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THE AI ACTUARY

VIRTUAL SUMMIT

Green 13

Decoding AI Era Technologies

Chris Martis FIA C.Act

Solutions Director

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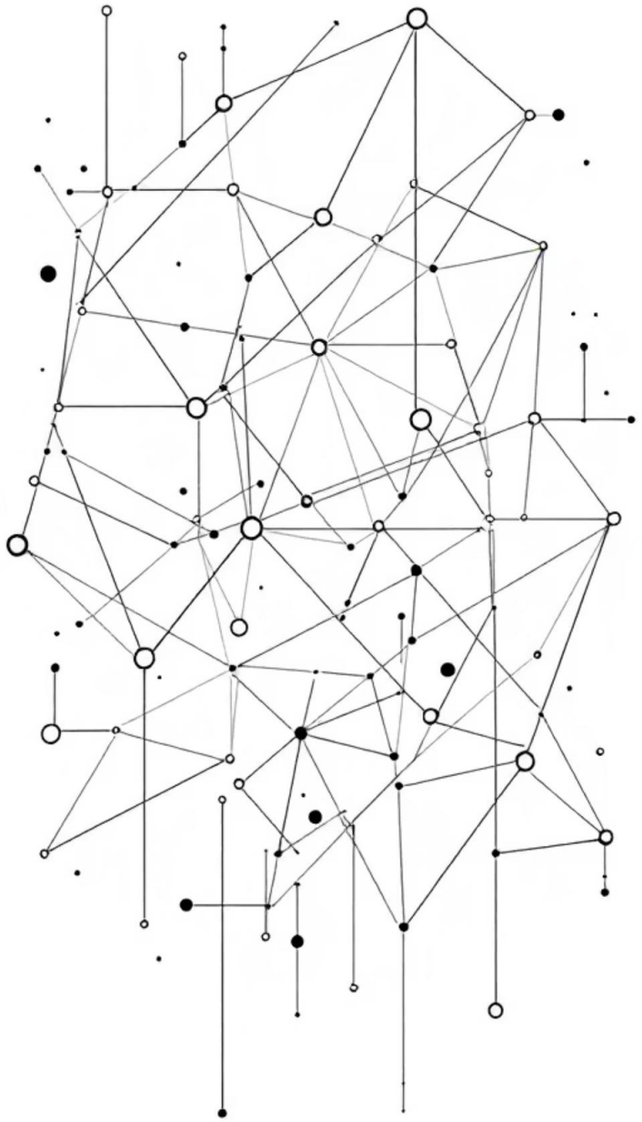

Decoding AI Era Technologies

For actuaries of all disciplines and roles, understanding today's AI technologies isn't just technical knowledge-it's a strategic advantage. This presentation unpacks the business relevance of Cloud, GPUs, GitHub, Open Source, APIs, LLMs, and SaaS/IaaS, focusing on their practical implications in actuarial software, including benefits and considerations.

Chris Martis FIA C.Act
Solutions Director

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Green 13: Who we are

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- Actuarial software company founded in UK in 2013 by Rob and Chris.
- Rob, Technical Director, ex-big4 partner, auditor and software engineer: Back-end C++/AVX/Infrastructure/APIs/Automation/Grid.
- Chris, Solutions Director – ex-big4 and independent consultant: Front-end/Expressions/CUDA/Cloud/Open Source/Actuarial Modelling/ALMs/AI.
- Ross, Actuarial Manager – ex-deputy Chief Actuary, IFRS17, Solvency II expert
- Motivated to create a different platform to solve persisting real-world actuarial problems.

Iris Actuarial Platform

- Iris is an end-to-end, low-code, high-performance actuarial platform, utilizing modern hardware technologies.
- Comprises of apps for data, calculations, reporting and analysis.
- Used in ~24 countries, 4 continents and ~60 clients.

Today I will attempt to demystify some of the technologies commonly encountered and used in the AI era. My favourite mottos, which are very relevant to my presentation, are:

- “Because you can, doesn’t mean you should”.
- “You do not need to cut butter with a chainsaw”.

Rob Green FIA C.Act
Technical Director

Chris Martis FIA C.Act
Solutions Director

Ross Waddell FIA C.Act
Actuarial Director

Difficulty ☆☆☆

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Difficulty rating: Should I build or should I buy/rent?

Explainer

- In most new technologies, companies have a choice to “build” or to “buy” or to “rent”.
- The decision depends on preferences, budgets, skillset and needs. There is no unique correct answer and with AI acting as support, the barrier of entry for any technology is much lower.
- Still, care should be taken for the non-obvious costs of ownership (management, audit, documentation, key person).
- The below ratings are from the perspective of difficulty in adoption/development, as I see it.

Difficulty ★☆☆ Low: Barrier of direct use/implementation is low.

Difficulty ★★☆ Medium: Some knowledge required, with cost of development/maintenance higher.

Difficulty ★★★ High: Expertise required, cost of development/maintenance highest.

Difficulty ★★☆

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The Cloud: Someone Else's Infrastructure

What It Is

Cloud computing provides on-demand access to computing resources-servers, storage, databases, networking-through the internet, without direct active management by users. It's essentially "renting" infrastructure rather than building and maintaining your own data centers.

Why Should You Care

The cloud enables unprecedented scalability, flexibility, and potential cost efficiencies. For actuaries, this means the ability to run complex models that would otherwise exceed in-house capabilities, particularly during peak calculation periods like quarter-end.

Costs are per-run, and can add up. Efficiencies or inefficiencies multiplied by 100s or 1000s of times. US and EU laws complicating US owned cloud providers for EU data.

Benefits and Considerations

- Scale calculations beyond in-house fixed grid size
- Pay only for what you use-no idle servers (but some overheads)
- Reduced IT maintenance burden
- Potential data security and governance concerns
- Costs for storage (~$0.02/GB/month), compute (~$0.12/2 vCPU/hour), and infrastructure can accumulate
- ~$60 per 1000 cores per hour (or more)
- vGPU costs can be $5-120 per hour (40x or more).

How We Use It

In Iris-C, we can deploy models in serverless autoscaling compute environments. One client reduced their runtime on CPUs from 3 hours to just 9 minutes-though most of that time involves overheads spinning up cores and transferring data. Many clients prefer to keep data and hardware under direct control using our Iris-Grid instead.

We use Dropbox, SharePoint, and OneDrive for collaboration and to host training.

Difficulty ★★☆

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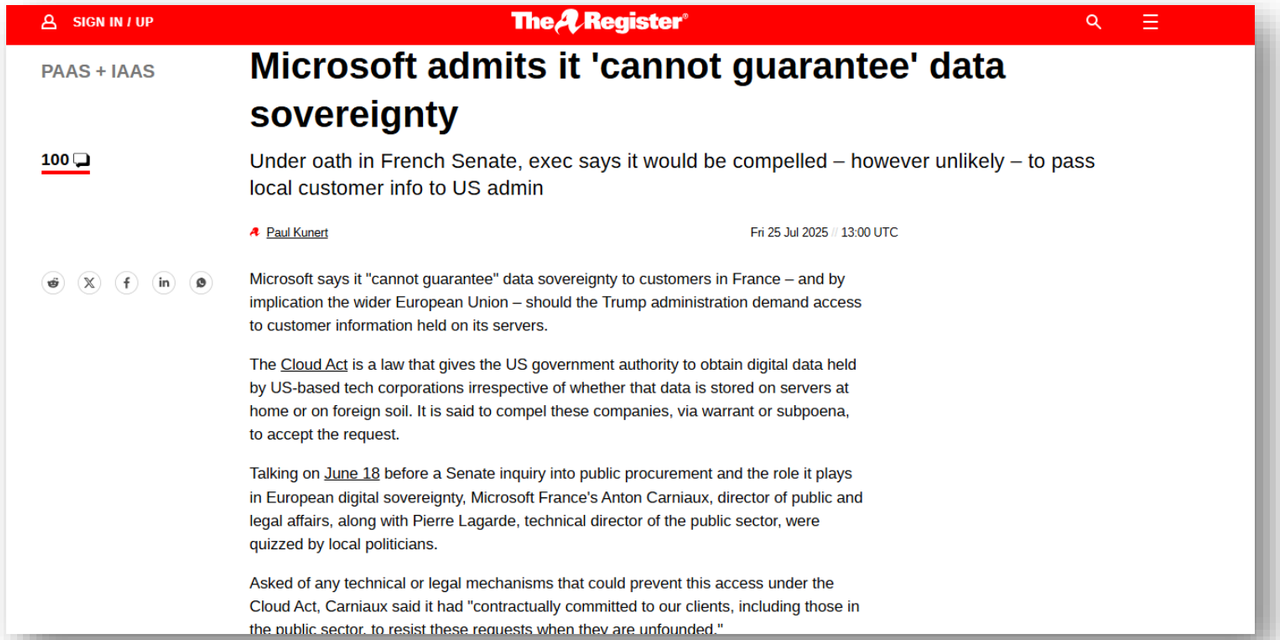
The Cloud: Someone Else's Infrastructure



SIGN IN / UP

The Register

PAAS + IAAS

Microsoft admits it 'cannot guarantee' data sovereignty

100

Under oath in French Senate, exec says it would be compelled – however unlikely – to pass local customer info to US admin

Paul Kunert

Fri 25 Jul 2025 // 13:00 UTC

Microsoft says it "cannot guarantee" data sovereignty to customers in France – and by implication the wider European Union – should the Trump administration demand access to customer information held on its servers.

The Cloud Act is a law that gives the US government authority to obtain digital data held by US-based tech corporations irrespective of whether that data is stored on servers at home or on foreign soil. It is said to compel these companies, via warrant or subpoena, to accept the request.

Talking on June 18 before a Senate inquiry into public procurement and the role it plays in European digital sovereignty, Microsoft France's Anton Carniaux, director of public and legal affairs, along with Pierre Lagarde, technical director of the public sector, were quizzed by local politicians.

Asked of any technical or legal mechanisms that could prevent this access under the Cloud Act, Carniaux said it had "contractually committed to our clients, including those in the public sector, to resist these requests when they are unfounded."

https://www.theregister.com/2025/07/25/microsoft_admits_it_cannot_guarantee/

https://www.forbes.com/sites/emmawoollacott/2025/07/22/microsoft-cant-keep-eu-data-safe-from-us-authorities/

Forbes

Microsoft Can't Keep EU Data Safe From US Authorities

By Emma Woollacott, Senior Contributor. Emma Woollacott is a freelance j... Follow Author

Published Jul 22, 2025, 07:56am EDT

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NOW PLAYING

FORBES' FEAT

The French Senate (Photo by Samir Hussein - Pool/WireImage)

WIREIMAGE

Microsoft has admitted that it can't protect EU data from U.S. snooping.

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Difficulty ★★★

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GPUs: Another Processing Powerhouse

What They Are

Graphics Processing Units were originally designed for rendering images but have evolved into specialized hardware for parallel processing. Unlike traditional CPUs with fewer, more powerful cores, GPUs contain thousands of simpler cores designed to handle multiple tasks simultaneously.

Why Should You Care

For computation-heavy actuarial modeling-particularly stochastic modeling with thousands or millions of policy/sim combinations, GPUs can deliver performance improvements, reducing run times from hours to seconds and enabling more complex analysis within practical timeframes.
Not a silver bullet, as some sacrifices needed, but capabilities increase. Should compare against optimized CPU code for detailed cost/benefit considerations.

Benefits and Considerations

- Big performance gains for suitable workloads (still memory bound)
- Can scaled inter-model interactions (ALM)
- Can reduce time-to-insight for critical business decisions
- Require specialized programming approaches - open source exists, but not optimized (yet).
- Not all algorithms benefit equally from GPU architecture and due to cost of GPUs, cost/benefit investigation matters.

How We Use Them

In our use-cases: processing 100 million records in seconds; running 2 million record Asset-Liability Management calculations (period by period) for 4 interconnected models in under 1 second per simulation; and reducing a 63 CPU core-hour run to ~40 GPU seconds.

Difficulty ★★★

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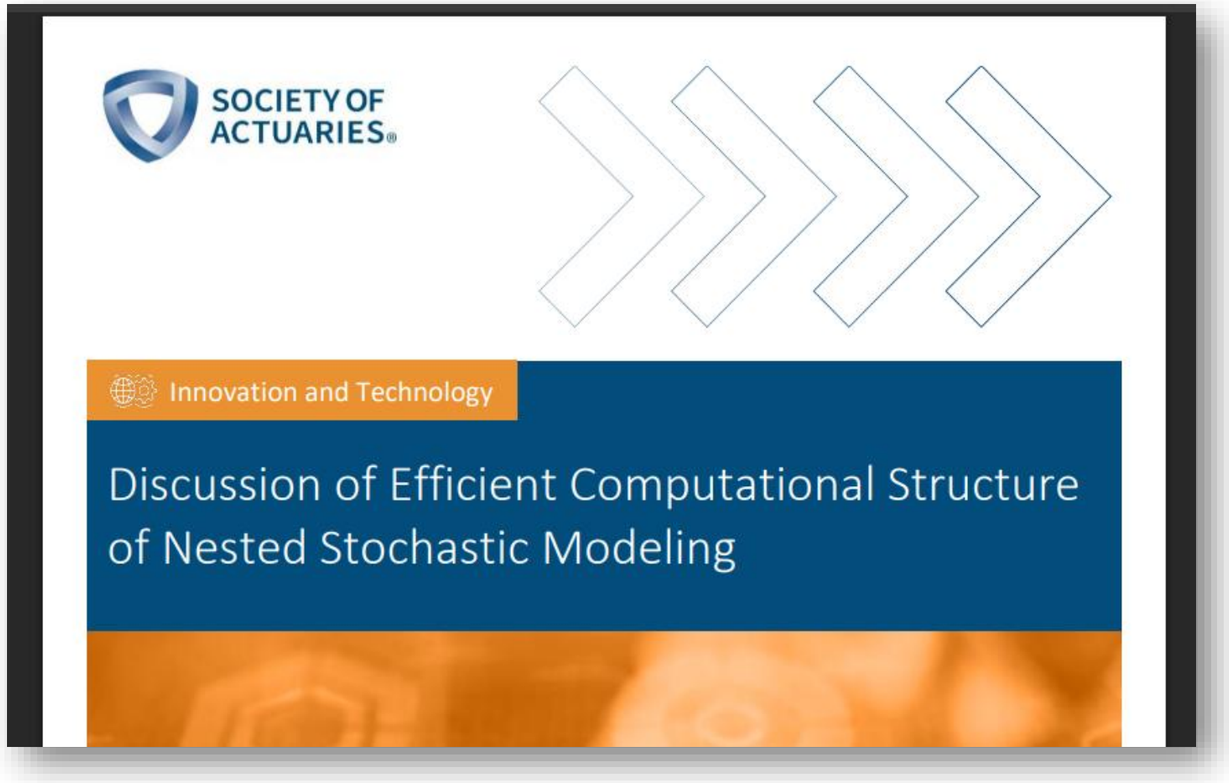
GPUs: Another Processing Powerhouse



https://www.soa.org/4a0719/globalassets/assets/files/resources/research-report/2021/efficient-computation-nested-stochastic.pdf

Section 5: Conclusions

Actuaries have a long history with stochastic modeling. The fact that stochastic modeling can capture the randomness of the financial market would allow a stochastic model to estimate the probability of different potential outcomes. These probabilities could further be translated into various hedging positions of ALM, financial results of valuations, and even business decisions with respect to the pricing of a new product. To actuaries, stochastic modeling is a powerful tool to gauge market movement.

NSM is often used when the modeling components under each economic scenario are themselves determined by stochastic scenarios in the future. The computational barrier of a normal stochastic model would be aggravated even more on a nested stochastic model. Thus, most of the research and testing focuses on how to improve the efficiency of a nested stochastic model.

The computational structure of a NSM has been the elephant in the room over the past few years. While we were all busy talking about the different approximation methods to avoid a true brute force NSM, it's easy to lose track of the more fundamental question: how to set up an efficient computational algorithm for an NSM?

In this paper, three methods have been suggested that can be added on top of existing enhancement methods to improve NSM efficiency. What's more important is that there is no compromise to the accuracy of a NSM model. The test results showed that we could achieve a 100% matching with the naïve brute force approach. The techniques discussed in this paper include vectorization plus broadcasting, RISP and CuPy programming. We achieved over 1000X runtime reduction by coming up with the most efficient modeling structure. All those methods are not to try to approximate the brute force Monte Carlo method, but rather to improve the efficiency directly.

The hope with this paper is to set a good foundation and platform for future research work, such as Machine Learning approximation to NSM.

Summary Stats

- X50 faster with vectorization
- X20 faster with CuPy
- = 1000x!!!

Difficulty ★☆☆

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Git/GitHub: Beyond "Geeky Version Control"

What It Is

Git/GitHub is a platform that enables collaborative development and version control. It allows users to track changes to files, revert to previous versions, and maintain multiple branches of development simultaneously. Think of it as a sophisticated backup system with collaboration/merging features.

Why Should You Care

For actuaries, version control is crucial for regulatory compliance, audit trails, and collaboration. It provides transparency into who changed what and when, allows safe experimentation with model assumptions, and ensures you can always recover previous states of your work. Blends nicely with open source. Good for text-based configurations.

Benefits and Considerations

- Complete audit trail of all changes
- Safe experimentation with new methodologies
- Seamless collaboration across teams
- Recovery from errors or incorrect changes
- Learning curve for non-technical users

How We Use It

We track all our work on GitHub for remote working and version control. For Iris, we've developed simplified Git representations and extended functionality to include Excel and CSV comparisons and backups-making version control accessible to actuaries without requiring technical expertise, using database grade controls.

Difficulty ★☆☆

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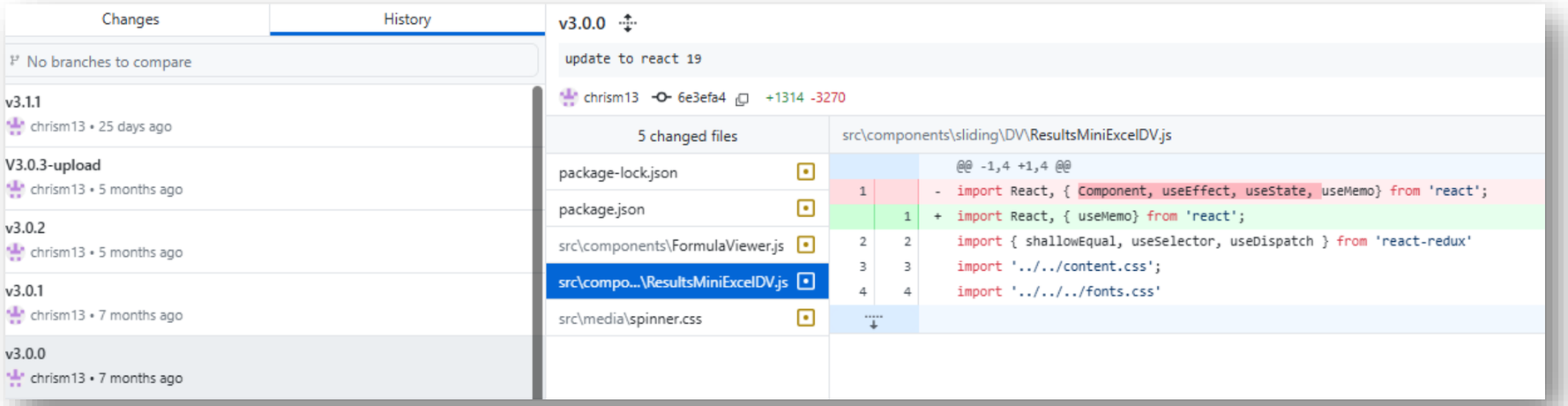
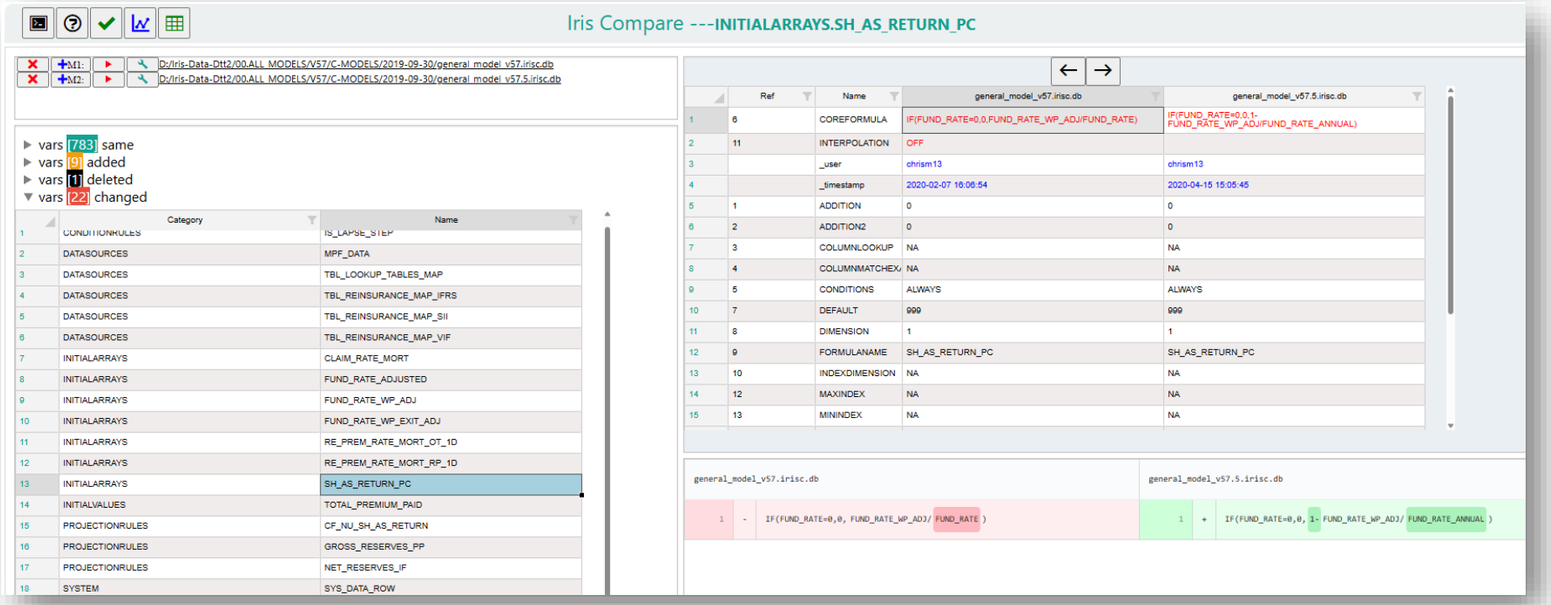
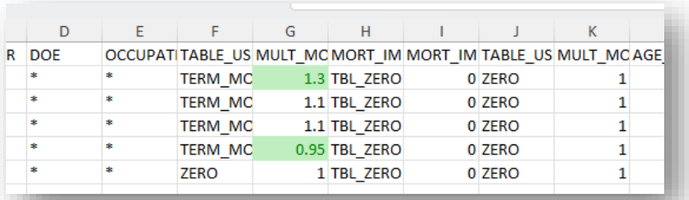
Git/GitHub: Beyond "Geeky Version Control"







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	*	*	TERM_MC	0.95	TBL_ZERO	0	ZERO	1	
	*	*	ZERO	1	TBL_ZERO	0	ZERO	1	

Difficulty ★☆☆

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Open Source: Ready-Made Libraries

What It Is

Open source software is code that's freely available for anyone to use, modify, and distribute. It's developed collaboratively by communities of developers who share their work. For specialized fields like actuarial science, open source provides access to powerful algorithms and tools without reinventing the wheel.

Why Should You Care

Open source accelerates development and innovation by leveraging collective expertise. It enables access to cutting-edge algorithms, reduces development costs, and often provides performance advantages. For actuaries, this means more sophisticated analysis capabilities without waiting for proprietary solutions.

Benefits and Considerations

- Access to vast libraries of pre-built functionality
- Rapid prototyping and development
- Community-vetted, often high-quality code
- Potential security concerns require due diligence
- Varying levels of documentation and support
- Need for technical expertise to evaluate, integrate and audit

How We Use It

We leverage open source for API connectors (cloud, AI), data processing, visualization, Containers. These enables remarkable capabilities like querying hundreds of millions of records from within a spreadsheet in seconds-approximately 5-10 times faster than PowerBI, without requiring specialized data warehouse infrastructure, querying larger than RAM files.

Difficulty ★☆☆

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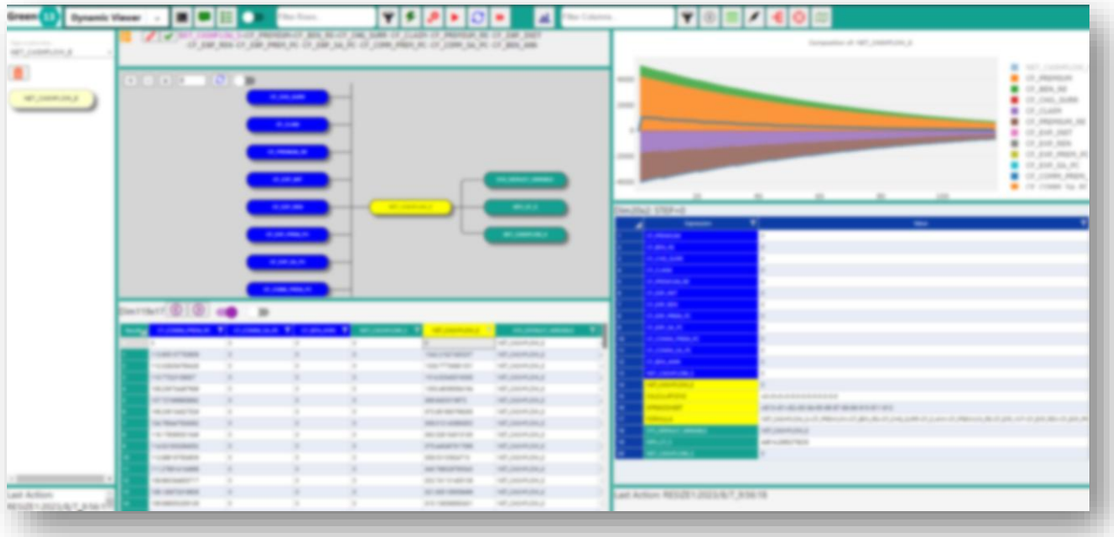
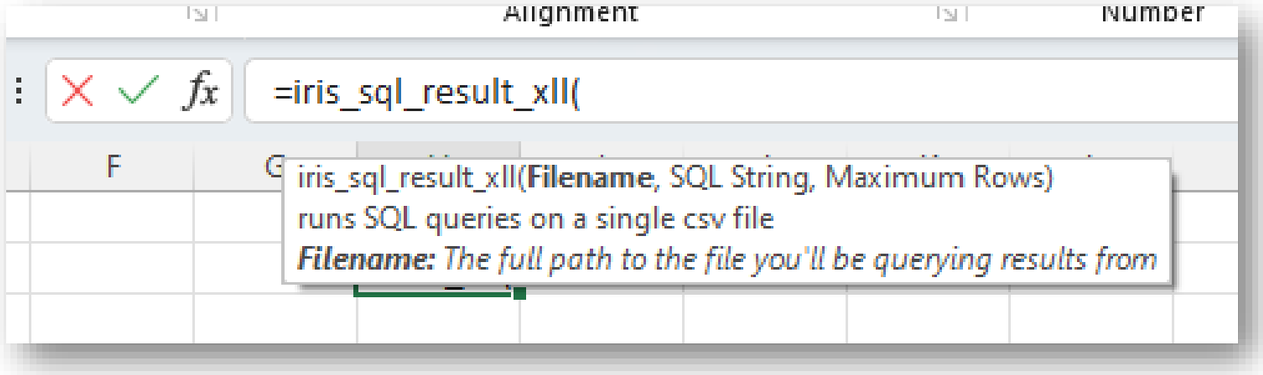
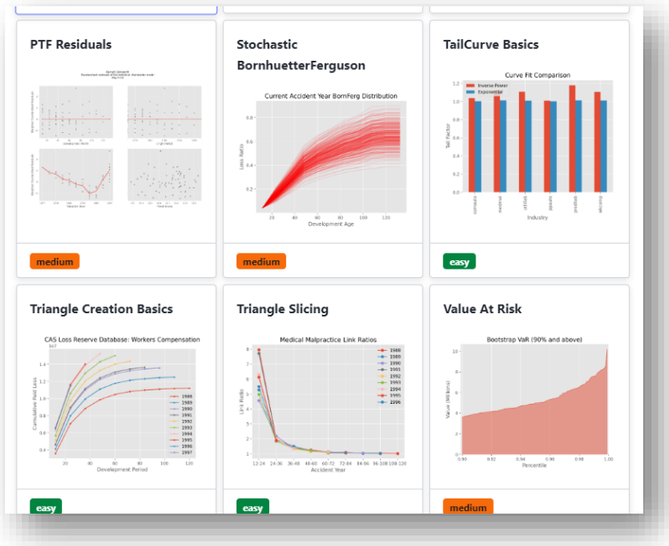
Open Source: Ready-Made Ingredients







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Difficulty ★★★

APIs: The Digital Conversation Enablers

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What They Are

Application Programming Interfaces (APIs) are standardized methods that allow different software components to communicate with each other. They define the types of requests that can be made, how to make them, and the format of responses-typically using JSON data structures. Used in “microservices” (the opposite of “Monolith”)

Why Should You Care

APIs enable modularity, integration, and automation across your technology ecosystem. For actuaries, they allow specialized tools to work together seamlessly, enabling workflows where your modeling software can communicate with data sources, reporting tools, and even regulatory submission systems. Important to log interactions.

Benefits and Considerations

- Connect and Automate different systems without custom integration
- Enable modular architecture that’s “easier” to update
- Require security considerations and access control
- Dependency on API providers for stability
- Amazon ditched “microservices”

How We Use Them

Iris uses a modular approach with a central engine that all applications make requests to. This enables powerful capabilities like controlling actuarial models directly from spreadsheets, with Excel functions that call the Iris engine, connect to cloud resources or AI providers. This architecture provides flexibility while maintaining performance and ease of maintenance.

Difficulty ★★★

APIs: The Digital Conversation Enablers

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https://devops.com/microservices-amazon-monolithic-richixbw/


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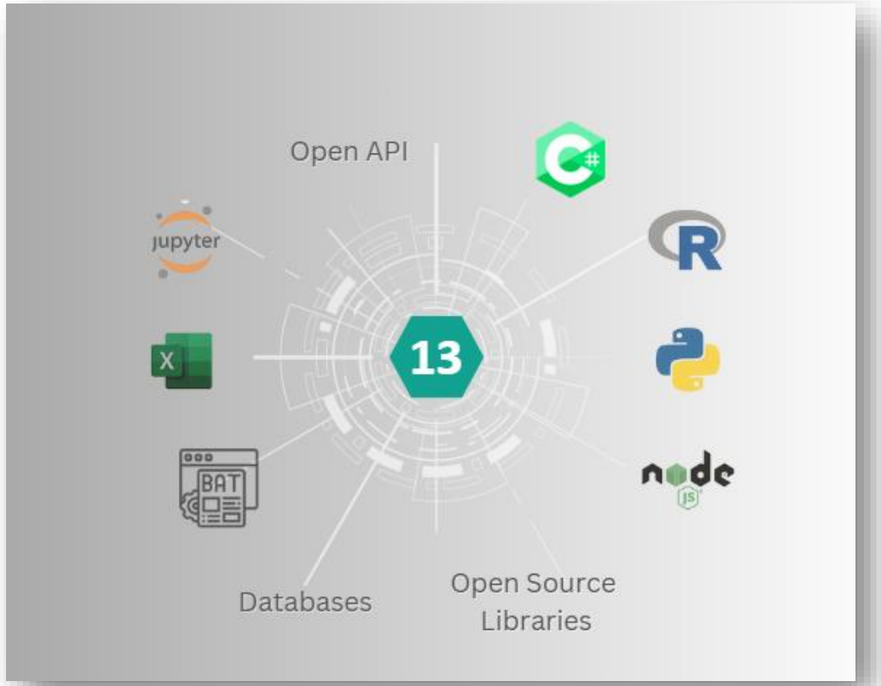

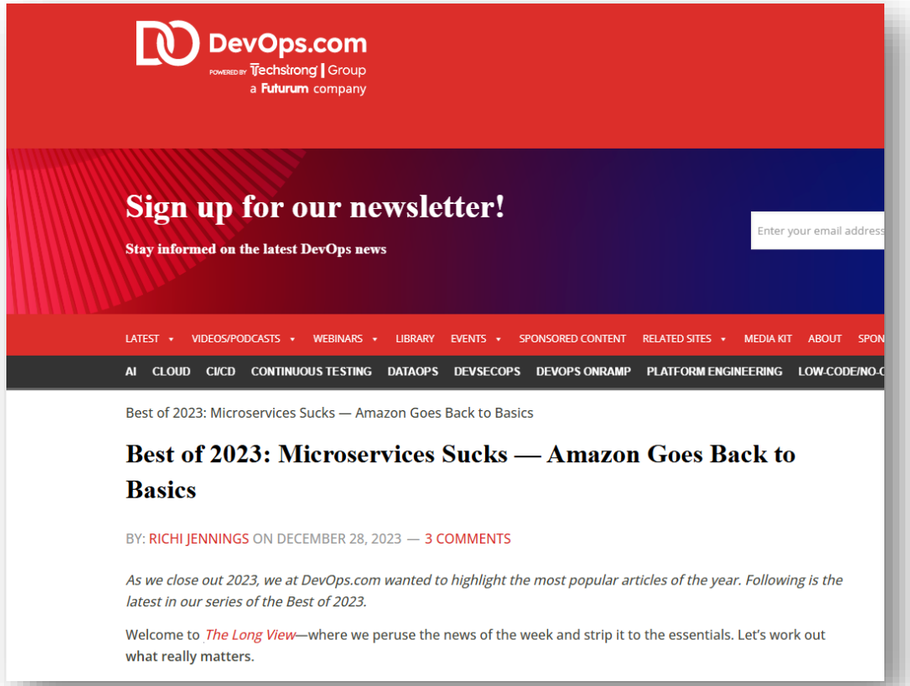

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Difficulty ★☆☆

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LLMs: AI Text Completers

What They Are

Emily M. Bender coined “Stochastic Parrots” (2021). Large Language Models (LLMs) are sophisticated AI systems trained on vast amounts of text data. They can “understand”, generate, and manipulate human language in remarkably natural ways. Modern LLMs can process and generate text based on prompts, summarize documents, extract structured information, and even generate code.

Why Should You Care

LLMs offer unprecedented capabilities to automate knowledge work. For actuaries, they can accelerate document analysis, model creation, report generation, summarise information, extract information, and technical documentation-tasks that traditionally required substantial manual effort.

They're particularly valuable for processing unstructured data like policy documents, regulatory texts, and research papers.

Benefits and Considerations

- Dramatically accelerate document processing
- Extract structured information from unstructured text
- Generate first drafts of reports and analyses
- Risk of "hallucinations" (incorrect information)
- Data privacy concerns when using third-party APIs
- Require human validation of outputs

How We Use Them

We've integrated LLMs with APIs to read insurance documents and automatically create actuarial models. In one case, we processed 7 comprehensive documents and produced models for over 200 product/versions in under 20 minutes at a cost of ~$0.50. We also use LLMs for marketing content (i.e. this presentation used Gamma), contract review, code review, and generating specialized code snippets-significantly accelerating tasks that previously required specialized expertise and research.

Difficulty ★☆☆

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LLMs: AI Text Completers

https://dl.acm.org/doi/pdf/10.1145/3442188.3445922

On the Dangers of Stochastic Parrots: Can Language Models Be Too Big? 🦜

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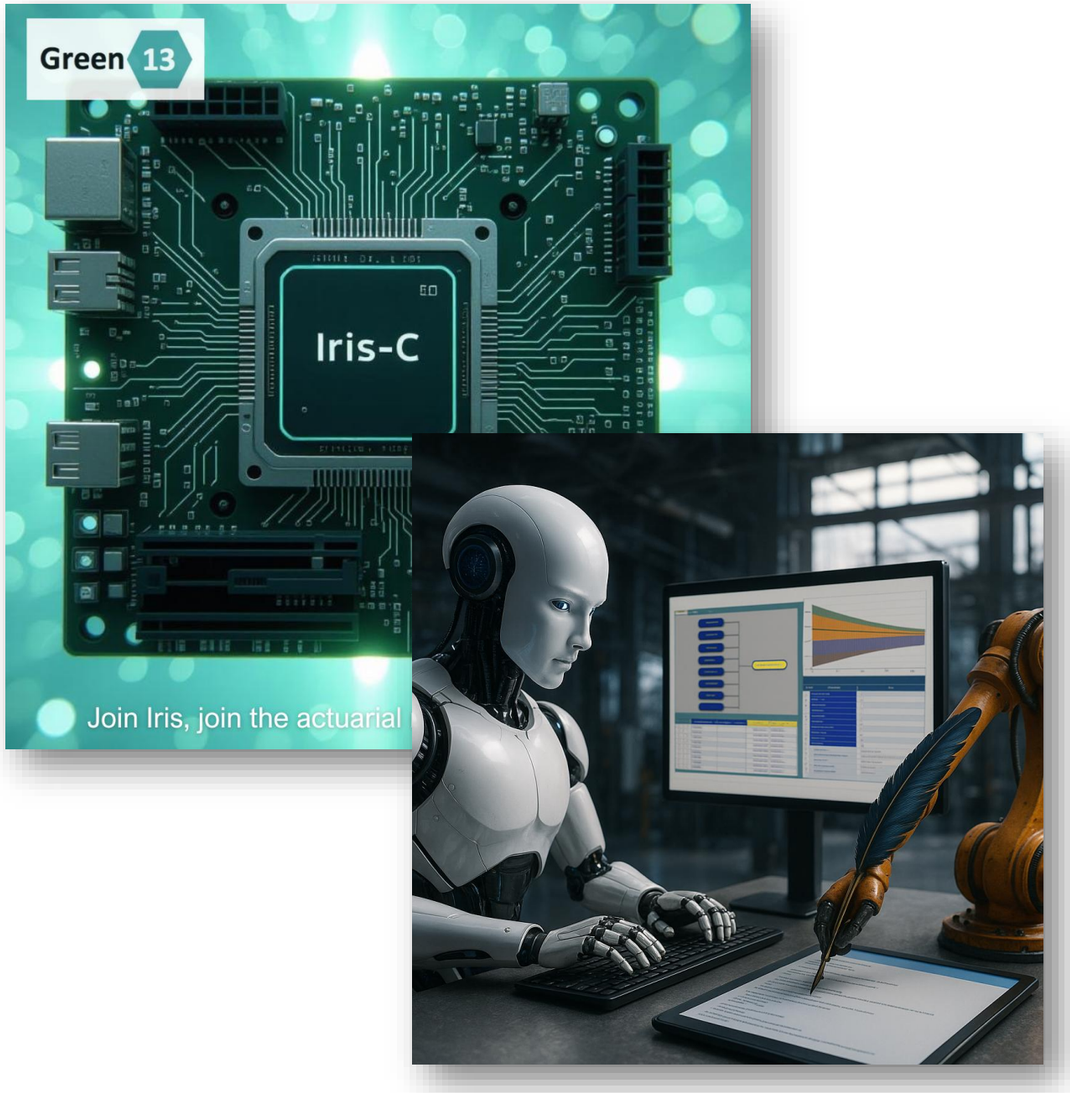
ABSTRACT

The past 3 years of work in NLP have been characterized by the development and deployment of ever larger language models, especially for English. BERT, its variants, GPT-2/3, and others, most recently Switch-C, have pushed the boundaries of the possible both through architectural innovations and through sheer size. Using these pretrained models and the methodology of fine-tuning them for specific tasks, researchers have extended the state of the art on a wide array of tasks as measured by leaderboards on specific benchmarks for English. In this paper, we take a step back and ask: How big is too big? What are the possible risks associated with this technology and what paths are available for mitigating those risks? We provide recommendations including weighing the environmental and financial costs first, investing resources into curating and carefully documenting datasets rather than ingesting everything on the web, carrying out pre-development exercises evaluating how alone, we have seen the emergence of BERT and its variants [39, 70, 74, 113, 146], GPT-2 [106], T-NLG [112], GPT-3 [25], and most recently Switch-C [43], with institutions seemingly competing to produce ever larger LMs. While investigating properties of LMs and how they change with size holds scientific interest, and large LMs have shown improvements on various tasks (§2), we ask whether enough thought has been put into the potential risks associated with developing them and strategies to mitigate these risks.

We first consider environmental risks. Echoing a line of recent work outlining the environmental and financial costs of deep learning systems [129], we encourage the research community to prioritize these impacts. One way this can be done is by reporting costs and evaluating works based on the amount of resources they consume [57]. As we outline in §3, increasing the environmental and financial costs of these models doubly punishes marginalized communities that are least likely to benefit from the progress achieved



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Difficulty ★☆☆

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SaaS/IaaS: Someone Else's IT or Actuarial Department

What It Is

Software as a Service (SaaS) and Infrastructure as a Service (IaaS) are cloud-based service models that provide ready-to-use software applications or infrastructure components on a subscription basis. Instead of buying, installing, and maintaining software or hardware, you "rent" it from a provider who handles updates, security, and technical maintenance. It is also another means of service provision for vendors or consultancies.

Why Should You Care

These models can transform capital expenditures into operational expenses, reduce IT burden, and provide access to cutting-edge capabilities without significant upfront investment. For insurance companies, this can mean faster deployment of new actuarial capabilities, reduced technical debt, and more resources focused on core business analysis rather than IT management.
Can also increase cost of analysis and discourage from bespoke investigations due to pay-as-you-ask costs.

Benefits and Considerations

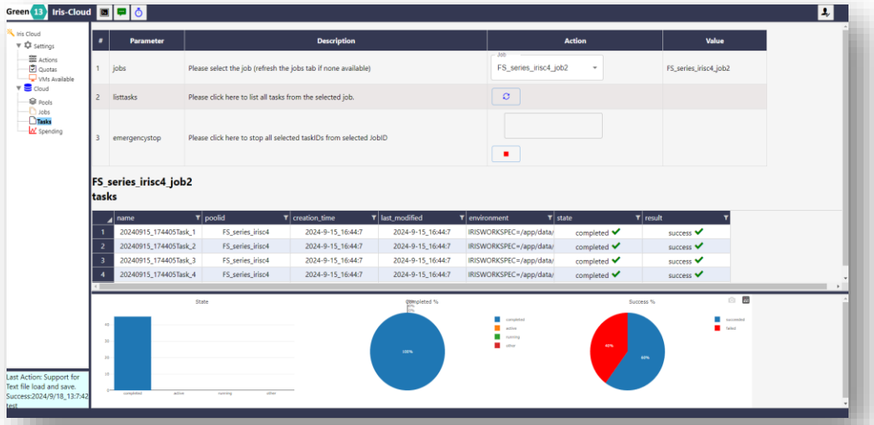
- Reduced internal headcount burden and maintenance
- Always-current software without manual updates
- Scalable resources that grow with your needs
- Potential data residency and security concerns
- Dependency on vendor for availability and performance
- Need for strong vendor management practices
- Some loss of direct analysis of process and can be costly

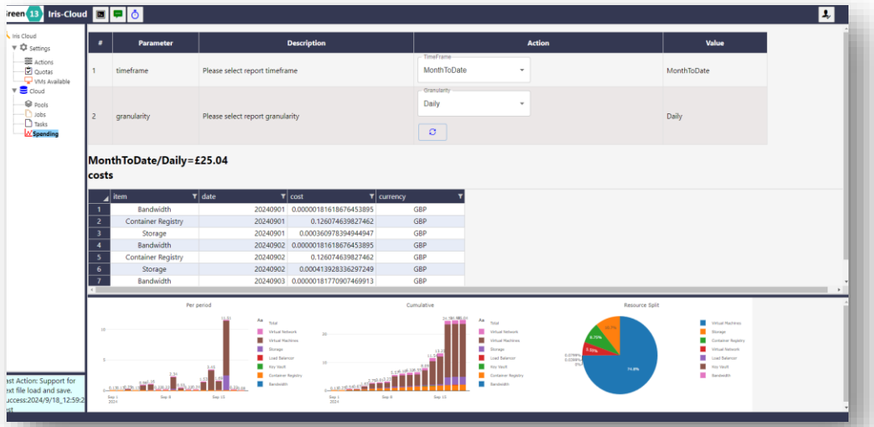
How We Use It

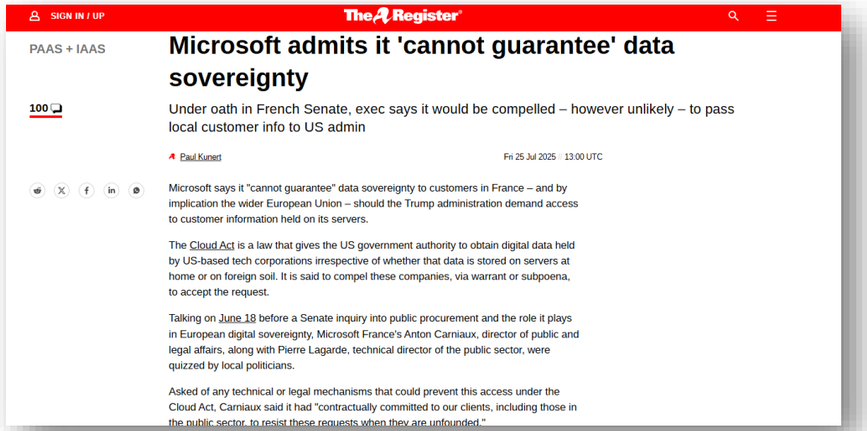
We leverage SaaS/IaaS for high-performance computing (serverless cloud infrastructure), user management (licensing checks), and collaborative file management (Dropbox, SharePoint). This allows us to focus on our core expertise-actuarial software development-while leveraging specialized providers for infrastructure needs.
Some of our clients use Iris for Actuarial Outsourcing.
Setting up an Azure or AWS environment is not difficult.

Difficulty ★☆☆

SaaS/IaaS: Someone Else's IT or Actuarial Department







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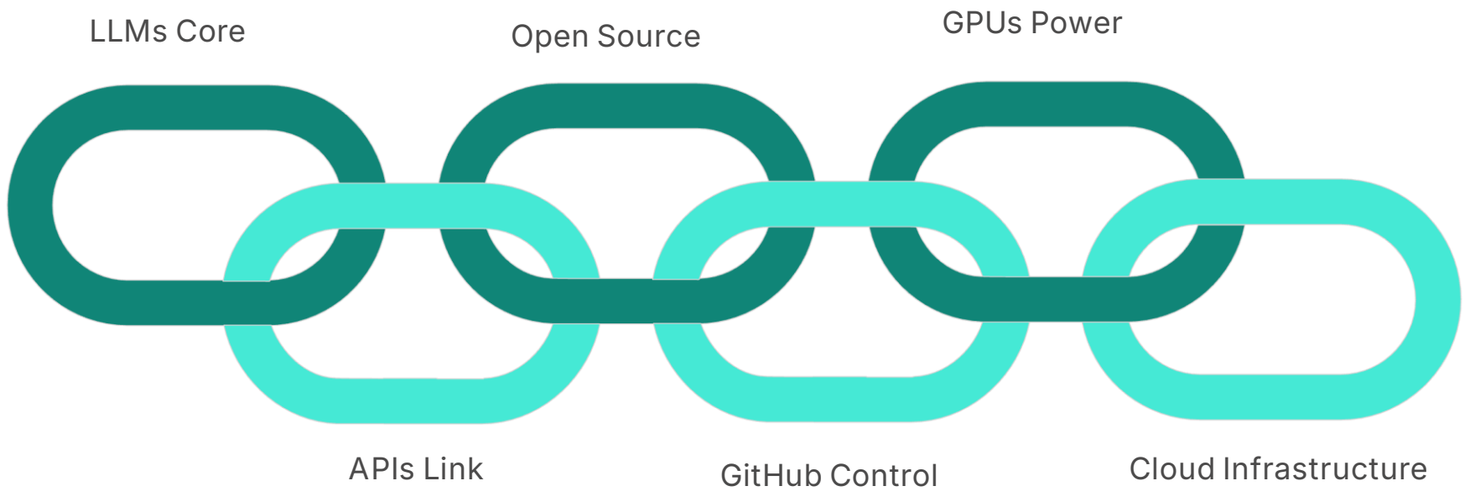
Putting It All Together: The Technology Ecosystem



These technologies don't exist in isolation-they form an integrated ecosystem that multiplies their individual benefits. Modern actuarial solutions leverage multiple technologies in concert:

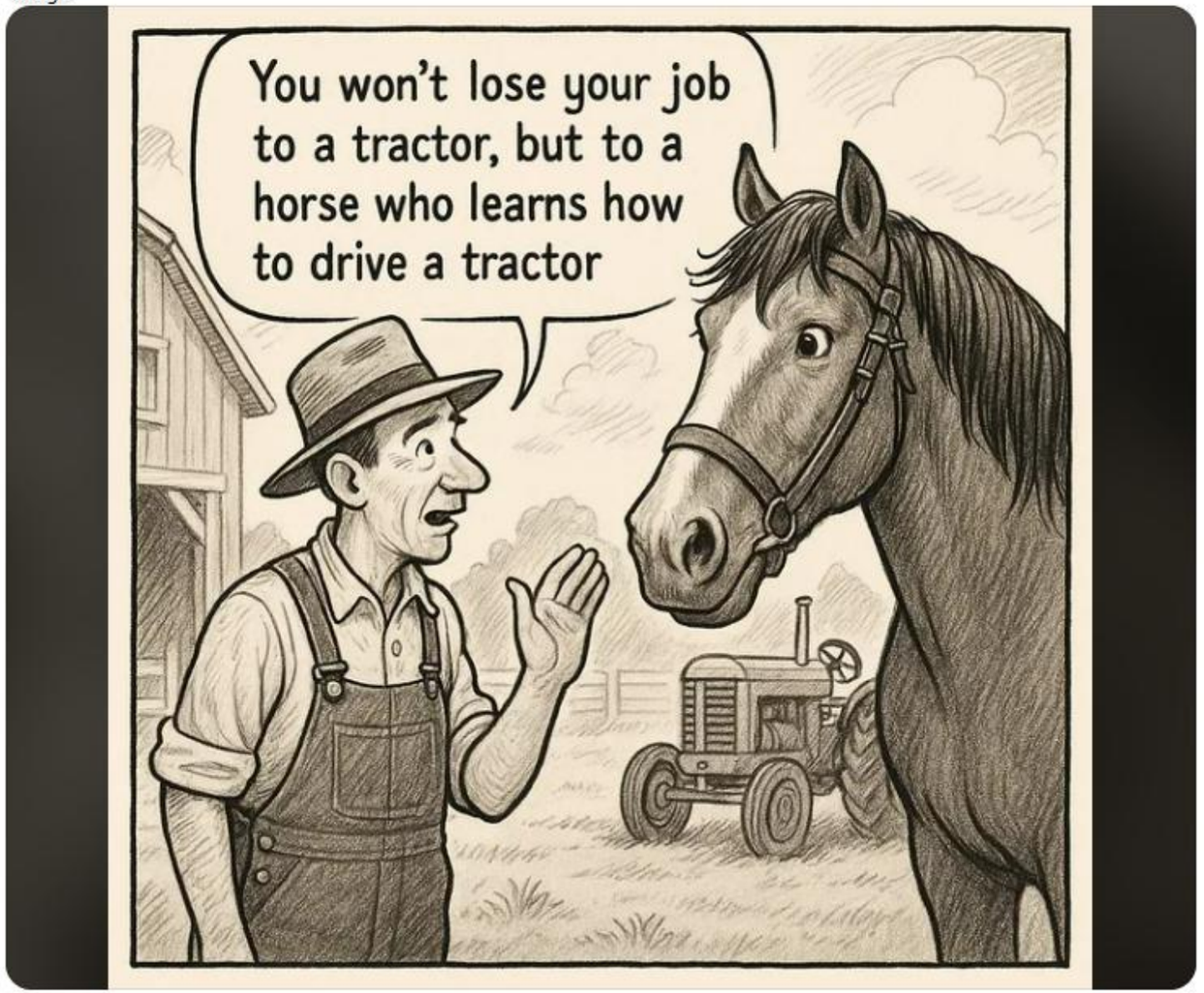
- Cloud infrastructure provides the elastic computing resources needed for GPU-accelerated processing ⇒ you do not always need it
- APIs connect specialized components into cohesive workflows ⇒ you do not need to deal with it direct
- Open source libraries provide building blocks that accelerate development ⇒ you should embrace and use
- GitHub ensures that all changes are tracked and recoverable ⇒ one of the many ways to version control
- LLMs process unstructured data and generate insights that feed into models ⇒ can be very useful
- SaaS/IaaS delivery models make these capabilities accessible without infrastructure burden ⇒ cost/benefit

Putting It All Together: The Technology Ecosystem

r/OpenAI • 2 mo. ago
MetaKnowing Top 1% Poster

Learn to use AI or... uh...

Image



Key Takeaways: Strategic Implications for Insurance Leaders

~5,000x

Performance Gain

GPU acceleration of complex actuarial models compared to traditional CPU processing

~20 min

Model Creation

Time to process 7 documents into 200+ product models using LLMs

~10x

Query Speed

Improvement in data processing using open source technologies compared to traditional BI tools

~5 minutes

Automation

Improvement from 2 weeks on process automation (pre/post model).

Strategic Considerations

- These technologies aren't just IT concerns-they're business enablers that can transform actuarial capabilities
- The combined effect of these technologies can deliver order-of-magnitude improvements in speed, capacity, and insight generation
- Consider vendors who leverage these technologies strategically, not just as marketing buzzwords
- Balance innovation with appropriate governance around data security and control, along with model auditability and flexibility
- Focus on business outcomes rather than technologies themselves-faster insights, more accurate pricing, better risk assessment

The insurance companies that thrive in the AI era will be those that understand how to leverage these technologies not as IT projects, but as strategic assets that enable better decision-making, more responsive product development, and more precise risk management.

Q&A Time

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