uncertainty of pricing insurance products, since its very inception, the industry has leveraged data and analytics to get a reasonable handle on the future, especially in the actuarial function. This paper shares a historical perspective on the use of data and analytics in the insurance industry, how this journey has advanced to the present day, and what the future holds.

The Journey So Far

In the 17th century, actuarial science developed into a formal mathematical discipline, soon after the invention of the probability theory. The initial focus was on the life insurance industry; property and casualty (P&C) came a little later. An interesting tidbit: the first reliable life mortality table was developed by the astronomer Edmond Halley (of Halley's Comet fame).

Moving ahead in time, the insurance industry has leveraged the power of predictive analytics by using classical statistical modeling for many decades now. In the US, minimum bias procedures started to be used in the 1960s for ratemaking. While the first academic papers on Generalized Linear Models (GLM) were published as early as in 1972 and Tweedie M.C.K. published his seminal paper on the eponymous statistical distribution in 1984, industry adoption took some time. US actuaries started using GLM for rate making in the early 2000s, though actuaries in the UK, Ireland and France had started a few years earlier for personal auto insurance. While statistical modeling has been used most by actuaries, many other functional areas such as underwriting, claims, and marketing have also taken advantage of methods such as linear and non-linear regression.

Statistical modeling is able to utilize only clean or structured data, though that encompasses a wide range of data sources. This data spans data residing on the insurance carrier's systems such as 'core' insurance data including loss ratios, underwriting expenses, claims adjustment expenses, and so on. It also includes 'extended' data such as media costs, conversion ratios, and more. For example, structured data outside an insurance carrier's premises includes data from third-party aggregators. Industry aggregators add value by including additional data spanning anonymized claims data, building construction costs, and catastrophic weather data disseminated by providers like CoreLogic, Verisk Analytics, Inc., and Risk Management Solutions (RMS). The industry has also been able to leverage seemingly unrelated data. The classic US example is the negative correlation between an individual's credit score and a higher future loss in personal auto insurance. This has also sometimes given rise to the fallacy that for business purposes, all you need is correlation, NOT causation! There have been so many failures, that an amusing book has been published![1]

However, while classical statistical analysis has continued to give us a lot of business value, the techniques cannot be applied easily to large sets of unrelated data. This is mainly because much of classical statistical modelling assumes a 'tall and skinny' data structure with many more rows that index observational or experimental units (n) rather than columns that index variables (p). Images (both two- and three-dimensional), blog posts, twitter feeds, social posts, audio recordings, sensor data, and videos are just some examples of new types of data that don't fit this 'rectangular' model.

Fast-forward to the Present

From an insurance industry standpoint, natural language processing (NLP) technologies and machine learning (ML) algorithms have been used to perform analytics on unstructured data (primarily text, though speech-to-text is starting to mature). This has triggered a revolution in advanced analytics with applications across many functional areas that deliver real business benefits, as evident from the examples below:

- In claims, a global P&C insurer automatically analyzes adjusters' unstructured notes using NLP techniques of named entity recognition and relationship extraction to identify the presence of witnesses to accidents or assess the potential of a future lawsuit. This approach to embracing risk judiciously has resulted in a 40% reduction in large claim payouts.

- In underwriting, a leading life facultative reinsurer is using social data to unearth behavioral factors such as sleep apnea and high levels of social drinking based on the hundreds of pages of documents that make up attending physician statements (APS) and medical reports. Better understanding of such behavioral factors using NLP has enabled personalized underwriting without undue effort, resulting in higher customer satisfaction.

- In customer servicing, a leading group insurer has leveraged ML and NLP technologies to construct a topic model from unstructured customer feedback. This has helped achieve a 90% reduction in the time taken for root cause analysis of enrollment delays and drastically cut overall cycle time.

In our opinion, these are the low hanging fruits, and if insurers, re-insurers, and brokers are not already leveraging these, they are losing ground to their peers.

Playing the AI Opportunity to Win

The insurance industry is making strides in utilizing fast-developing technologies such as artificial intelligence (AI), ML, and cognitive automation to go after any kind of data – structured or unstructured. The insights gained are being leveraged to improve and streamline existing business processes. These computationally intensive projects are becoming more affordable thanks to developments in graphics processing units (GPUs), the rise of on-demand analytical cloud platforms, robust open source software languages and libraries, and fall in computer hardware prices.

Real-life examples include a leading UK life insurer's US subsidiary[2] offering life insurance quotes based on a selfie. The company has embraced risk by leveraging AI to reliably and accurately determine the age, gender, and body mass index (BMI) of the applicant and arrive at a quote based on those parameters. This is in contrast to the prevailing practice of companies issuing 'lower value' online life policies to meet the tech-savvy millennial segment's demand for convenient digital options. Such policies are issued without verifying the information provided by the applicant, which could potentially expose companies to large claims. A startup[3] is developing a deep learning application to assess damage and give real-time recommendations on whether to salvage, repair, or appraise a vehicle based on photographs of the damaged vehicle. To achieve this, the startup has tapped into its partner ecosystem by collaborating with the industry leader in collision repair. To streamline property underwriting, a company[4] uses geospatial imagery, computer vision and ML to instantly and automatically collate data on aspects like roof condition, square footage measurements, and parcel features such as solar panels and pool enclosures for insurance carriers in nine US states. By leveraging this data, insurers can customize quotes to suit each individual customer's context to achieve greater segmentation and personalization at scale.

Academia too is blazing a path in this exciting area. An analysis[5] of 120 million mortgages originated over a 19-year period revealed that large loan portfolios built using deep neural networks outperformed risk models currently in use. Considering that the 2008 financial crisis was largely due to mortgage risk being underestimated, imagine the future transformational potential of these AI-based models for the insurance and financial services industry.

The Internet of Things (IoT) is also making an entry into the insurance sector, and the technology has a compelling value proposition to offer – sensors embedded in equipment can stream data that can be analyzed to gain important insights to improve processes, enhance customer service, and mitigate risk. Let's examine some probable future scenarios: soon, a home-owner's roof will inform the insurer that it may spring a leak in the next two weeks, and the insurer will automatically schedule a repair crew to avoid a large claim. A combination of a virtual geo-fence and a sensor-embedded collar will prevent the owner's pet from wandering into the work area and hurting itself thereby averting a potential claim for vet bills. Similarly, in life insurance, smart watches will notice variations in ECG during gym workouts and proactively advance the insured's routine physical.

Clearly, the transformational potential of adopting AI and IoT in insurance is immense, and the industry needs to embrace these new developments, and change its mindset to risk mitigation from risk identification.

Take the Next Step

To facilitate a move to 'next-gen' insurance and capitalize on emerging opportunities, the insurance industry must stitch together three threads: data (both internal and external), advanced analytics (leveraging AI, ML, and cognitive technologies), and business and domain knowledge (to identify the key business drivers that must be influenced). Companies that take this step will blaze a new trail of success to forge ahead of their peers.

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