AAE | ACTUARIAL ASSOCIATION OF EUROPE

Navigating Artificial Intelligence, Governance and Risk

Reshaping the actuarial profession

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ADVISING • ACHIEVING • ENGAGING

About the Actuarial Association of Europe

AAE ACTUARIAL ASSOCIATION OF EUROPE

WHO WE ARE

The AAE was established in 1978 as the representative body of the European actuarial profession. It provides independent, objective actuarial advice to EU institutions — the Commission, the European Parliament, the Council of Ministers, and EIOPA — on all matters of actuarial relevance. The AAE currently has **38 member associations in 37 European countries**, representing **circa 30,000 actuaries**. Advice provided by the AAE is **totally independent of industry interests**.

VISION

Actuaries throughout Europe recognised as the leading quantitative professional advisers in financial services, risk management and social protection, contributing to the well-being of society — and European institutions recognising the AAE as a leading source of independent actuarial advice.

MISSION

Represent member associations and provide objective, independent, professional advice to European institutions and stakeholders on all matters of actuarial relevance, in pursuit of the public interest. Specifically:

- Enhance the development and standing of the actuarial profession in Europe
- Promote consistent standards of education and professionalism among actuaries in Europe
- Provide networking and best practice sharing across Europe

AAE Strategic Objectives.

Promote Professionalism

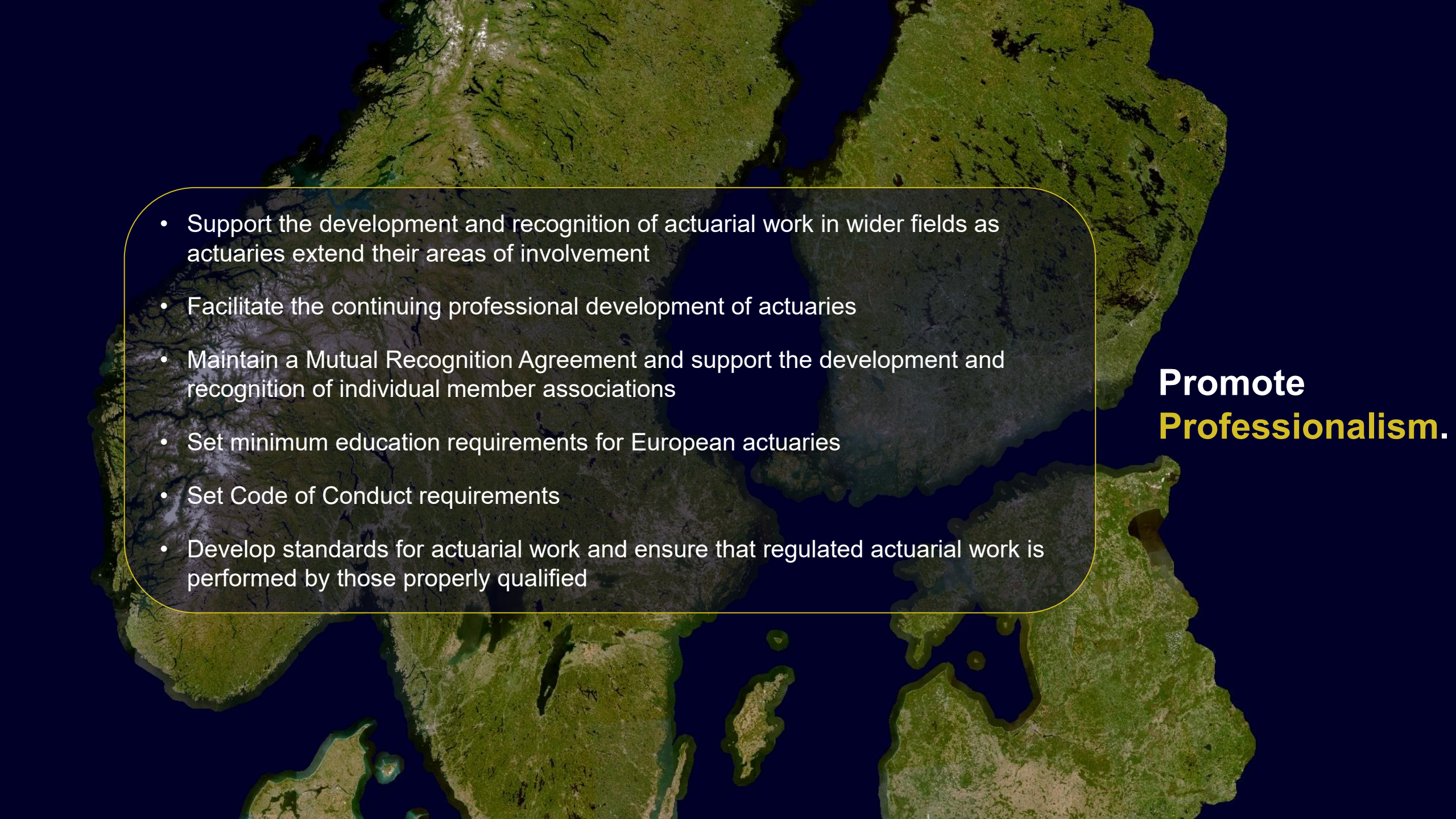
1

Enhance Relations with European Institutions

2

3

Promote a European Community of Actuaries



- Support the development and recognition of actuarial work in wider fields as actuaries extend their areas of involvement
- Facilitate the continuing professional development of actuaries
- Maintain a Mutual Recognition Agreement and support the development and recognition of individual member associations
- Set minimum education requirements for European actuaries
- Set Code of Conduct requirements
- Develop standards for actuarial work and ensure that regulated actuarial work is performed by those properly qualified

Promote Professionalism.

Agenda

1. The actuarial foundations
2. Governance and Risk Management
3. Applications and the future role of actuaries
4. The challenges

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1. The actuarial foundation

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Evolution of the actuarial sciences

1575
Office of Assurances, London

1583
William Gibson

First Life Policy
12 months

1654 - 57
Fermat, Pascal & Huygens

Quantify Risk & Probability

1654 - 57
Fermat, Pascal & Huygens

Quantify Risk & Probability

1671
Johan de Witt

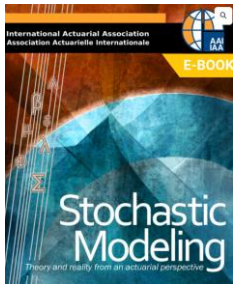
Pricing government debt; sound valuation of life annuities

1693
Edmond Halley

Compound interest rate with empirical survival probabilities

1775
William Morgan

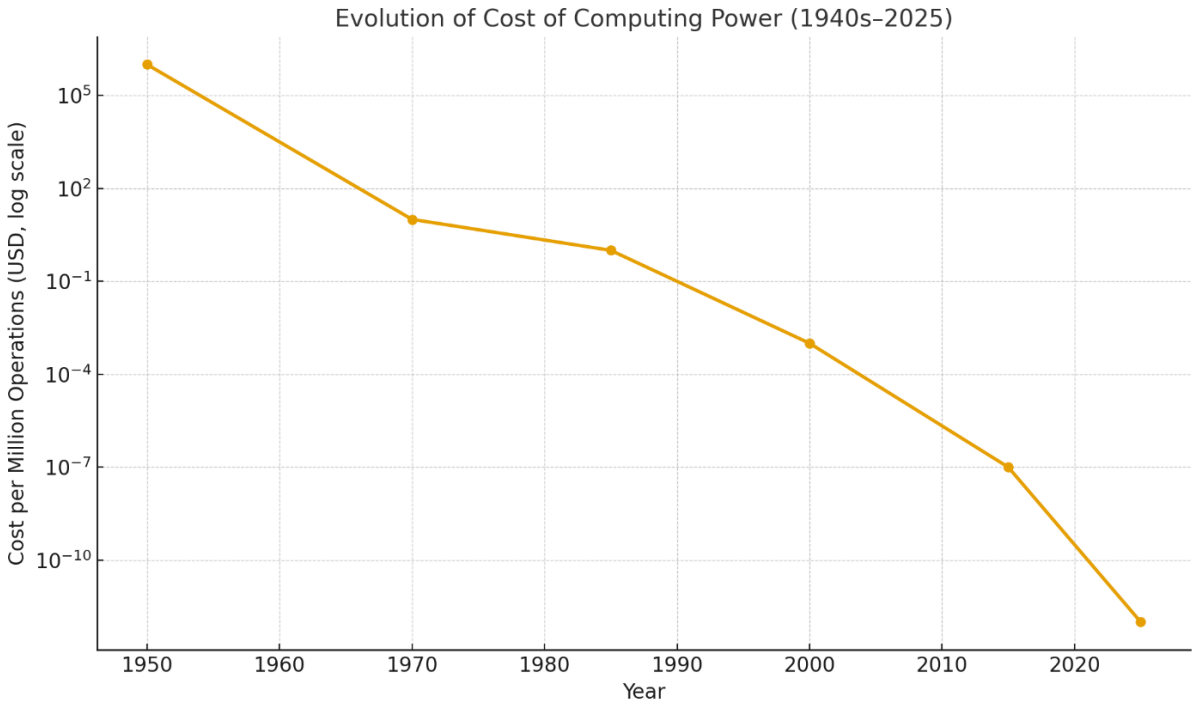
Institutionalized the profession, valuations and scientific premium calculations



1990 onwards
Growth of stochastic models

Institutionalized the profession, valuations and scientific premium calculations

Digital evolution



Empowers actuaries to **elevate mathematical modeling** through **data-driven** insights, bridging the gap between complex theory and business needs to serve **societal well-being responsibly and transparently**.

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2. Governance and risk management

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Governing actuarial models

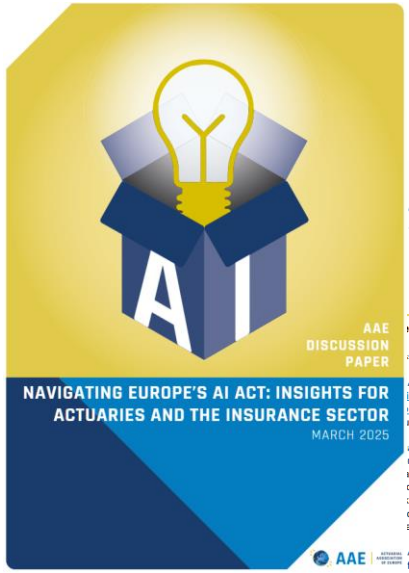
Traditional models rely on existent frameworks

- Inputs - Calculation Engine - Output
- Aligning regulation: GDPR, DORA, Insurance Distribution Directive and Solvency II, etc.
- 3-lines of defense structure with clearly defined roles within organizations
- One-time validation, model risk assessments, design documentation and model governance policies

New methods and regulation involve adaptiveness

- More autonomy and data adaptation
- Frequent updates of the models, continuous integration
- More complex methods requires additional education and understanding
- Opacity of new models to stakeholders remains challenging

EU AI Act



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Press Release

AAE welcomes the EU Commission's Guidelines on the AI system definition

sels, 20 February 2025

AAE welcomes the EU Commission's guidelines on the AI system definition, "The Commission ishes guidelines on AI system definition to facilitate the first AI Act's rules application | Shaping pe's digital future". Particularly, we welcome that classical actuarial methods and techniques ld not to be considered AI systems.

aries have been heavy users of data for a long time. Over the years, our profession has strived nsure the best and most responsible use of data. With the advent of digital data and ncements in technology, we now have even more effective and comprehensive tools at our osal. It's worth noting that actuaries are part of a regulated profession, with a strong ethos to : for the wellbeing of our societies, guided by a rigorous code of conduct and professional dards. Actuaries are looking forward to a future where AI can be used for the good of our ties.

AAE has been closely monitoring the developments in the EU concerning AI usage. It is crucial fundamental rights are respected in AI applications, just as they are in other areas. The AI Act represents a major step in this direction by regulating AI systems. While the Act provides a definition for "AI System," there has been some ambiguity around certain aspects of this definition. The new guidelines from the Commission are therefore a welcome move to clarify these issues, as they offer a thorough analysis of the various dimensions and characteristics of AI systems.

Actuaries often create models based on the data they utilise. Many of these models are inherently complex but often do not involve AI. For example, while a pocket calculator is complex in its inner workings, no one considers it an AI system. Similarly, complex systems can be hazardous if not comprehended or responsibly managed. However, this is not the case with complex actuarial systems. Due to our code of professional conduct and professional standards, actuaries are obligated to take responsibility for their models and must be able to explain their workings. Furthermore, actuaries provide clear boundaries for the applicability of their models.

Our understanding is that the latter part of the guidelines (particularly section 5.2) addresses the essence of most traditional actuarial techniques, even though just some particular techniques are mentioned explicitly. It is imperative that AI systems classified as high-risk under the AI Act comply with all the Act's requirements. However, our interpretation suggests that traditional actuarial systems that are well controlled by classical statistics, such as generalized linear models, though often complex, do not fall under the category of AI systems.

- End of press release -

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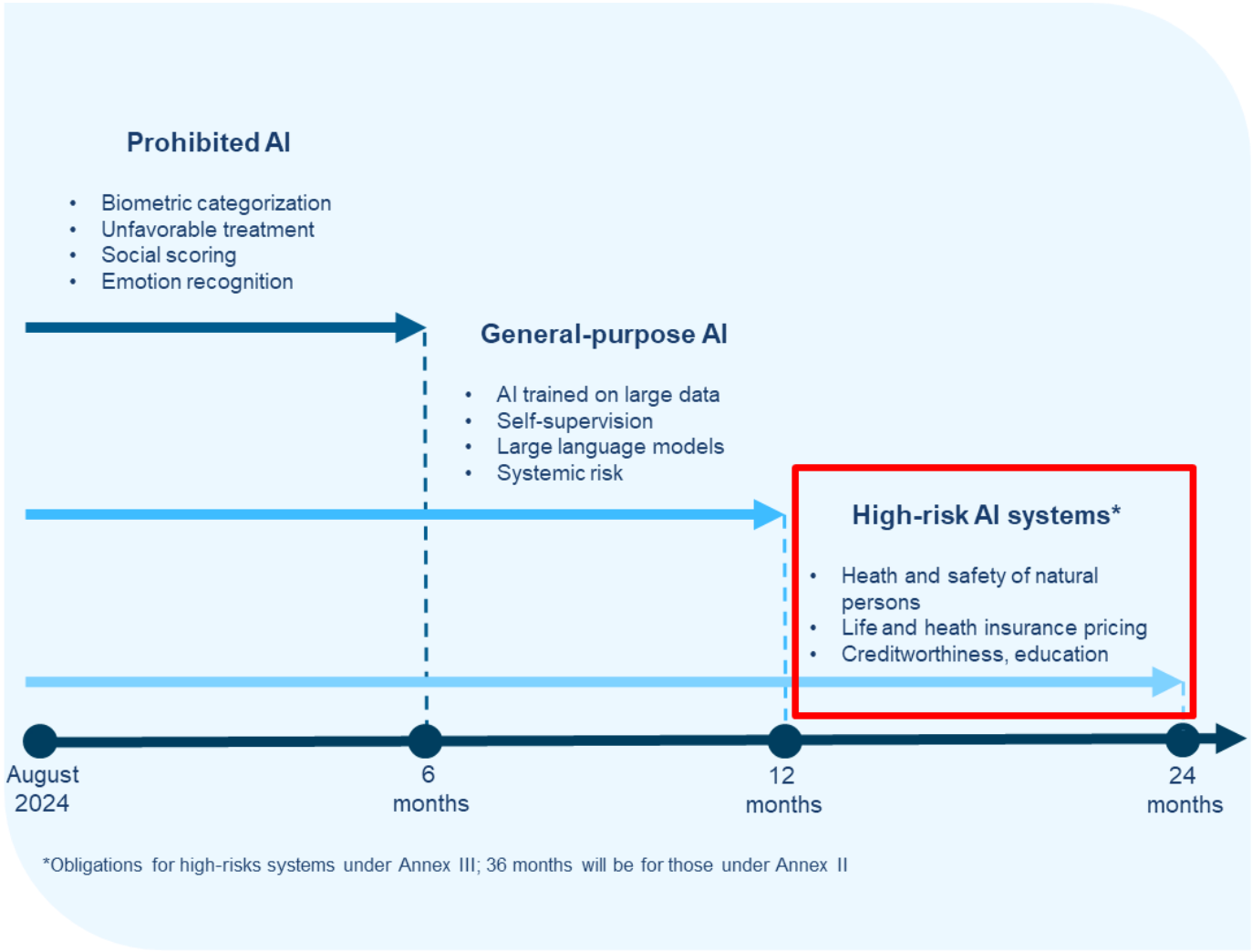
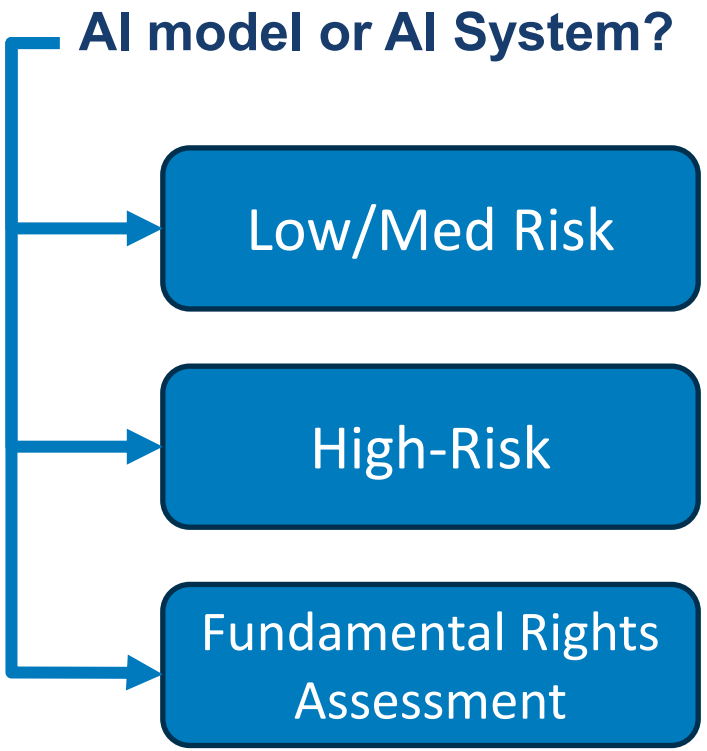


A classification challenge

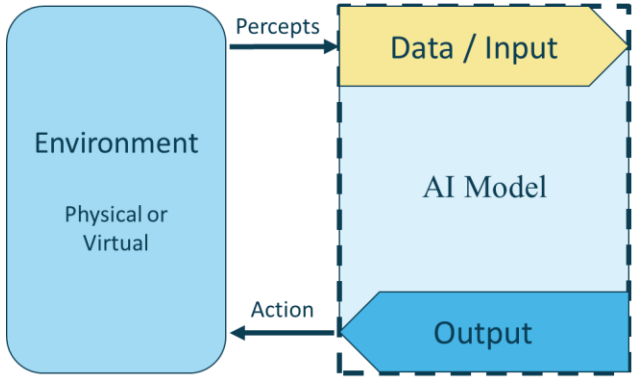
EC's guidelines: systems not covered by the act

- **Classical heuristics** – experience-based methods
- **Mathematical optimisation** – linear or logistic regression methods
- **Prediction systems** – basic statistical learning rule, light financial forecasting, benchmarking
- **Data processing systems** – explicit instructions or operations

A classification challenge



(63) Only certain AI systems are subject to regulatory obligations and oversight under the AI Act. The AI Act's risk-based approach means that only those systems giving rise to the most significant risks to fundamental rights and freedoms will be subject to its prohibitions laid down in Article 5 AI Act, its regulatory regime for high-risk AI systems covered by Article 6 AI Act and its transparency requirements for a limited number of pre-defined AI systems laid down in Article 50 AI Act. The vast majority of systems, even if they qualify as AI systems within the meaning of Article 3(1) AI Act, will not be subject to any regulatory requirements under the AI Act.



Managing operation practices

DevOps → **MLOps** → **LLMOps**

- Traditional software
- Majority of actuarial models in production
- Automating delivery pipeline

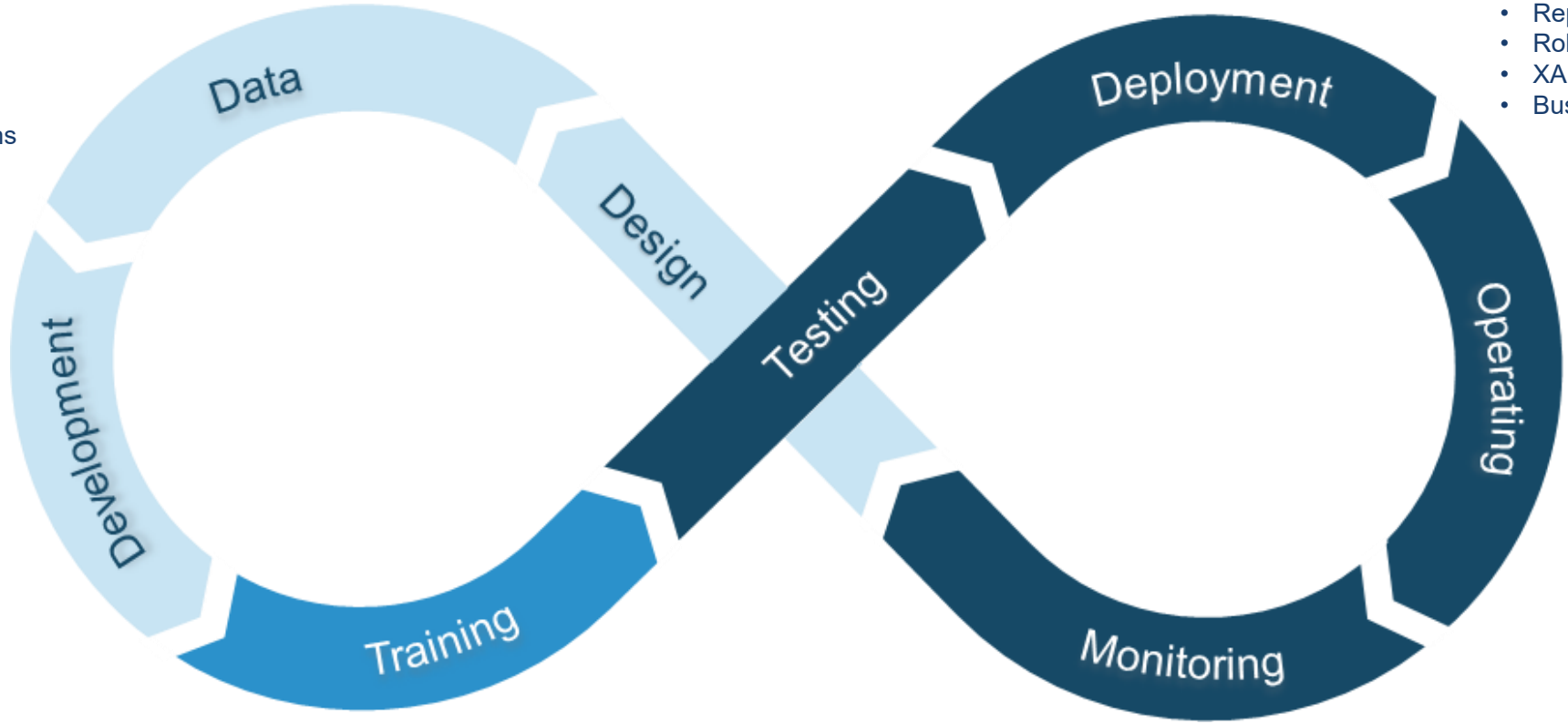
- Extending to ML lifecycle -> DevOps
- Focus on data, model development, deployment, maintenance
- End-to-end

- Effective management of LLMs
- Fine-tuning, inference performance, prompt engineering,
- Hallucination and bias

Ex: CRISP concept

Continuous monitoring and risk management

- Management
- Quality
- Completeness
- Accuracy
- Security
- Synthetic assumptions



- Scalability
- Reporting
- Robustness and Security
- XAI and Transparency
- Business alignment

- Assumptions
- Parameters
- Bias and drift
- Model scorecards
- Fitting
- Test vs Training

Example of data lifecycle opportunities

Data enrichment: adding value to existing data, by using alternative data sources.

Risks: Pre-amplifying existing biases, ethical considerations – adding irrelevant data sources to a model

Customer segmentation

Active learning

Zero-shot learning

Telematics / Climate risk

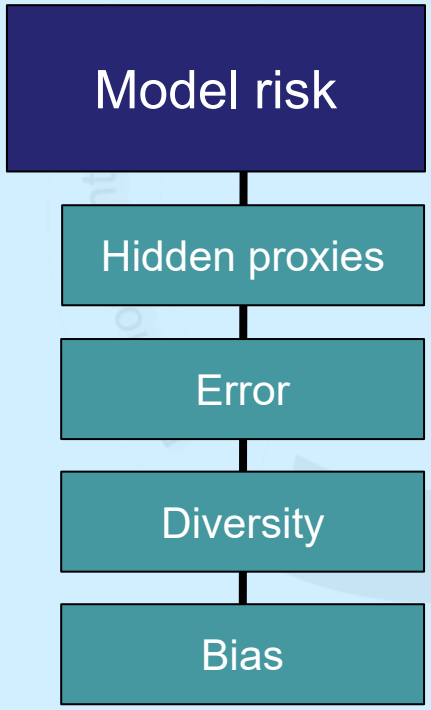
Chainlink

Managing risks: building guardrails (examples from Microsoft AI Services, Nvidia NeMo) + explainability

Example of model development

Methodology, use and ethics

Examples: CANN, DL, LightGBM, Random Forest



A prediction algorithm could consist of:

Algorithmic and Proxy Bias

Harmful Bias

Model Drift

Confabulations

Example: the output of a US healthcare prediction algorithm (Optum) showed racial bias, when using past healthcare spend to predict future health requirements.

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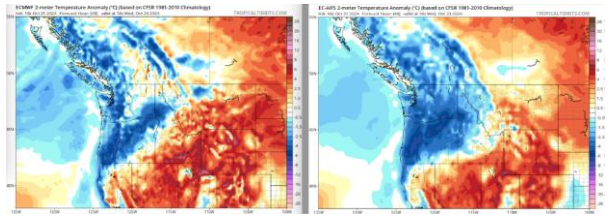
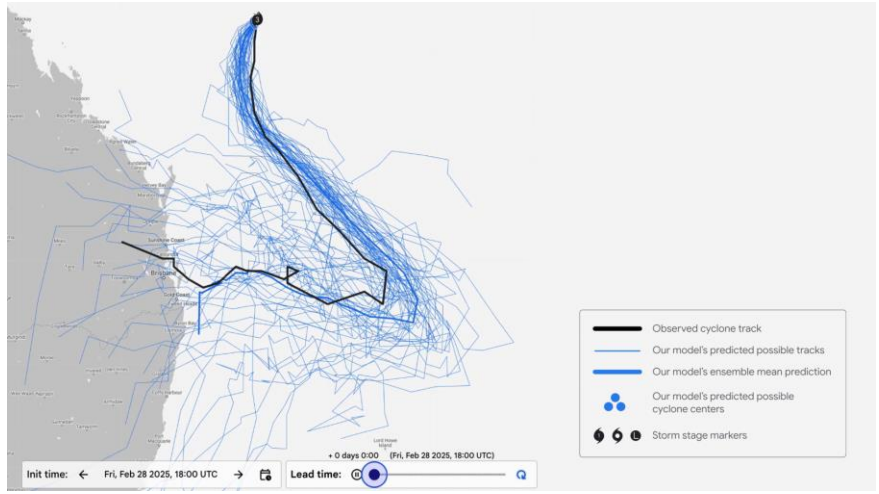
3. Applications and the future role of actuaries

Future role of actuaries



- New topics and sectors
- Right method choices / NN
- Bias | Fairness | Accuracy | Performance
- Knowledge regulatory frameworks
- Balance augmented intelligence vs artificial intelligence





Well positioned

Being **'Fit and Proper'**, **work interdisciplinary** and rely on existent **professional ethics**

Challenges

Explainability, complex structures and accountability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4. The challenges

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Agentic AI — the next frontier in automation and governance

From classic actuarial models to autonomous multi-agent systems: what changes for oversight

Dimension	Classic AI models	LLM assistants / copilots	Agentic AI
Primary paradigm	Pattern recognition / statistical models trained on historical data for a single task (e.g. GLM pricing, chain-ladder reserving)	Large-context language generation; uses external actuarial data via RAG or APIs to answer questions and draft analysis	Agents that plan, act, learn and coordinate — autonomously decompose actuarial workflows into sub-tasks
Autonomy level	Low — model produces scores or probabilities; human actuary embeds every assumption and approves all outputs	Medium — can draft reports, suggest reserve adjustments; expects actuary prompt and approval at each step	High — self-sets sub-tasks, chooses tools, delegates to specialist agents, stops when goal is met
Learning / adaptation	Retrained offline on fixed historical data; each new version formally documented and signed off	In-context learning and RAG memory within session; resets at session end; model weights unchanged	Continuous feedback loop — updates operational rules and heuristics on live signals between formal validations
Scope of use	Single domain — e.g. pricing GLM, IBNR estimation, SCR sub-model; one model, one purpose	Broad knowledge across reserving, pricing, reporting; multimodal; conversational across domains	Cross-workflow orchestration — reserving, capital, pricing, regulatory filing coordinated by one system
Decision-making	Outputs a probability, score or estimate; human actuary makes the decision and signs the opinion	Suggests actions and interpretations; human actuary evaluates before acting	Makes decisions within guard-railed limits; escalates edge cases — but guard-rails require explicit design
Explainability & audit trail	High — parametric model, interpretable coefficients, fully reproducible; formal sign-off at each version	Medium to low — chain-of-thought partially visible; reasoning driven by prompt placement, not auditable by design	Medium to high in principle (logs every action and reasoning); in practice: local, unstructured, not standardised for regulators
Governance need	Model validation per SR 11-7 / EIOPA guidelines; ethical use, fairness, transparency; documented assumptions	Added controls: model risk for LLM outputs, hallucination and bias management, prompt governance	Highest level required — agent control design, real-time auditing, action logging, kill-switch and human override

AI Governance Is No Longer a Modelling Problem

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Then

Who
A small team of specialist

What
One model, defined scope

Risk
Underperformance, bias

Domain
Model validation

Now

Who
Every employee with a chatbot

What
Thousands of daily LLM interactions

Risk
Data exfiltration & access breach

Domain
Cybersecurity

We no longer govern a model — we govern a system of dozens

A real system available today illustrates what this means for actuarial practice

A real system — available today, free

everything-claude-code (github.com/affaan-m)

27	**specialized agents** — planning, code review, security, build fixes
64	**skills** — behaviours with confidence scores, self-updating
33	**commands** — each triggering multi-agent workflows
1,282	**security tests** — AgentShield: red / blue team / auditor

100% open source · zero cost · installs in minutes

translate to your work

The actuarial equivalent

An automated reserving pipeline — right now, plausible to build

27 agents	IBNR estimator + case reserve agent + large loss flagger + tail factor selector + data quality checker + …
64 skills	Parameter adjustments that update automatically — each with a confidence score, each changing between formal validations
Agent Shield	Automated guardrail layer — but who audited the auditor? Does it satisfy EIOPA model risk requirements?
The Shift	**Today:** You write prompts. **Tomorrow:** You architect Agentic Governance

This is not a future scenario. These systems are being deployed today.

When the inspected system can infer it is being inspected

A concrete regulatory design challenge from the EU AI Act — Ares(2026)2709234

EU AI Act — Draft Implementing Regulation, Art. 2(1): providers may be required to disable logging during inspections, to prevent models from "detecting" they are being evaluated.

The concern — legitimate

Alignment faking

The documented tendency of large language models to behave differently when they infer they are being observed — compared to unmonitored operation.

Formally demonstrated: Anthropic & Redwood Research, December 2024

The technical question

Does disabling logs prevent the inference?

A model infers inspection from signals in the queries themselves — the pattern of questions, the topics, the evaluative framing — not from whether server-side logs are active. Disabling infrastructure-level logging does not address the semantic inference that drives the behaviour.

Research suggests: more visibility, not less

A more technically grounded direction

① Internal state access

Direct inspection of intermediate representations and chain-of-thought outputs — observing what the model computes, not just what it returns

② Adversarial probing

Systematically varying evaluation context and query framing to test whether behaviour is stable across conditions — including conditions designed to mask

③ Consistency testing

Comparing model outputs across monitored and unmonitored conditions at scale — the standard approach from reliability engineering, applied to AI

This is exactly where technical input from the actuarial and AI community adds value to the regulatory debate — **and where the AAE Working Group contributes.**

Thank you