Machine Learning for Risk Management

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Growing artificial intelligence systems are unearthing previously unknown wrongdoing in organisations, but they should be matched by human oversight.

It all started as a normal day for David and John (not their real names). Out of the blue, the Audit and Compliance team called them, seeking clarifications about some of their recent trades. Shortly afterward, David and John realised they had just become more victims of the rise of the machines.

Both traders had engaged in inappropriate behaviours. David had favoured a single counterparty at the expense of his employer but this had been cloaked by a complex trading pattern. John, on the other hand, had built a position with an unauthorised risk profile and camouflaged this through after-hours orders and inappropriate communications with other traders. For months, both individuals had been able to evade detection but the bank had just implemented a new system of behavioural analysis based on artificial intelligence. They got caught.

This tool now gives the bank the ability to process massive amounts of structured and unstructured data from multiple sources to reveal trends and detect deviations from expected behaviour, incorporating data-driven rules that learn and adapt to changes in the environment. This solution includes extensive business logic to review multiple trading activities. It also mines and analyses chat-logs and news. Within days of system deployment, David and John were identified.

Naturally, the compliance team had conducted reviews of trading activities for years. However, the new system differs vastly from the traditional approach, which was:

- Manual and not scalable – Significant manual effort was required to pre-process, cleanse and analyse data. This made scalability of the process challenging – given the high number of traders and increasing volumes of trades.
- Based on a low coverage of data sources – The prior framework relied on selected data sources and provided only a partial view of actual behaviours. Thus, it was not possible to holistically monitor and detect suspicious activities.
- Suffering from the drawbacks of sampling – Due to the sheer size of the data, small parts of the data were randomly selected for analysis thus leading to higher risk of missing suspicious activities.
- Not adaptive – The framework was not adaptive to changing business situations.

Aside from its blind spots, the old system was often inconclusive and often more useful for reconstructing incidents that were already detected.

In contrast, the new system has essentially shifted the paradigm away from a risk-auditing methodology based on backward looking sampling to a more comprehensive and continuous monitoring. This provides several advantages. First, the approach is more *efficient* and allows the bank to do more with less manpower. Second, it is more *effective*. The fact that incidents can be detected earlier allows the bank to prevent them from spiralling out of control. For example, many rogue traders follow a "doubling up" strategy of risking an increasing amount of capital. Stopping the spiral early enough can prevent cases such as the collapse of Barings Bank from happening again. Third, the system is *adaptive*. Humans have a great capacity to adapt to controls imposed on them. In contrast, policies adapt at

a much slower rate to changes in practices and business conditions. The new system's learning capability helps address this problem. This creates a positive impact on organisational culture by reducing the bureaucratic burden created by meaningless controls and by protecting social norms through the detection of early deviations.

The benefits of predictive analytics and machine learning are not limited to the detection of rogue trading. Take credit risk management, for example. Traditional systems focus mainly on borrowers financials with limited assessment of their business dependencies and networks. Assessments are conducted based on events such as user-initiated loan applications and regular annual reviews. The process is labour intensive and critically depends on the heuristics of individual judgements. Machine learning technology can leverage on a range of different sources of information such as company financials, transactions, real-time market information, business networks and news.

Another example is anti-money laundering (AML) compliance. Trade finance, one major area of AML monitoring, is traditionally supported by heavy documentation that is more or less manually reviewed for compliance. Big data analytics can similarly support the detection of trade anomalies through the monitoring of activities, networks and trends.

There is an emerging recognition in the financial services sector that leveraging advanced technologies, such as artificial intelligence and machine learning, is the key to deriving real value from big data infrastructure.

Naturally, like any other innovation, the new approach is not a panacea. For example, although algorithms used to manage risks can be described in general terms, understanding and perhaps more importantly explaining exactly how they work is extremely challenging. Regulators, executives, auditors or clients without a technical background may be wary of relying on these new oracles. Data scientists are currently in hot demand but their technical skills will gradually become a commodity. However, the capacity to mesh hard and soft skills will continue to carry a premium. Perhaps paradoxically, the technicity of the new tools has made the combination more valuable. Indeed, the new technologies may have made the human element of risk management more important!

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