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Machine learning in the cloud: A sound policy for P&C insurers

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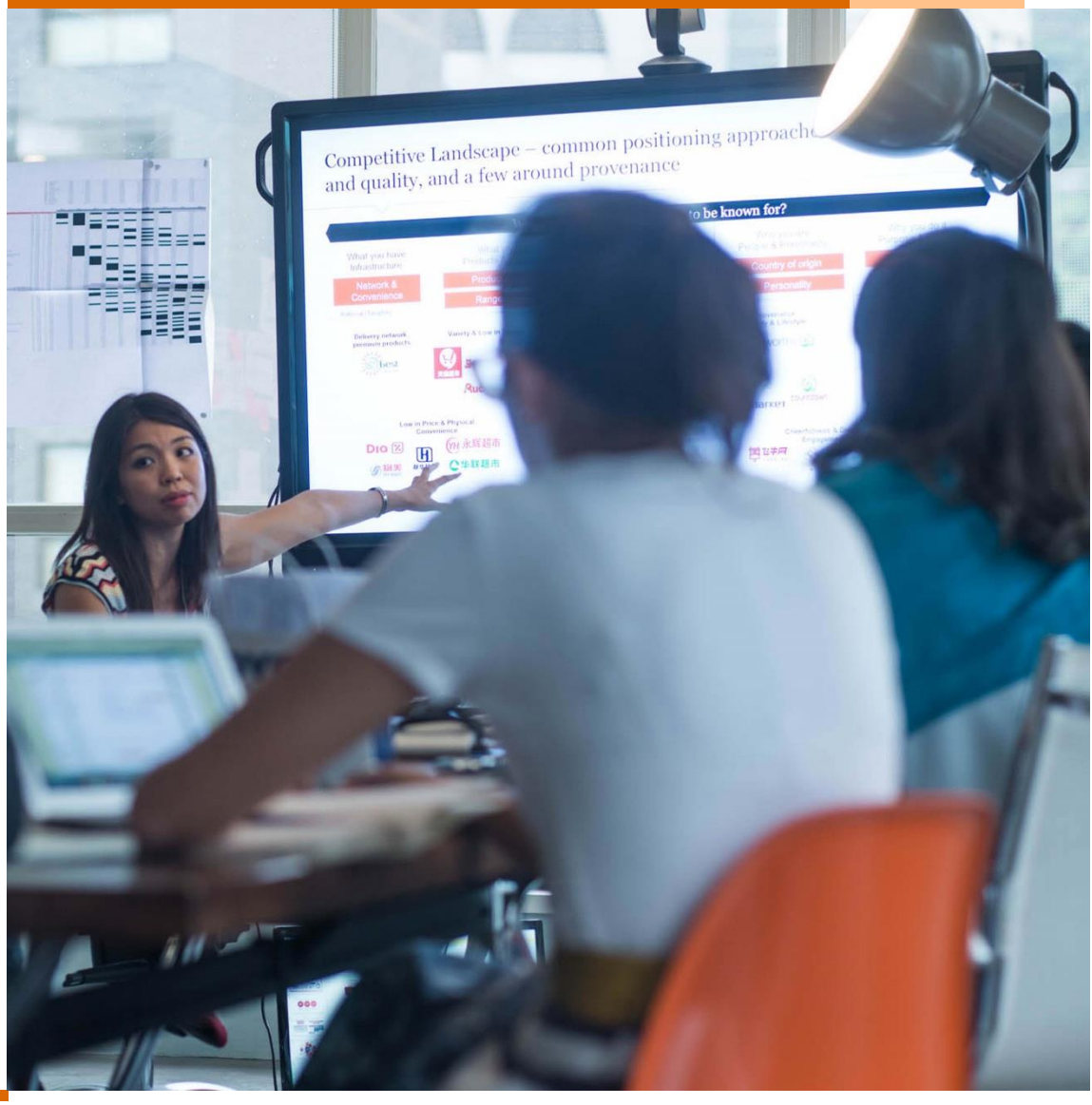
Prediction, profitability, and prevention. Machine learning and cloud technologies help P&C insurers beat competition.



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The heart of the matter

As the insurance industry faces shrinking revenues and declining profits, property and casualty (P&C) carriers should find new ways to compete. Lately, P&C carriers have focused on system transformation projects to upgrade various systems in the hopes of improving data quality. While these projects sometimes provide short-term benefits, insurers often miss long-term revenue opportunities. In our view, predictive analytics and machine learning (ML) technology are key to future success.

With insurers everywhere struggling, P&C insurers have been stripping their operations as lean as possible to stay competitive in the market. Many now concentrate their spending on customer-facing applications and reduced budgets for strategic analytics tools.

Still, a growing number of carriers recognize the need for big data and analytics to generate fresh insights and bolster their business. Many have spent millions (in some cases, tens of millions) on core systems transformation projects to upgrade policy, billing, and other systems, with the goal of increasing the quantity and enhancing the quality of their data. We've also seen more companies move their data to the cloud to take advantage of the cheap storage and massive computing power it offers.

While these projects may provide short-term benefits, many insurance companies are missing the long-term revenue opportunities that big data analysis may promise. However, new technologies are starting to fill the gaps in these projects. In the data field, the biggest opportunity is in machine learning.

Machine learning is a subset of artificial intelligence (AI) that involves pattern recognition. Using modern ML techniques in the cloud, P&C carriers can mine their big data to find new (and sometimes unexpected) patterns or trends that yield insights to improve business.

And more companies are embracing these new technologies. Forrester projects the market for predictive analytics and machine learning will increase at a 15% compound annual growth rate through 2021.[1] We believe we're just at the "end of the beginning" of cloud adoption in the insurance sector.[2] Front-runners that are early to adopt ML and cloud computing could make it difficult for slower-moving competitors to catch up.[3]

[1] Forrester Research, Inc., "The Forrester Wave™: Predictive Analytics and Machine Learning Solutions, Q1 2017," March 2017.

[2] PwC, "Cloud: The end of the beginning," November 2017.

[3] PwC, "Sizing the Prize: What's the real value of AI for your business and how can you capitalise?," June 2017.

An in-depth discussion

Some P&C insurers may question why new technology is needed to perform analytics, as they are no stranger to analytical tools. For years, the insurance industry has relied on generalized linear modeling (GLM), based on regression analysis, as a primary analytical tool. But older GLM techniques have important limitations that modern ML can overcome.[4]

Common challenges of existing methods

While GLM techniques have generally been adequate, their weaknesses become more and more clear as time goes on. Here are some common issues we have seen companies struggle with.

- ***Slower, less complete analysis:*** GLM techniques struggle with modern data sets. It can take weeks or more to identify significant correlations in big data. Also, sometimes key trends can be missed because traditional analysis has difficulties in identifying which variables are highly significant and which are less important.
- ***Difficulties in analyzing a diverse data set:*** P&C carriers gather enormous amounts of data from various sources ranging from smartphones and telematics devices to social media and credit reports. This data gives insurers much richer information to analyze than historical data from claims and other traditional sources. Older GLM techniques aren't up to the task of analyzing this volume and variety of data.
- ***Lack of adaptability:*** GLM techniques are time tested and inflexible. If new data or data structures are introduced, the entire model will need to be reprogrammed. In fact, if a GLM technique identifies a pattern in one data set, it would have to be configured completely differently to find the same pattern in another set. All of this adaptation takes time and resources.
- ***High cost, low return:*** Predictive analysis using GLM techniques is expensive. It requires that data scientists create models and develop hypotheses to test. And if a result does not produce anything useful, analysts can't quickly alter the algorithm to change direction. The data scientist team has to help make the changes.

What we've seen leaders do differently

Leading P&C insurers have a different approach. They often use ML to improve all key operations of the business, from pricing and product development to claims and customer service. Along the way, they've reduced costs, increased efficiency, and gained a competitive edge. Here are some examples of how insurers are using ML for various business applications:

[4] Tree-based techniques such as Xtreme Gradient Boosting (XGBoost) are among the powerful modern ML techniques that can be used in core insurance applications as they allow for interpretability, which is critically important for core insurance tasks such as underwriting. Some ML techniques can be used for certain applications but are inappropriate for others. Artificial neural networks (ANNs), for instance, are important for enabling capabilities such as natural language processing and computer vision, but they may not be well suited for underwriting. Regulators require insurers to explain the key factors that contribute to underwriting decisions. But the inner workings of an ANN are similar to a "black box," with only minimal interpretation possible.

Enhancing products, pricing, and underwriting

By applying ML, carriers can more accurately predict underwriting risk by identifying which patterns in the data are most significant. For example, a teen driver who is thought to be high-risk based on traditional criteria might be placed in a lower-risk pricing tier once a broader range of significant factors is considered (such as whether the teen lives at home, goes to college, and owns his or her car). Carriers can combine and analyze data from a variety of sources (such as social media, email, and browsing patterns on customer websites) to create a comprehensive view of an individual customer.

PwC has assisted international insurance companies in implementing effective cross-selling campaigns. PwC used one company's internal data (including customer profiles, transactions, demographics, and more) to create an ML-based recommendation engine. This generated a list of top customers along with product recommendations for each one. Such individualized recommendations would be difficult (and costly) to deliver using traditional analytics.

Machine learning also enables the development of new products. One example: usage-based auto insurance, which requires rapid, low-cost analysis of a wealth of changing sensor data and other factors to determine pricing. This wouldn't be possible using traditional analytic techniques.

Strengthening the claims process

Machine learning enables more efficient and effective handling of claims, which can account for as much as 80% of operating costs.[5] Using ML, insurers can identify risk factors that help to more accurately predict the probability and size of claims. They can then use this information to adjust pricing strategies and improve claims negotiations. The technology can also enable claims agents to monitor and mitigate claims leakage during the early stages of claims processing, and help to reduce overpayments.

Predicting and preventing fraud

One of the more powerful uses of ML is to detect false claims and prevent fraud. False claims cost the insurance industry billions of dollars annually and, by one estimate, account for an estimated 10% of P&C insurance losses each year.[6, 7] (We believe the actual percentage is likely higher, because most fraud investigations are still carried out manually).

Companies can use ML to identify patterns and correlations in data that are suggestive of fraud. For example, an ML analysis might reveal that 15% of claims involving a doctor in a particular state who uses a certain attorney are fraudulent. This information could be flagged for underwriters. The technology can also help carriers identify additional instances of fraud while reducing the number of false positives (cases that are flagged as fraudulent, investigated, and ultimately cleared as valid).

[5] Gray, Alexander and Cindy Maike. "Using Machine Learning to Curb Insurance Claims Leakage," Insurance Innovation Reporter, April 14, 2015, accessed August 14, 2018.
[6] Federal Bureau of Investigation, "Insurance Fraud." www.fbi.gov, accessed August 14, 2018.
[7] Insurance Information Institute, "Background on: Insurance fraud," November 6, 2017, www.iii.org, accessed August 14, 2018.

Consider the example of one online insurer that was able to automate the claims process and complete the full cycle, from claims receipts to fraud detection and payout and notification, in three seconds, compared to weeks or months using traditional methods.[8]

Enhancing customer service and billing

By applying ML, P&C carriers can substantially improve customer service. In a call center, for example, they can use the technology to analyze a customer's data (including information from past calls to tone of voice) and automatically route the person to the appropriate staff member. This can eliminate the customer's frustration of working through a phone tree and repeatedly pressing buttons to find a person who can help. It can help insurers predict customers who are at risk of leaving, enabling targeted interventions.

The billing process can benefit as well. Using ML, P&C insurers can detect patterns (such as repeated delays in payment) that correlate with non-payment or policy cancellations. This allows them to adjust their billing strategies accordingly. The key is that ML-based data analytics can offer a clear picture of each customer's habits and provide the information needed to take corrective actions.

Using the cloud to boost ML results

Some leaders are turning to cloud computing—essentially, computing services delivered over the Internet from remote servers—to get the most out of ML. Leveraging the power of parallel processing (using more than one processor simultaneously), the cloud can support today's power-hungry ML techniques. Cloud computing also makes it easy and cost-effective to aggregate, store, and analyze the wealth of data from smartphones, telematics, and various other sources that P&C carriers gather.

Cloud computing can also reduce analytics costs and provide better flexibility. Carriers who have implemented cloud computing pay only for the analytics they need, enabling them to scale up or down as business dictates. No additional hardware is required to execute ML runs in the cloud, which can save millions of dollars in infrastructure costs.

[8] PwC, "Sizing the Prize: What's the real value of AI for your business and how can you capitalise?," June 2017, page 9.

We've heard CEOs express reservations about cloud computing, so it's worth considering cloud computing risks—and how to mitigate them.

Of course, these are complex issues, and a simple table won't do them justice. We want to be clear, though, that the risks can be managed, and that today's leaders are doing exactly that.

"I'm concerned about *data security and privacy*."	While cybersecurity risks are real, they often point out gaps in access controls and governance rather than where data sits.
"We could face *resistance from our IT team*."	Maybe. Frankly, change management issues around any new technology are often harder than the technology itself. Plan accordingly. You may need to train, or hire, a new kind of IT worker.[9]
"We *can't rely so heavily on one infrastructure vendor*."	Some firms spread activity across multiple vendors. Technical solutions exist that now make it easier to shift work quickly across platforms.
"We can't afford any *performance issues*."	Today's cloud providers often offer services that are more responsive, updated more frequently, with flexible architectures to handle even extreme use cases. Define what you really need and find the vendors that fit.
"I'm not sure *regulators* would support such a move."	Many regulators are getting on board with these changes.[10] Often, the key is proactive communication and a more comprehensive view of managing risks.

Private versus public cloud

Clouds can be public or private. In a public cloud, resources are shared among multiple organizations. In a private cloud, servers are maintained on a private network, and resources are devoted to a single organization.

We have seen many insurance companies embrace cloud computing using private clouds. This enhances security because it does not involve sharing of computing resources with other organizations. It also gives companies more flexibility in storing and analyzing their data, helping them to get the most out of their data warehouses. Major cloud vendors such as Amazon, Google, and Microsoft offer ML modules and user-friendly tools to help companies operate private clouds.

We've heard CEOs express reservations about cloud computing because of security concerns. But data in a private cloud is no more or less secure than the overall level of corporate security, as a private cloud operates within a company's own security and firewall parameters. We recommend that insurers consider the security of cloud vendors, although we note that the security protocols of leading vendors have been well established. Security concerns should not, therefore, be a major factor in deciding whether or not to make the move to a private cloud.

[9] Strategy&, "The future of your company depends on next-gen IT talent," March 2018.
[10] PwC, "3 Things: The intersection of cloud computing, regulations and financial services – have we arrived?" June 2017.

What this means for your business

In a world where cost-cutting and smaller margins are becoming the norm, the combination of machine learning and cloud computing can enable your P&C firm to mine and analyze big data quickly and cost-effectively, allowing you to gain insights that can improve business. Leveraging ML and cloud computing, carriers can make more accurate predictions and better, data-driven decisions; identify new business opportunities; and accelerate speed to market. ML technology has the potential to improve your core business, remove some of the headaches from the claims process, and reduce fraud. The ideal ML application may even give your business a competitive edge by providing you with insights into market opportunities that you might have missed otherwise.

Though investments in ML may seem expensive today, we anticipate that AI costs will continue to decline over the next decade as software becomes more commoditized.[11] Additionally, infrastructure upgrades or a move to cloud computing will likely become inevitable as insurers scramble to keep up with the times. And the return on investments in ML and cloud could be substantial as P&C carriers capitalize on the technology to operate more efficiently and effectively, reduce costs, forge stronger relationships with customers, and position themselves for a more competitive, sustainable future.

Machine learning for P&C insurers: Five keys to success

Understand what you are working with. If your organization chooses to embrace this technology, the first step is to assess the status of your core systems transformation project to identify your IT infrastructure and data needs. Your current technology may not be enough to handle the processing load.

Consider a data audit. As part of the assessment process, it's a good idea to conduct a data audit to determine if you need to augment your existing data in order to leverage machine learning effectively. ML can do such a thorough and complete analysis, it's possible the technology may need access to additional data sets to provide robust results.

Think about what you want. Consider what areas you want the machine-learning technology to focus on. It's tempting to use ML in every area, but you may have a better long-term benefit by piloting in key areas where it will can have a significant benefit.

Go to the cloud. With the results of the assessment in hand, you can develop a strategy for implementing ML in the cloud. If you haven't yet embarked on a core transformation project, consider embracing ML and cloud computing from the start. When planning for this phase, consider whether to enlist the help of external partners with expertise in machine learning and cloud computing.

Find your competitive edge. These technological capabilities could let your company differentiate itself from competitors—to become known for industry-leading customer service, for the breadth and flexibility of your product lines, or for another capability that machine learning and cloud computing can enable. The trick is to find those areas in your market that machine learning would help you stand out as a leader.

[11] Strategy&, "A Strategist's Guide to Artificial Intelligence," May 10, 2017.

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