Society of Actuaries in Ireland

Data Science forum

Ger Bradley (he/him), Chair DS Committee

13th June 2024

Disclaimer

The views expressed in this presentation and all subsequent presentations today, are those of the presenter(s) and not necessarily those of their employer(s) (if any) or the Society of Actuaries in Ireland.

Housekeeping

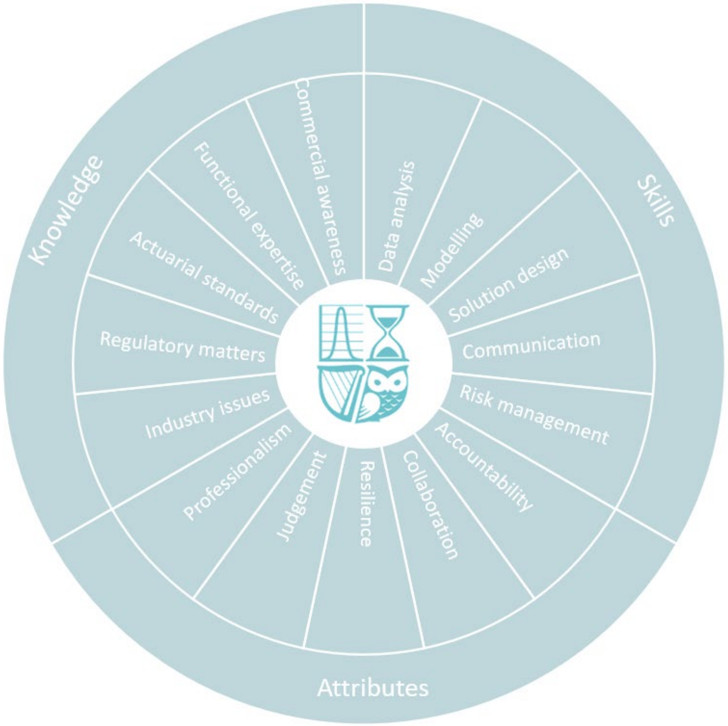
Sign-In Sheet

[Name] Meeting

[Date] [Time] [Location]

Name – Print	Role – *principal, teacher, parent, etc.*	Signature

Competency Wheel



Skills

- Data analysis
- Modelling
- Solution design
- Communication
- Risk management

Attributes

- Accountability
- Collaboration
- Resilience
- Judgement
- Professionalism

Knowledge

- Industry issues
- Regulatory matter
- Actuarial standards
- Functional expertise
- Commercial awareness

SAI Strategy 2024 to 2026 – Areas of Increased Focus

Connection and Engagement

Profile and Reputation

AI Data Science

Education and Professional Development

Public Interest

QUOTE OF THE DAY, NEW YORK TIMES, AUGUST 5, 2009

- ”I keep saying that the sexy job in the next 10 years will be Data Scientist.”
- HAL VARIAN, chief economist at Google.
- Was he right?
- Nearly!

2024:Introduction to the current Data Science Committee

1. Ger Bradley (Chair)
2. Bence Zaupper (Deputy Chair)
3. Alan McDonagh
4. Aaron Mcglone
5. Anita Subramani
6. Brian Cunningham
7. Clare Reidy
8. Conor Cronin
9. Dara Roberts
10. Donal McGinley

1. Eilish Bouse
2. Grainne Mcguire
3. Hani Ghulam Abbas
4. Jack Harrington
5. James Bredin
6. Jean Rea
7. Jennifer Loftus
8. Kate Barry
9. Kate Bell
10. Laura Higgins
11. Laura Rossi

1. Luke Gaughan
2. Marian Keane
3. Noman Zafar
4. Octavio Palomo Sanchez
5. Pedro Ecija Serrano
6. Priya Mantri
7. Ramona Dolan
8. Robert Murphy
9. Sinead Heavey
10. Stephen Brennan

Data Science Sub-Committees

1. Regulation and professional Standards (Marian Keane)
2. Communication (Robert Murphy)
3. CPD (Laura Rossi)
4. Study Groups (Bence Zaupper)
5. Newsletter/Blogs (Kate Barry)
6. Consumer Protection and Public Interest (Kate Bell)

First SAI Data Science Newsletter

Society of Actuaries in Ireland

Data Science Committee Newsletter

May 2024

Introduction

Dear all,

The Data Science sub-committee (as it was originally) was founded with the primary goal of enabling our

A series of sub-groups have been created to achieve this and to ensure that actuaries are recognised for their technical skills and not just business acumen. It is

Moreover, we actively support initiatives aimed at fostering inclusivity and diversity within the data science community. Most notably, committee members have

WIDS: Datathon 2024 Challenge: Equity in Healthcare

Datathon Impact...

4,000	100	75%	90%
Competitors	Countries	Women	First-Timers

- Sponsor Gilead Sciences
- Rich data on metastatic breast cancer treatment
- Providers, facilities, and patients.
- Objective: to identify possible inequities in patient care

- The Women in Data Science Dublin Regional Conference (Eventbright)
- Friday 21st June in UCD.
- Speakers include three members of the SAI community
  - Mary Coghlan (EY); Michelle Aw (Réitigh Software); and Jennifer Loftus Acorn.
- Tickets only €10
- ALL GENDERS ARE WELCOME!!!

Agenda

Title	Company	Speakers
Intro	DS Comm Chair	Ger Bradley
(Introduction to) The EU AI Act – New opportunities for actuaries in the second-line?	Forvis Mazars	Gary Stakem, David O'Sullivan
A Day in the life of an Actuary with AI co-pilots	KPMG	Jean Rea, Stephen Brennan, Tomasz Gagola, Iliana Simova
Insurance Claims Fraud Detection using Machine Learning and Deep Learning AI models	Deloitte	Graham Crowley, Dr.Pranav Sai S R
Transforming L&H Underwriting & Claims with Gen AI – where do we stand?	SCOR	Vicky Gardner, Antoine Ly, Pierre Gilloury
		Coffee
A game of two halves: similarities and differences between 'old' AI and GenerativeAI"	WTW	Arlen Galicia Carreon, Vatsal Gomber
Looking back to look forward: Data Science and AI's role in the Health sector"	EY	Mary Coughlan, Luke Gaughan
Results of survey and comparison to South Africa	DS Comm	Kate Bell
Panel Discussion	President Elect TUD KPMG Deloitte Freelance	Roz Briggs Prof Sarah Jane Delany Jean Rea Brendan Guckian Pedro Ecija Serano

Society of Actuaries in Ireland

The AI Act – Opportunities for Actuaries in the Second-Line

Gary Stakem (he/him) – Forvis Mazars
David O'Sullivan (he/him) – Forvis Mazars

13 June 2024

"Actuaries should be really excited about becoming compliance officers"

Who will champion innovation?

Risk	Compliance
Internal Audit	External Audit
Boards	Regulators

The compliance function will need diverse skills

Compliance & legal skills	Consumer protection knowledge	Coding & machine learning
Cyber security	Actuarial science	Commercial nous
Business & economic environment	Holistic insurance management	Project management & influence

Actuaries can enable well governed AI

Risk

Compliance

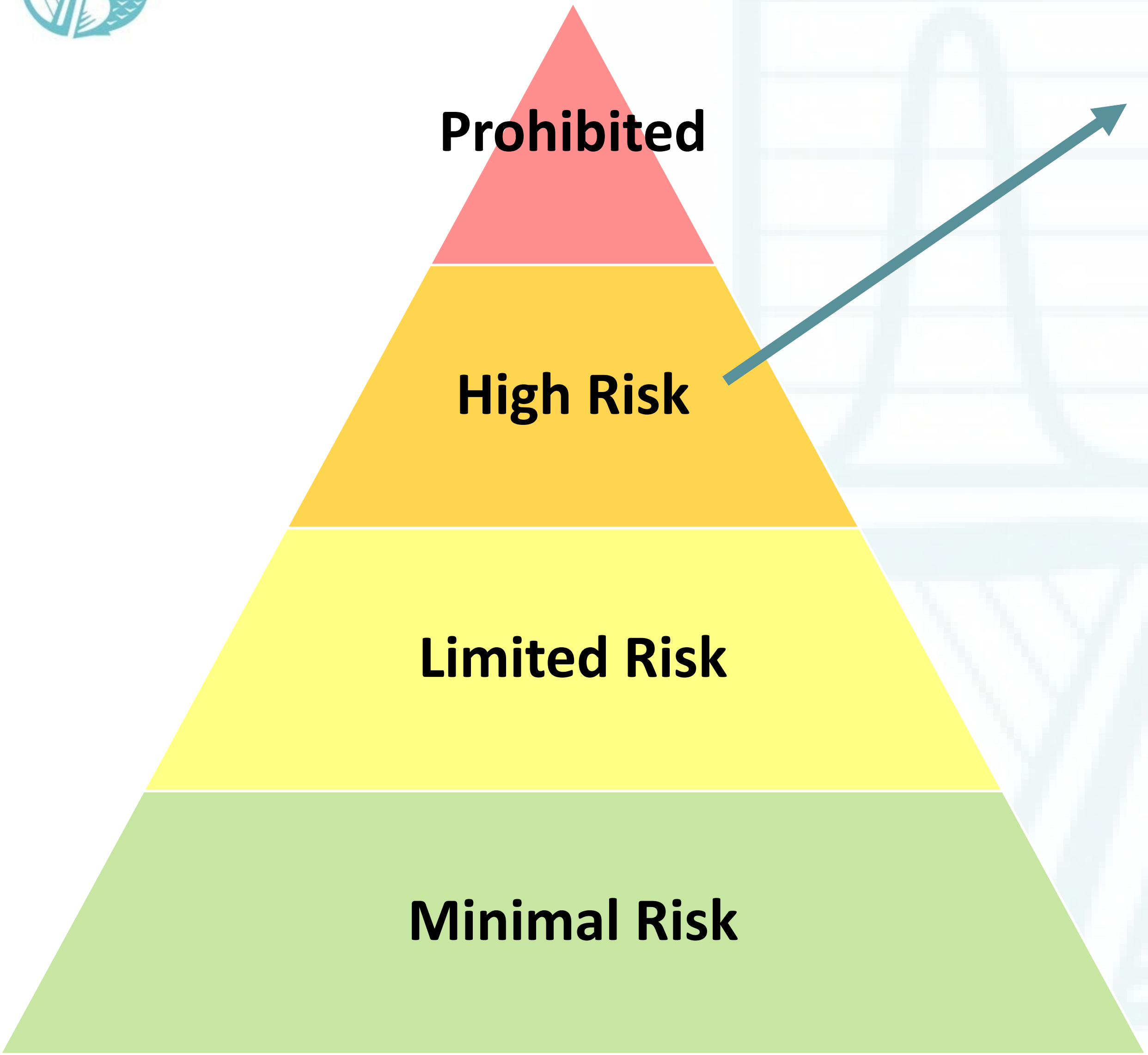
Internal Audit

External Audit

Boards

Regulators

AI Act – Risk Management Systems



Chapter III Section II: Requirements for High-Risk AI Systems (Articles 8 to 15)

- Art 9 – Risk Management Systems
- Art 10 – Data and Data Governance
- Art 14 – Human Oversight
- Art 15 – Accuracy & Robustness

The Compliance Actuary requires a broad skillset

Know related regulation

GDPR | Solvency II | Insurance Distribution Directive | DORA | Digital Services Act | Consumer Protection Code | Differential Pricing

Learn Coding & ML Fundamentals

Python, R, SQL |ML models & architecture | XAI techniques

Influence & Communication

Understand risk & compliance frameworks

Compliance management | Data protection principles | Cybersecurity fundamentals

Develop broad stakeholder relationships

Sales | Underwriting | IT | Risk | Legal | Compliance | Claims

Actuaries can enable well governed AI

Risk

Compliance

Internal Audit

External Audit

Boards

Regulators

forvis mazars

The AI Act

Dec 2023

Agreement
Following marathon plenary sessions agreement was made between the houses

June 2024

Adoption
Adopted on 21st May, published in OJEU May/June and adopted 20 days after

Dec 2024

Unacceptable risk
Unacceptable risk systems are banned

March 2025

Codes of practice
EU AI Office is to published codes of practice mainly focusing on GPAI

June 2025

Regulator & GPAI
Notifying Authority and Market Surveillance Authority/Authorities must be appointed. Rules for providers of GPAI in place

June 2026

Enforced
All obligations are fully enforced!

Roles under the Act

Providers

Distributors

Operators

AI risk levels

Unacceptable risk

- Banned AI systems
- Includes systems that deploy subliminal techniques beyond a persons consciousness to distort behaviour or make decisions.
- Exploit vulnerabilities, infer emotions

High risk

- Listed in Annex III of the Act.
- Large amount of obligations
- Conformity test needed
- Includes credit assessments, **insurance pricing**, HR practices etc.

Limited risk

- Includes generative AI systems such as ChatGPT
- Also includes general purpose AI, or systems that may have a systemic risk on society
- Transparency and management requirements

Minimal risk

- Every other AI system
- No real obligations
- Monitor the system to ensure it does not adapt and fall into another category

High risk AI systems

High risk

- Listed in Annex III of the Act.
- Large amount of obligations
- Conformity test needed
- Includes credit assessments, **insurance pricing**, HR practices etc.

Biometrics

Critical infrastructure

Education

Employment

Public & private services

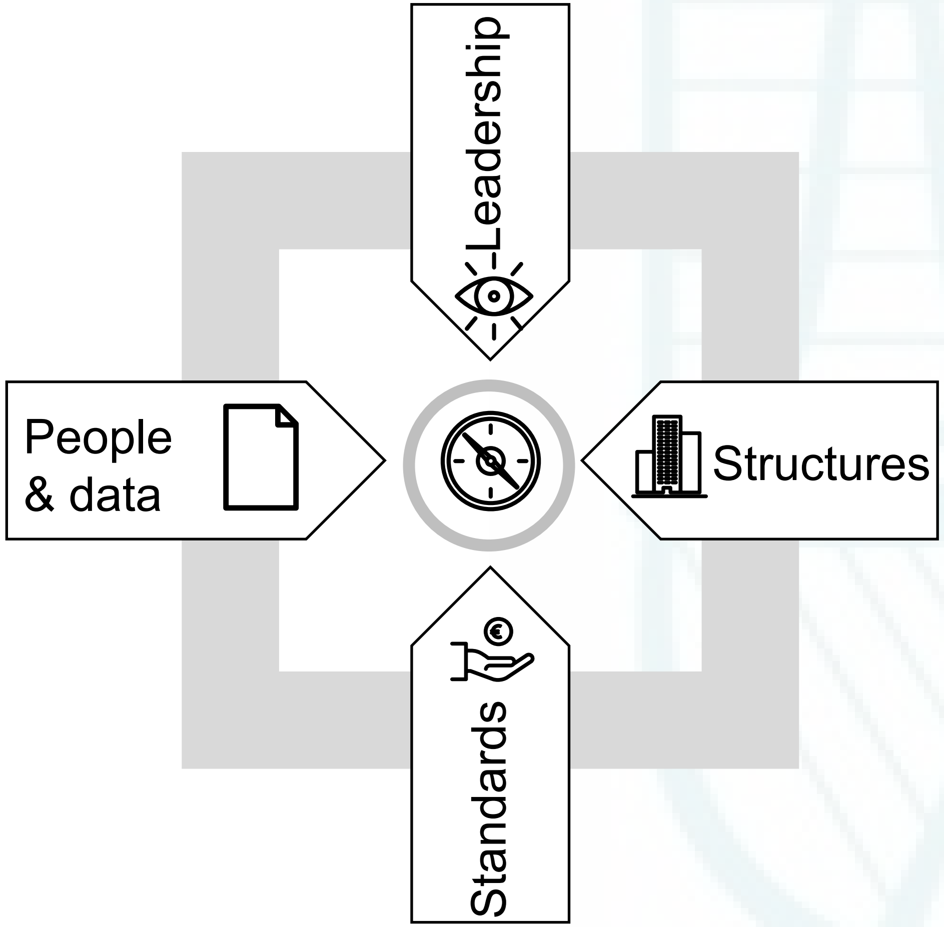
Law enforcement

Judicial system

Migration

risk assessment and pricing in relation to natural persons in the case of life and health insurance

Next steps



Act Fast

Move Slowly

Q&A

Please raise your hand to ask a question,
and wait for a mike to get to you

Society of Actuaries in Ireland

A day in the life of an actuary with AI copilots

Jean Rea (she/her), Iliana Simova (she/her)
& Stephen Brennan (he/him)

13/06/2024

With you today

Jean Rea

Partner, Consulting

jean.rea@kpmg.ie

Jean Rea
Partner at KPMG Ireland

Iliana Simova

Manager, Data Science

iliana.simova@kpmg.ie

Iliana Simova
Data Scientist | Natural Language Processing

Stephen Brennan

Manager, Actuarial

stephen.a.brennan@kpmg.ie

Stephen Brennan
Non-Life Actuary

A day in the life of an Actuary with AI copilots

- Integration of AI into our daily work
- In-house AI tools
- Q&A

Integration of AI into our daily work

Demonstration - Context

- **Request to develop an expert judgement log template.**
- **Template must meet the Central Bank's expectations**

Urgent: Completion of Internal Task and Project Overview: Client X

Summarize

KS

Khodake, Saurabh

To Brennan, Stephen

24/05/2024

Dear Team,

I hope this message finds you well. Before we delve into the details of our new project, I would like to remind everyone to complete the pending internal task related to our quarterly review. This task is of utmost importance and requires immediate attention.

Now, let's move on to our new endeavor involving a potential client, referred to as Client X for confidentiality purposes. Client X, a financial institution of considerable repute, operates within a complex regulatory environment.

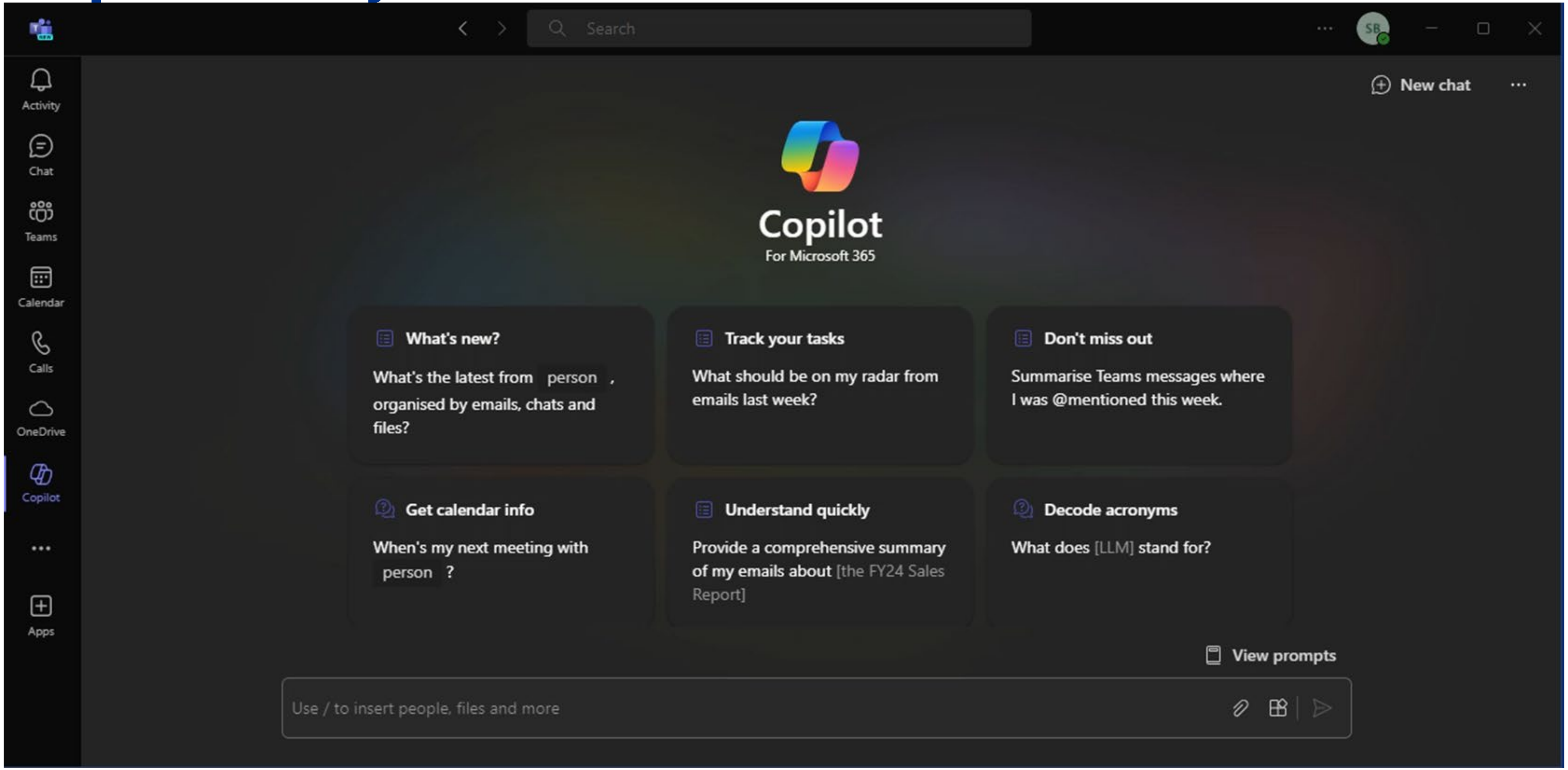
We have been entrusted with several significant tasks, each of which is crucial to the success of our project:

1. **Expert Judgement Log**: Develop a template for the Expert Judgement Log that aligns with the guidelines issued by the regulatory authority. This document is a critical part of actuarial documentation and must be user-friendly, easy to comprehend, and designed in such a way that it can be easily updated and maintained by Client X's team.

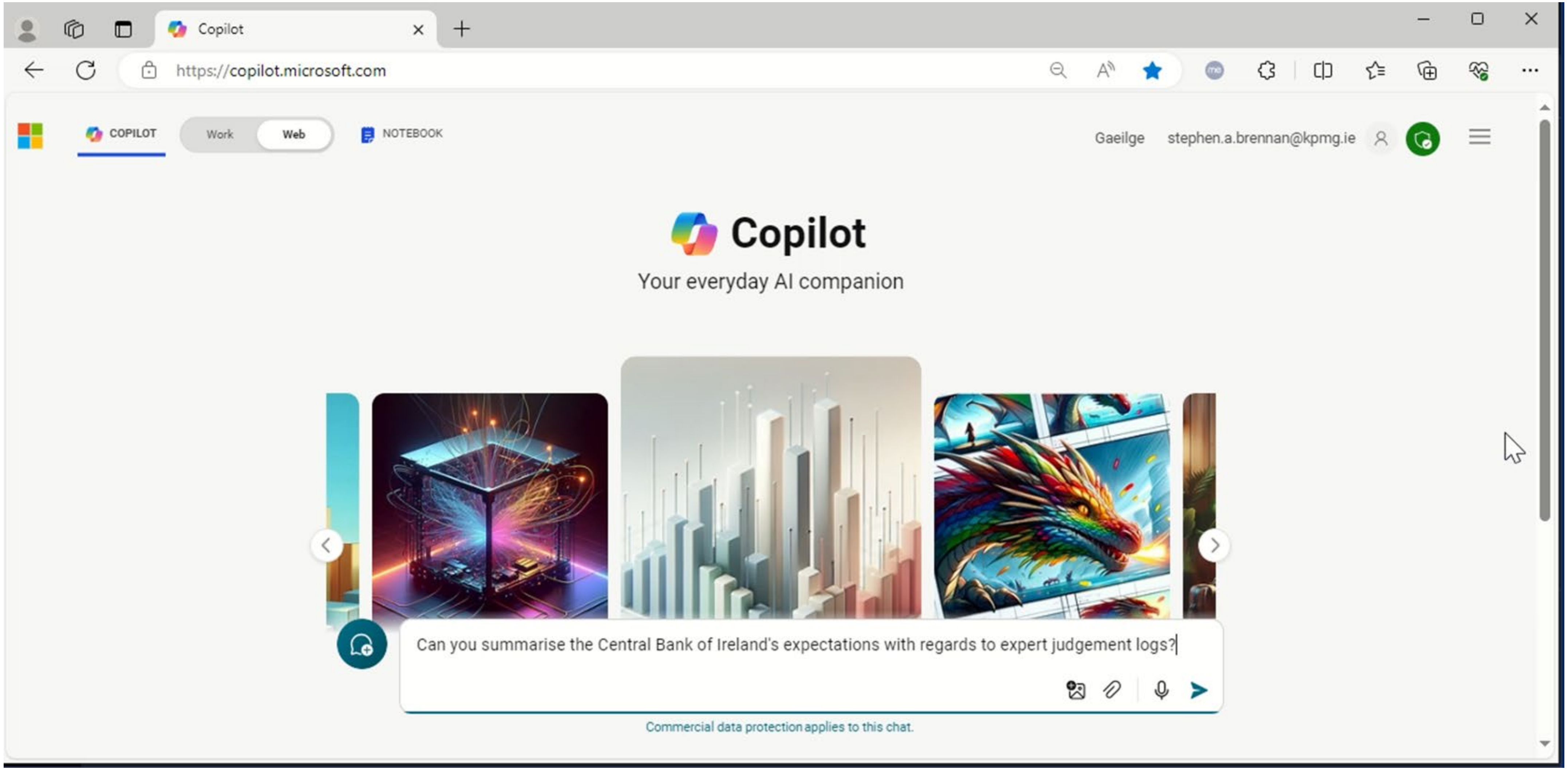
2. **Risk Assessment**: Conduct a comprehensive risk assessment of Client X's current operations. This will involve identifying potential risks, assessing their impact, and developing strategies to mitigate them.

3. **Regulatory Compliance Review**: Carry out a thorough review of Client X's compliance with existing regulations. This will involve examining their current policies and procedures, identifying any areas of non-compliance, and recommending necessary changes.

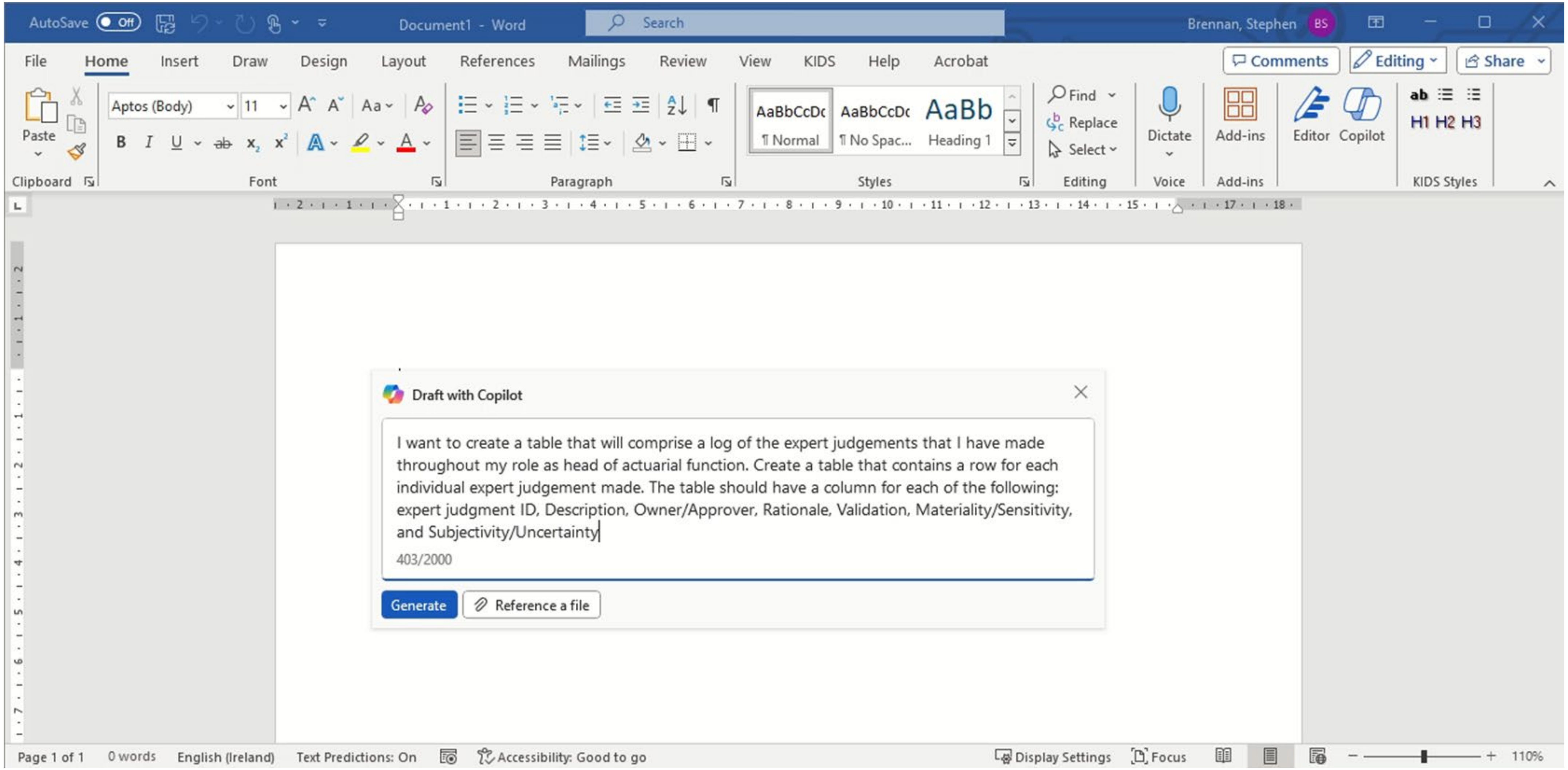
Step 1 – Identify and summarise the task



Step 2 – Understand the expectations



Step 3 – Draft the Expert Judgement Log

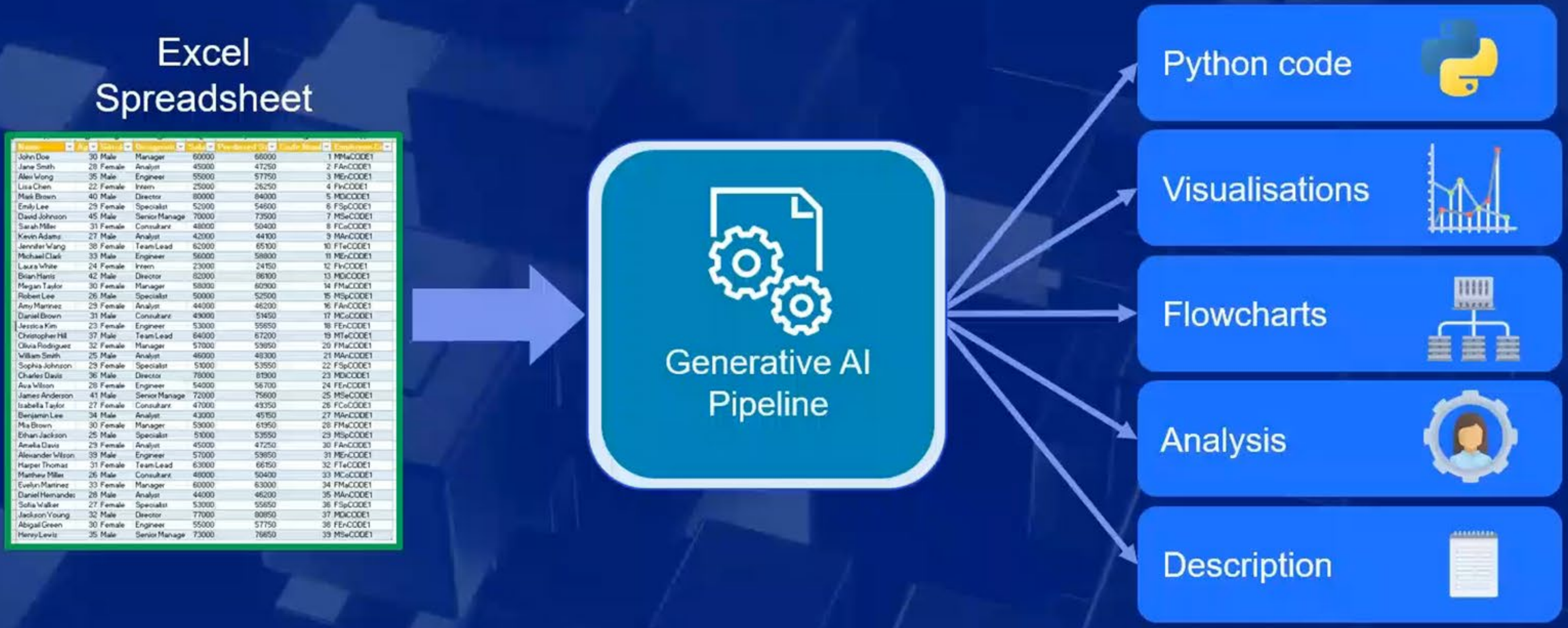


Result

ID	Description	Owner/ Approver	Rationale	Validation	Materiality/ Sensitivity	Subjectivity/ Uncertainty
Client X – Expert Judgement Log						
EJ-001	**Selection of mortality assumptions for annuity business**	John Smith	Based on industry experience and best practice	Compared with external benchmarks and peer companies	High materiality and low sensitivity	Low subjectivity and low uncertainty
EJ-002	**Adjustment of lapse rates for unit-linked business**	Jane Doe	Based on historical data and expected trends	Back-tested with actual experience and scenario analysis	Medium materiality and medium sensitivity	Medium subjectivity and medium uncertainty
EJ-003	**Estimation of expense inflation for long-term business**	John Smith	Based on economic forecasts and company budget	Reviewed by senior management and external auditor	Low materiality and high sensitivity	High subjectivity and high uncertainty

In-house AI tools

Excel Analysis Demo Overview



KPMG

Excel to Python conversion with Generative AI

Python Automation GenAI Step (LLM = Azure OpenAI GPT 4.0)

Inputs

- ✓ Excel workbook containing model across multiple sheets
- ✓ Configuration file specifying expected input and output variable sheet locations and names manually compiled by user
- ✓ Unique name for the model (default model name taken from excel file path)

Outputs

- ✓ Python script that executes original excel model with named input and output variables for understanding
- ✓ Configuration file of input variables in JSON format with default variable values taken from original excel model
- ✓ Static reference tables used in model calculations saved separately to a csv file
- ✓ Automatic unit testing of generated python script to check its performance using original excel model parameters

Q&A

Please raise your hand to ask a question, and wait for a mike to get to you

Society of Actuaries in Ireland

Data Driven Claims Fraud Detection using Machine Learning and Deep Learning

Speakers - Graham Crowley, Pranav Sai S R

13th June 2024

About the Speakers

Graham Crowley – FSAI, CERA

Email: gcrowley@deloitte.ie
Contact: +353 1 417 2381

- Qualified Actuary with over 19 years' experience in the Irish non-life insurance industry.
- Prior to joining Deloitte in June 2022, Graham held senior actuarial and executive roles in Allianz Ireland.
- Specialises in Audit, Assurance and Advisory related work, focusing on Reserving, Capital Management, Reinsurance, Data Analytics, Claims Transformation and Solvency II.

About the Speakers

Dr S.R.Pranav Sai – PhD Actuarial Science

Email: psai@deloitte.ie
Contact: +353 1 417 3254

- Part qualified actuary with over 4 years of actuarial experience. Joined Deloitte Actuarial Modelling Centre (AMC) in July 2022.
- Specialises in:
    - Programming Languages – Python, R, VBA, C, SAS
    - Tools & Platforms – Power BI, Power Automate, AWS
    - Methodologies – Machine Learning, Deep Learning
- Have 7 research papers, 3 international conference presentations and 1 book chapter to my credit.

Agenda

- Background to Insurance Fraud
- Challenges in Insurance Fraud Detection
- Fraud Detection Architecture
- Fraud Model POC

Background to Insurance Fraud

Loss due to Insurance Fraud

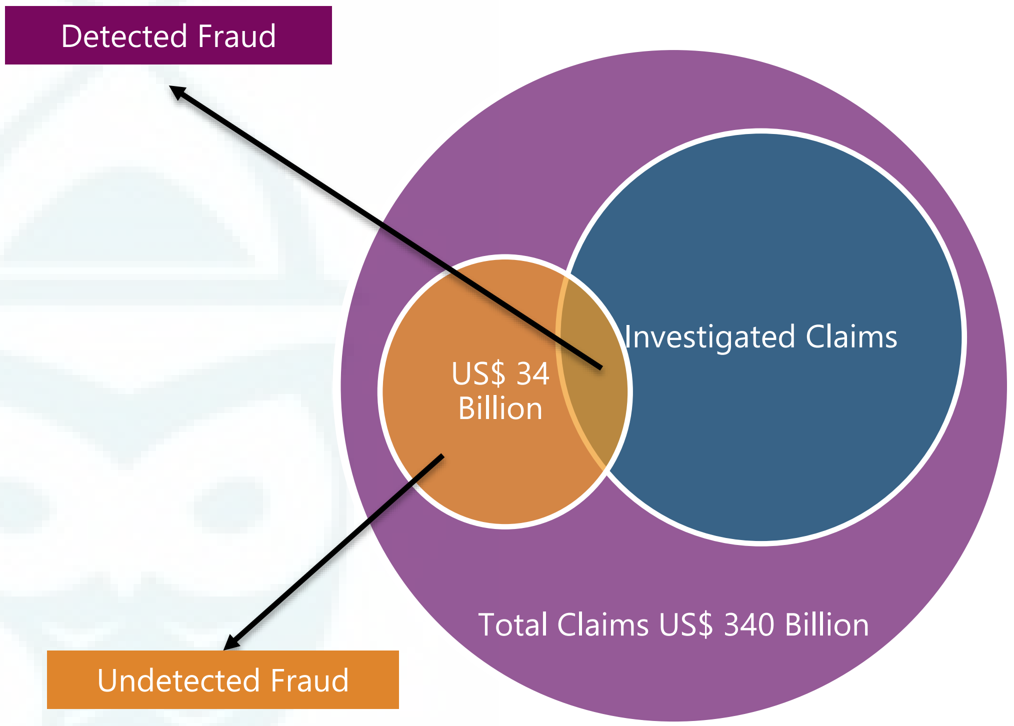
Irish Market

Loss of €200 Million annually in Ireland

Every Motor insurance customer pays €50 extra to pay for fraud claims.

Sources: The Irish Times (24th Oct 2023)

US Market



Sources: 2022 Fraud USA Statistics from Coalition Against Insurance Fraud

Challenges in Insurance Fraud Detection

Major challenges in data-driven approach

1. Availability of the data
2. Data imbalance
3. Identifying appropriate classification model
4. Business interpretation

Availability of the data

Not easy to get access to the insurance data at an industry level

Public data not suitable for fraud detections

Confidentiality of user information

Angoss Software Knowledge Seeker (Australia)

- Automobile insurance – Claims data
- 15,420 records
- 6% fraudulent claims
- 32 features

Automobile Insurance Data (French)

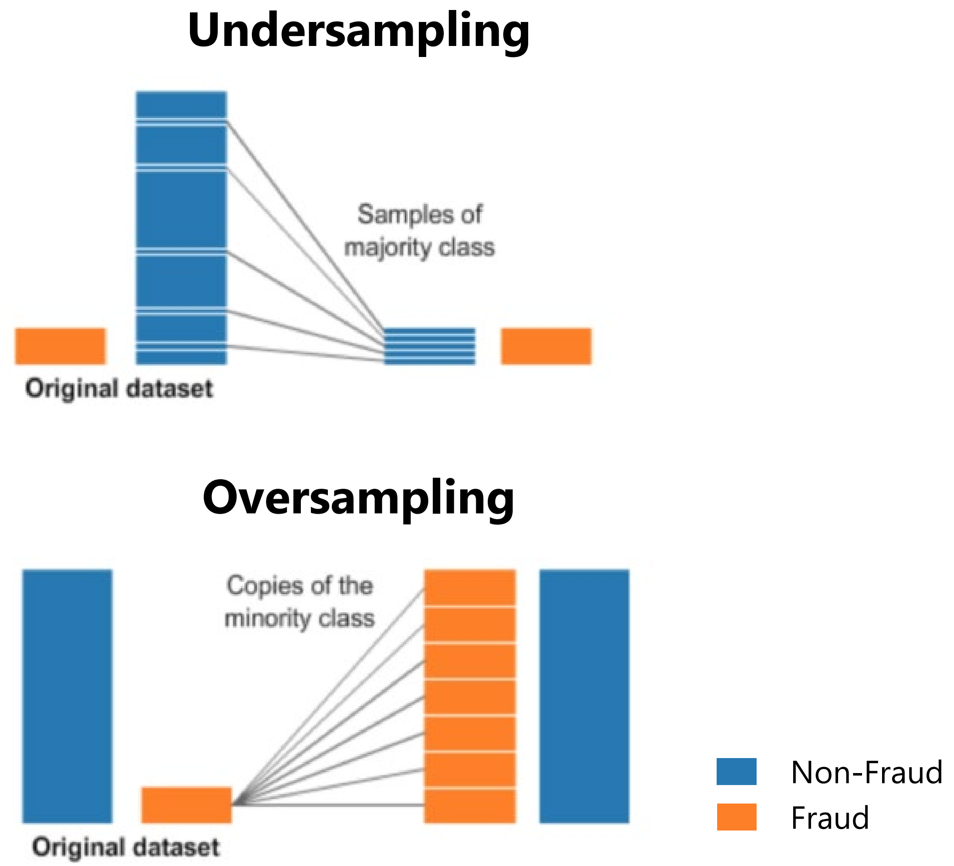
- Claims data
- 27 features
- 150,000 records
- 2% fraudulent claims

Data Imbalance

Less number of fraudulent claims compared to non-fraudulent claims

Skewed nature of the dataset results in the bias during training

High accuracy could be deceptive



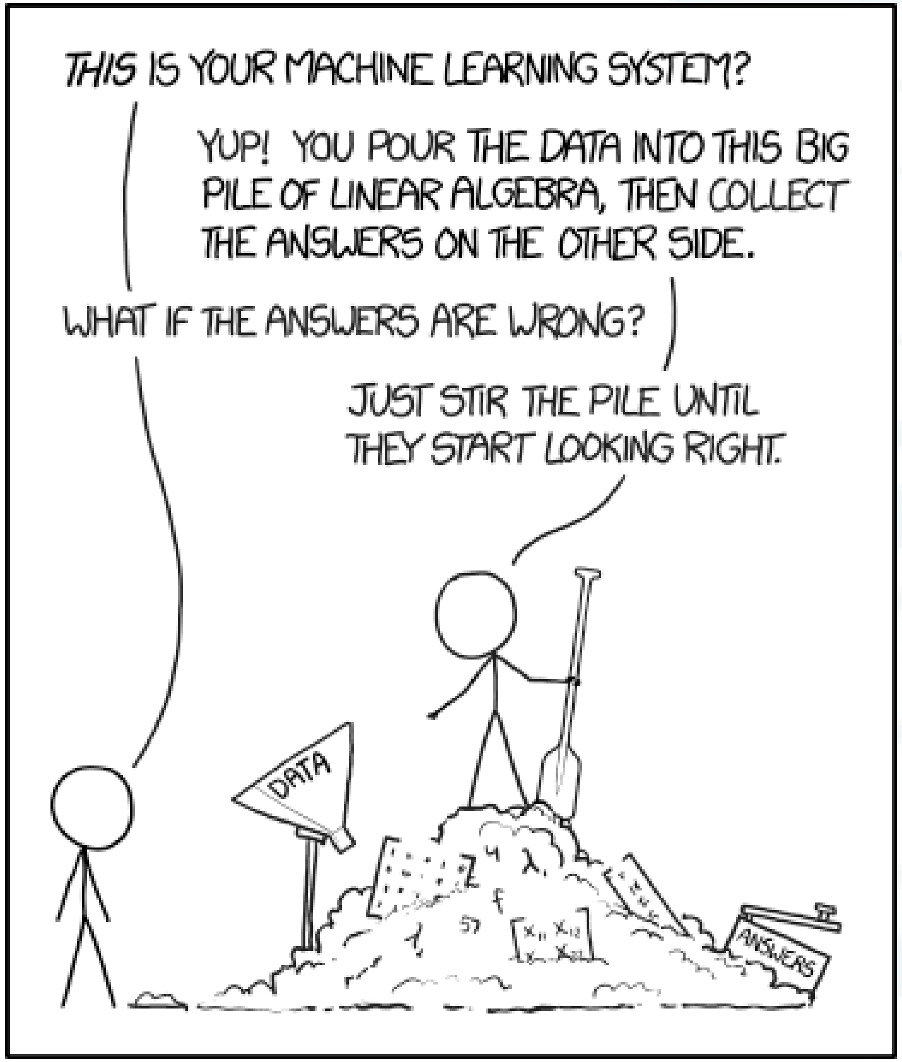
- Ali, A., Shamsuddin, S. M., & Ralescu, A. L. (2013). Classification with class imbalance problem. Int. J. Advance Soft Compu. Appl, 5(3).
- Mellor, A., Boukir, S., Haywood, A., & Jones, S. (2015). Exploring issues of training data imbalance and mislabelling on random forest performance for large area land cover classification using the ensemble margin. ISPRS Journal of Photogrammetry and Remote Sensing, 105, 155-168.

Identifying appropriate classification model

Efficacy of the classification model could differ with the datasets used and the line of business

Choose classification models which brings explainability

Business interpretation



Certain questions that needs to be addressed

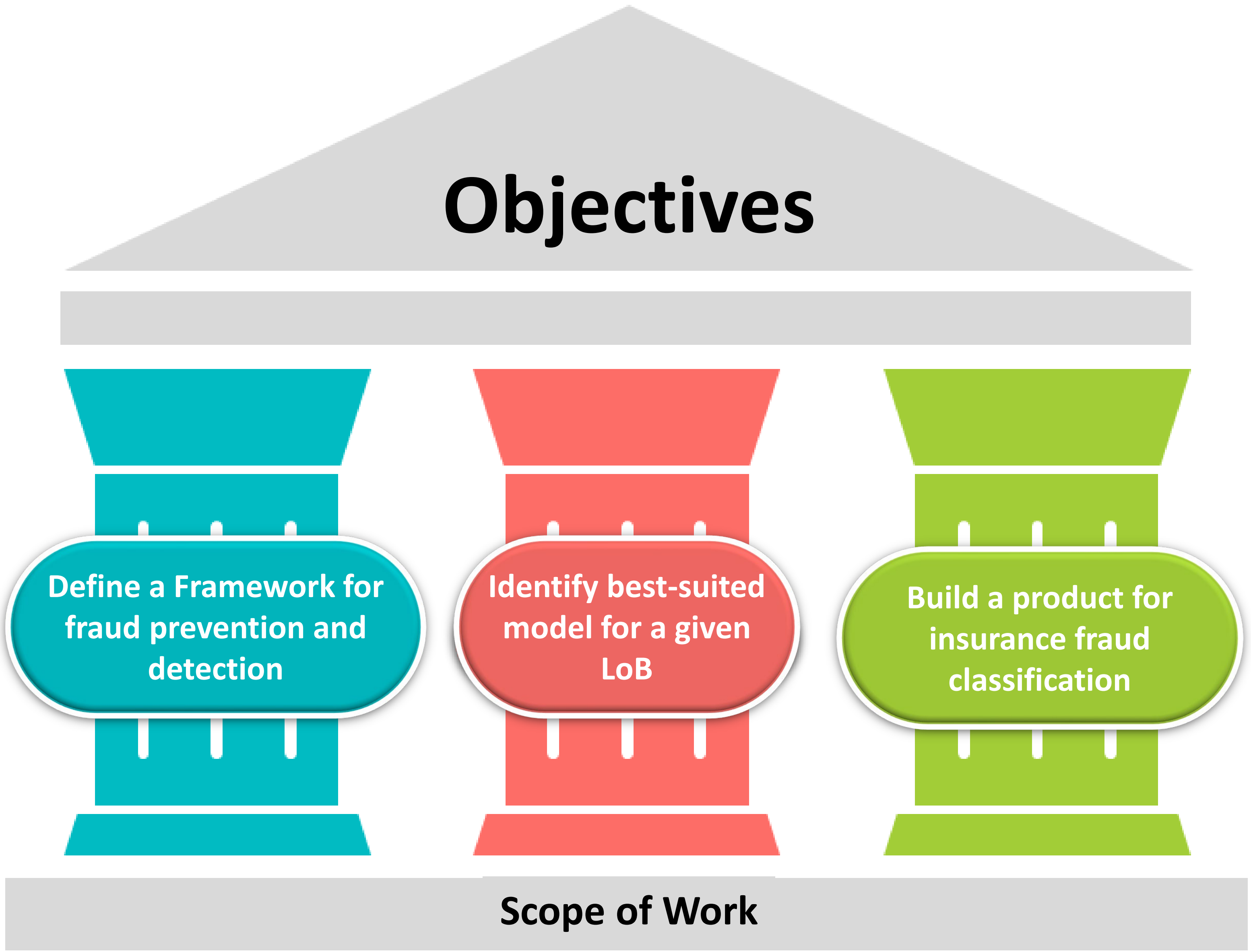
- How can I trust your model?
- How does the model make its decisions?

Model Interpretability Vs Model Performance trade-off

Source: Johansson U, Sönströd C, Norinder U, Boström H. Trade-off between accuracy and interpretability for predictive in silico modeling. Future Med Chem. 2011 Apr;3(6):647-63. doi: 10.4155/fmc.11.23. PMID: 21554073.

Fraud Detection Architecture

Approach to developing a Data-Driven fraud model



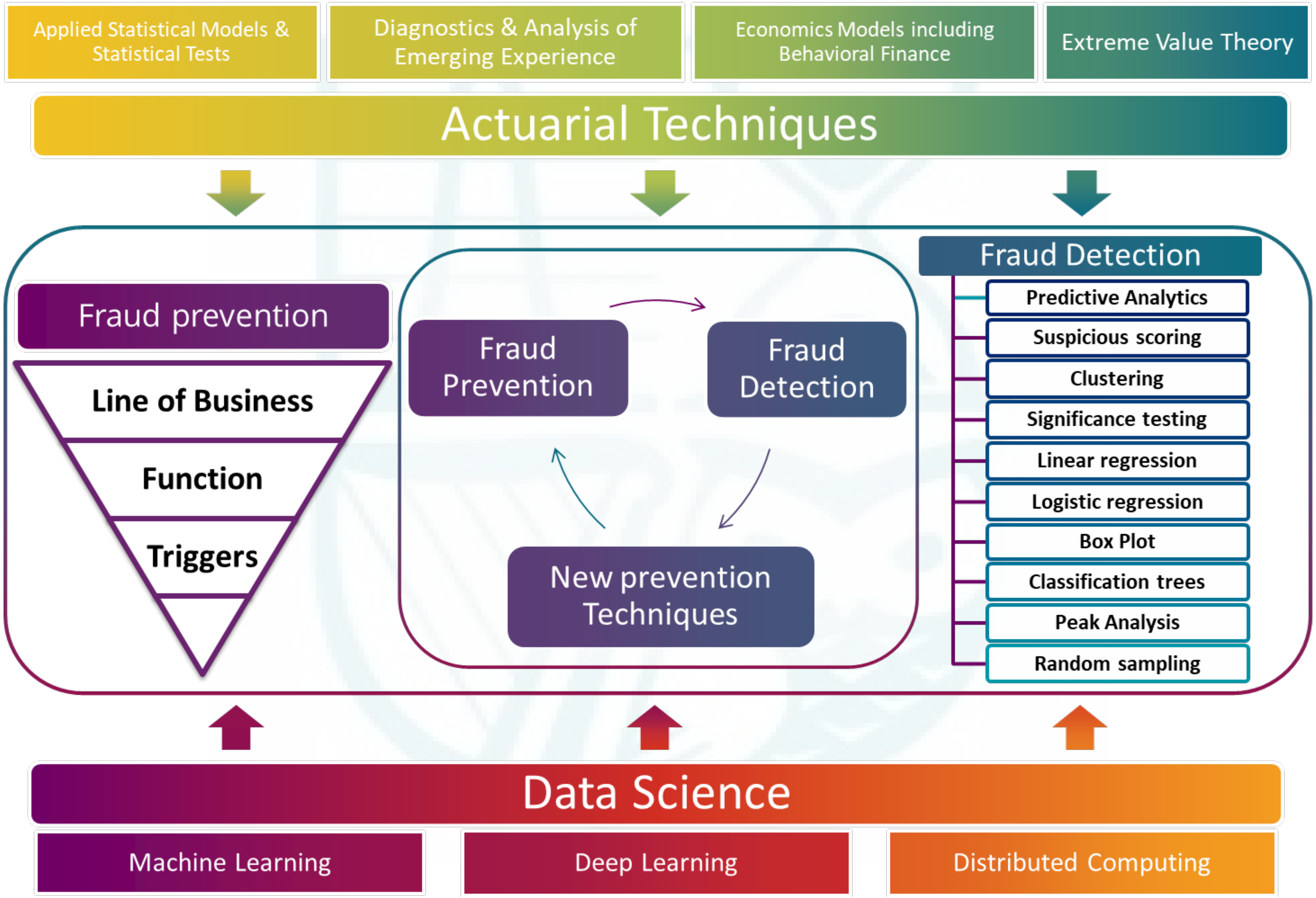
Define a Framework for fraud prevention and detection in insurance business using actuarial and data science techniques

A comprehensive study of the performance of various fraud detection models on different lines of insurance business, and indicating the best-suited model for a given line of insurance business

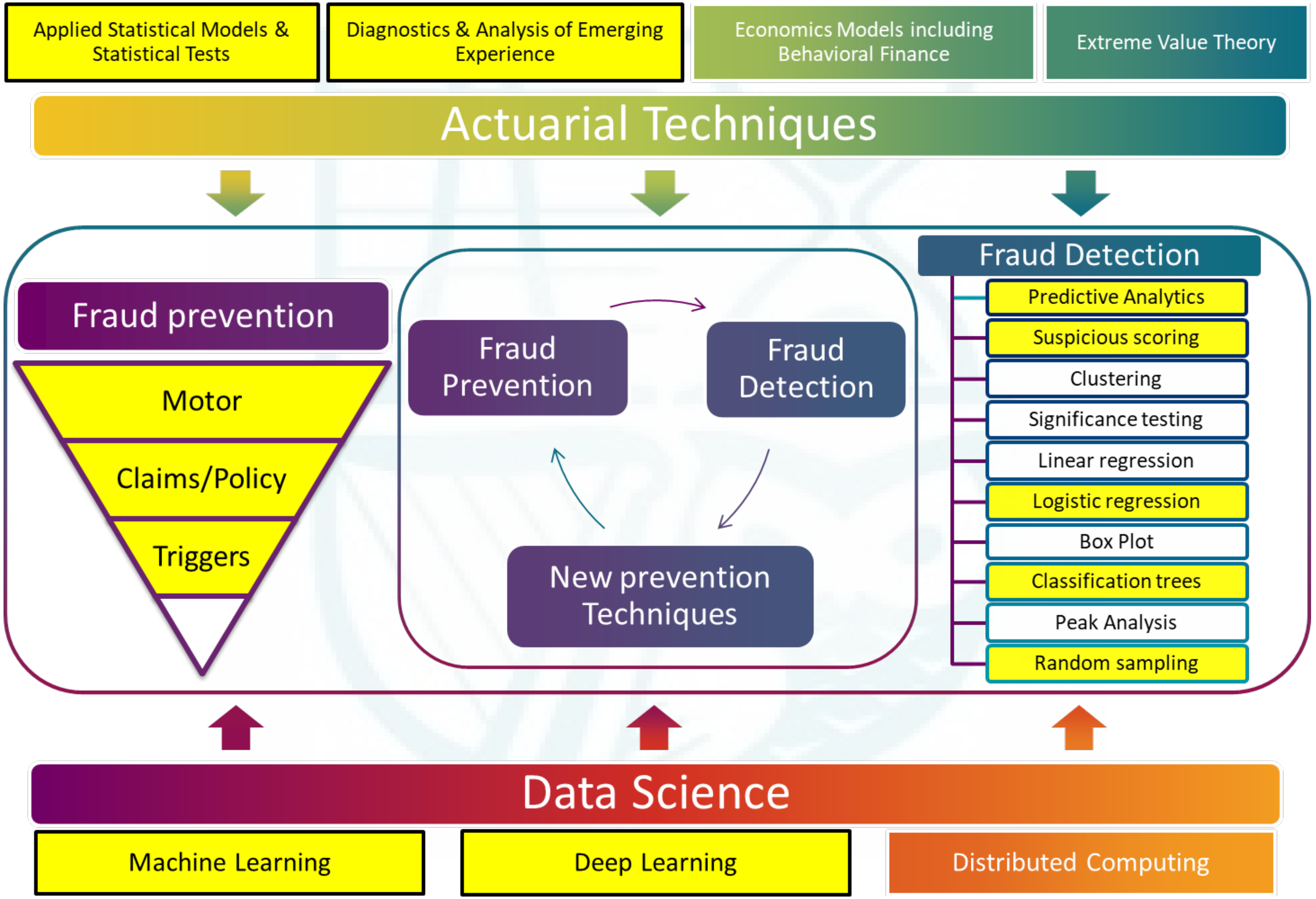
Build an Insurance Fraud Classifier using open-source languages (Python/R)

Scope of Work → Non-Life

Customer/Provider Fraud Prevention and Detection Framework



Customer/Provider Fraud Prevention and Detection Framework

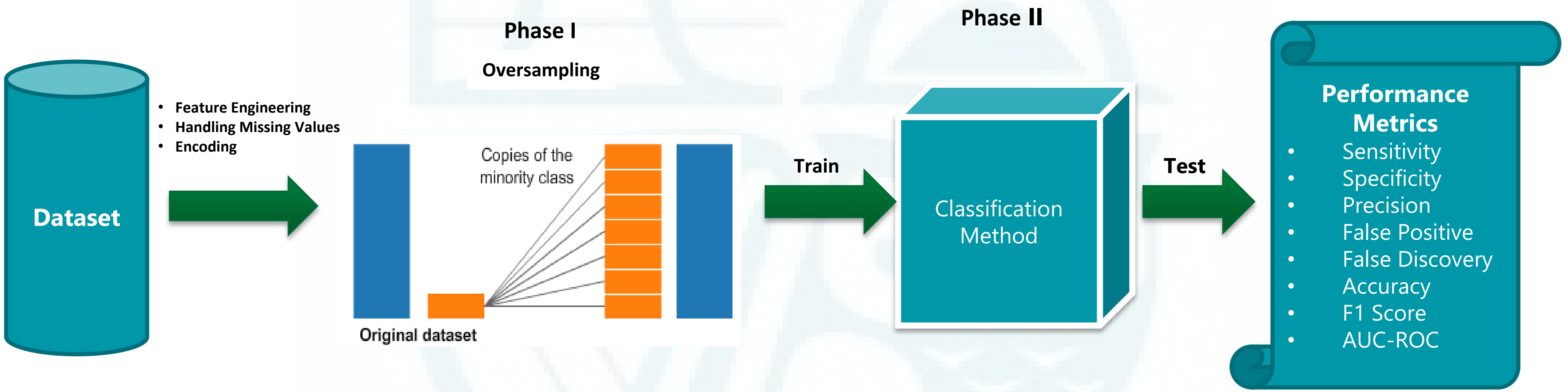


Fraud Model POC

The Two-phased method

1 **Phase I**
- Deals with data pre-processing
- Major challenge of data imbalance is also handled

2 **Phase II**
- Build a classification model to classify claims as fraudulent or not



The goal is to find a golden combination of a technique in Phase I and a specific model in Phase II for assured best performance of a Fraud Detection Model

Flexibility of the Two-phased method

Phase I

- Undersampling
- SMOTE
- MWMOTE
- ADASYN
- TGANs
- Baseline

Phase II

- Gradient Boosting
- Decision trees
- Random forests
- XGBoost
- LightGBM
- Neural Networks

Results

Models		AUC-ROC	Sensitivity	Specificity	Precision	Accuracy	F1 Score
Decision Tree	Baseline	0.9566	0.9248	0.9885	0.9174	0.9808	0.9211
	SMOTE	0.9534	0.9208	0.9860	0.9006	0.9781	0.9106
	ADASYN	0.9508	0.9155	0.9862	0.9016	0.9776	0.9085
	TGANs	0.9548	0.9214	0.9883	0.9155	0.9801	0.9185
Random Forest	Baseline	0.9462	0.8947	0.9977	0.9818	0.9852	0.9362
	SMOTE	0.9493	0.9027	0.9959	0.9682	0.9846	0.9343
	ADASYN	0.9500	0.9057	0.9942	0.9556	0.9834	0.9300
	TGANs	0.9460	0.8942	0.9977	0.9820	0.9852	0.9361
XGBoost	Baseline	0.9307	0.8615	0.9999	0.9989	0.9831	0.9252
	SMOTE	0.9458	0.8970	0.9945	0.9572	0.9826	0.9262
	ADASYN	0.9270	0.9835	0.8705	0.5119	0.8842	0.6733
	TGANs	0.9111	0.8223	1.0000	1.0000	0.9784	0.9025
LightGBM	Baseline	0.9486	0.8977	0.9994	0.9952	0.9871	0.9440
	SMOTE	0.9499	0.9014	0.9988	0.9905	0.9869	0.9438
	ADASYN	0.9523	0.9105	0.9940	0.9547	0.9839	0.9320
	TGANs	0.9482	0.8970	0.9994	0.9950	0.9870	0.9435
GBM	Baseline	0.9425	0.8852	0.9997	0.9975	0.9858	0.9380
	SMOTE	0.9451	0.8958	0.9945	0.9576	0.9825	0.9257
	ADASYN	0.9288	0.9779	0.8796	0.5288	0.8916	0.6864
	TGANs	0.9282	0.8566	0.9992	0.9992	0.9224	0.9224
Neural Networks	Baseline	0.9406	0.8826	0.9986	0.9885	0.9845	0.9325
	Weighted	0.9557	0.9418	0.9644	0.7852	0.9617	0.8564
	Undersampled	**0.9525**	**0.9374**	**0.9676**	**0.9663**	**0.9526**	**0.9516**
	SMOTE	0.9496	0.9533	0.9459	0.7087	0.9468	0.8130
	ADASYN	0.9389	0.9822	0.8955	0.5650	0.9061	0.7173
	TGANs	0.9392	0.8795	0.9989	0.9908	0.9844	0.9318

Fraud detection model validation

- $Sensitivity = \frac{Fraud\ claims\ identified\ as\ fraud}{Total\ fraud\ claims\ (actual)} = \frac{TP}{P} = \frac{TP}{TP+FN}$
- $Specificity = \frac{Non\text{-}fraud\ claims\ identified\ as\ nonfraud}{Total\ non\text{-}fraud\ claims\ (actual)} = \frac{TN}{N} = \frac{TN}{TN+FP}$
- $Precision = \frac{Fraud\ claims\ identified\ as\ fraud}{Total\ claims\ identified\ as\ fraud\ by\ the\ model} = \frac{TP}{TP+FP}$
- $False\ Positive\ Rate = \frac{Non\text{-}fraud\ claims\ identified\ as\ fraud}{Total\ non\text{-}fraud\ claims\ (actual)} = \frac{FP}{N} = \frac{FP}{FP+TN}$
- $False\ Discovery\ Rate = \frac{Non\text{-}fraud\ claims\ identified\ as\ fraud}{Total\ claims\ identified\ as\ fraud\ by\ the\ model} = \frac{FP}{FP+TP}$
- $Accuracy = \frac{Total\ correct\ predictions\ both\ fraud\ and\ nonfraud}{Total\ claims} = \frac{TP+TN}{P+N}$
- $F1\ Score = \frac{2 \times Precision \times Recall}{Precision + Recall} = \frac{2TP}{2TP+FP+FN}$

Fraud Detection Tool

Questions

Please raise your hand to ask a question, and wait for a mike to get to you

Thank You

Society of Actuaries in Ireland

Transforming Life & Health underwriting & claims with generative AI

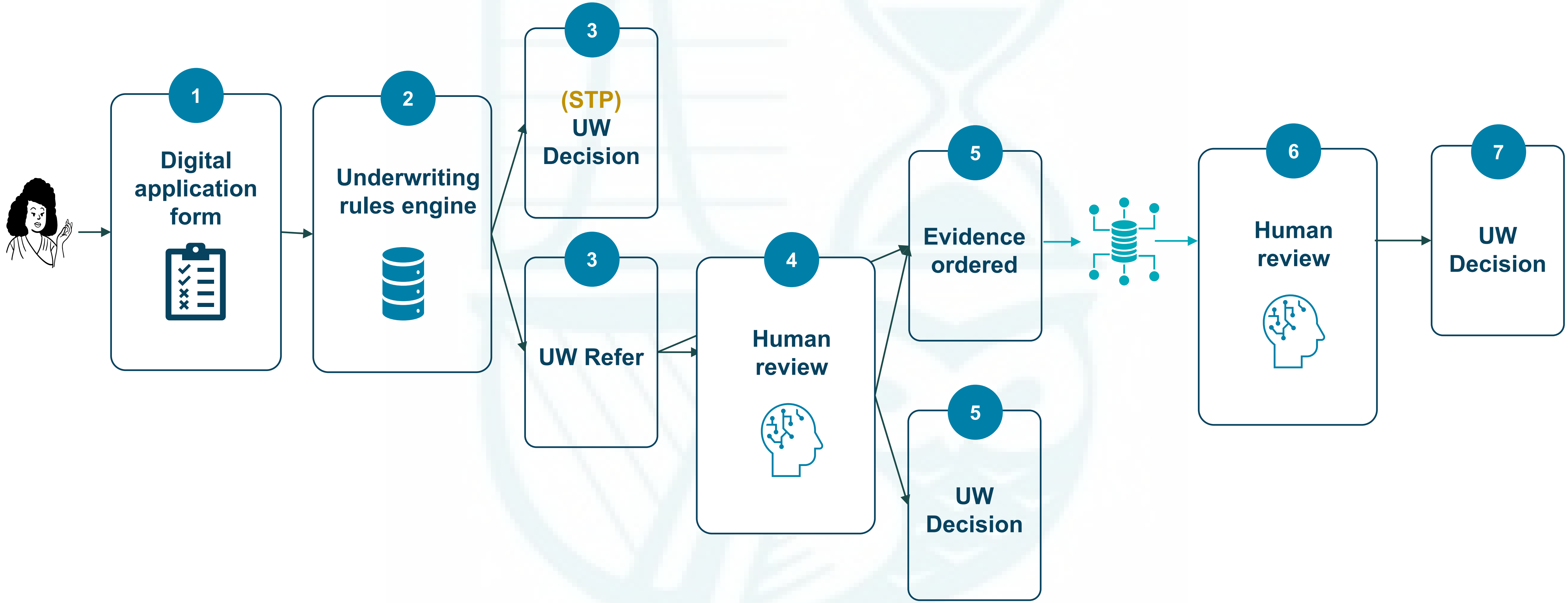
Antoine Ly, Chief Data Science Officer, SCOR
Vicky Gardner, Head of Life & Health Data Analytics Solutions, SCOR

13 June 2024

Current underwriting process

Underwriting journey

Majority of applicants are straight-through processed but ~30% need human review

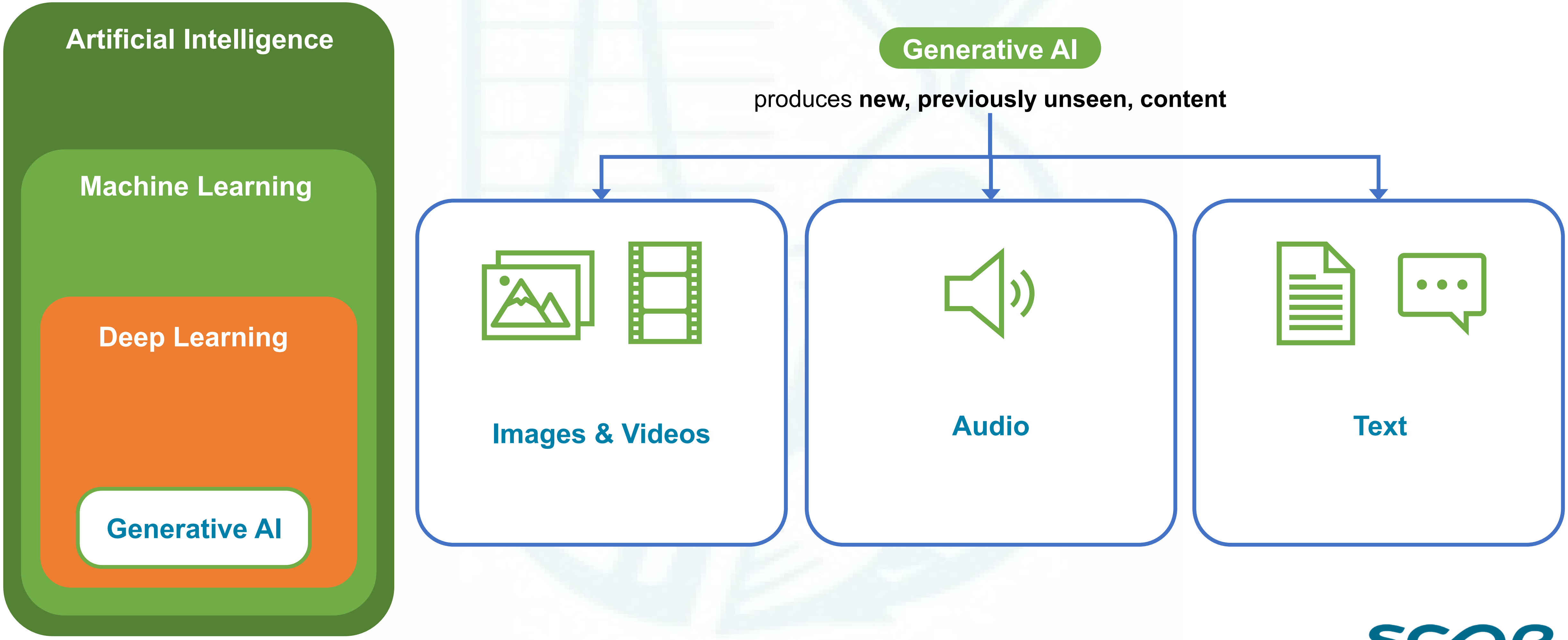


SCOR
The Art & Science of Risk

What is Generative AI (Gen AI)?

Context

The launch of Open AI's Chat GPT in November 2022 has highlighted the huge potential of Gen AI across a wide range of tasks

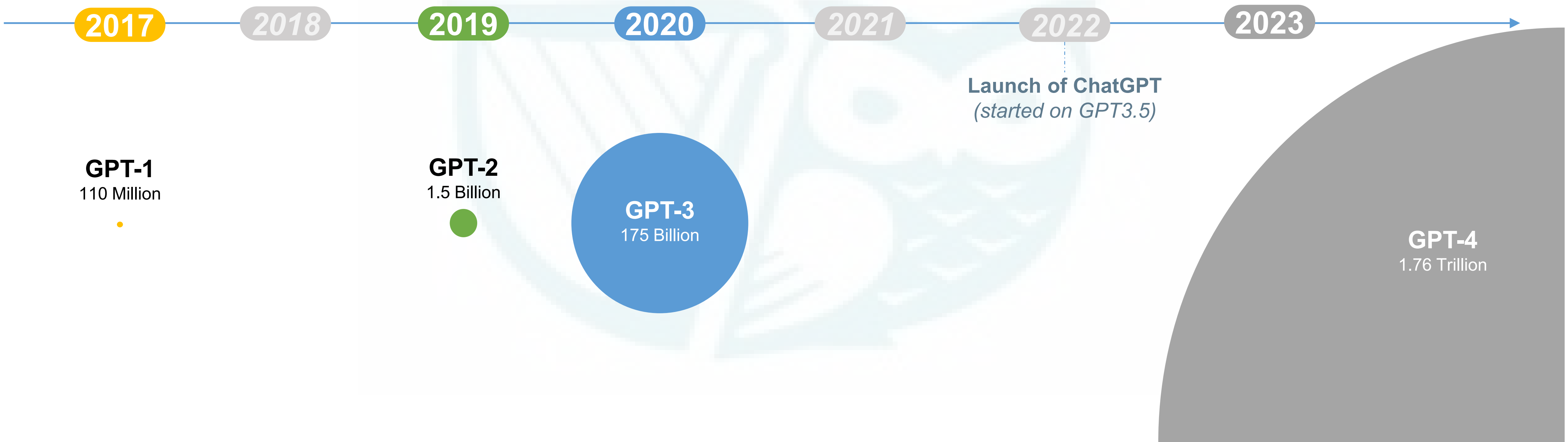


Context

Text is one of the main use cases today, propelled by ever-growing computing power and large language models (LLMs)

The models are not new – but the tech is now mature enough to turn them into truly powerful solutions, based on a wide range of parameters

Number of parameters of Open AI's GPT models



Context

Gen AI has the potential to power several use cases in the life & health (re)insurance industry, across the whole customer journey

- Customer Support
- **Claim Processing**
- Policy Recommendation
- **Document Analysis**
- **Underwriting**

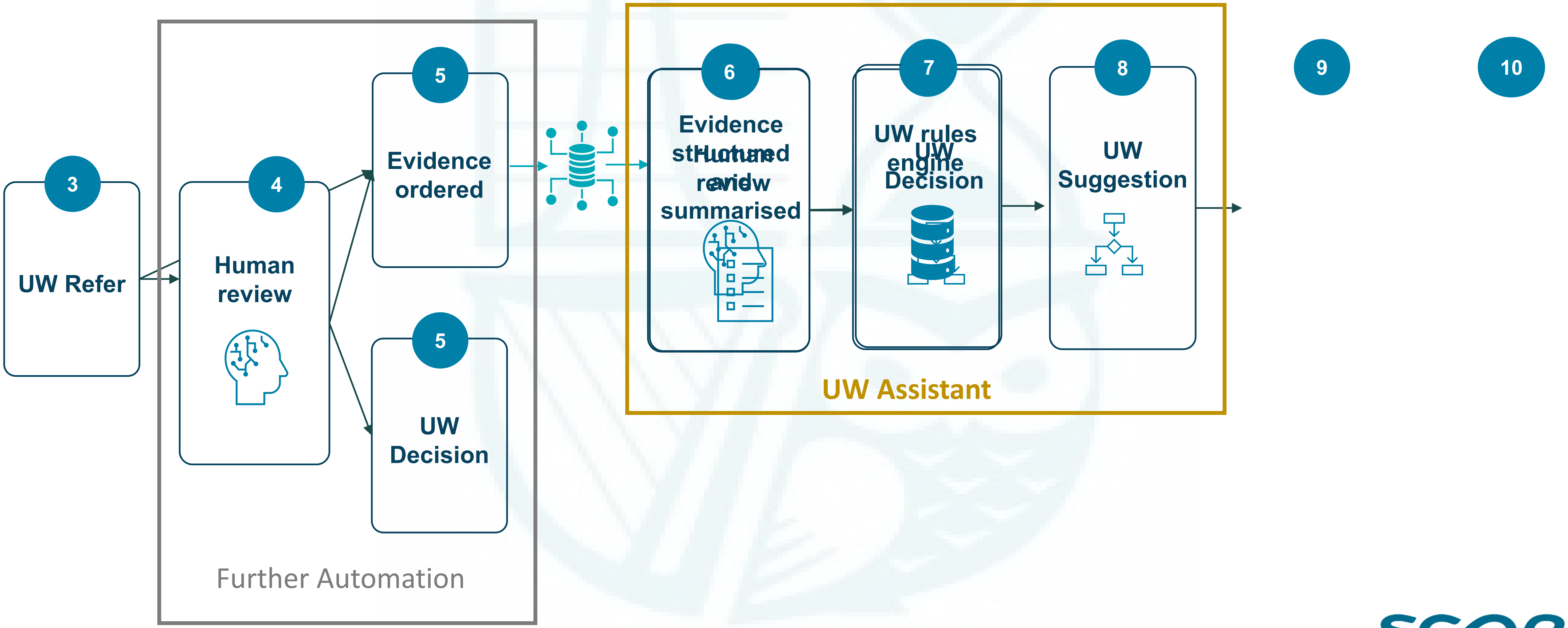
Focus of today: Claim Processing, Document Analysis, Underwriting

- Risk Assessment
- Trend Analysis
- Feedback Analysis
- Regulatory Compliance
- Engagement

How can generative AI help underwriting and claims processes?

New Underwriting journey

The review of structured and unstructured evidence can be considerably quicker and *recommended* UW decisions returned for human review



The Art & Science of Risk

AIssistant New document(s) Open chat

Chris McCain

Summary | Details

Search summary...

Gender/occupation/citizenship

Gender	Female
Occupation	Accountant
! Citizenship	Information not specified in provided documents
Travel	No foreign travel vaccination discussion noted

Vitals

Height	175 cm
Weight	93 kg
BMI	30.4

Blood pressure readings

Reading 1	145 / 90	06/01/2023

Tobacco use history/status

Tobacco use	Current smoker, 20 cigarettes per day

Personal medical history

Heart and blood pressure issues	Hypertensive disease	06/01/2020
Cancer	Family history of breast cancer in sister	12/01/2020
Respiratory disorders	Asthma	06/01/2020
Musculoskeletal Issues	ACL, discussed surgery but proceeded only with physio	23/02/2020
Surgery/Medical Procedures	ACL, discussed surgery but proceeded only with physio	06/01/2020
Recent prescribed Medication	Amlodipine 5mg Tab 1 tab per day, Micardis 80mg - 25mg 1 tab per day	12/01/2020

Application_Richie.PDF

Page 1 of 57

Application_Richie.P...

PATIENT:
DATE OF BIRTH: 11/14/1962
DATE: 08/18/2023
VISIT TYPE: Office Visit
PROVIDER:

This 60 year old female presents for hypertension, anxiety and insomnia. *Established patient*

Assessment/Plan

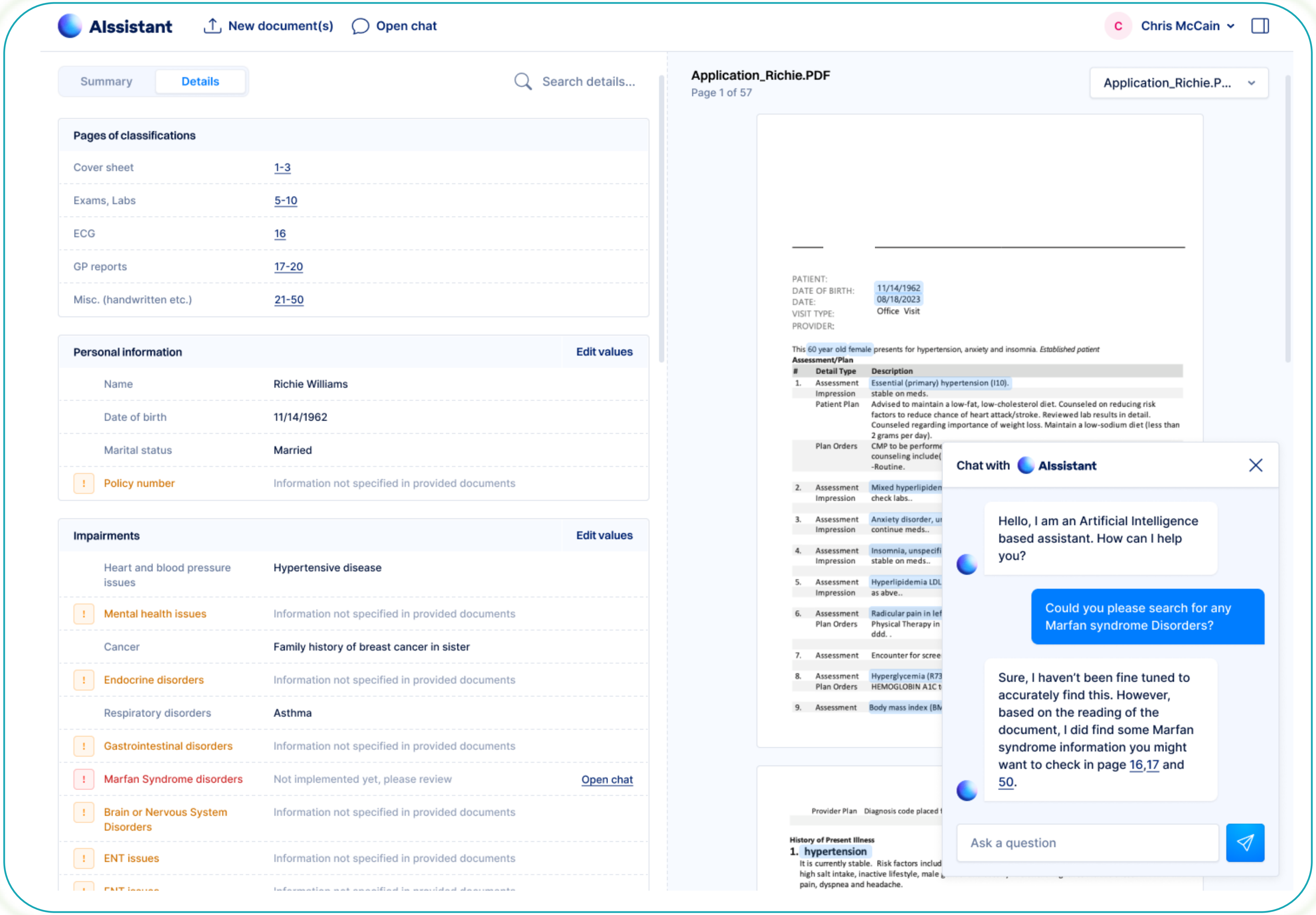
#	Detail Type	Description
1.	Assessment	Essential (primary) hypertension (I10).
	Impression	stable on meds.
	Patient Plan	Advised to maintain a low-fat, low-cholesterol diet. Counseled on reducing risk factors to reduce chance of heart attack/stroke. Reviewed lab results in detail. Counseled regarding importance of weight loss. Maintain a low-sodium diet (less than 2 grams per day).
	Plan Orders	CMP to be performed and Lipid Panel - LIPID to be performed. Today's instructions / counseling include(s) Follow a low sodium diet and Increase activity. follow-up visit -Routine.
2.	Assessment	Mixed hyperlipidemia (E78.2).
	Impression	check labs..
3.	Assessment	Anxiety disorder, unspecified (F41.9).
	Impression	continue meds..
4.	Assessment	Insomnia, unspecified type (G47.00).
	Impression	stable on meds..
5.	Assessment	Hyperlipidemia LDL goal <100 (E78.5).
	Impression	as abve..
6.	Assessment	Radicular pain in left arm (M79.2).
	Plan Orders	Physical Therapy in 4 Weeks. Clinical information/comments: Axis, neck pt cervciall ddd. .
7.	Assessment	Encounter for screening mammogram for malignant neoplasm of breast (Z12.31).
8.	Assessment	Hyperglycemia (R73.9).
	Plan Orders	HEMOGLOBIN A1C to be performed Today.
9.	Assessment	Body mass index (BMI) 30.0-30.9, adult (Z68.30).

Provider Plan Diagnosis code placed for administrative purposes.

History of Present Illness

1. hypertension

It is currently stable. Risk factors include African American race, age over age 60, depression, high salt intake, inactive lifestyle, male gender and obesity. Pertinent negatives include chest pain, dyspnea and headache.


AIssistant
New document(s)
Open chat
C
Chris McCain
Summary
Details
Search details...
Pages of classifications
Cover sheet 1-3
Exams, Labs 5-10
ECG 16
GP reports 17-20
Misc. (handwritten etc.) 21-50
Personal information
Edit values
Name Richie Williams
Date of birth 11/14/1962
Marital status Married
Policy number Information not specified in provided documents
Impairments
Edit values
Heart and blood pressure issues Hypertensive disease
Mental health issues Information not specified in provided documents
Cancer Family history of breast cancer in sister
Endocrine disorders Information not specified in provided documents
Respiratory disorders Asthma
Gastrointestinal disorders Information not specified in provided documents
Marfan Syndrome disorders Not implemented yet, please review
Open chat
Brain or Nervous System Disorders Information not specified in provided documents
ENT issues Information not specified in provided documents
Application_Richie.PDF
Page 1 of 57
Application_Richie.P...
PATIENT:
DATE OF BIRTH: 11/14/1962
DATE: 08/18/2023
VISIT TYPE: Office Visit
PROVIDER:
This 60 year old female presents for hypertension, anxiety and insomnia. Established patient
Assessment/Plan
Detail Type Description
1. Assessment Essential (primary) hypertension (I10).
Impression stable on meds.
Patient Plan Advised to maintain a low-fat, low-cholesterol diet. Counseled on reducing risk factors to reduce chance of heart attack/stroke. Reviewed lab results in detail. Counseled regarding importance of weight loss. Maintain a low-sodium diet (less than 2 grams per day).
Chat with AIssistant
Hello, I am an Artificial Intelligence based assistant. How can I help you?
Could you please search for any Marfan syndrome Disorders?
Sure, I haven't been fine tuned to accurately find this. However, based on the reading of the document, I did find some Marfan syndrome information you might want to check in page 16,17 and 50.
Ask a question
History of Present Illness
1. hypertension

Benefits
Used in underwriting, claims or as a post-issue tool

Reduces human error and improves consistency

Enables quicker manual underwriting or claims processing

Underwriters and claims assessors able to focus more on high-value tasks

Benefits

The business case centres around the savings in operational costs without impacting the risk profile

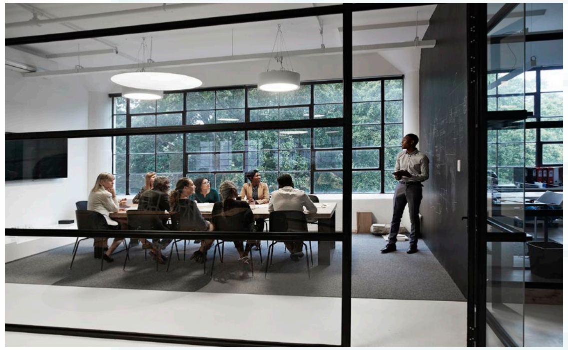
Example (medium-sized insurer with high STP rate)	Without UW assistant tool	With UW assistant tool - Scenario 1	With UW assistant tool - Scenario 2
Applications with additional medical evidence (per year)	10,000		
Human underwriter – cost per hour	€50		
Human underwriter – time per case	45 mins	30 mins	10 mins
Total human underwriting cost (per year)	€375k	€250k	€83k
Potential annual savings		€125k	€292k

What are the challenges in building a Gen AI tool for underwriting and claims?

Challenges

The promise of Generative AI is high, but it is moving quickly and needs considered adoption into business processes

Fast-moving environment



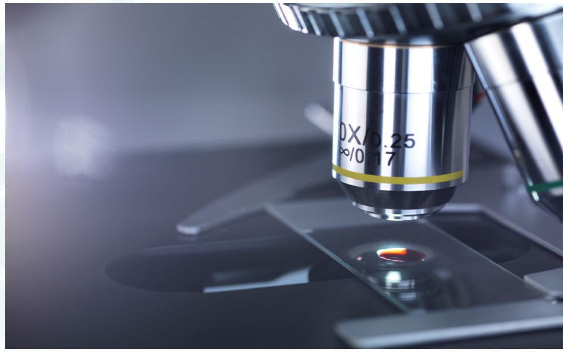
Management buy-in

Insurance specificities

Benefits > Costs?

Security

Guardrails



Testing

Why do we need underwriting and claims expertise to help build a solution?

A tool needs to be more than an LLM

Underwriting and claims expertise is important in prompt engineering and post-processing

Date	Height	Weight	BMI
1 Jan 2022	1.70 cm	90.2 kg	31.2
30 May 2022	1.69 cm	88.3 kg	30.9
18 Nov 2022	1.70 cm	86.2 kg	29.8
1 May 2023	1.69 cm	80.1 kg	28.0

What BMI will the underwriter want to see?

Date	Height	Weight	BMI
1 Jan 2022	1.70 cm	90.2 kg	31.2
30 May 2022	1.69 cm	58.3 kg	20.4
18 Nov 2022	1.70 cm	86.2 kg	29.8
1 May 2023	1.69 cm	80.1 kg	28.0

How will we spot data errors?

Electronic Health Record	
Date	BMI
1 Jan 2022	31.2

Which data source do we trust when they tell us different things?

Blood Test Report	
Date	BMI
12 June 2022	33.0

Application Form	
Date	BMI
1 June 2022	30.9

Impairment	UW Decision
'Mild' Asthma + no smoking	Standard rates
'Mild' Asthma + smoking	+50%
…	
'Severe' Asthma + no smoking	+250%

How do we ensure we extract sufficient and relevant information for each impairment?

SCOR
The Art & Science of Risk

Summarisation is good but full integration is the gold standard

The real value comes when underwriting summaries can be structured to feed underwriting rules engines…but still with human review

Underwriting summary for human underwriters to review

+ Integration into underwriting workbenches and admin systems

+ Link to underwriting manual to return suggested underwriting decision

When will it fully replace human underwriters?

Never ?

Risks and mitigations

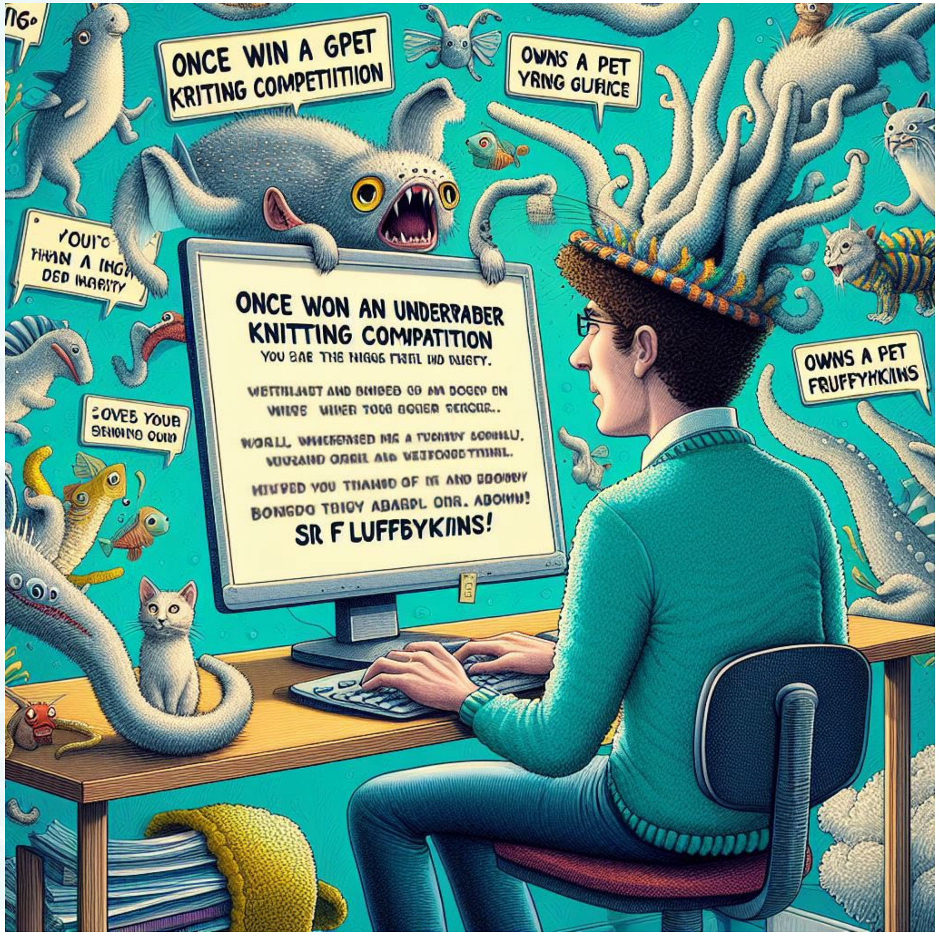
All AI carries risk, but generative AI has additional risk

Risks

- Hallucinations – incorrect conclusions
  - Decisions too harsh
  - Decisions too lenient
- Inability to act on misrepresentation at claim stage
- Legal – the right to request human decisions
- Legal – use of impermissible data
- Data/systems may evolve

Mitigations

- Human review of every case used in UW/claims
- Regular testing



Thank You!

Please raise your hand to ask a question, and wait for a mike to get to you

The Art & Science of Risk

Society of Actuaries in Ireland

Coffee – come back in 15 minutes

13 June 2024

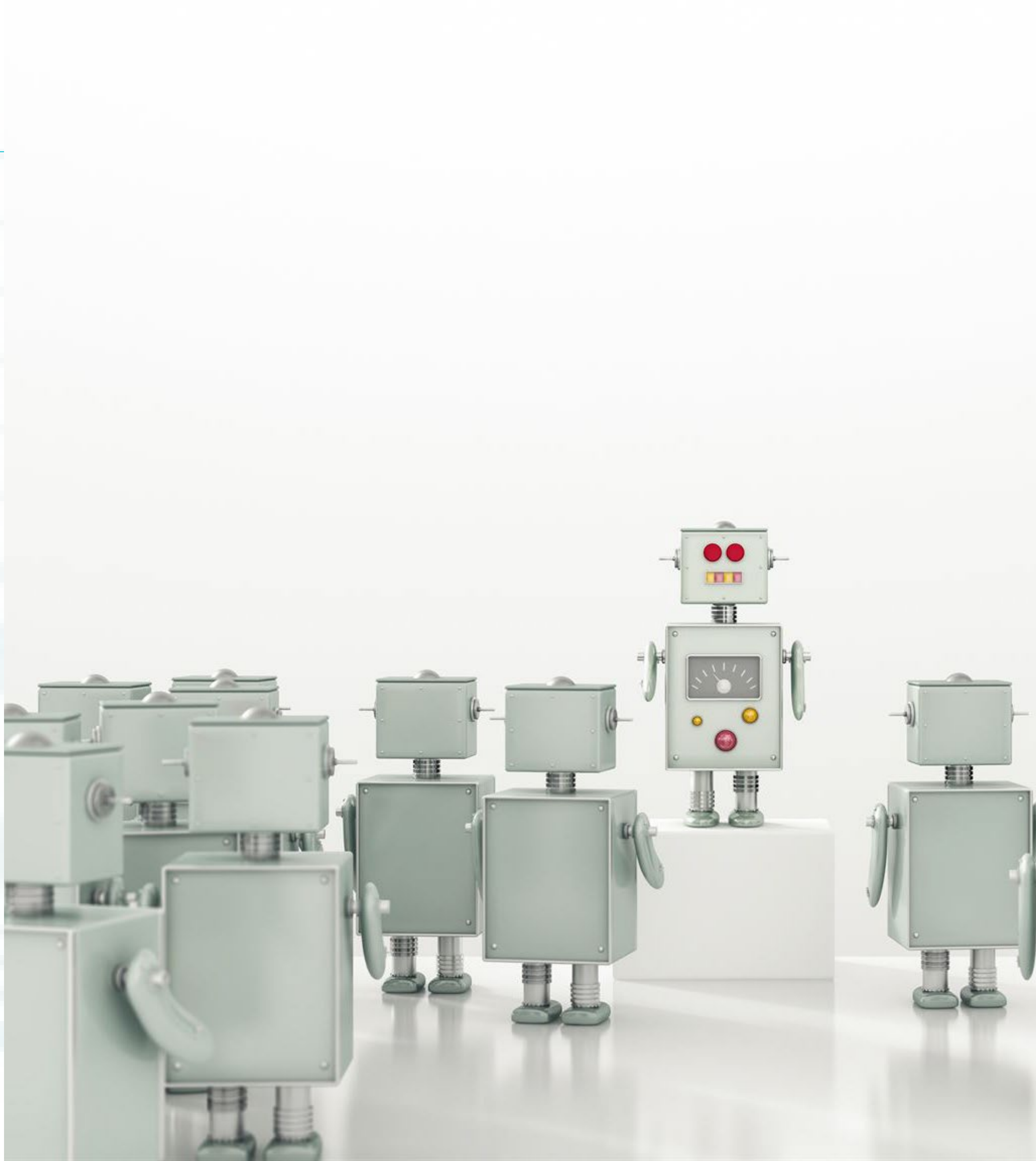
Society of Actuaries in Ireland

A game of two halves: Similarities and differences between ‘old’ AI and GenerativeAI

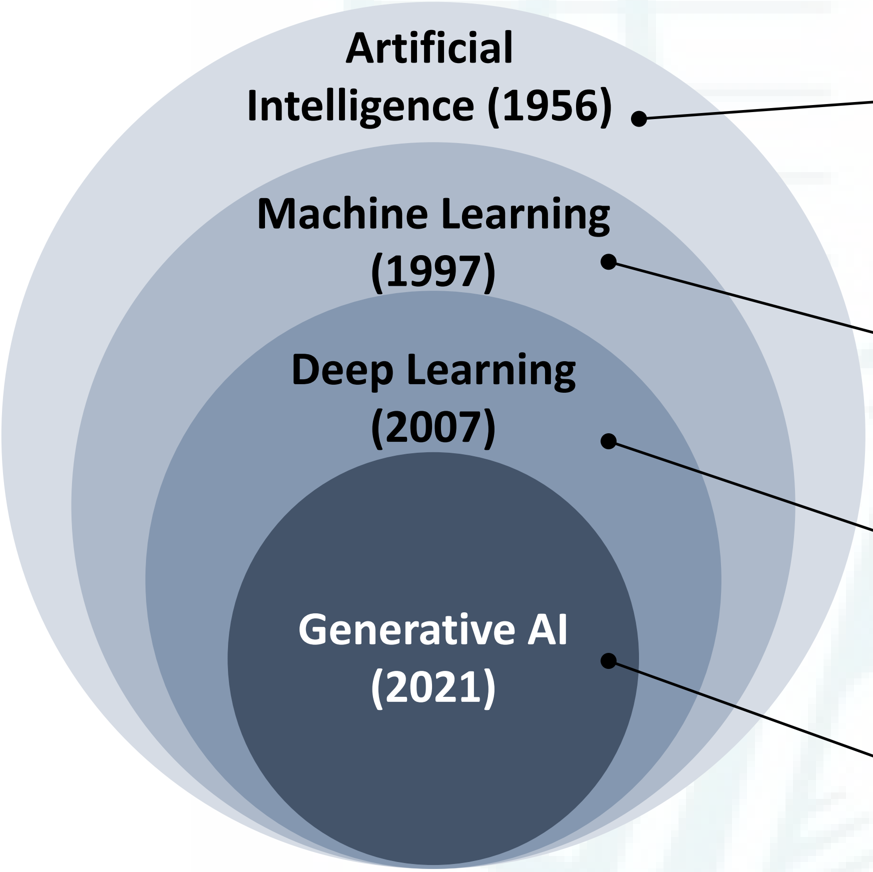
Arlen Galicia Carreon (she/her)
Vatsal Gomber (he/him)

13 June 2024

- Distinguish between traditional AI used in analytics and the new wave of Generative AI. We'll explore their distinct applications and discuss their strengths, weaknesses, opportunities, and threats that are unique to these technologies.
- Presenters:
  - Arlen Galicia Carreon – Associate Director at WTW (she/her)
  - Vatsal Gomber – Senior Consultant at WTW (he/him)



Relationship between Traditional AI and Generative AI



Field of computer science that seeks to create intelligent machines that can replicate or exceed human intelligence

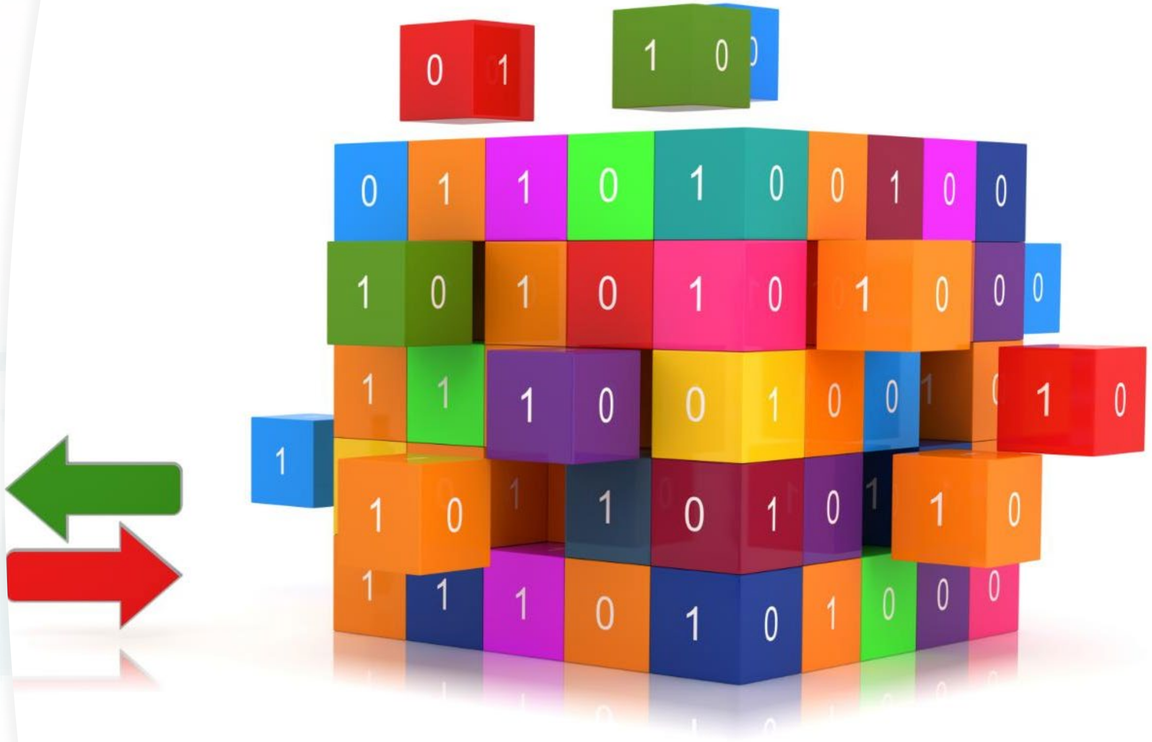
Enables machines to learn from existing data and improve upon that data to make decisions or predictions

Layers of neural networks are used to process data and make decisions

Create new written, visual and auditory content given prompts.

Narrow Artificial Intelligence

- Aims to create machines capable of intelligent behaviour
- Includes methods like machine learning, natural language processing, robotics, and more
- Limited to specific tasks
- Does not have the ability to create anything new

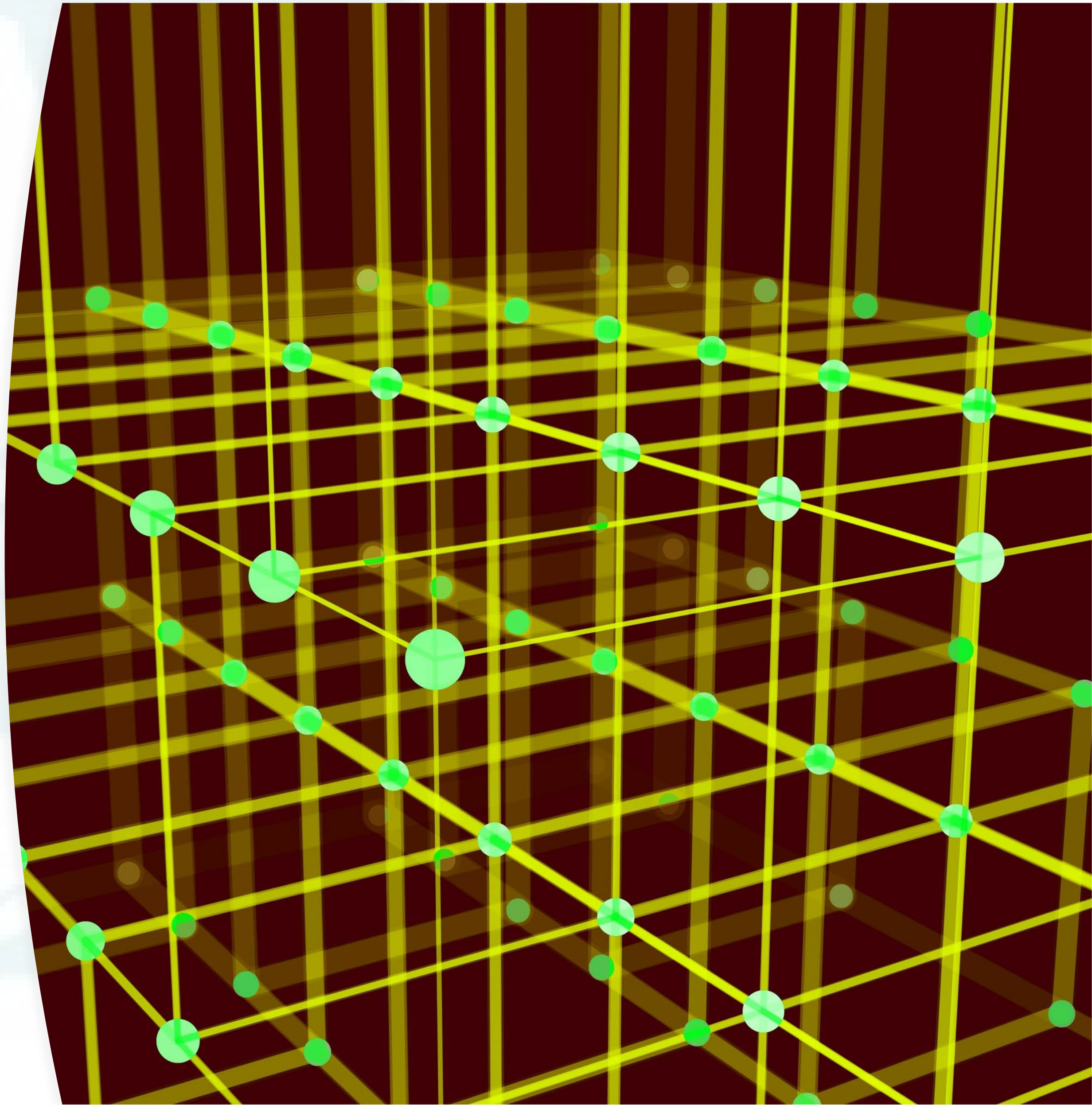


Examples of Narrow AI

- AI-powered fraud detection systems in banks which analyse transaction patterns in real-time to flag potentially fraudulent activity
- Some actuarial examples
  - Improved risk assessment and customer understanding in Underwriting
  - GLMs for Pricing or understanding the relationships between key variables
  - Automated Claims Processing

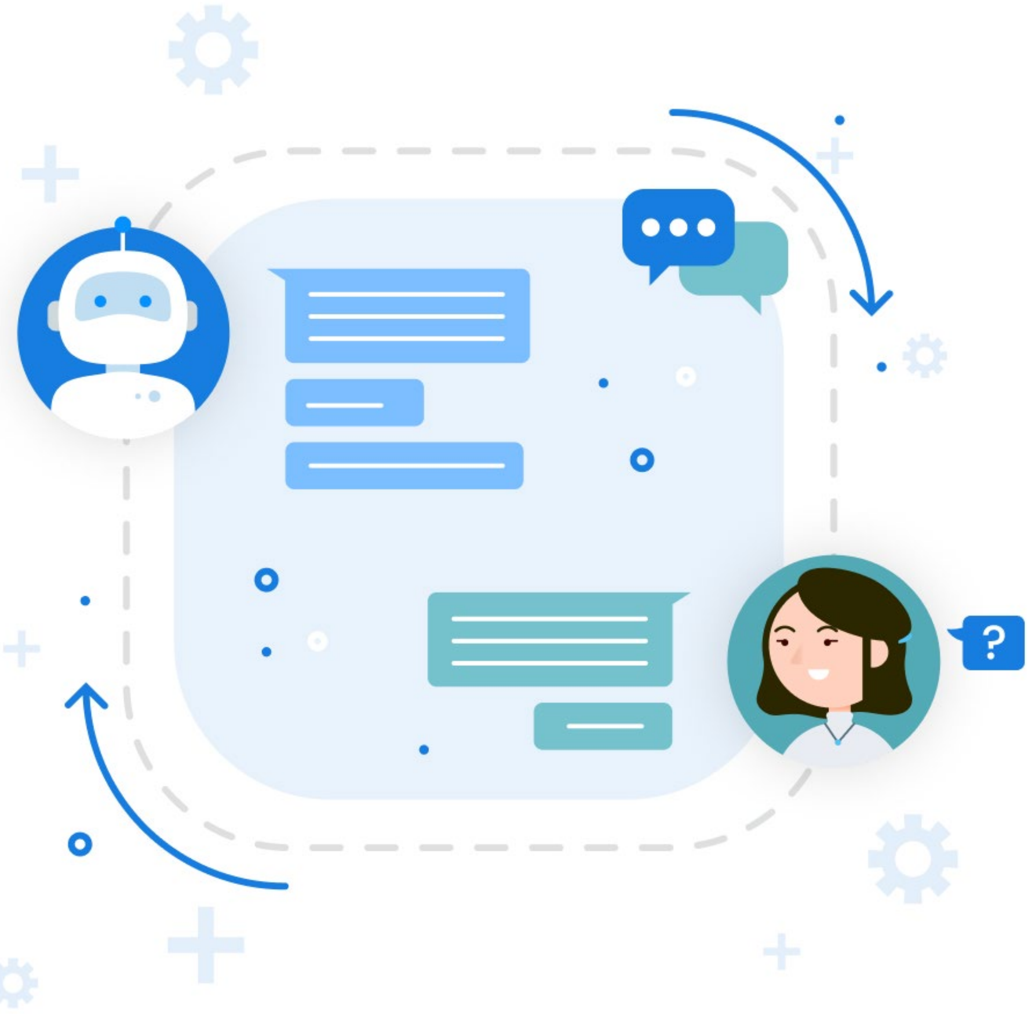
Generative AI

- Refers to artificial intelligence that can generate **new content**
- Ranging from text and images to music and code



Examples of Generative AI

- ChatGPT – allows multimodal conversation
- DallE – allows to create images
- The most recent one Sora – text to video model
- Some actuarial examples
  - Coding assistants for modellers
    - Code writing
    - Debugging
    - Code clean-up and efficiency
    - Legacy code documentation & reformatting
  - Automated production of customised and tailored customer communication
  - Automated data cleansing



Examples of Generative AI

Prompt: Photorealistic closeup video of two pirate ships battling each other as they sail inside a cup of coffee.

Examples Narrow AI vs GenAI

- Data Analysis
  - Narrow AI – understanding, summarizing and generating insights from structured data, predictions
  - GenAI – Structuring unstructured data, augmenting limited datasets, generating model points, simulating synthetic training/testing data
- Dynamic Assumption Modelling
  - Narrow AI – understanding the important explanatory variables, their impacts and correlations
  - GenAI – Understanding the core reasons for the assumption trends, focusing on the root causes and potentially solving wider issues

SWOT Analysis – Narrow AI

Strengths

- Proven Reliability
- Specificity
- Regulatory compliance

Weaknesses

- Limited Creativity
- Data Dependency
- Inflexibility
- Maintenance

Opportunities

- Integration
- Industry Expansion
- Process Optimisation

Threats

- Generative AI Advancements
- Data Privacy Regulations
- Obsolescence Risk

SWOT Analysis – Generative AI

Strengths

- Natural language interface
- Integration and automation
- Versatile
- Make use of additional context to inform their responses

Weaknesses

- Bias and Fairness
- Explainability
- 'Hallucinations'
- Can struggle with arithmetic and computational tasks

Opportunities

- Creative Innovations
- Learning & Development
- Expansion into complex fields

Threats

- Potential for misuse
- Regulatory challenges
- Information security

Key differences

What does it do?	• Narrow AI: Prediction Classification • Generative AI: Creation, Innovation
How is it applied?	• Narrow AI: Automation, Decision Support • Generative AI: Content generation
Who can use it?	• Narrow AI: Requires knowledge and specialized skills • Generative AI: Anyone – Prompt Engineering
How can it help actuaries?	• Narrow AI: Risk Assessment, Pricing • Generative AI: Code Generation, Code translation, Automate testing

What happens when things do go wrong?

- How much does it matter when I am wrong?
- How quickly will I find out that I am wrong?
- How quickly can I remediate the problem?

Questions?

Please raise your hand to ask a question, and wait for a mike to get to you

Arlen.GaliciaCarreon@wtwco.com

Vatsal.Gomber@wtwco.com

Society of Actuaries in Ireland

Looking back to look forward - Data Science and AI's role in the Health sector

Dr Mary Coghlan, Luke Gaughan

13 June 2024

Introductions and Contents

Dr Mary Coghlan,

Partner,

Head of Health Data Analytics & AI

Luke Gaughan,

Senior Consultant,

Non-Life Actuarial

Agenda

1. The Health Care Sector
2. An EY Case Study
3. The Health Insurance Industry

The Health Care Sector

The Current Landscape

Trends and challenges in the Health Sector

Patient Care Trends

Increase in patient volume and complexities

Rising prevalence of chronic diseases

Growing demand for personalised medicine

Operational Trends

Growing need to reduce health care costs using technology

Shrinking operational workforce in health care facilities

Data/Technology Trends

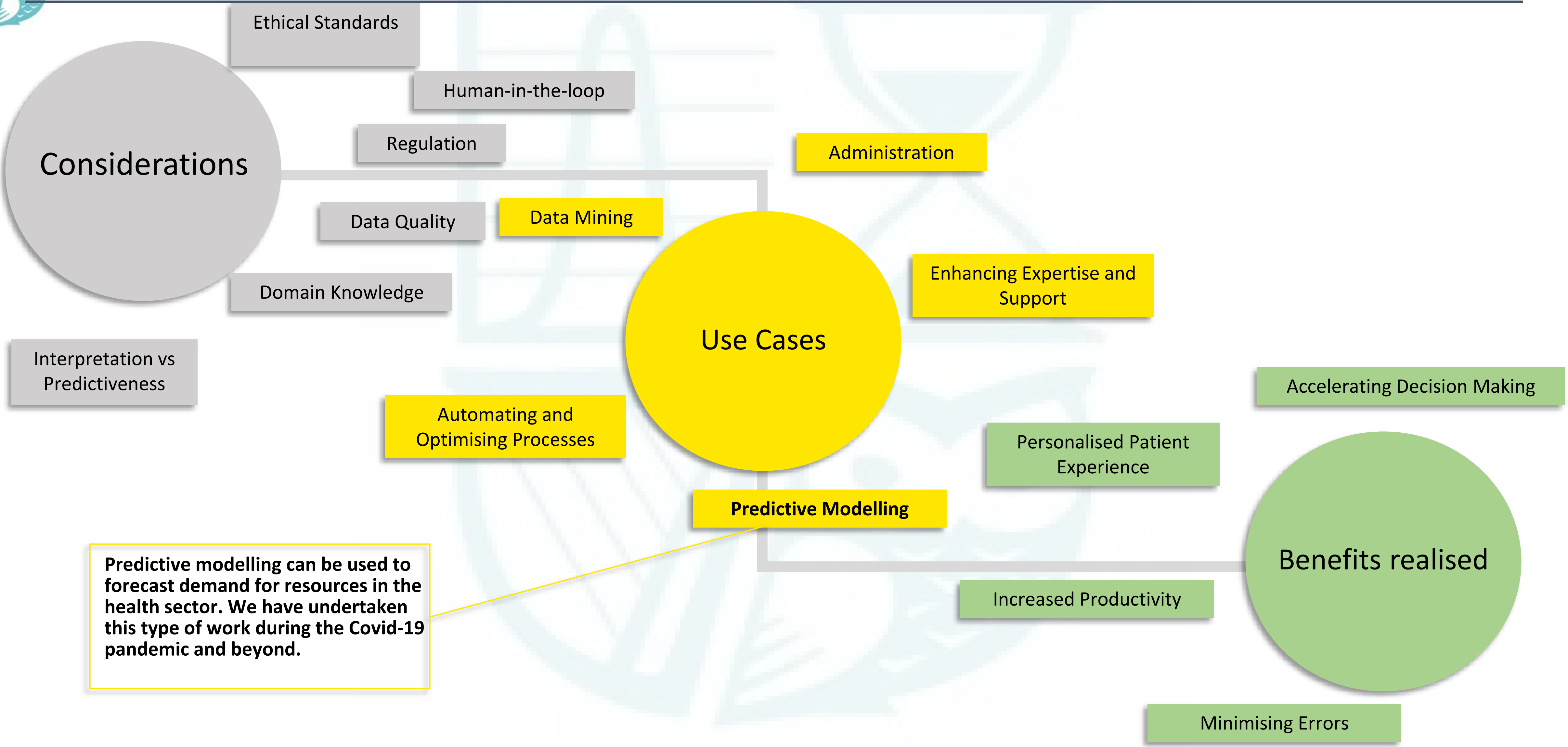
Large inflow of patient health-related data

Technological advancements and innovations

Increasing use of artificial intelligence

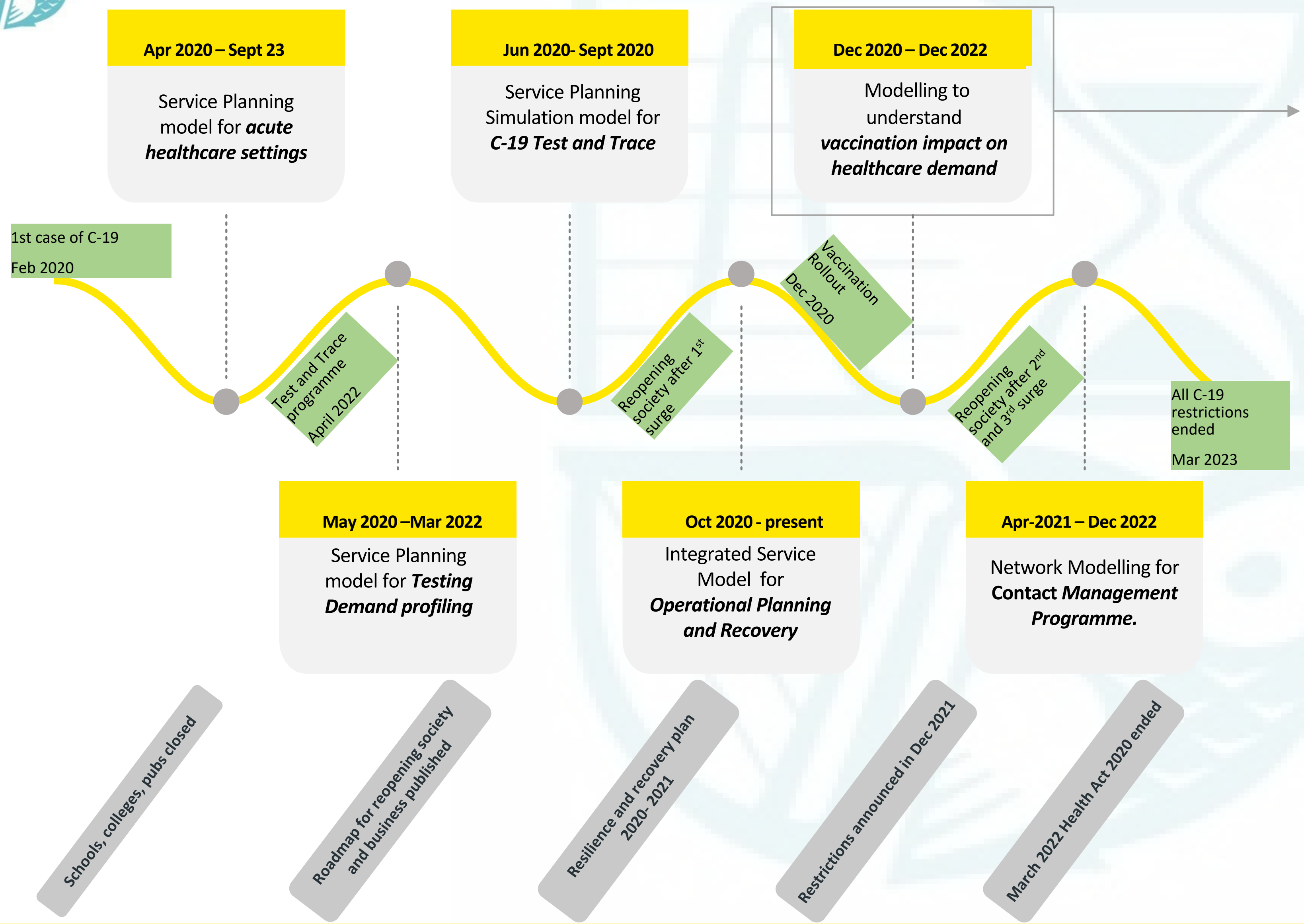
Use Cases for Data Science

Benefits realised to date and key considerations



An EY Case Study on Predictive Modelling in the Health Sector

EY's support during COVID-19 to Health Services



Vaccination Modelling:

Irish vaccine rollout commenced in late December 2021 with high-risk cohorts including health care workers and residents of long-term facilities.

EY developed model to ***forecast the impact of the vaccination programme on the levels of hospitalisation resulting from COVID-19*** and the subsequent demand this creates for acute hospital beds.

This model was closely ***linked to the COVID-19 hospitalisation model*** and was deployed to make longer term ***predictions based on available clinical trial data and experience globally.***

Model Inputs: The model accounted for the various types of vaccine used, their performance, volumes ordered and administered as well as approval dates of any new vaccines. The model also accounted for the order in which the public was to be vaccinated – with at risk groups prioritised.

Model Parameters: The model was iterative and adaptable, keeping pace with the everchanging dynamics of COVID-19 in Ireland . Baseline demand analysis was further enriched by the addition of scenario modelling to provide opportunities for greater flexibility and deeper discussions.

Model Outputs: The various inputs were combined to model a day-on-day measure of vaccine protection in the community and a subsequent risk profile for hospitalisation. This calculated risk profile was then fed into the COVID-19 hospitalisation model to project hospital demand into the future.

The methods and tools provided a new ways of thinking about service planning

How our work would have benefited from emerging technologies

Significantly reduce end-to-end project execution time by reducing model development cycle time and model run time

Reduced Execution Time

Targeted Resource Allocation

Adopting targeted approach to modelling resources calling on specialists like MLOps and AI Engineers

Facilitates automation, allowing for increased time available for collaboration with clinicians and healthcare providers to refine healthcare models.

Greater focus on clinical expertise

Enhanced Decision-Making Processes

Provides opportunity to create more sophisticated and intricate models

Example: During the modelling phase, HSE requested various scenarios. Although our model was equipped to generate these scenarios, running new simulations would take additional modelling time. Nevertheless, with the implementation of Gen AI, we can now create an interface that allows healthcare organisations to input scenarios, thereby facilitating rapid responses and aiding in more informed decision-making

The Health Insurance Industry

Developing Data Science Methods

How prescriptive analytics is gaining traction

Descriptive Analytics

Insights into the past:

"What has happened?"

Predictive Analytics

Understanding the future:

"What could happen?"

Prescriptive Analytics

Advise on possible outcomes:

"What should we do?"

Applications for Prescriptive Analytics in Health Insurance

- Performance optimisation
- Marketing strategies
- Claims management

Exploring Generative AI

A future solution – with challenges

Hyper-personalise engagement

Drive efficiency via automation

Augment/ “Co-pilot” decision making

Reinvent industry models and value propositions

Transformation areas

A sample of use cases for Generative AI in insurance

Potential Use cases of Gen AI

Healthcare Management

Member Services

Corporate Functions

Claims Management

Marketing and Sales

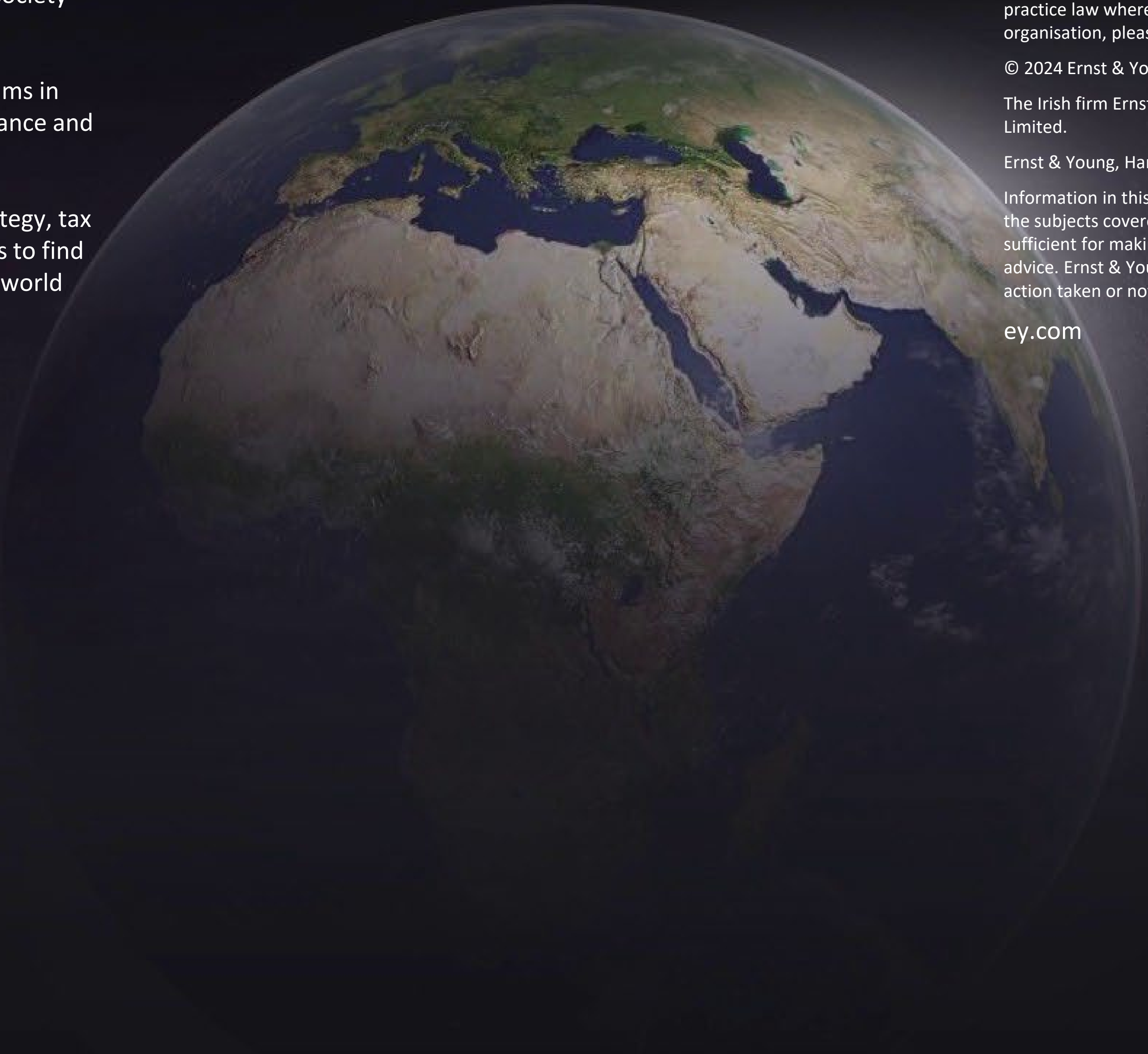
Q&A
Please raise your hand to ask a question, and wait for a mike to get to you

EY | Building a better working world

EY exists to build a better working world, helping to create long-term value for clients, people and society and build trust in the capital markets.

Enabled by data and technology, diverse EY teams in over 150 countries provide trust through assurance and help clients grow, transform and operate.

Working across assurance, consulting, law, strategy, tax and transactions, EY teams ask better questions to find new answers for the complex issues facing our world today.



The Irish firm Ernst & Young is a member practice of Ernst & Young Global Limited.

Ernst & Young, Harcourt Centre, Harcourt Street, Dublin 2, Ireland.

ey.com

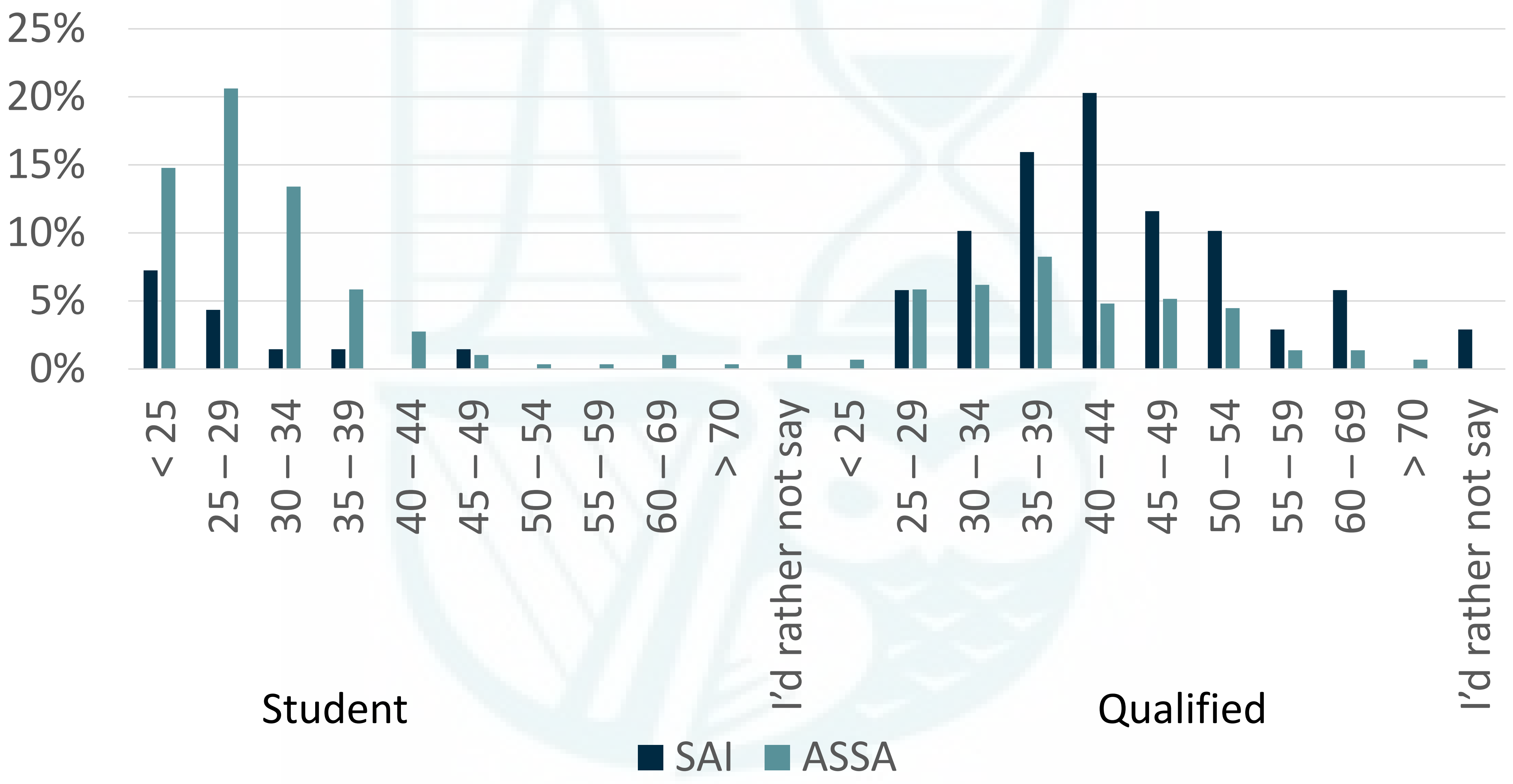
Society of Actuaries in Ireland

Data Science Survey

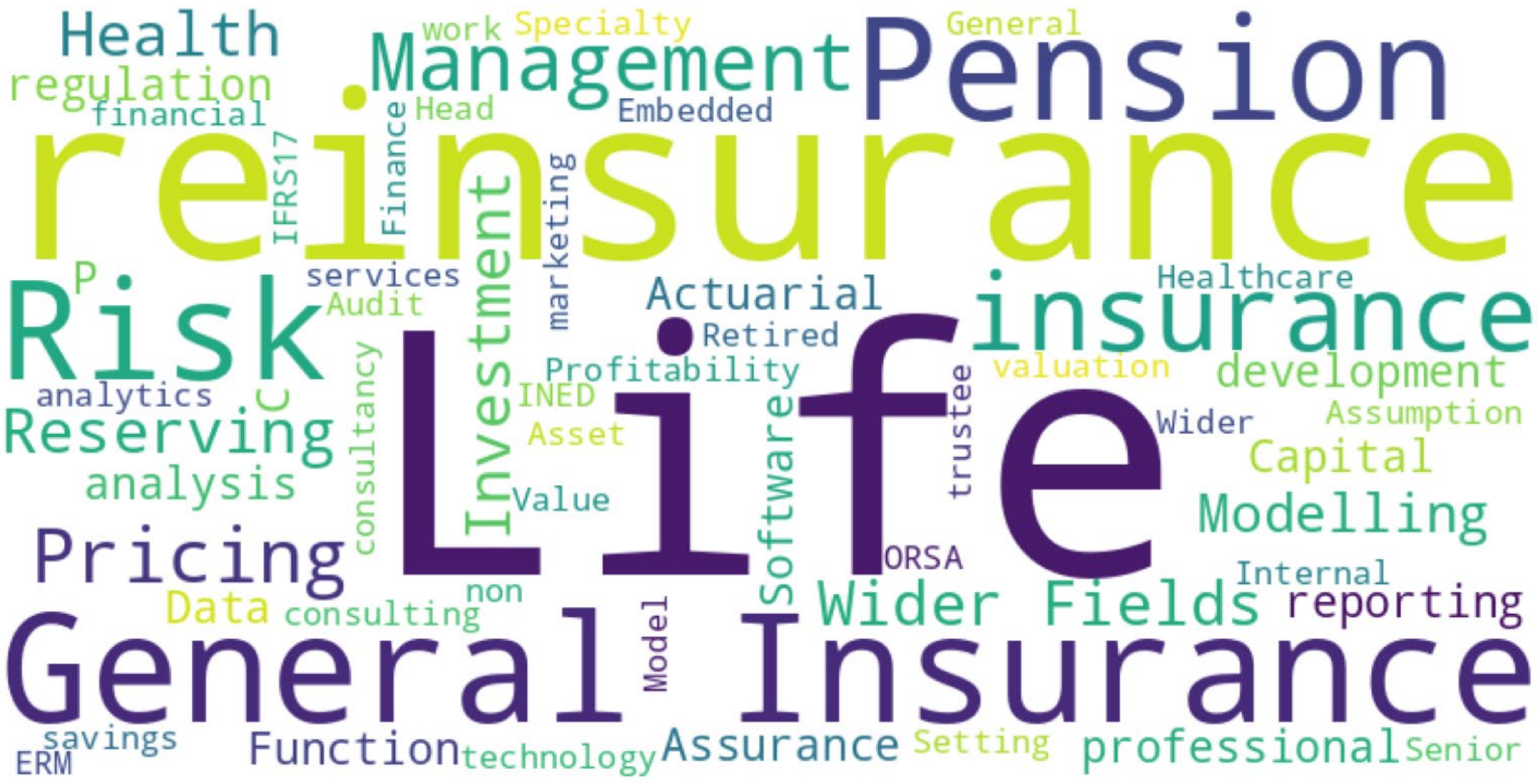
Kate Bell (she/her)

13/06/2024

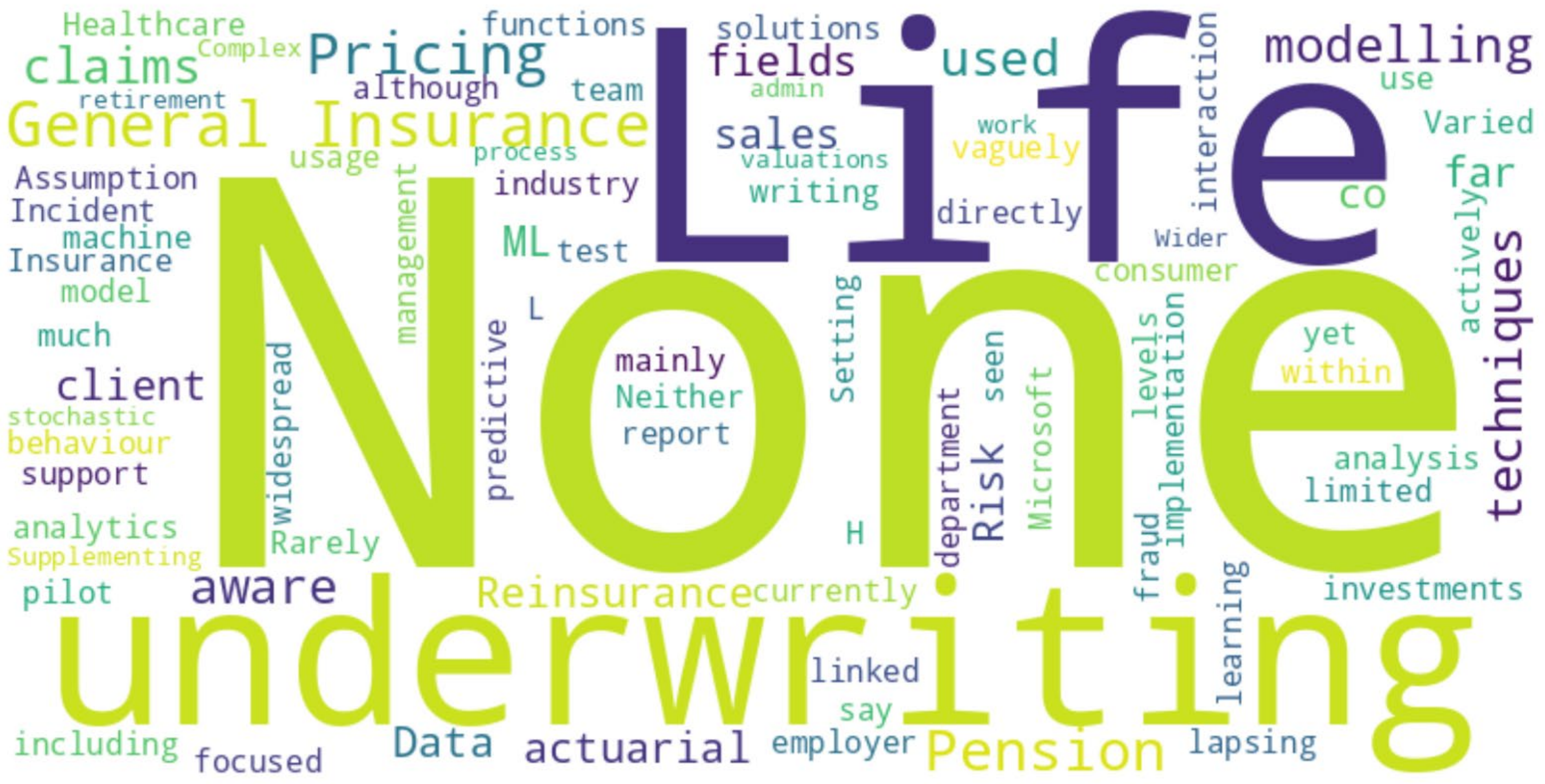
Age group and qualification status



Please specify the fields of actuarial science you work in

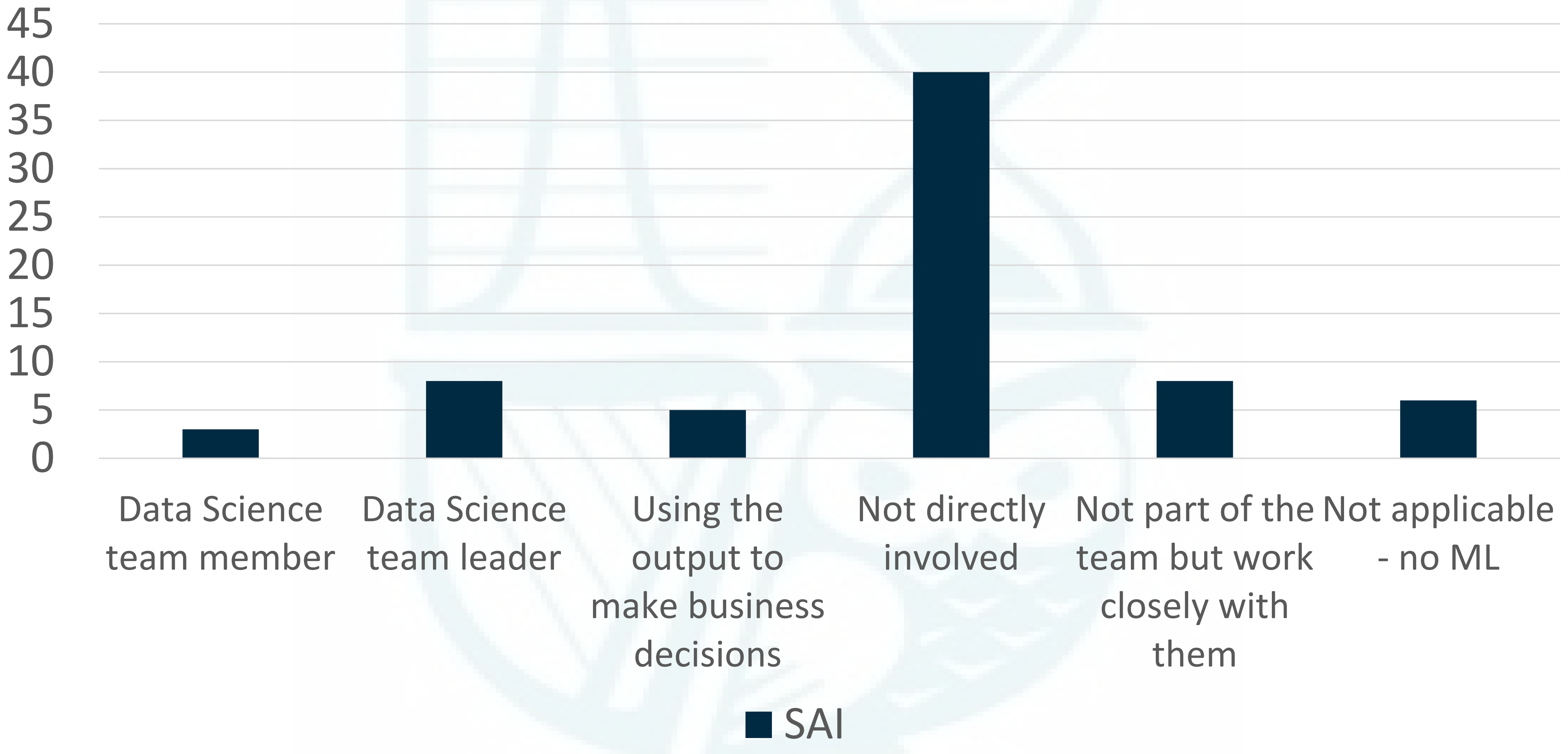


In which of the fields listed above are machine learning techniques most often utilized?

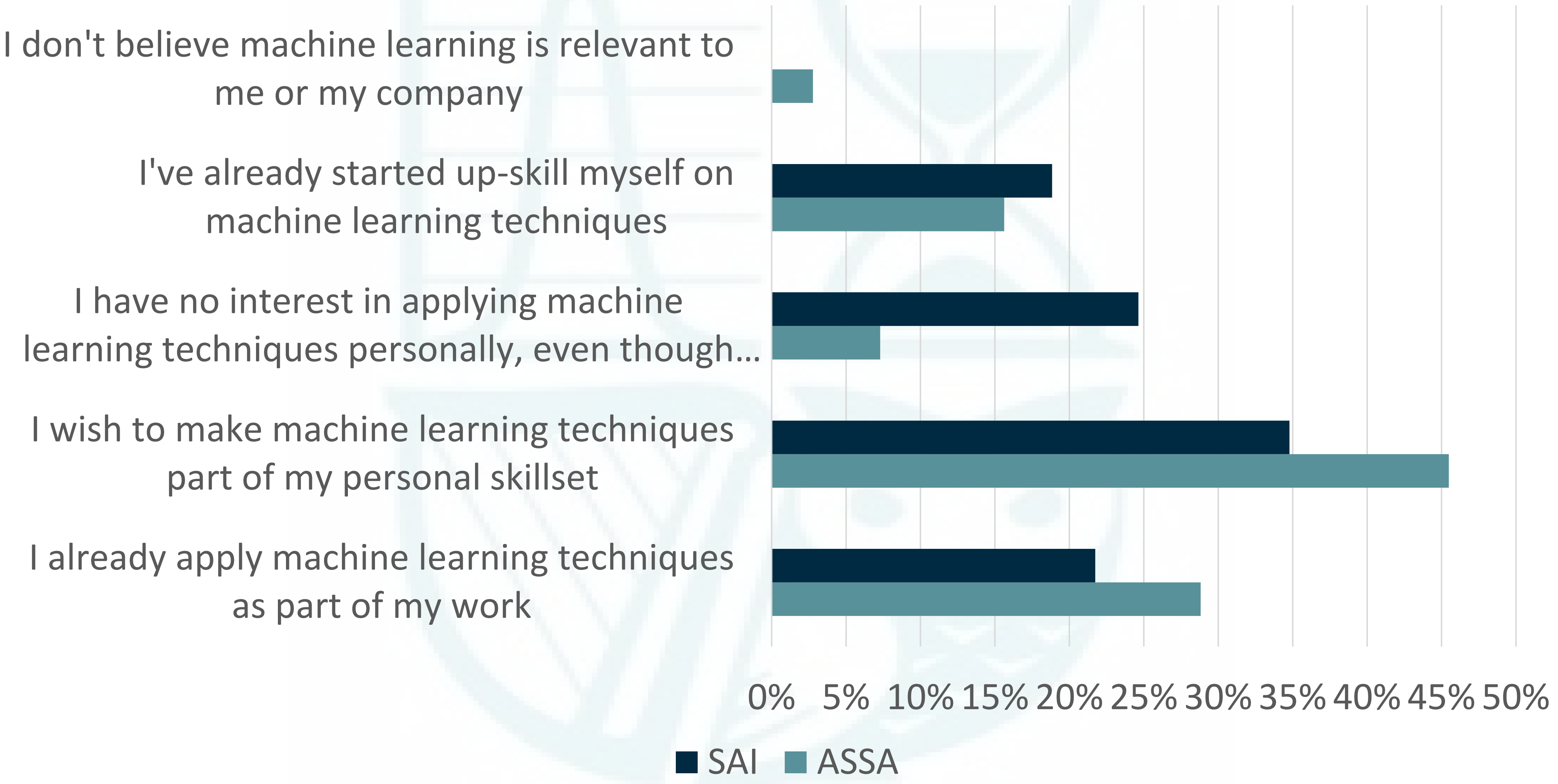


Which of the following options most accurately describes the seniority of your current role in your organisation?

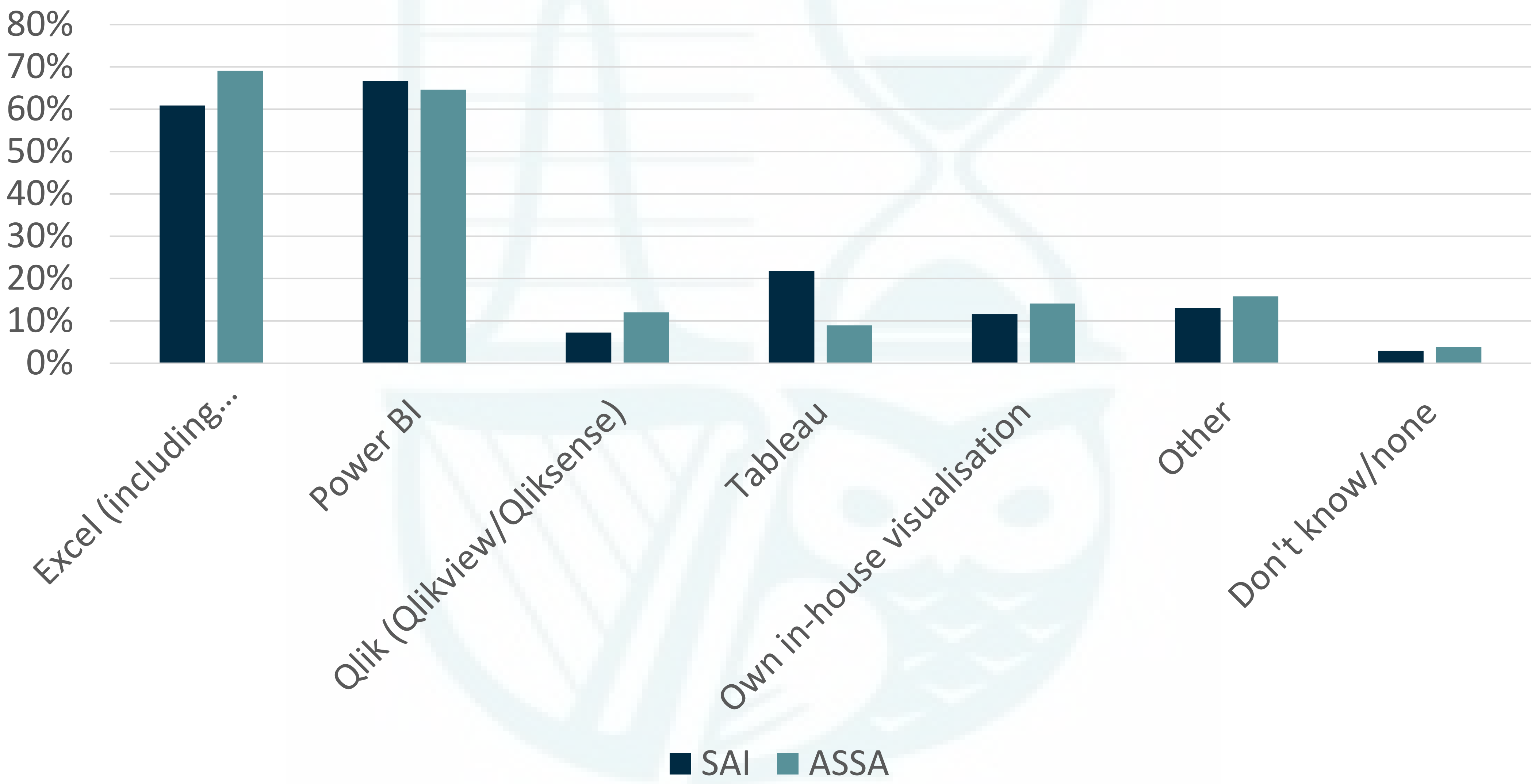
What is your relationship / association with the people (team) using machine learning techniques in your company?



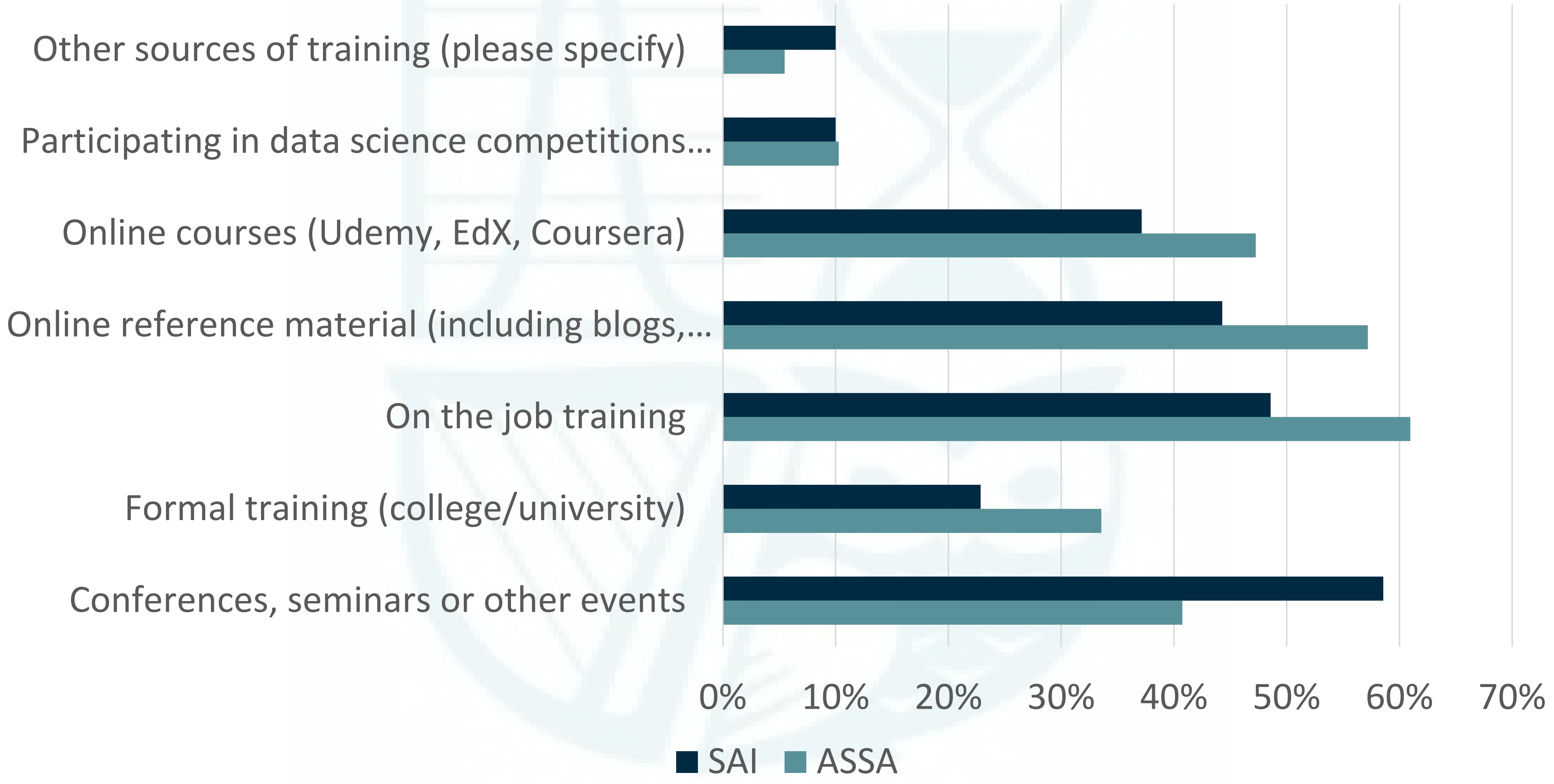
Select the statement which is most descriptive of your current thinking around data science and machine learning.



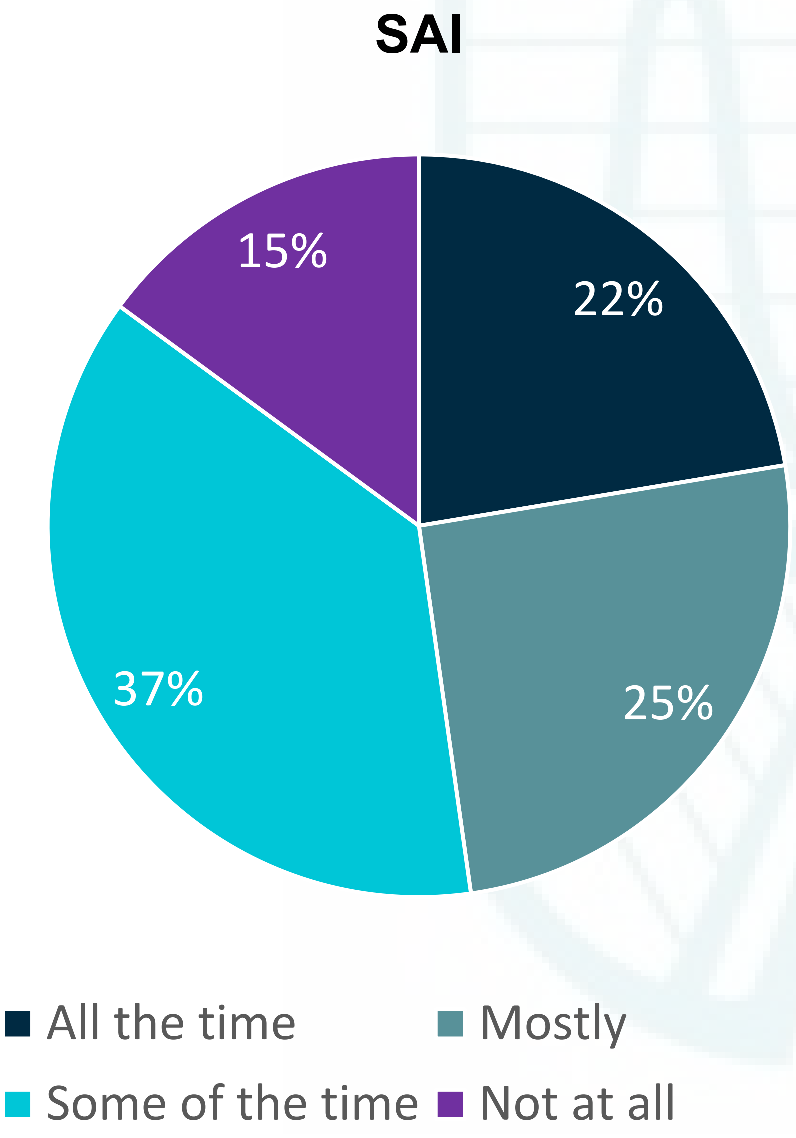
Which third-party visualisation / business intelligence are you or your organisation using?

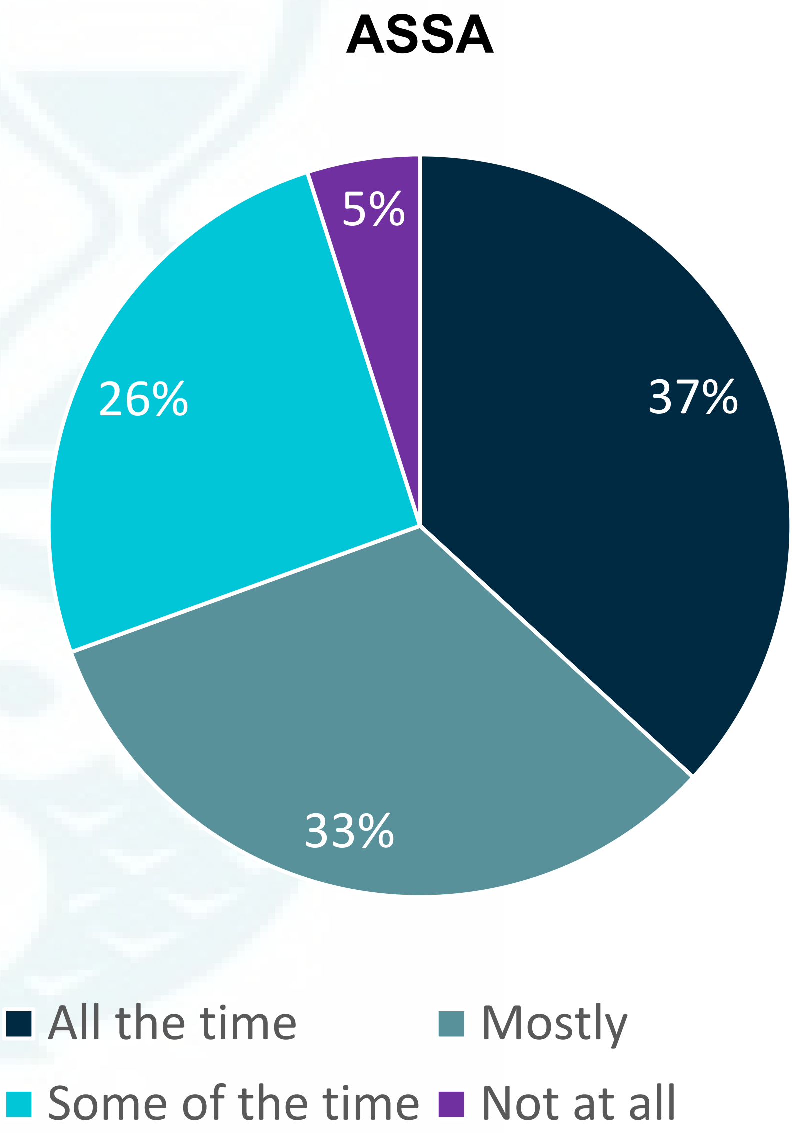


Which of the following methods you have found useful to find out more about data science, machine learning or big data?

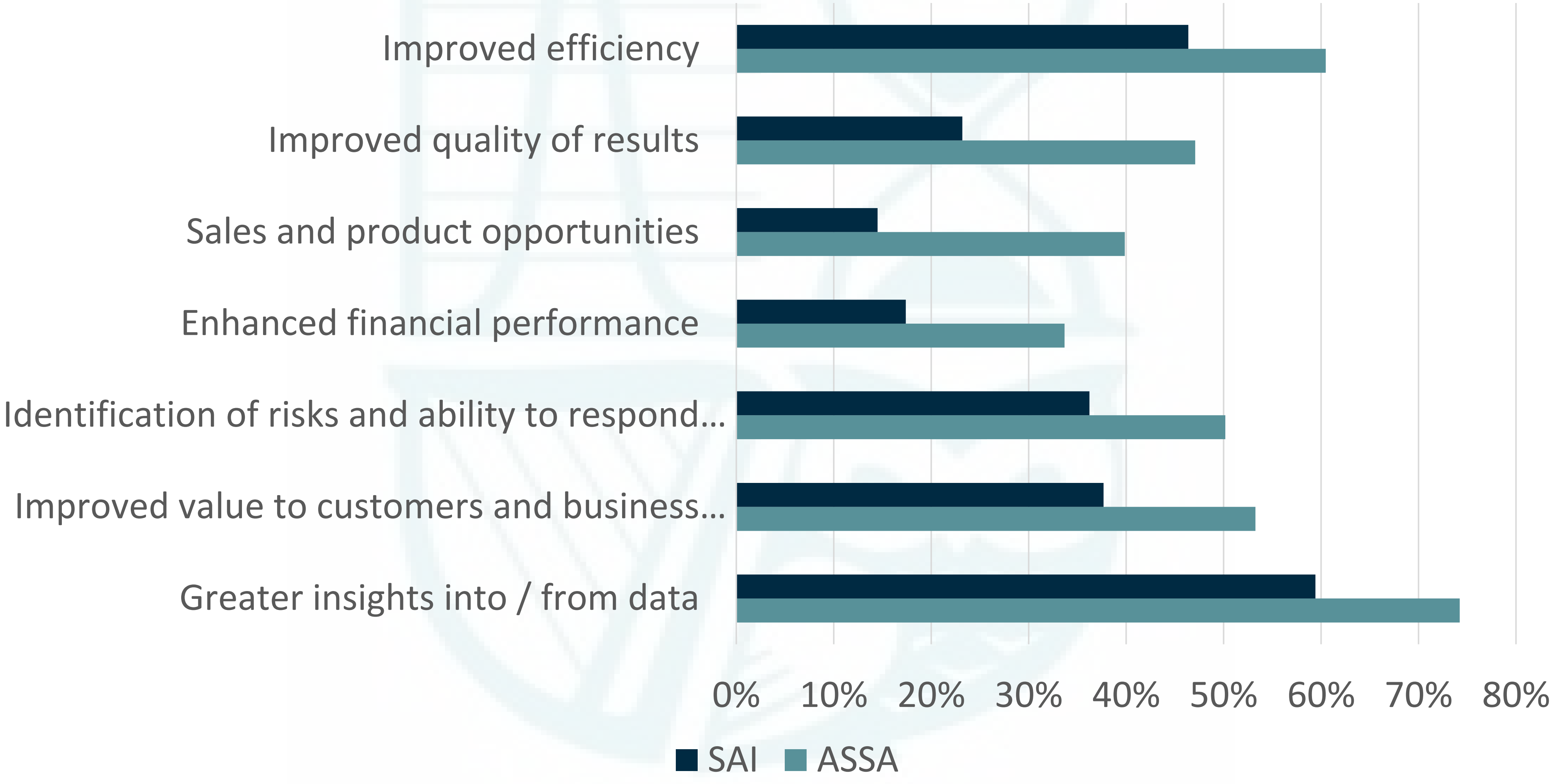


How often are important decisions made in your company informed and supported by data analytics? (or clients if you are a consultant).

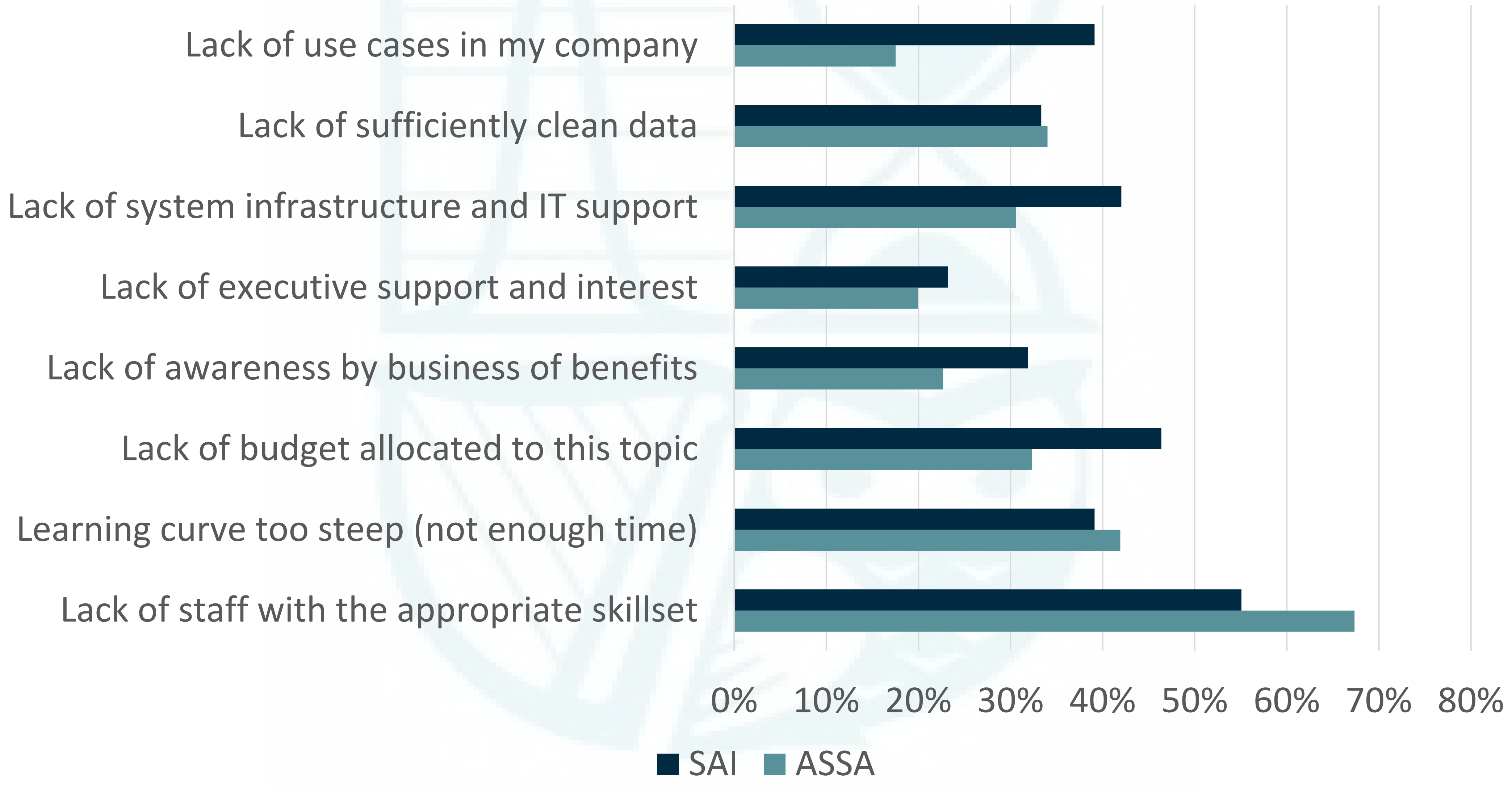




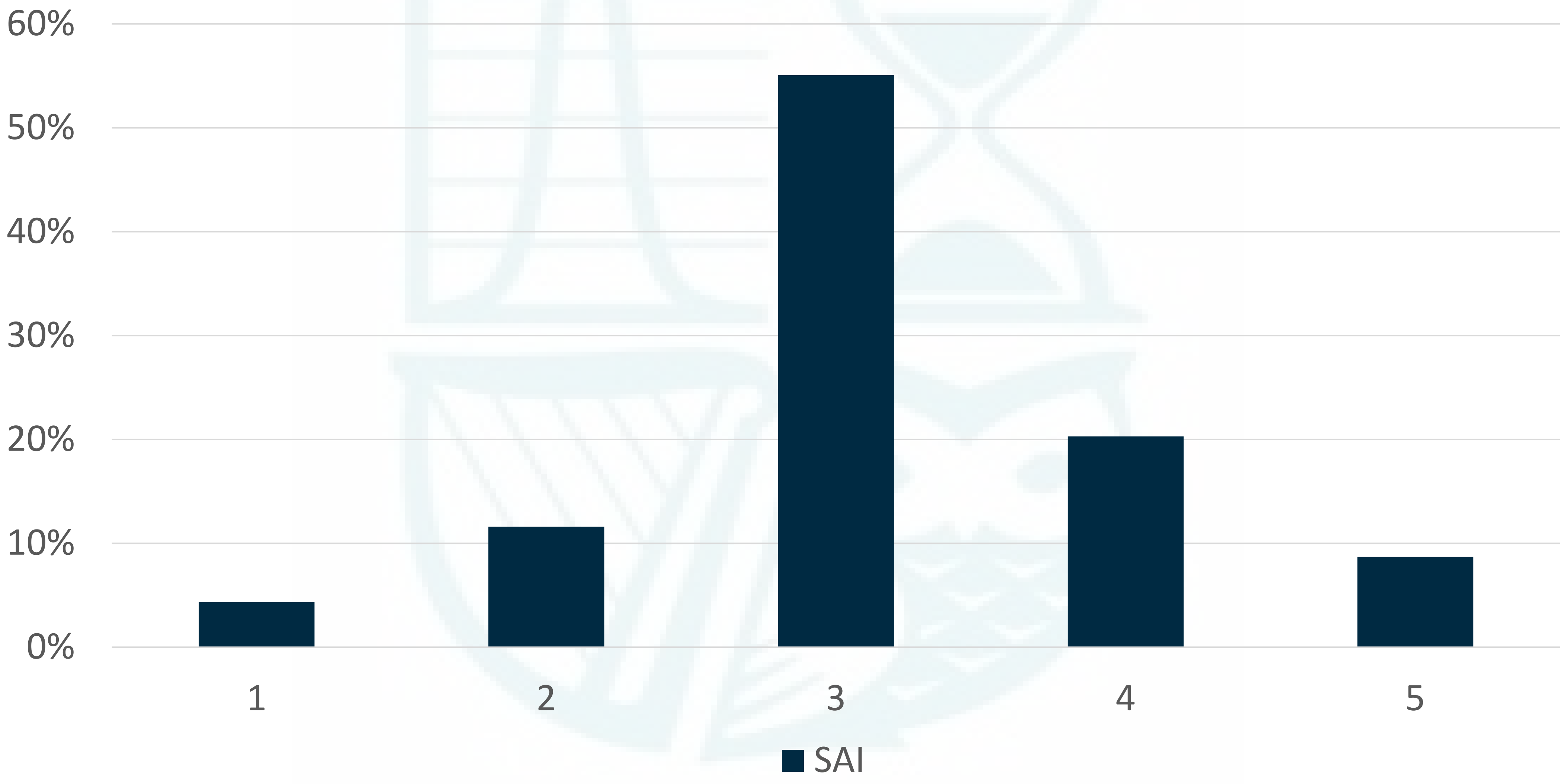
Rate to what extent (if any) you think data science and machine learning have benefited your company.



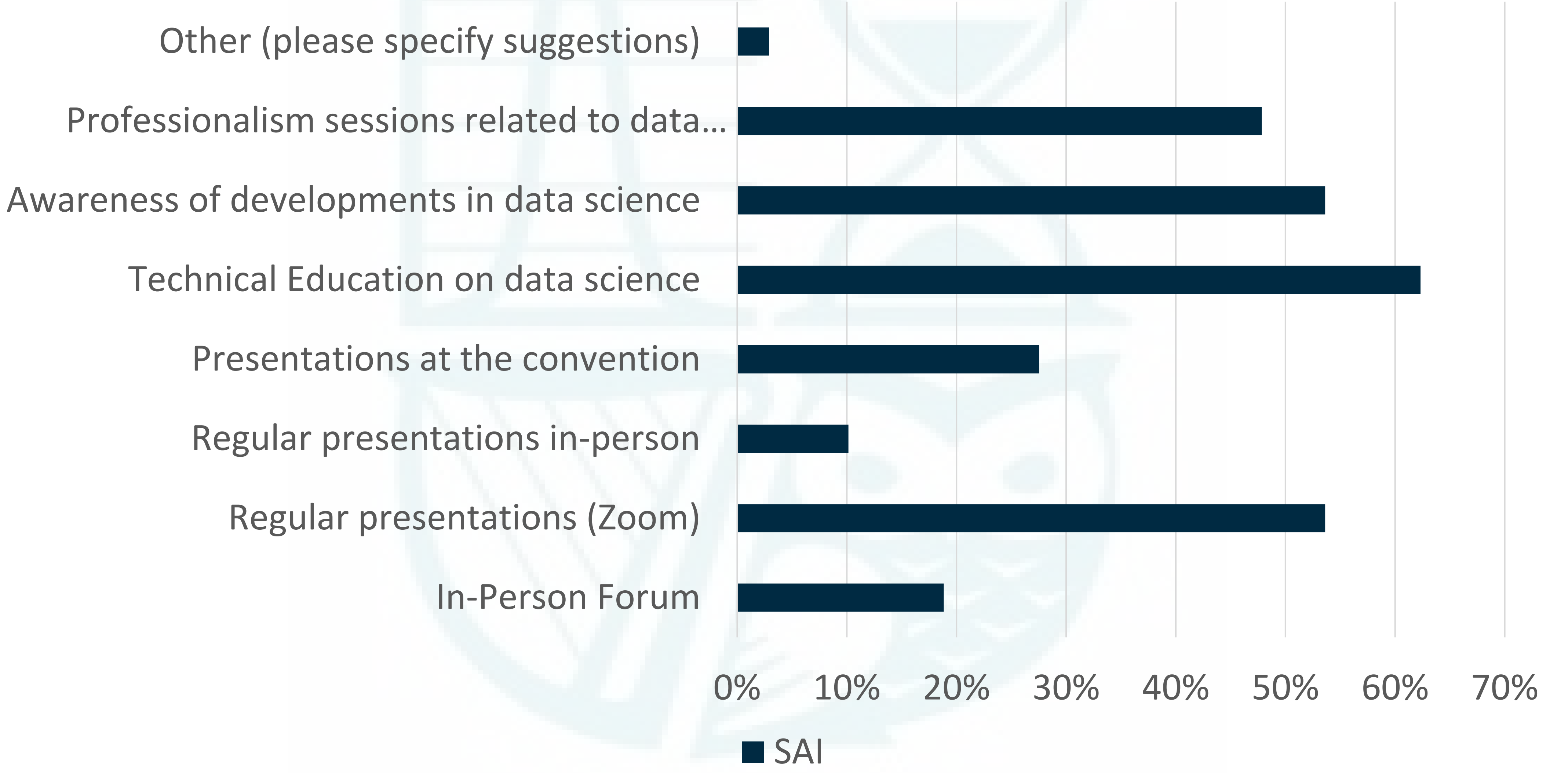
Rate to what extent the following is hampering the adoption of data science and machine learning techniques within your organization?



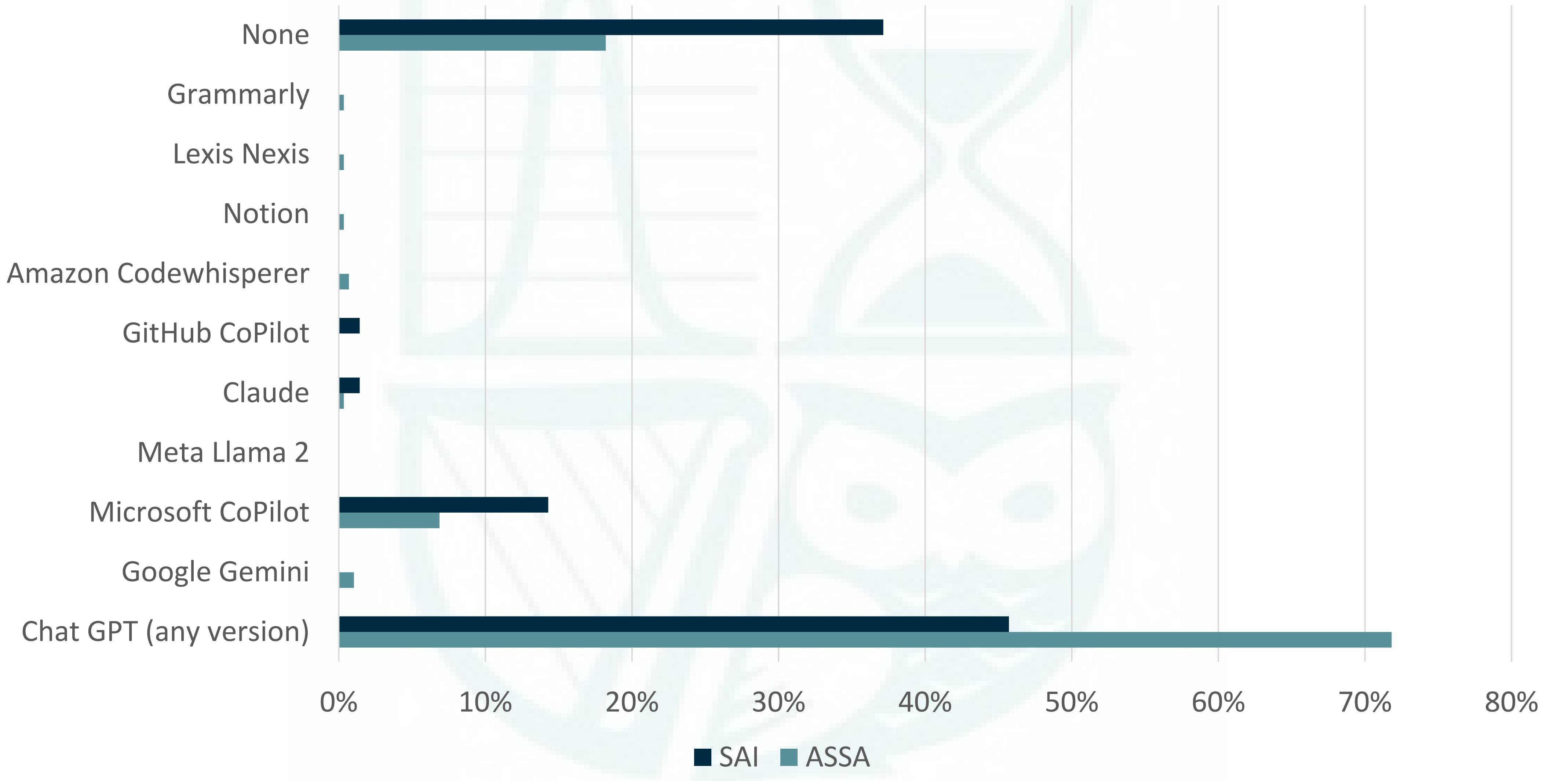
How satisfied are you with the support and resources SAI provide for data science (where 1 is very dissatisfied, and 5 is very satisfied)?



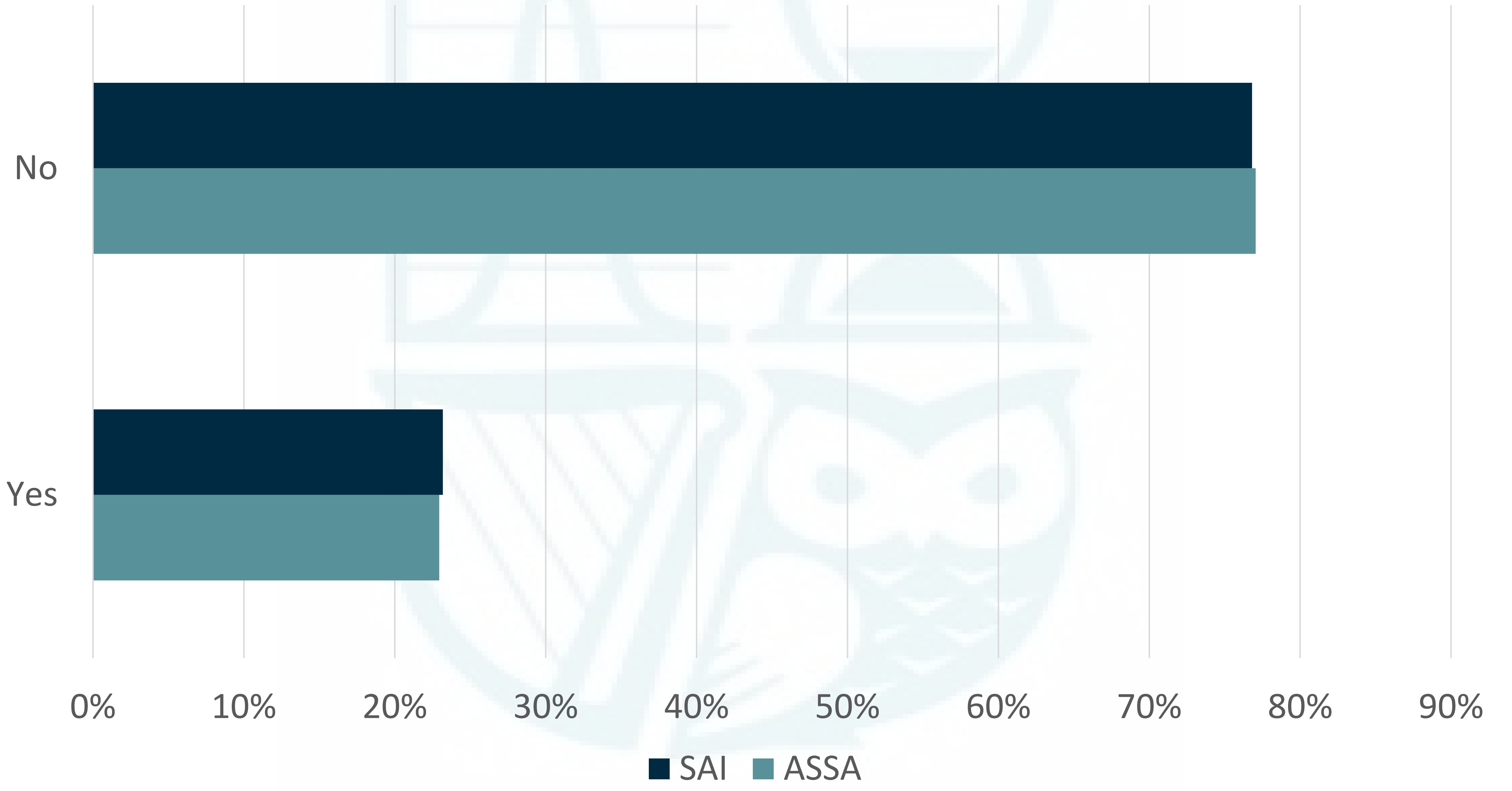
What could the Society do more of in terms of Data Science awareness & support?



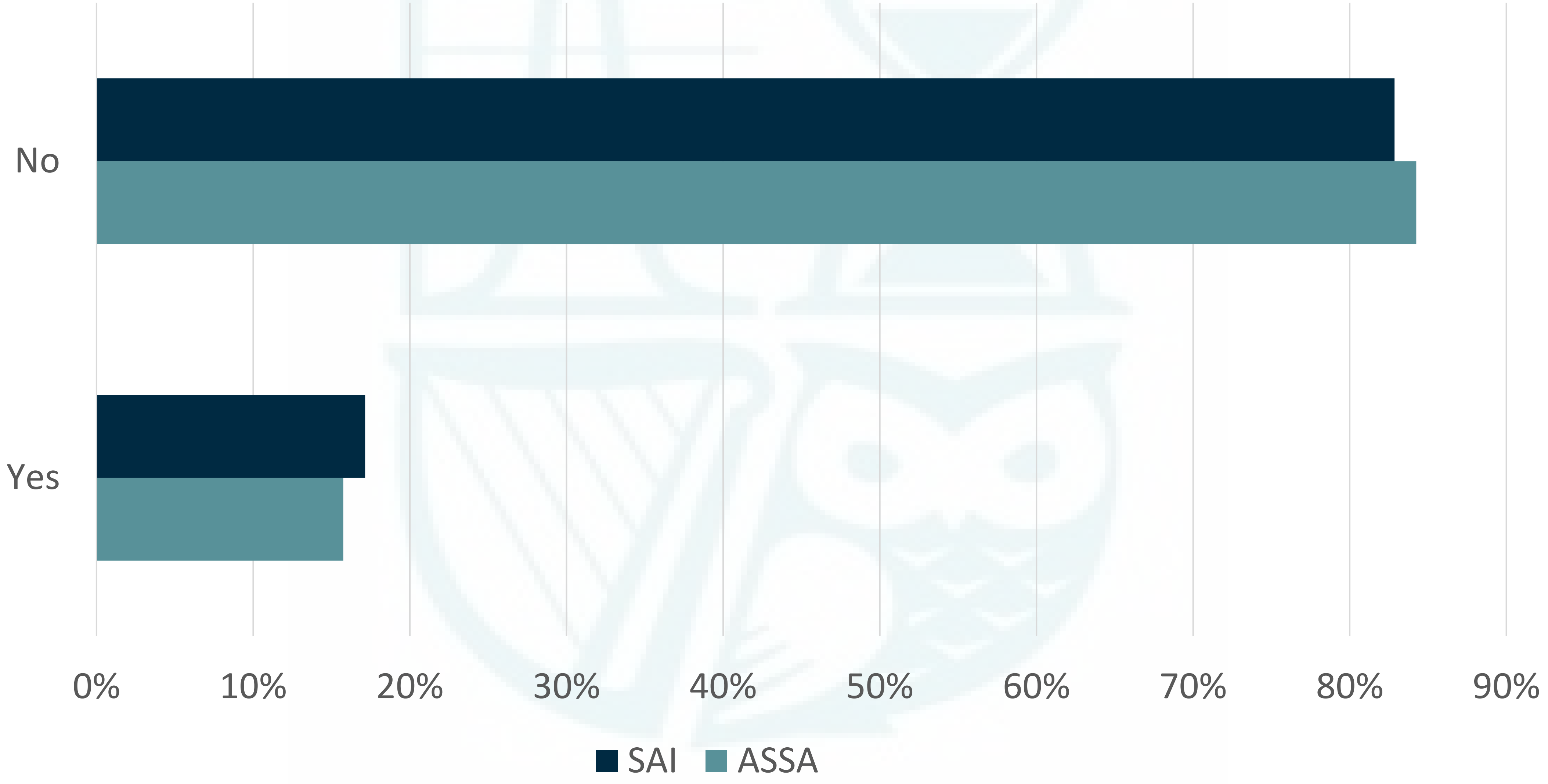
What LLM are you using on a regular basis?



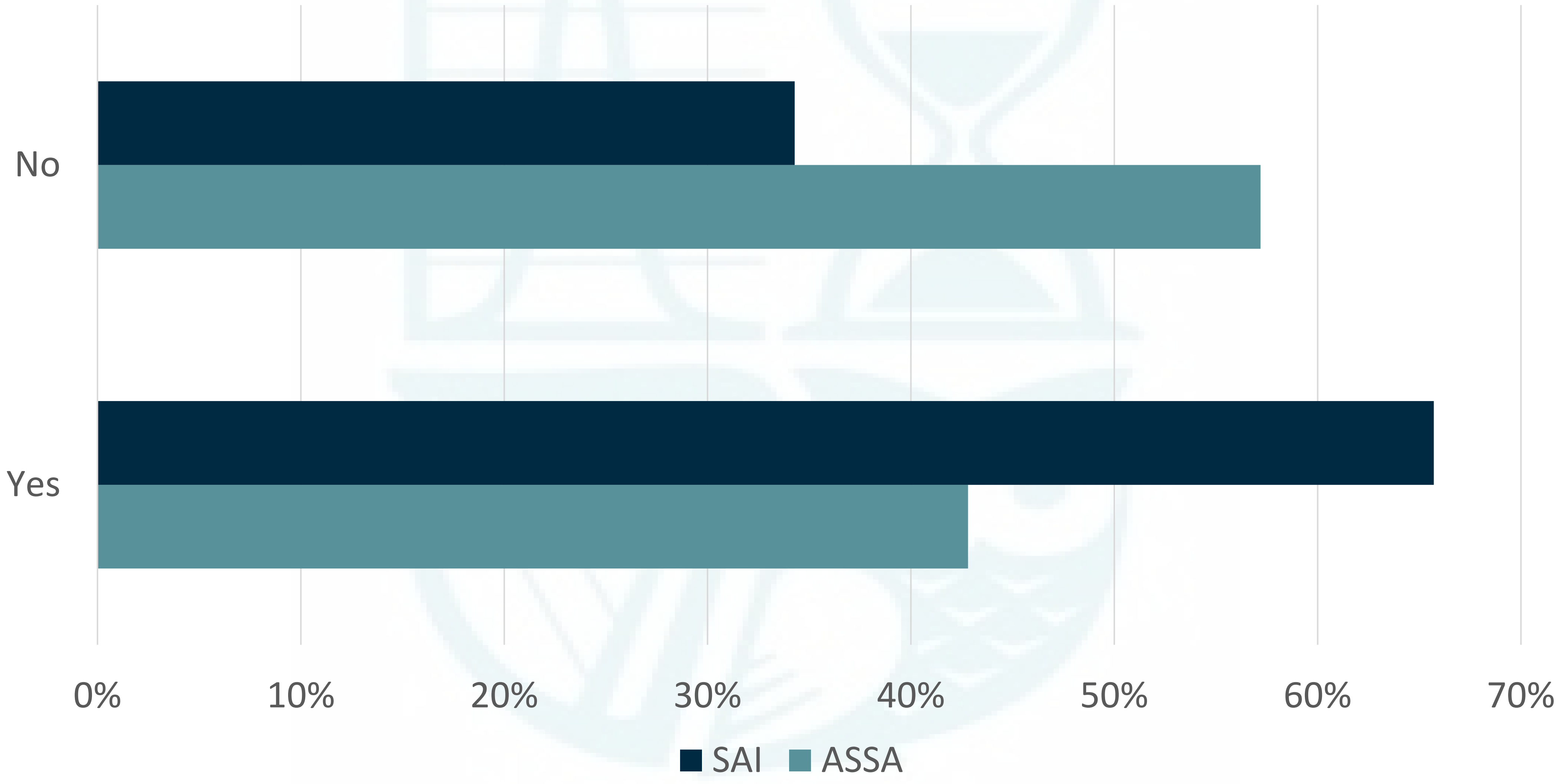
Are you currently making use of any paid LLM offerings?



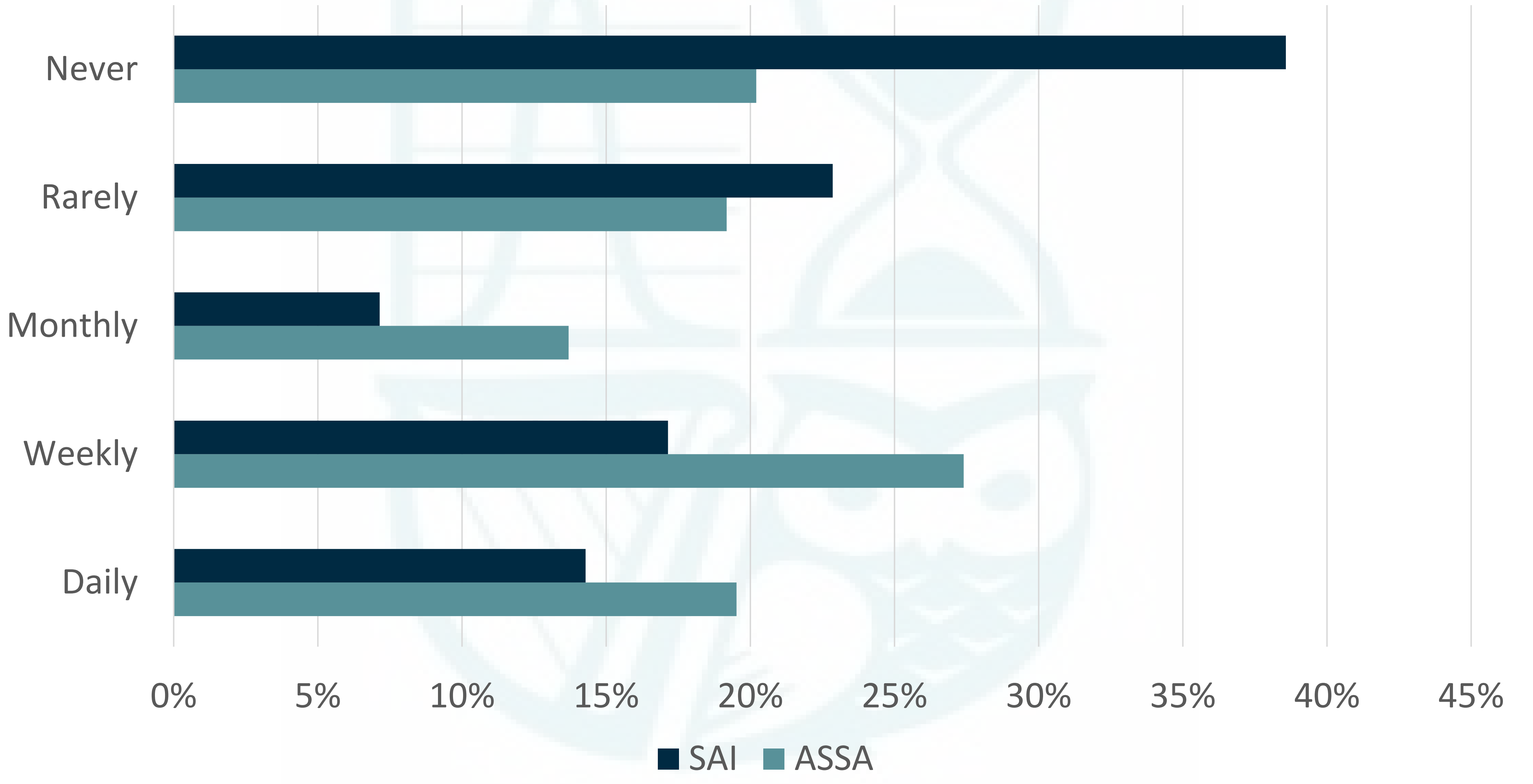
If you answered yes in the previous question, is your organisation paying for these services on your behalf?



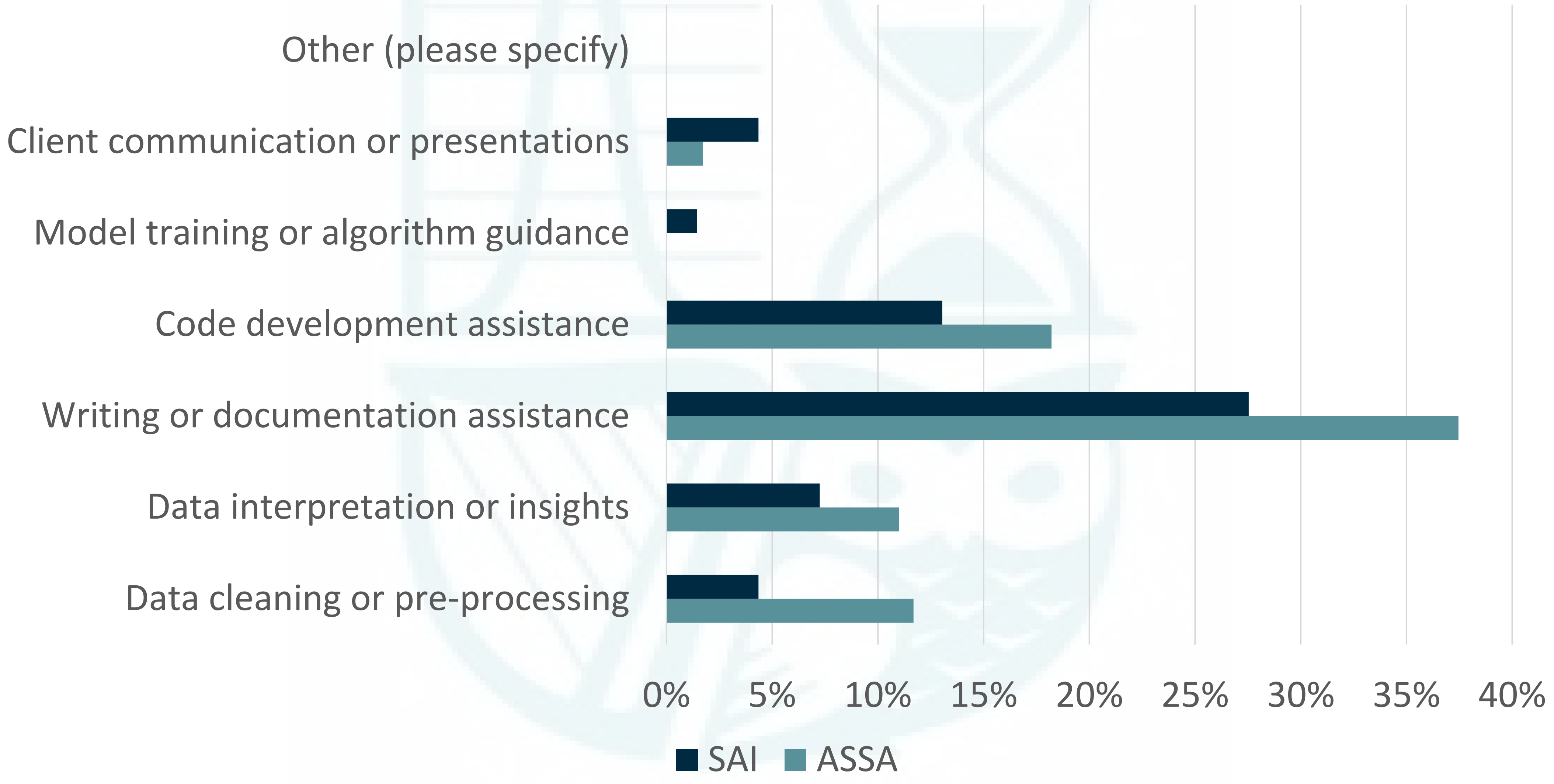
Does your organisation have an official policy on the usage of LLMs?



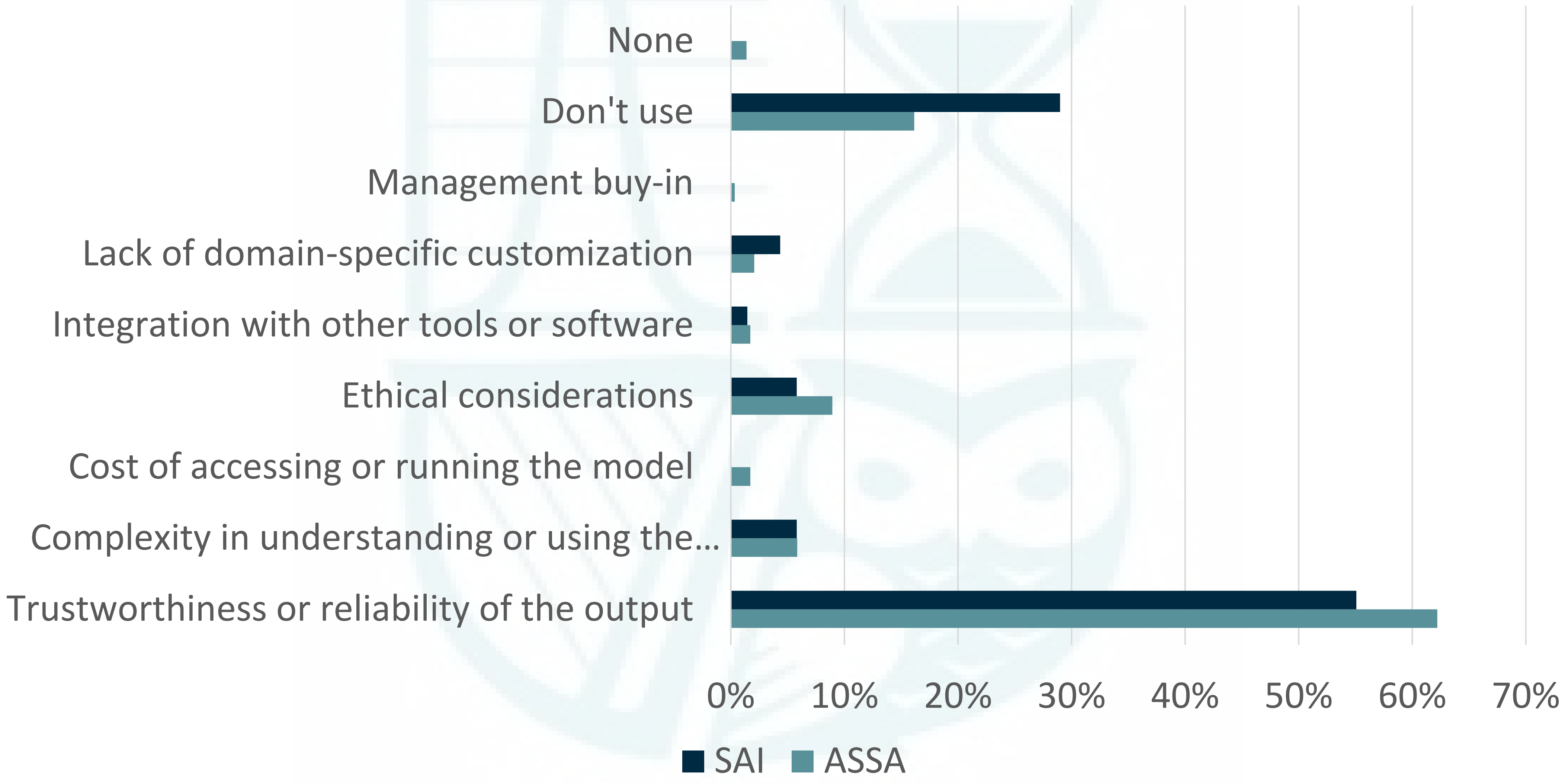
How often do you use LLMs (like ChatGPT) in a work context?



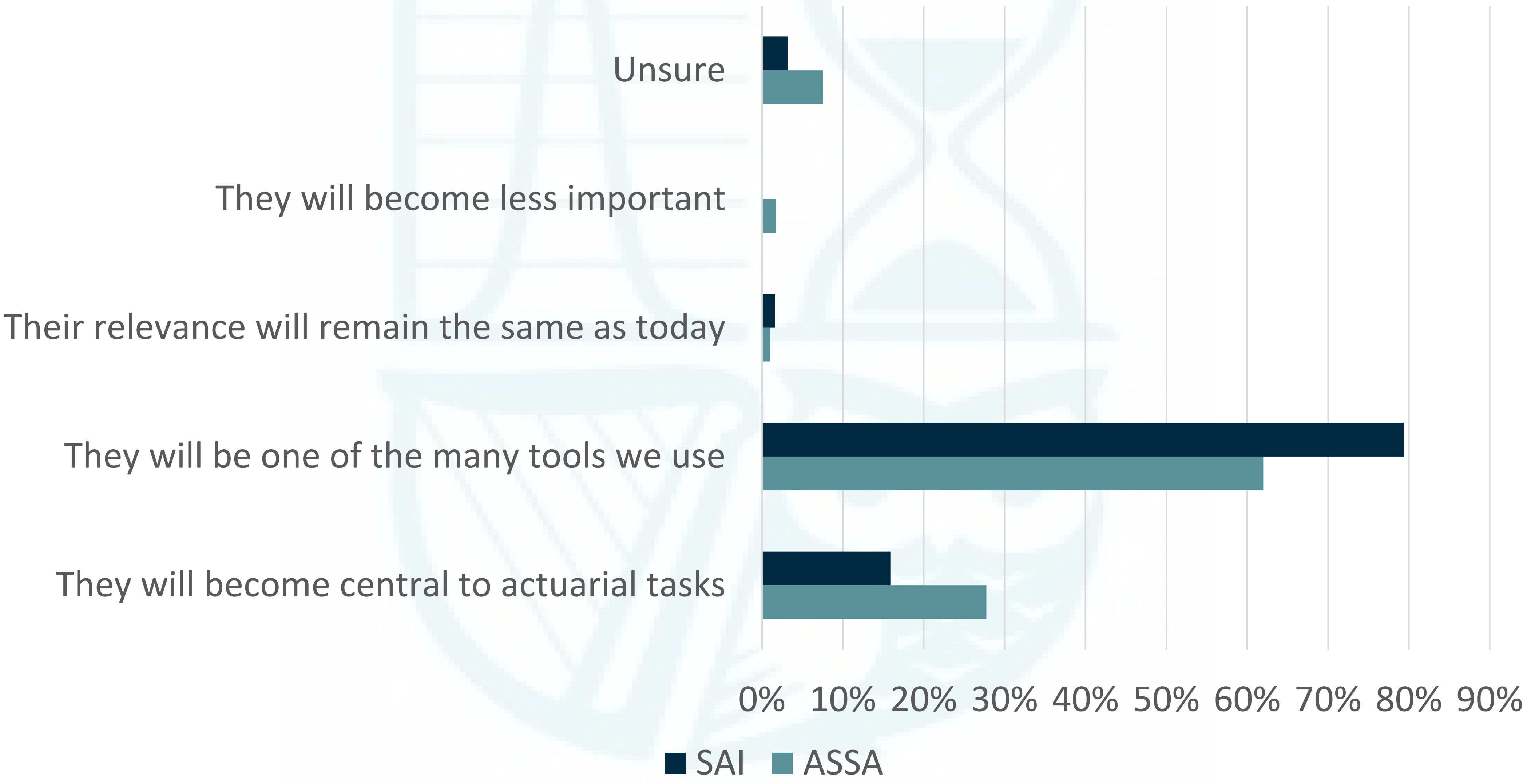
For what purposes do you primarily use LLMs in your actuarial work?



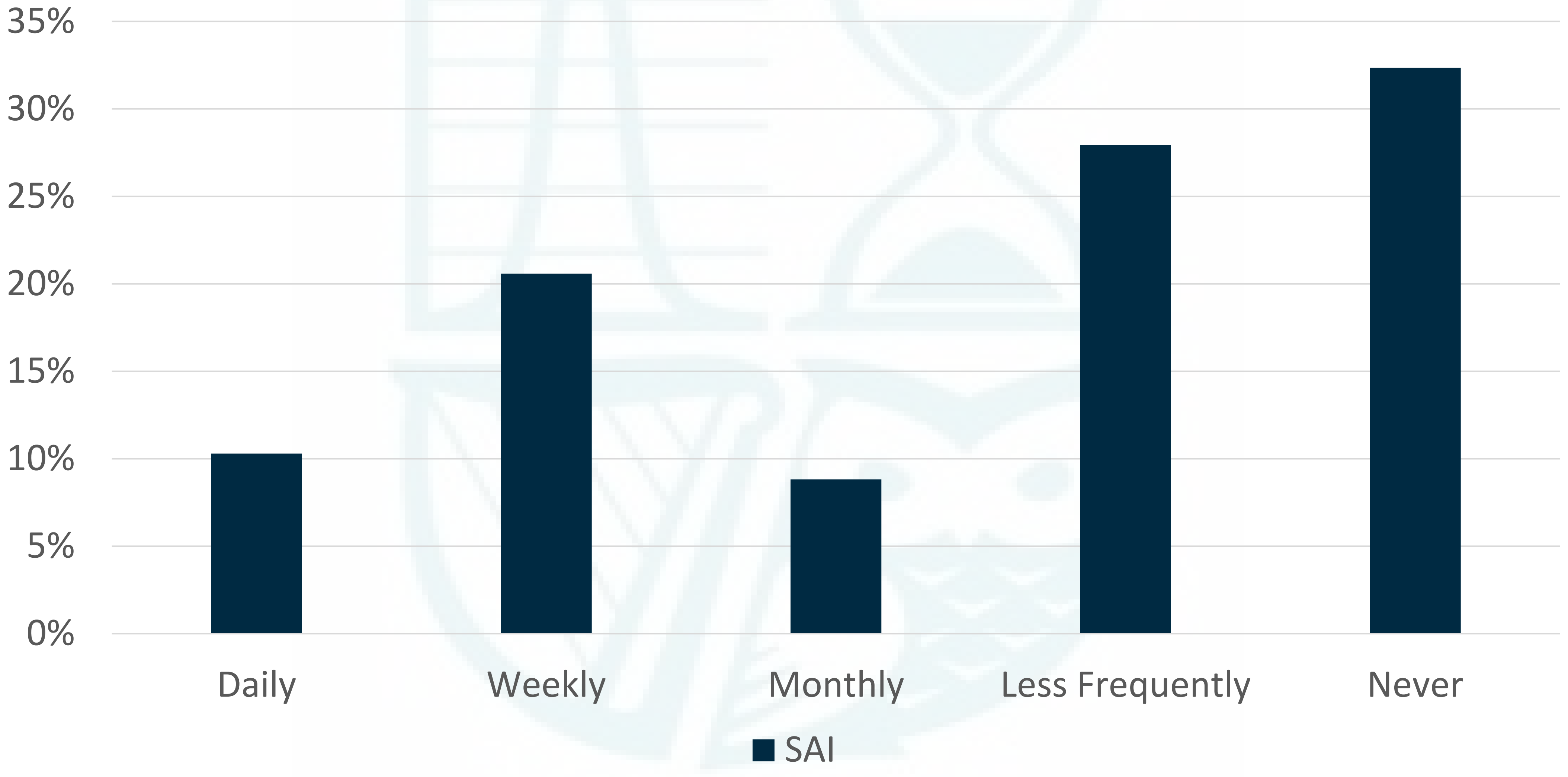
What challenges or concerns do you face when using LLMs in your actuarial tasks?



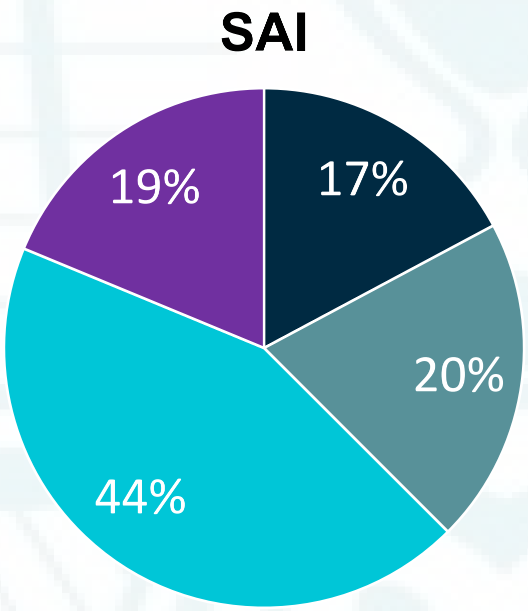
How do you see the role of LLMs in actuarial science evolving in the next 5 years?



How often do you collaborate with other data science or analytics professionals?



My organisation has invested in a POC machine learning exercise and is now considering deploying the model to support decisions.



- I would not get involved in the decision over whether or not to deploy the model
- I would feel confident in recommending controls around deployment, but not in challenging the model design or findings
- I would feel confident in seeking a high-level understanding of the model
- I would feel confident in testing or challenging all aspects of the proposed model

Q&A

Please raise your hand to ask a question, and wait for a mike to get to you

Society of Actuaries in Ireland

Panel Discussion

Compere Roz Briggs - incoming President

Society of Actuaries in Ireland

DEAI committee has put together the below survey to help plan their year ahead agenda.
Please complete at your convenience

Thank You