# Democratizing Actuarial Expertise Through Fine-Tuned Chain of Thoughts

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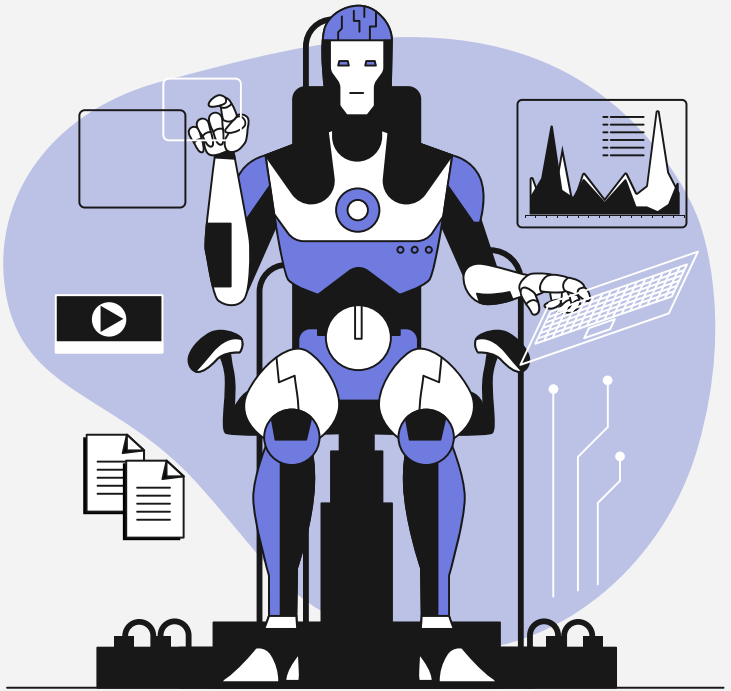
Italian Society of Actuaries,
***AI Task Force***



Pomeriggio Attuariale, 30 Gennaio 2026, Verona

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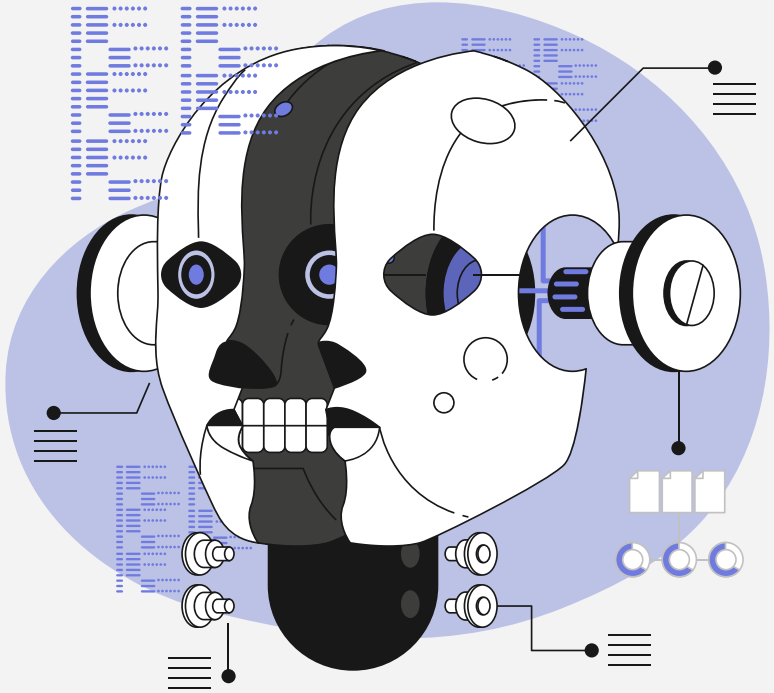
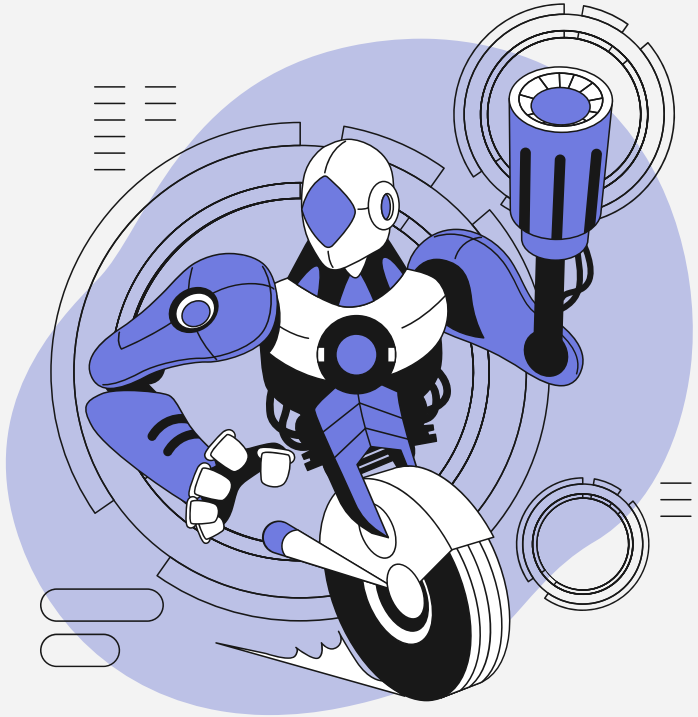
# Let's start!

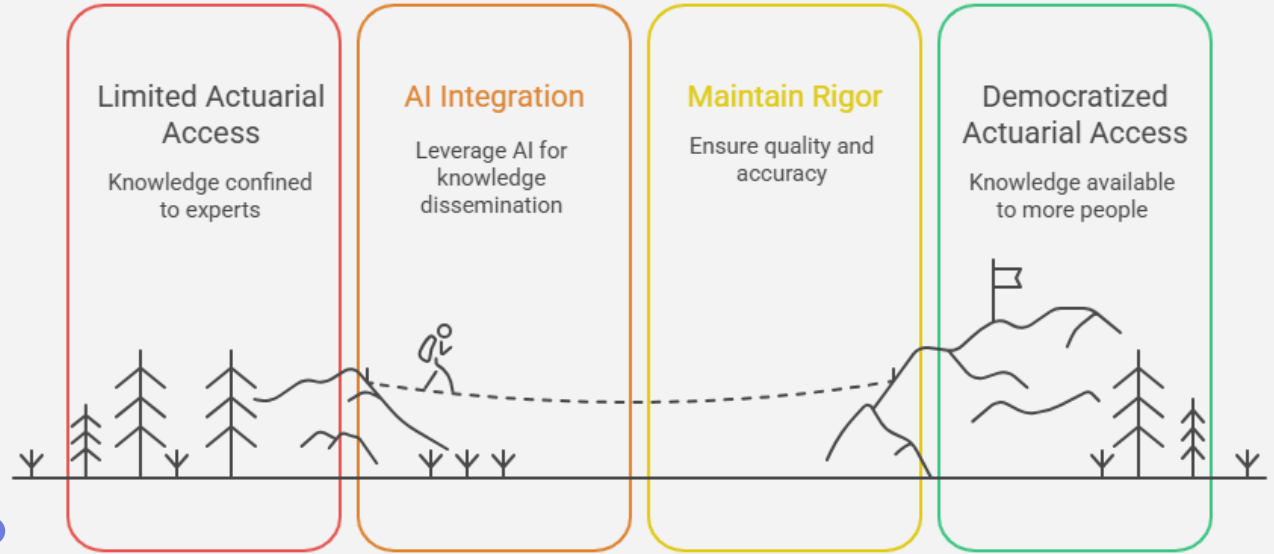


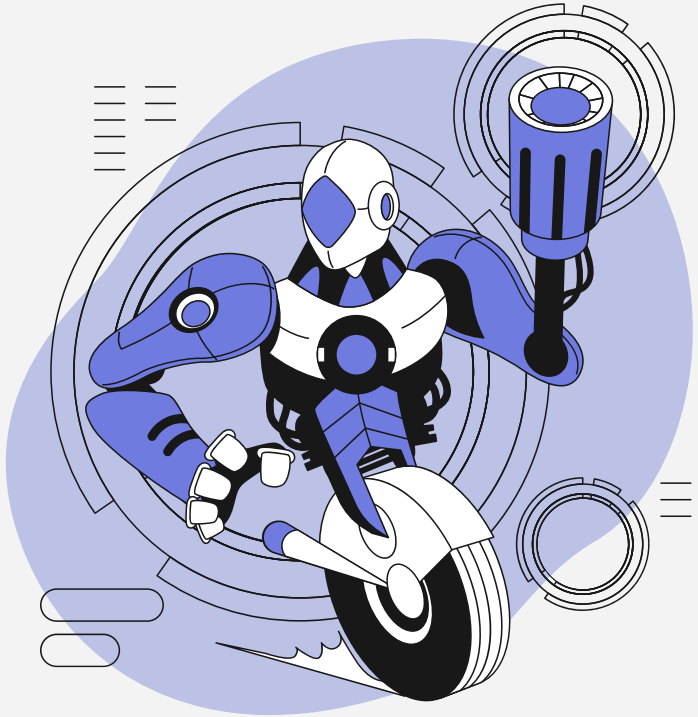


# 01

# Intro

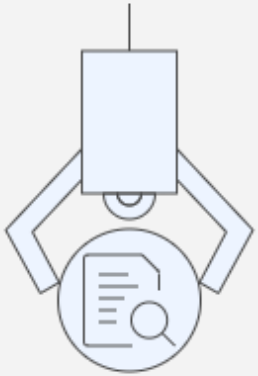
# How do we democratize advanced actuarial knowledge without compromising rigor?





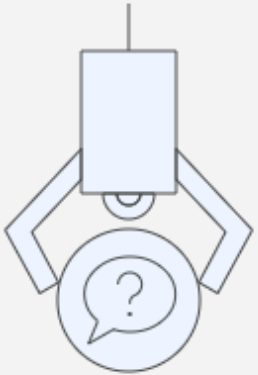
02

# The Problem & Our Solution



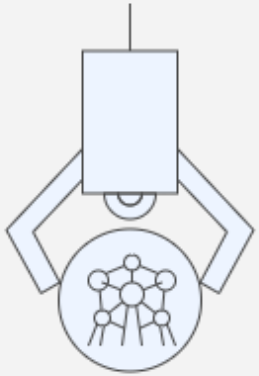
### The Challenge

Insurance products are complex, but actuarial expertise is scarce. Small insurers can't afford large teams.



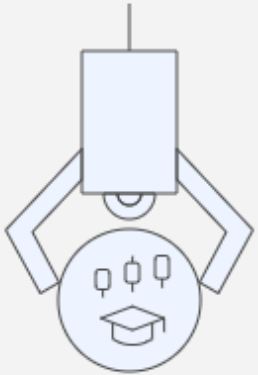
### The Question

What if business analysts could ask actuarial questions and receive professional analysis quickly?



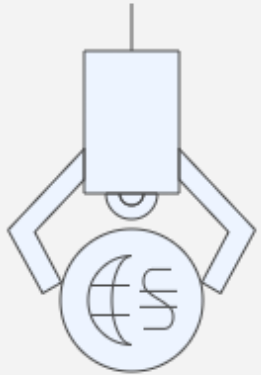
### The Solution

Combines Large Language Models with "Actuarial Chain of Thoughts" methodology.



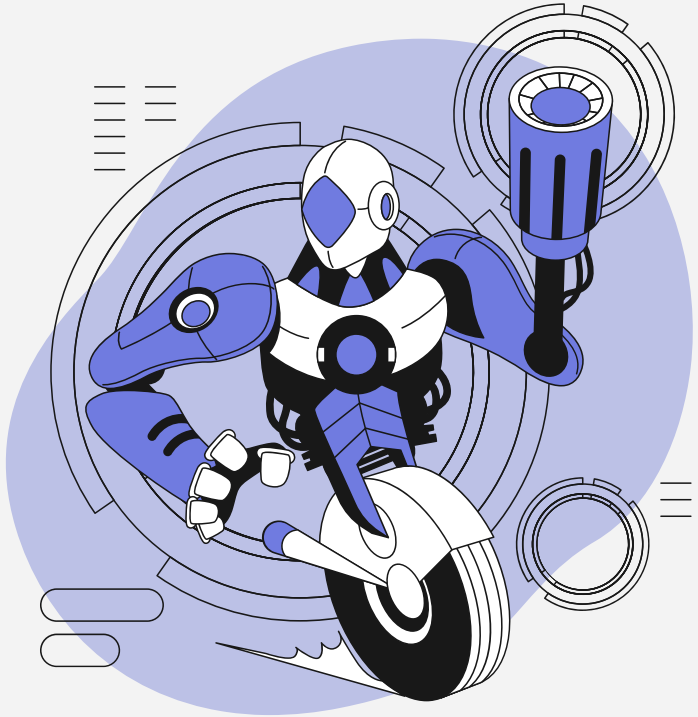
### The Foundation

15,000 curated examples from actuarial literature. Training on authoritative knowledge, not random text.



### Language Support

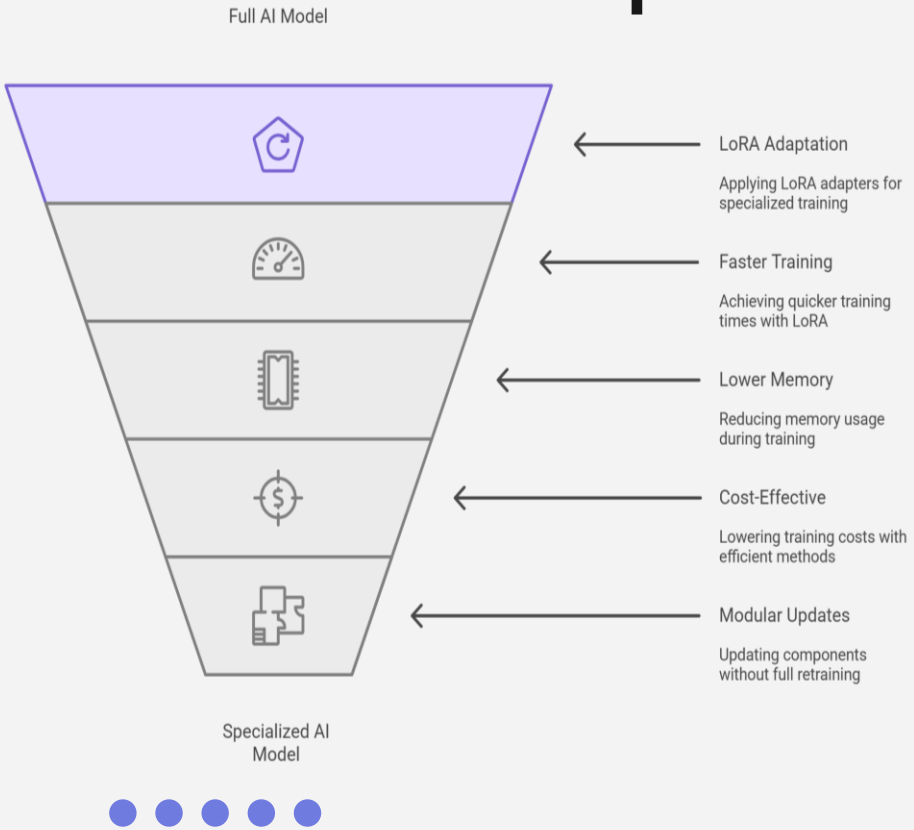
Supports 8 languages, covering over 90% of actuaries worldwide. Native actuarial thinking, not translation.



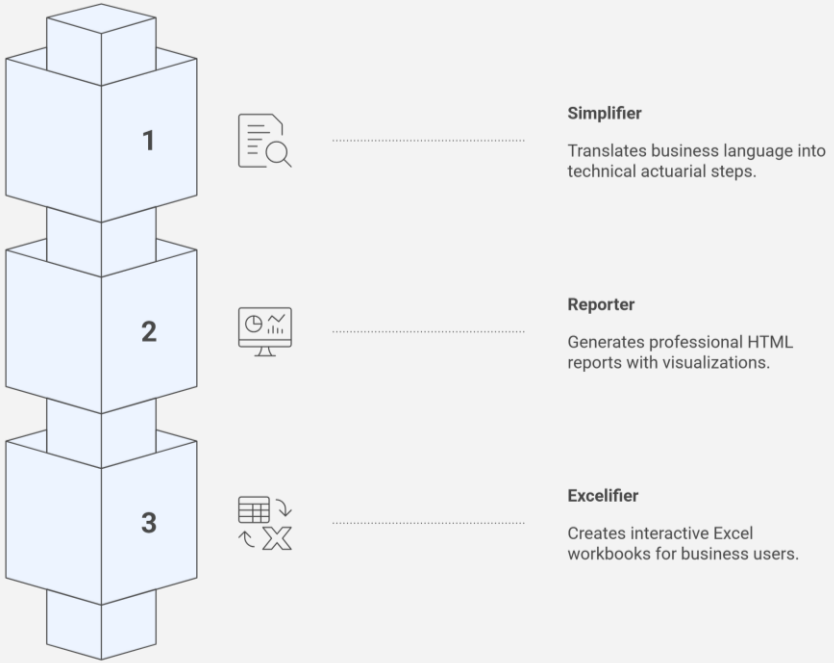
# 03

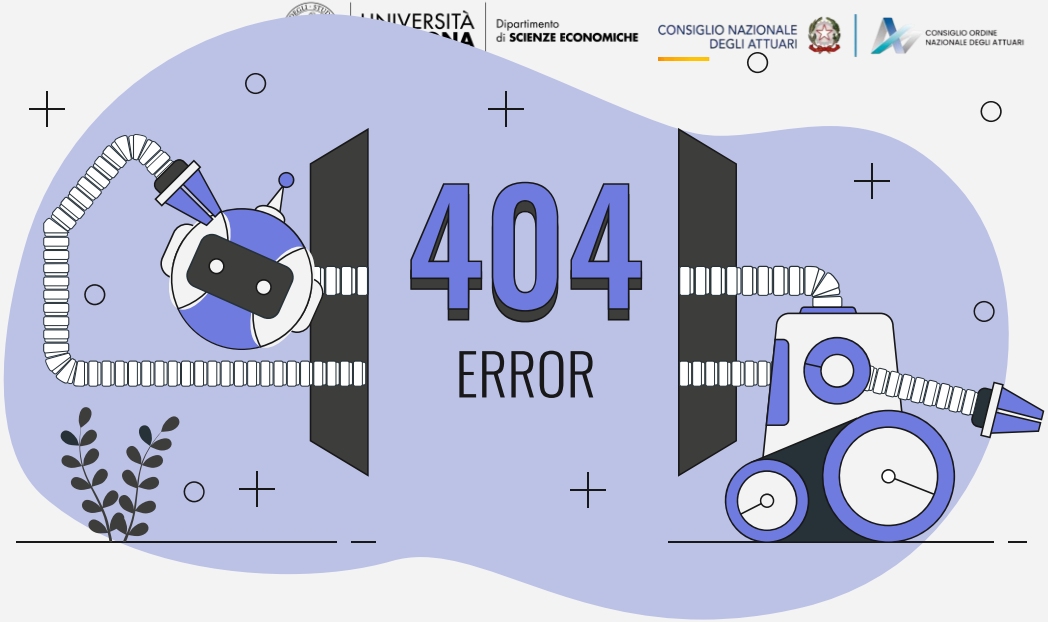
# Three-Model Architecture & LoRA Technology

# Why LoRa?



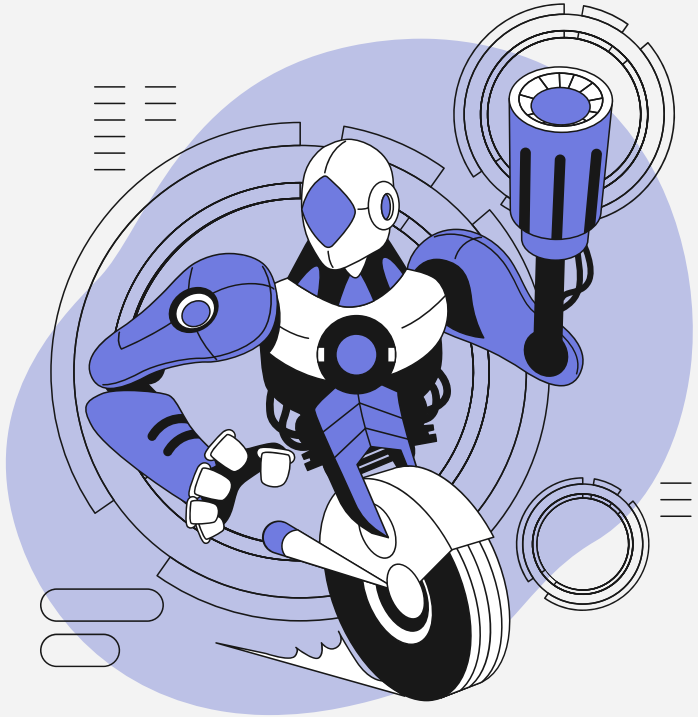

# How many LoRas?





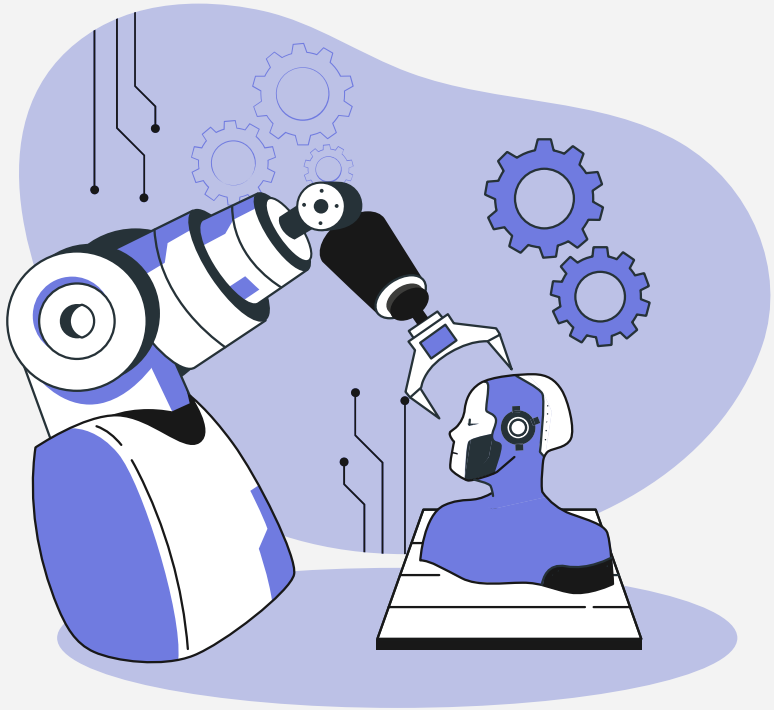

# 50,000

More than > **Actuarial** pages studied by AI



# 04

# Production Reliability & User Experience



# How to ensure reliability in AI code generation?

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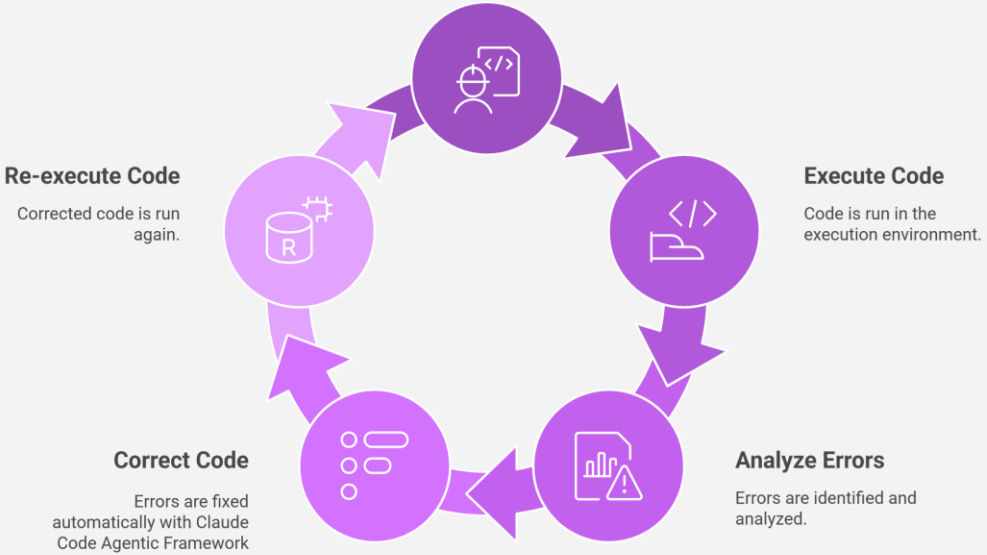
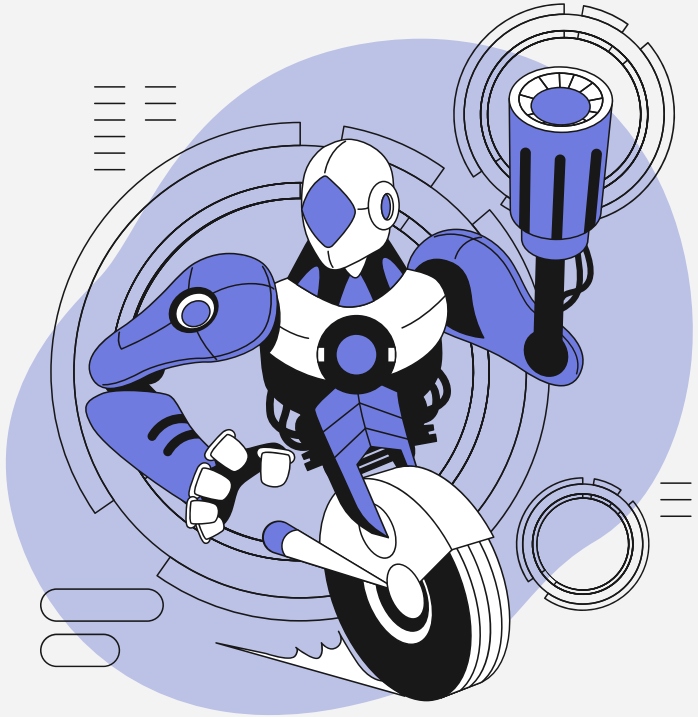
**Implement Agentic Framework**

Automatically analyzes and corrects errors, ensuring production-grade reliability.

**Rely on Human Intervention**

Requires manual analysis and correction, which can be time-consuming and less reliable.

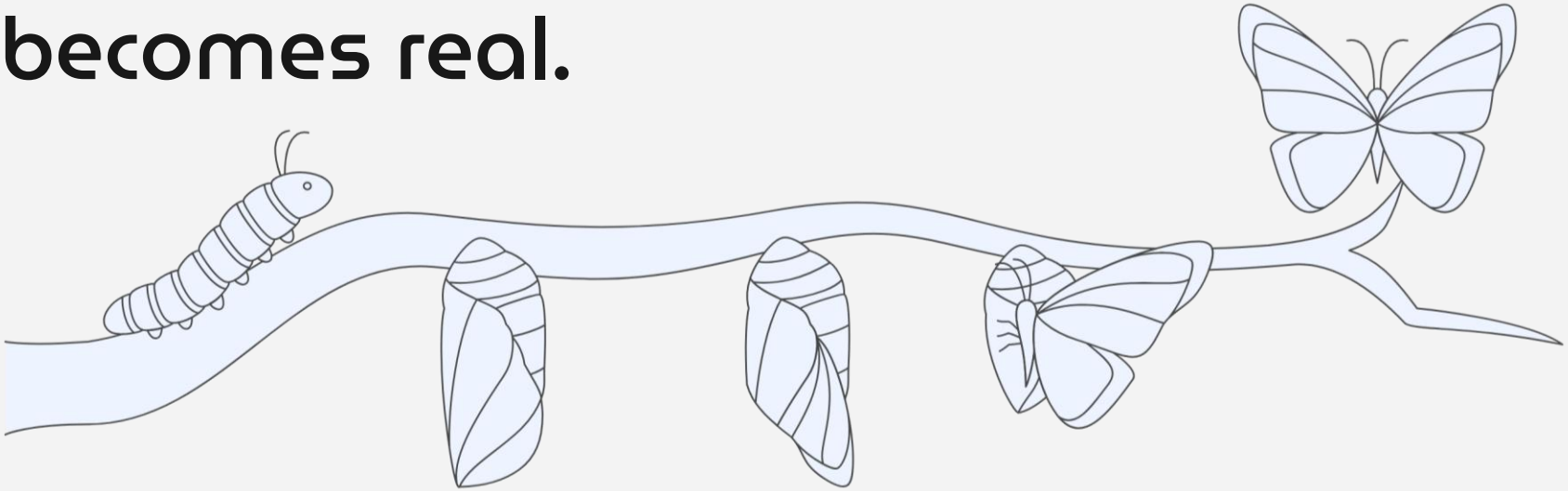




05

# Economics & Open Source Philosophy

# ...this is where democratization becomes real.



**Traditional ML**

High infrastructure costs, vendor lock-in

**Serverless Architecture**

Pay-per-use, auto-scaling

**Open Source**

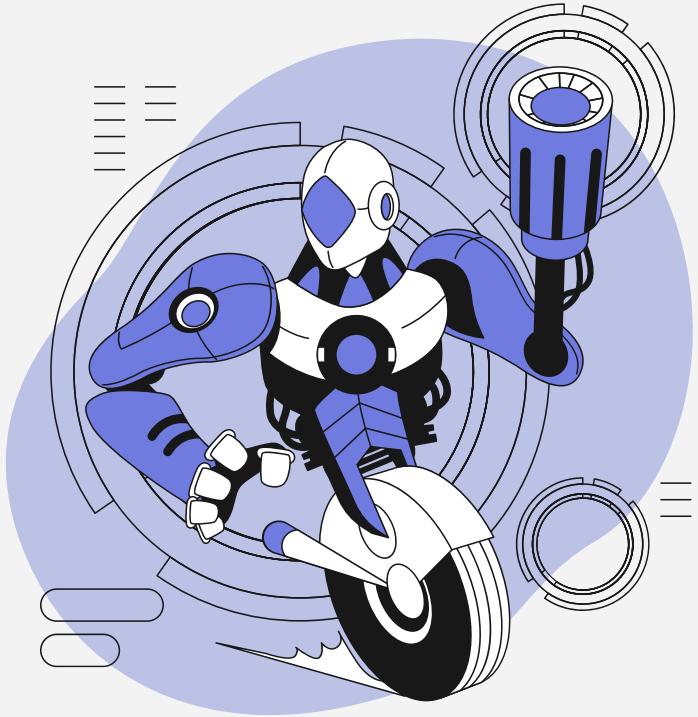
Community-driven, customizable

**Vendor Independence**

Deploy anywhere, switch providers

**Democratized AI**

Low cost, full control, community-driven



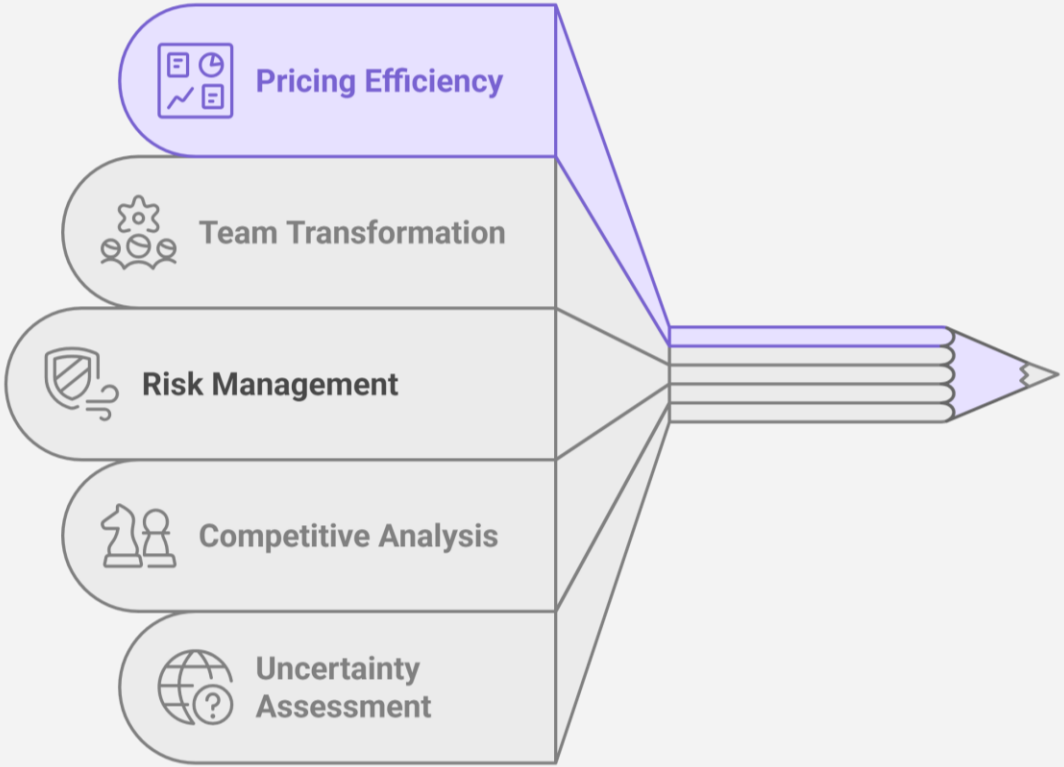
# 06

# Real-World Impact - Case Studies

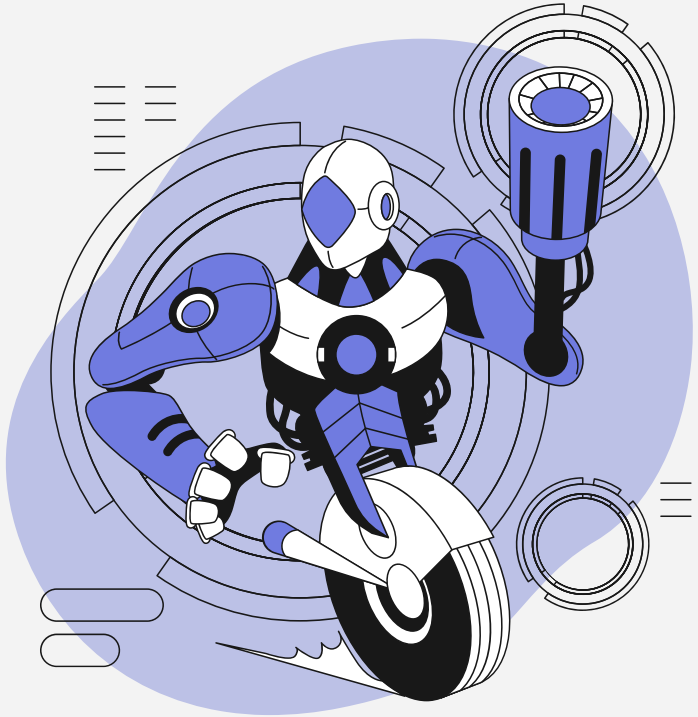
"We always overestimate the change that will occur in the next two years and underestimate the change that will occur in the next ten."

— Bill Gates

# Actuarial Team Capacity Before and After Automation



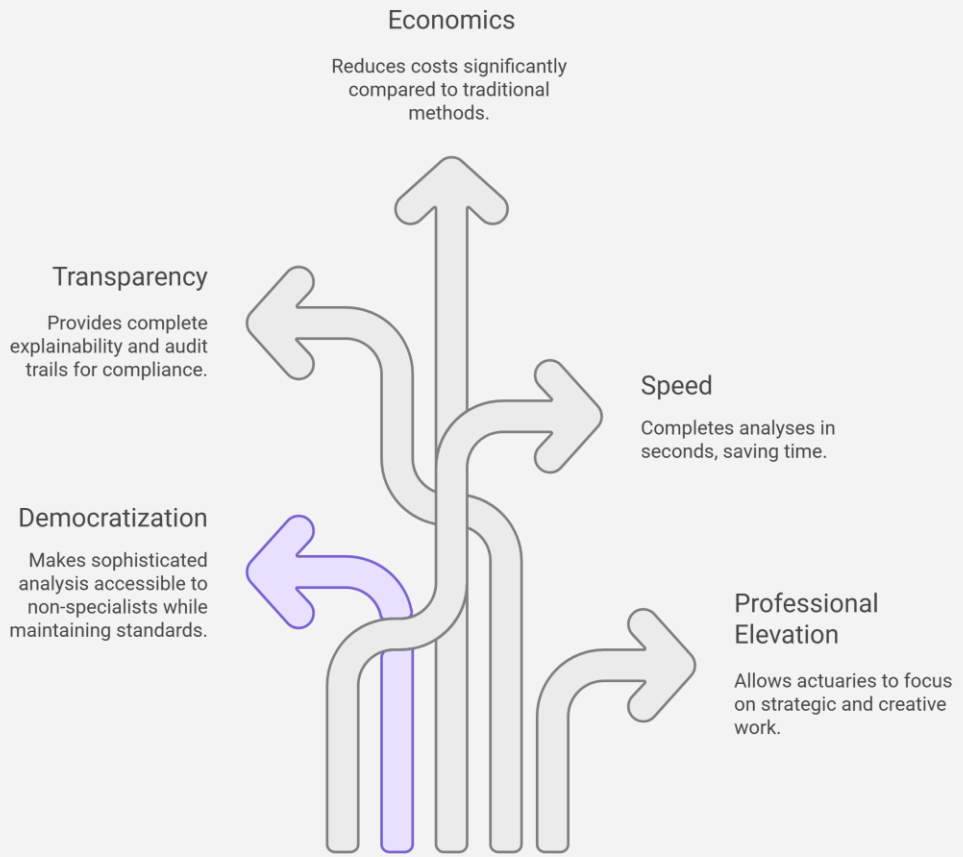
An actuary of Last Kind is coming...

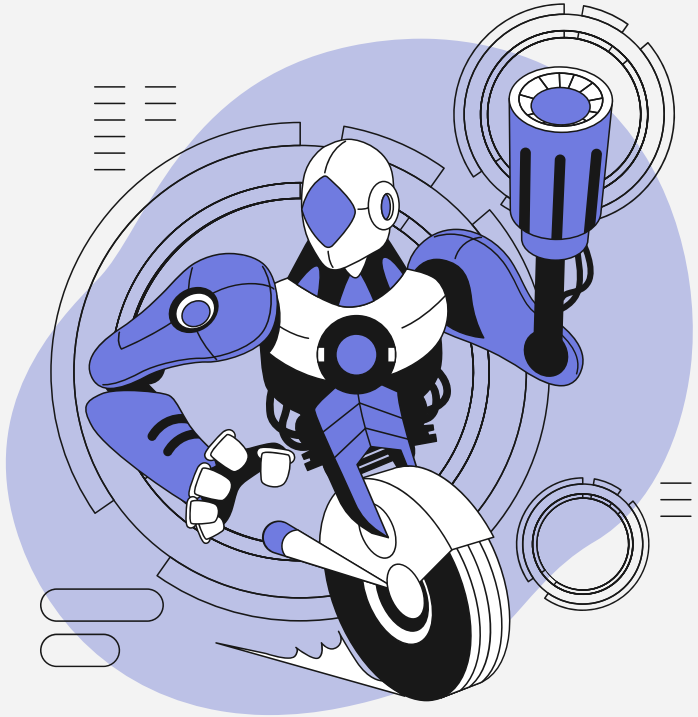


# 07

# Transparency, Compliance & Key Benefits

# How to enhance actuarial work through AI?





# 08

# Technical Innovation Summary

### Novel Training Approach

15,000 curated examples from authoritative actuarial literature across all major domains.

### Specialized Model Architecture

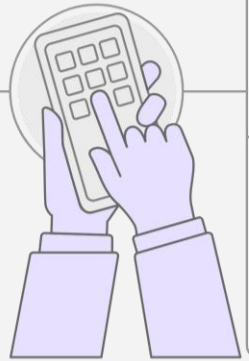
Three focused models rather than one generalist model, each optimized for its specific task.

### Agentic Validation

Automatic error detection and correction without human intervention, enabling production-grade reliability.

### Multilingual Support

Native actuarial reasoning in 8 languages covering 90%+ of global actuaries.



### Chain of Thoughts Methodology

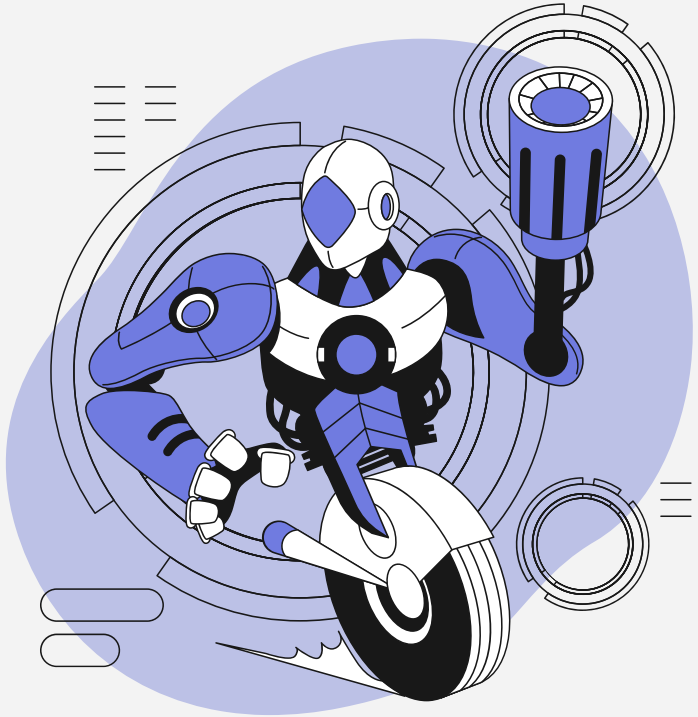
Generates the reasoning process that experienced actuaries use, making the output explainable, auditable, and trustworthy.

### LoRA Efficiency

Efficient fine-tuning through Low-Rank Adaptation, resulting in smaller models, faster training, lower costs, and greater modularity.

### Serverless Deployment

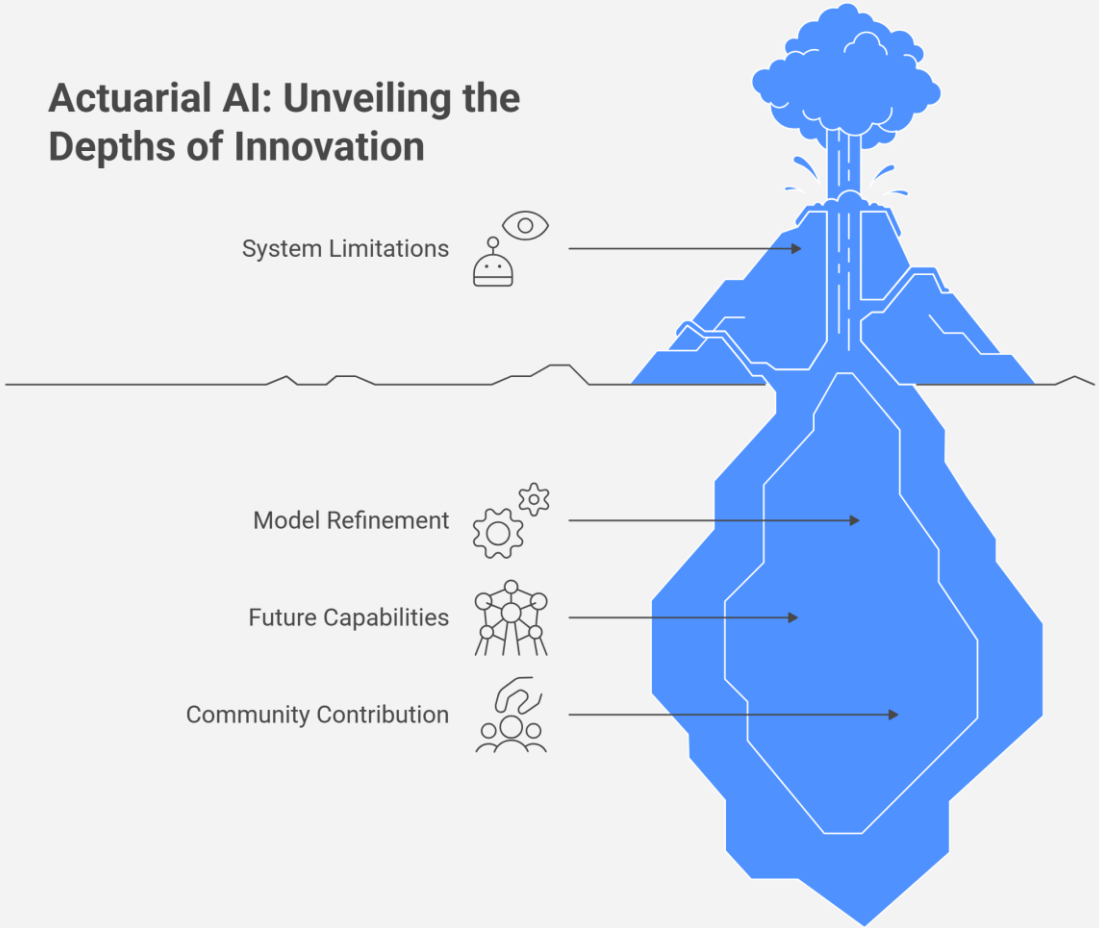
Pay-per-use economics, auto-scaling, and no vendor lock-in through Docker containerization.



# 09

# Limitations, Future Work & Call to Action

# Actuarial AI: Unveiling the Depths of Innovation

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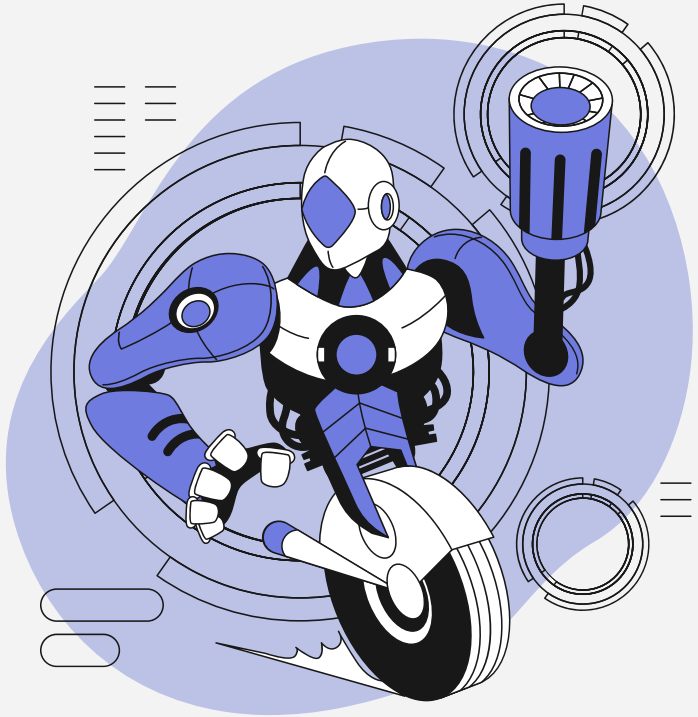

# 10

# Conclusions

### Train AI Models

Develop AI models using actuarial literature

### Improve Business Outcomes

Achieve better results through AI

### Democratize Access

Make AI tools accessible to all

### Enhance Actuarial Work

Free actuaries for strategic tasks

# Thanks!

## Do you have any questions?

**I'm going to publish everything I showed, stay tuned!**

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