

Second Prize Winner

The Actuary and the Algorithm: Navigating the New Symbiosis of Judgment

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INTRODUCTION

There's a new figure in the actuarial office. It doesn't sit at a desk, sip coffee, or show up at daily stand-ups. Yet its presence is unmistakable, quietly reshaping everything we do. That figure is artificial intelligence, a silent partner that is turning the age-old practice of risk assessment from a discipline of meticulous calculation into one of intelligent interpretation.

My first encounter with this partner was subtle. It came in the form of a modest Python script that could scan and categorize unstructured claims notes with remarkable speed, freeing junior analysts to focus on more demanding tasks. What seemed like a small tool at the time grew into something transformative, challenging my very sense of what it means to be an actuary in an era of machine intelligence.

This essay reflects honestly on that transformation. It isn't a theoretical exploration but a ground-level account of using AI in the daily work of reserving, pricing, and forecasting. I'll share the efficiency gains and the unexpected complications, the struggle to balance predictive accuracy with explainability, and the new skill set that has become essential. Above all, I argue that AI isn't diminishing the role of the actuary; it's elevating it. We are moving from calculators to conductors, orchestrating a new relationship between judgment and algorithms.

THE TRANSFORMATION OF ROUTINE: FROM MANUAL SCRUTINY TO STRATEGIC OVERSIGHT

The clearest and most immediate impact of AI has been on routine actuarial work. For decades, the profession was rooted in cycles of data collection, validation, endless Excel manipulation, model running, and result compilation. These were not just chores; they were rites of passage that gave actuaries a tactile feel for the data.

That world has changed. In our pricing team, we built a machine-learning pipeline that automates ingestion, cleansing, and feature engineering. It draws on thousands of variables from policy systems, claims data, and even external sources like credit-based insurance scores and geographic risk indices, capturing non-linear patterns we never could. The results are staggering. What once took three weeks of manual preparation now takes three days, and the output is far more consistent.

But efficiency came with a cost: the risk of losing familiarity. By automating the struggle with messy data, we risked losing the intuition that came from living inside it. Veteran actuaries once held invaluable memories of odd quarters or strange claims clusters, knowledge AI could never replicate.

Our answer was “Data Storytelling.” Before running any model, the lead actuary now walks the team through the dataset’s quirks, historical context, and anomalies. AI handles the heavy lifting, but we guard the human understanding. What was once a task of manual scrutiny is now one of strategic interpretation and narrative.

THE BLACK BOX DILEMMA: EXPLAINABILITY VERSUS PREDICTIVE POWER IN RESERVING

No actuarial task reveals the tension between AI’s power and opacity more than reserving. Accuracy matters, but so does defensibility.

Our experiment with gradient-boosting machines (GBMs) for reserve triangulation illustrates this. Compared with traditional chain-ladder methods, the GBM was 15% more accurate and far more stable. It drew on external indicators, like macroeconomic trends, that chain-ladders simply couldn’t.

But when I presented the results to our CFO, I faced the toughest question: “Why?” Not why was it better, but why did the model say this? With GBMs, tracing the reasoning behind a prediction is nearly impossible, like asking a single neuron to explain a thought.

We didn’t abandon the model. Instead, we built a governance framework:

1. SHAP Values (Shapley Additive Explanations):
These showed how each feature contributed to a prediction. We could now say, “The reserve rose by \$2M due to litigation spikes and a downturn in manufacturing.”
2. Counterfactual Analysis:
By asking “what if” questions, like assuming litigation frequency was average, we could stress-test the model.
3. The Regulator’s Report:
A special document that sets the AI-enhanced reserves side-by-side with chain-ladder results, using SHAP and counterfactuals to translate the black box into human terms.

The lesson was clear: validating AI models isn’t just about accuracy. It’s about constant interrogation and translation. Actuaries now certify not just numbers, but the reasoning behind the algorithms themselves.

THE NEW RISKS: THE ILLUSION OF OBJECTIVITY AND MODEL DRIFT

AI brings risks that go beyond prediction errors. Two, in particular, stand out: the illusion of objectivity and the creeping danger of model drift.

First, objectivity is an illusion. Models reflect the data they’re fed, and that data reflects human history, biases and all. We learned this when an auto pricing model unfairly penalized certain zip codes. It had linked urban density with claim frequency, overlooking socioeconomic realities. Left unchecked, it would have amplified historic bias. Objectivity had to be built, tested, and monitored, not assumed. Today, we conduct formal “bias audits” using tools like AIF360 as part of every validation cycle.

Second, model drift is relentless. Risk landscapes evolve with new treatments, climate events, and shocks to the economy. A model trained on 2020 data may already be stale in 2024. We experienced this firsthand, watching predictive accuracy erode silently as reality shifted. The fix was to monitor models like vital signs, retraining them continuously through automated pipelines. Without this vigilance, once-brilliant models quietly fade into irrelevance.

THE EVOLVING ACTUARY: FROM TECHNICIAN TO TRANSLATOR AND CONDUCTOR

This technological shift has redrawn the actuarial skill map. Some skills are losing importance, while others have become indispensable.

Declining in value:

- Manual data wrangling (no more weeks lost to VLOOKUPS).
- Exclusive reliance on classical methods like GLMs or chain-ladders.
- Working in silos, producing numbers without context.

Rising in value:

- Computational Thinking:
Fluency in Python/R, SQL, version control, and CI/CD pipelines is now baseline.
- Data Literacy and Ethics:
Beyond technical accuracy, we must question data sources, detect bias, and evaluate ethical impacts.
- Storytelling and Translation:
Turning AI outputs into clear, compelling narratives for executives and regulators is now central.
- Orchestration and Governance:
We act as conductors, defining problems, curating data, evaluating and explaining models, designing governance, and monitoring life cycles. Judgment ties it all together.

The future actuary is no longer just a technician but a translator and orchestrator of human-machine collaboration.

CONCLUSION: THE UNCHARTED PARTNERSHIP

AI in actuarial practice isn't about replacement. It's about partnership. In my experience, AI has gone from being a tool to being a colleague, powerful, fast, and brilliant, but also literal-minded, context-blind, and ethically neutral. Our job is to provide the qualities it lacks: judgment, ethics, and wisdom.

This partnership pulls actuaries in two directions at once. On one hand, it forces us deeper into technical skills, machine learning, data engineering, and software pipelines. On the other hand, it demands higher-level abilities, communication, ethics, and business strategy. We are the interface between the cold precision of algorithms and the complex realities of risk.

The real danger isn't that AI will outgrow actuaries. It's the actuary who will fail to grow with AI. The future belongs not to those who calculate the fastest, but to those who can wield AI wisely, balancing accuracy with ethics, prediction with explanation, and data with human judgment.

The silent partner is here to stay. Our responsibility, and privilege, is to give it a voice that society can trust.

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