Revolutionising the insurance industry with gen AI

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Disclaimer

This presentation has been prepared for general purposes only and does not purport to be and is not a substitute for specific professional advice. While the matters identified are believed to be generally correct, before any specific action is taken, specific advice on the circumstances in question should be obtained.

Agenda

1. Introduction to generative AI
2. Risks and regulation
3. Actuarial modelling use cases
4. Insurance use cases
5. AI strategy in your business
6. Governance framework example
7. Next steps

Our Data Science consulting practice

Extracting real business value from data science requires the right combination of technology, culture and insurance domain expertise

About us

- Our Data Science consulting practice is a team of Data Science experts with practical experience of successfully deploying machine learning and AI techniques within an insurance context.
- By collaborating with the WTW consulting teams, we provide a unique combination of technical Data Science delivery with domain expertise and industry experience.

Best practice review and roadmap development

- Helping insurers to extract business value from Data Science teams in various contexts – across General and Life insurance, in stable and changing systems environments.
- The creation of Data Science sophistication roadmaps, by carrying out best practice reviews of the existing technology and capability.

Infrastructure design

Supporting insurers with integrating Data Science tools and platforms with existing insurance processes & systems, identifying and recommending operating model changes to increase efficiency and reduce risk of errors.

Data Science delivery

Working with insurers to identify the use cases across various teams, carrying out the analytics to identify opportunities and deploying the analytics into production to extract business value.

Case studies

Integrating Data Science

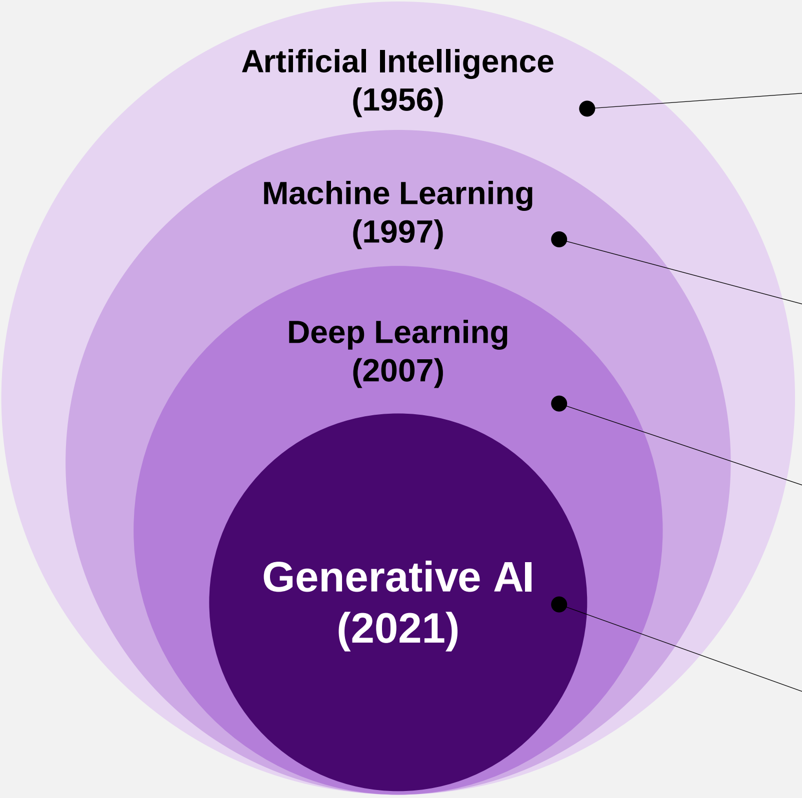
- We have worked with an insurer to develop a blueprint for future best practice modelling.
- The project included a specific focus on **how best to embed machine learning** and traditional modelling techniques together, and on how to ensure the insurer could leverage the maximum possible advantage from Data Science but within its current implementation constraints.
- Our work included specific support to **upskill and develop the team** with teaching and training around best practice modelling.
- Working with WTW allowed the insurer to embed machine learning successfully within the teams, in such a way that **optimally combined** the strengths of the various technologies currently available to the insurer.

Improving customer experience

- A large UK insurer was experiencing issues with an **increasing lapse rate** over time. The client was unable to identify the source of the issue.
- WTW conducted an initial discovery exercise, working with the **analysts, call handlers** and **senior stakeholders** to understand the existing processes.
- Historical data was **analysed** using Data Science techniques, and the **drivers** of the observed lapse rate increase **over time** were identified.
- The core issue was identified and this, combined with other recommendations from WTW such as **outgoing communications**, allowed the insurer to not only **reduce lapse rates** to previous levels, but also provided insight on how to reduce this further.

Why all the hype now?

Much of the 2023 excitement relates to 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.

Generative AI examples

Text & Code	Images
Music	Video

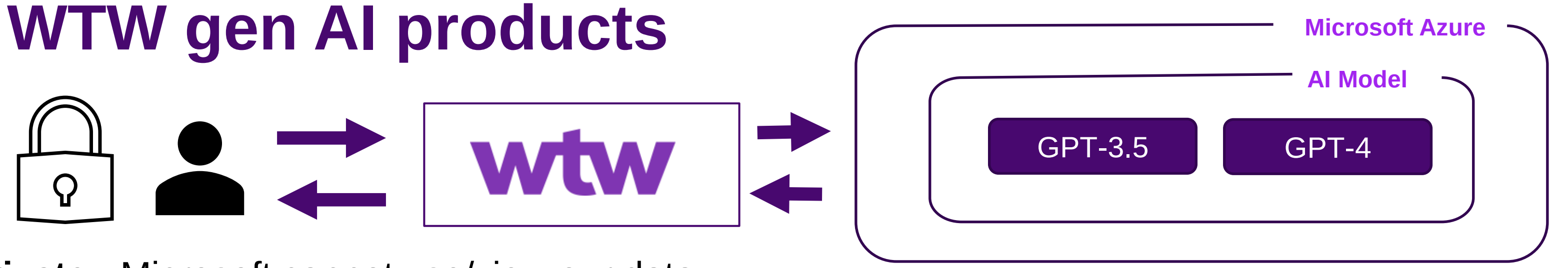
AI terminology overview

Generative AI	A group of AI models which generate both text (GPT-4) and images (mid-journey/ Dalle-2)	GPT 3 / 3.5 / 4	Different types of GPT models: GPT-3.5 is an updated to GPT-3 and powers ChatGPT, GPT-4 is 10 times more advanced and therefore much more powerful and expensive
Large Language Models	Generative AI models trained on huge amounts of text and data, for example GPT-4 and Llama		
GPT	Generative Pretrained Transformer, a type of AI model which produced high quality text	ChatGPT	A customer facing website in a chatbot form that uses GPT-3.5 to respond to prompts

ChatGPT

Public – OpenAI Can use user input/output data

WTW gen AI products



Private - Microsoft cannot use/view our data

Strengths and limitations

LLMs excel at generating text that closely resembles text written by humans

These models are competent at solving novel unseen problems

LLMs make use of additional context to inform their responses

LLMs can be fine-tuned for specific tasks and behaviors

LLMs can be biased based on the data it has been trained on

LLMs can very confidently generate incorrect answers

LLMs can struggle with arithmetic and computational tasks

Risks and threats

Solved problems / Trivial risks

- **Hallucinations / Unpredictable behaviours**
  - reduced with RAG and more sophisticated models
- **Bias / Toxicity**
  - Mostly an issue with customer facing systems
- **Data / IP leakage**
  - Firewalled private models
- **Copyright ownership of training datasets**
  - Google / Microsoft are taking legal responsibility

Real problems / Potential risks

- **Over-reliance**
  - erosion of understanding, especially among junior colleagues
- **Job security and reskilling**
  - Marginal cost of expertise falls to zero
- **Ignoring AI**
  - Competitors will be utilising these technologies

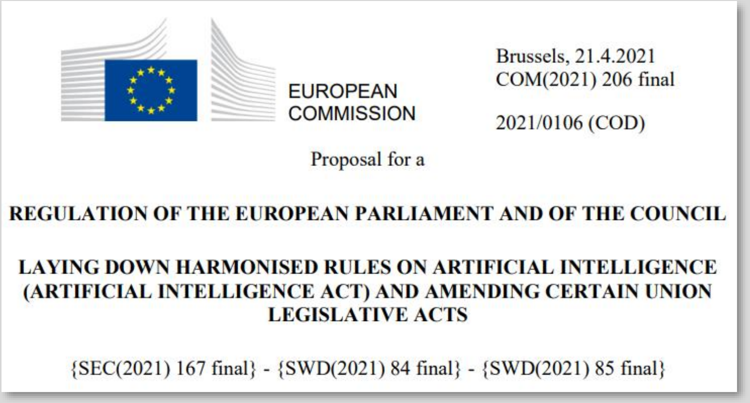
Regulatory perspectives from the European Union

European Legislation has been geared towards AI developments since 2019, supporting a EU-wide approach to AI. Common themes across the discussions, research publications and proposals are to establish a high degree of trustworthiness, accountability and transparency in the use of AI, with a strong focus on human oversight. So far, the European Commission has released:


EUROPEAN COMMISSION
Brussels, 19.2.2020
COM(2020) 65 final
WHITE PAPER
On Artificial Intelligence - A European approach to excellence and trust

The White Paper specifically considered the training data, maintaining records of the data sets used for training, and overarching human oversight to ensure systems do not undermine human autonomy or lead to other unintended consequences.

The guidelines emphasize the importance of developing AI systems in a trustworthy and responsible manner, stressing that they should be designed around transparency, fairness and accountability.


EUROPEAN COMMISSION
Brussels, 21.4.2021
COM(2021) 206 final
2021/0106 (COD)
Proposal for a
REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
LAYING DOWN HARMONISED RULES ON ARTIFICIAL INTELLIGENCE (ARTIFICIAL INTELLIGENCE ACT) AND AMENDING CERTAIN UNION LEGISLATIVE ACTS
{SEC(2021) 167 final} - {SWD(2021) 84 final} - {SWD(2021) 85 final}

The proposed regulation focuses heavily on ‘high-risk’ AI systems, and strongly considers consistency with existing policy provisions in areas of overlap, such as data – in fact this is designed to complement the provisions of the GDPR itself.

Regulatory perspectives from the USA and the UK

Kathleen Birrane (chair of National Association of Insurance Commissioners' (NAIC) Innovation, Cybersecurity, and Technology committee):

“This touches every area of insurance in one way or another … the risks that exist with respect to its use are scary.”

On discrimination: *“AI technology is subject to the same stringent requirements that other insurance practices might be … I don't care if you use an abacus or the most amazing bright shiny model, what I care is that when you pay somebody, you follow the rules in the output and the end result.”*

www.insuranceerm.com/analysis/exciting-and-scary-the-insurance-regulators-view-on-ai.html

NAIC

The UK Government published its AI White Paper in 2023, setting out its proposals for regulating the use of artificial intelligence (AI) in the United Kingdom. The White Paper is a continuation of the AI Regulation Policy Paper which introduced the UK Government's vision for the future "pro-innovation" and "context-specific" AI regulatory regime in the United Kingdom.

The White Paper proposes a different approach to AI regulation compared to the EU's AI Act. Instead of introducing a new far-reaching legislation to regulate AI in the United Kingdom, the UK Government is focusing on setting expectations for the development and use of AI alongside empowering existing regulators like the Information Commissioner's Office (ICO), the Financial Conduct Authority (FCA), and Competition and Markets Authority (CMA) to issue guidance and regulate the use of AI within their remit.

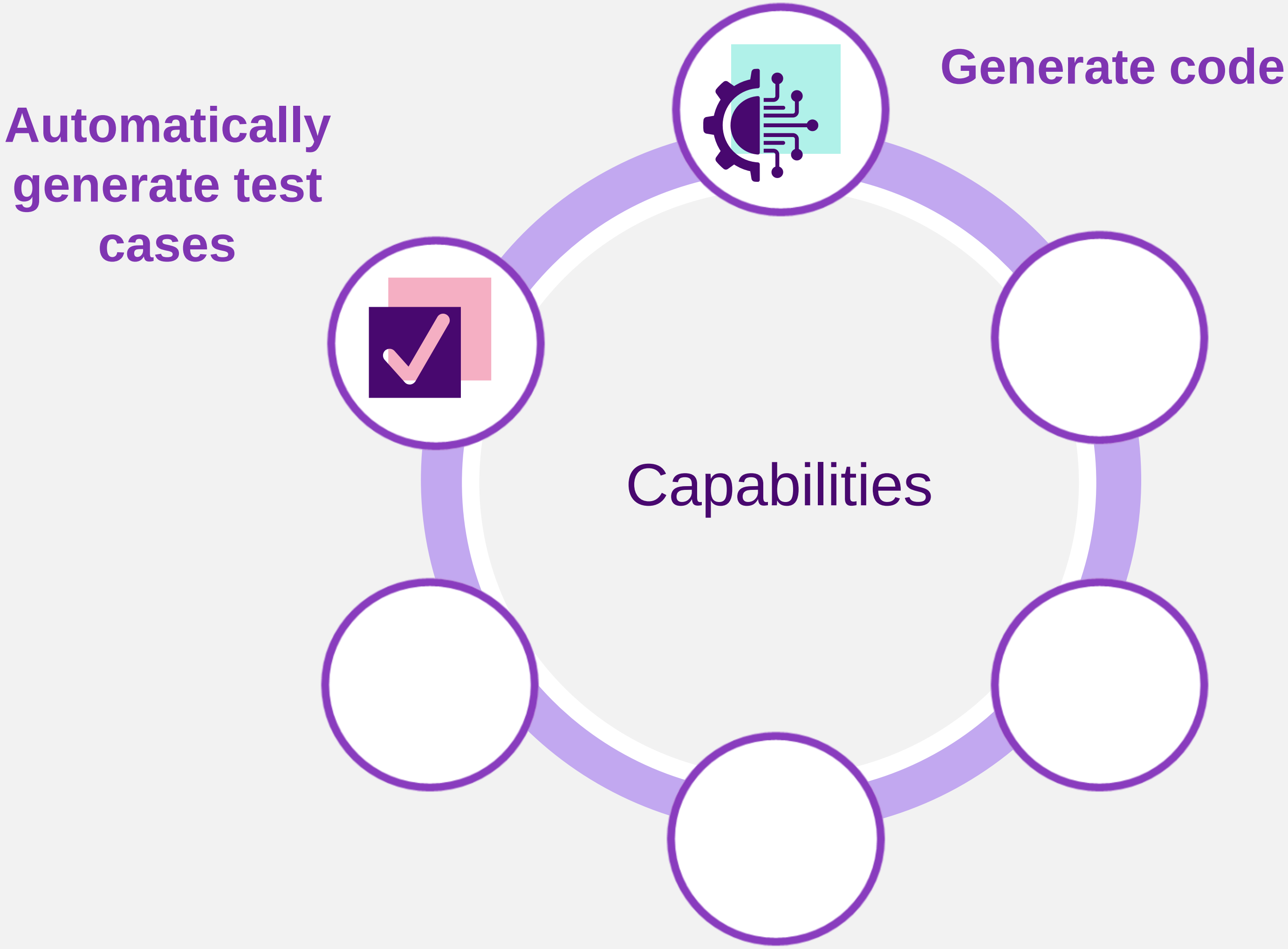
Use cases

Gen AI use in insurance

Actuarial	AI for actuarial modelling	AI for actuarial testing	AI for data cleansing
Insurance	Customised chatbots	AI for underwriting	AI for customer feedback

Modelling use case #1:
AI for actuarial modelling

What AI coding assistants can do right now

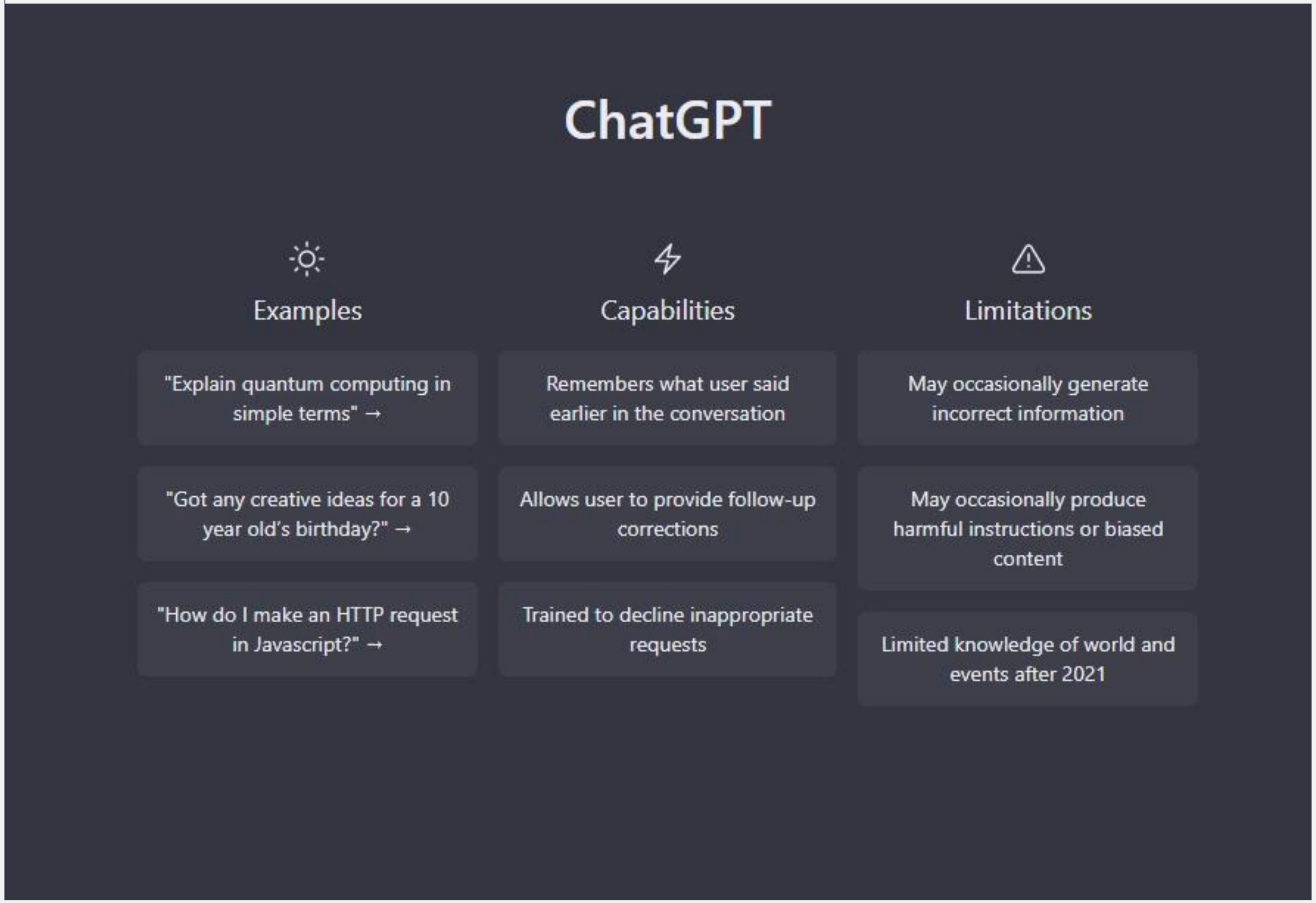


Generate code

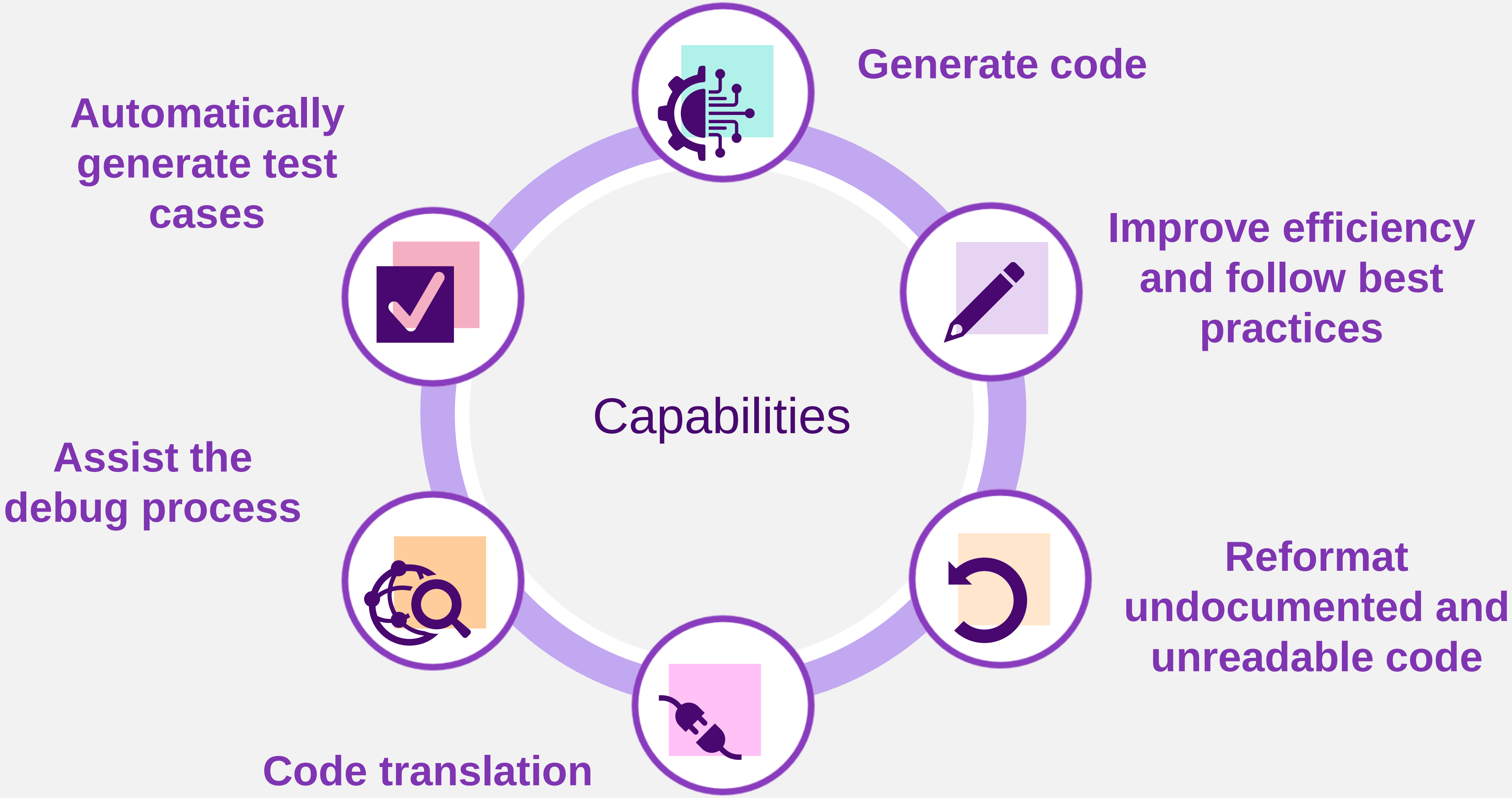
- Given a natural language prompt of user requirements, the bot will be able to generate the code that fulfils these requirements

Automatically generate test cases

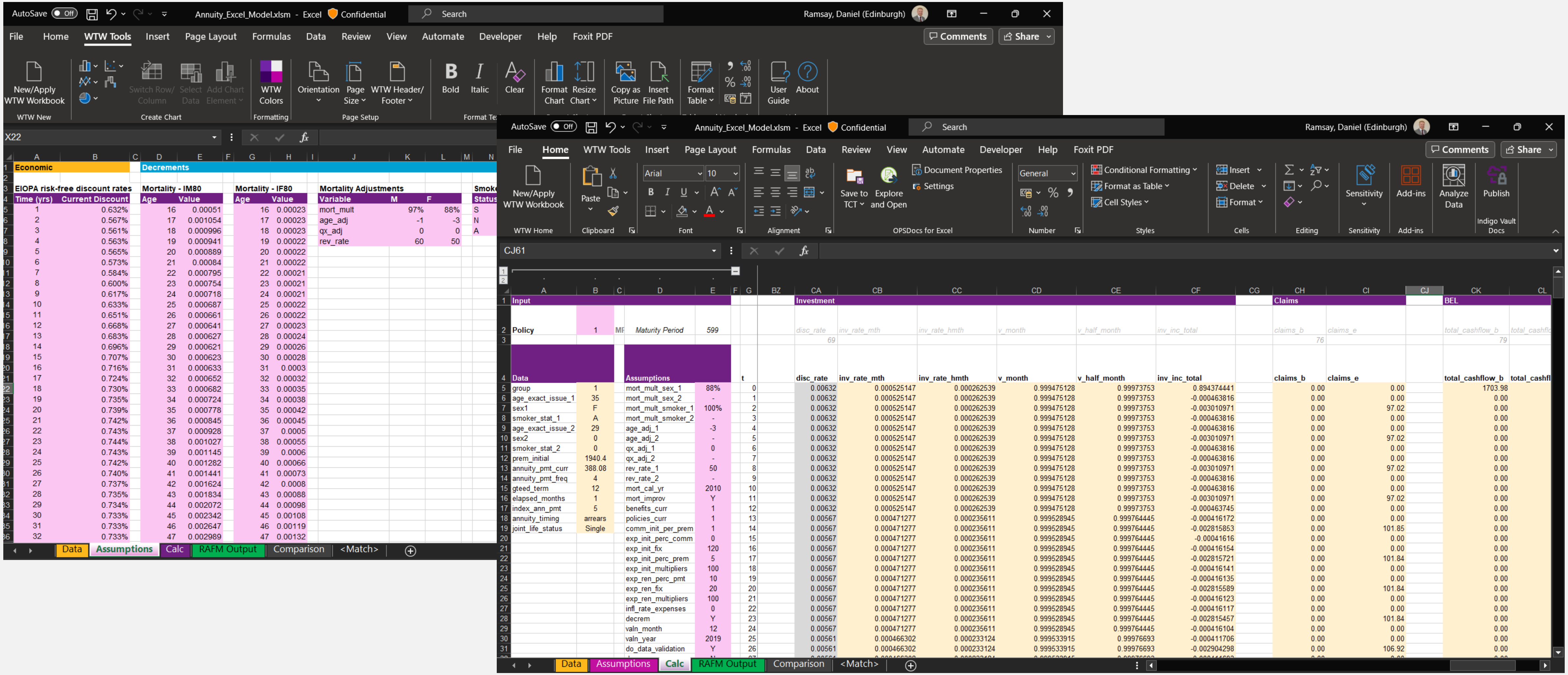
- Given a function, the bot will auto-generate parameter data for test cases



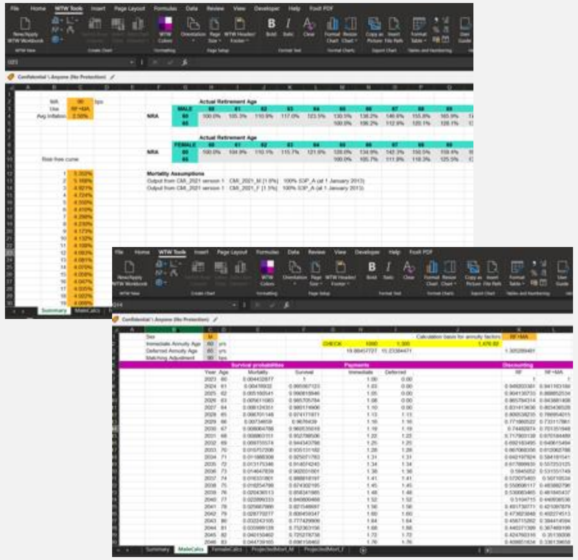
What AI coding assistants can do right now



Legacy models



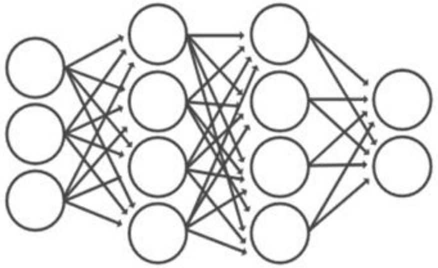
Using generative AI to assist transformation



Model compression

Prompt engineering

LLM



Generation of an audit trail or summary report

ActuatorGPT

File | C:/src/python/explain-excel/test_html/example_20230811_092733.html

wtw

Excel Workbook: late_retirement_factors.xlsm

Workbook Summary

This workbook is made up of three sheets: Summary, MaleCalcs, and FemaleCalcs. The Summary sheet provides an overview of the calculations for male and female late retirement factors based on different ages and interest rates. The MaleCalcs and FemaleCalcs sheets perform the calculations for males and females, respectively, using mortality assumptions and interest rates.

Summary Sheet

The Summary sheet displays the late retirement factors for males and females based on different ages and interest rates. The sheet retrieves data from the MaleCalcs and FemaleCalcs sheets and presents it in a tabular format. The interest rates used in the calculations are provided in column C, ranging from C12 to C88. The sheet also contains some key numerical assumptions, such as the average inflation rate of 2.5% (cell C4) and the risk-free curve (cell F10).

MaleCalcs Sheet

The MaleCalcs sheet calculates the late retirement factors for males using mortality assumptions and interest rates. The sheet uses the INDEX and MATCH functions to retrieve mortality rates from the ProjectedMort_M sheet based on the age and year. It then performs calculations for immediate and deferred annuity factors using the interest rates from the Summary sheet. The results are displayed in columns Z to AT for different ages and interest rates.

FemaleCalcs Sheet

The FemaleCalcs sheet calculates the late retirement factors for females using mortality assumptions and interest rates, similar to the MaleCalcs sheet. It retrieves mortality rates from the ProjectedMort_F sheet and performs calculations for immediate and deferred annuity factors using the interest rates from the Summary sheet. The results are displayed in columns Z to AT for different ages and interest rates.

VBA Code

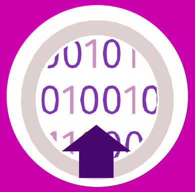
Generation of python code

explain_excel.ipynb | example_1686065389.py 1 | example_1686127655.py

test_py > example_1686127655.py > ...

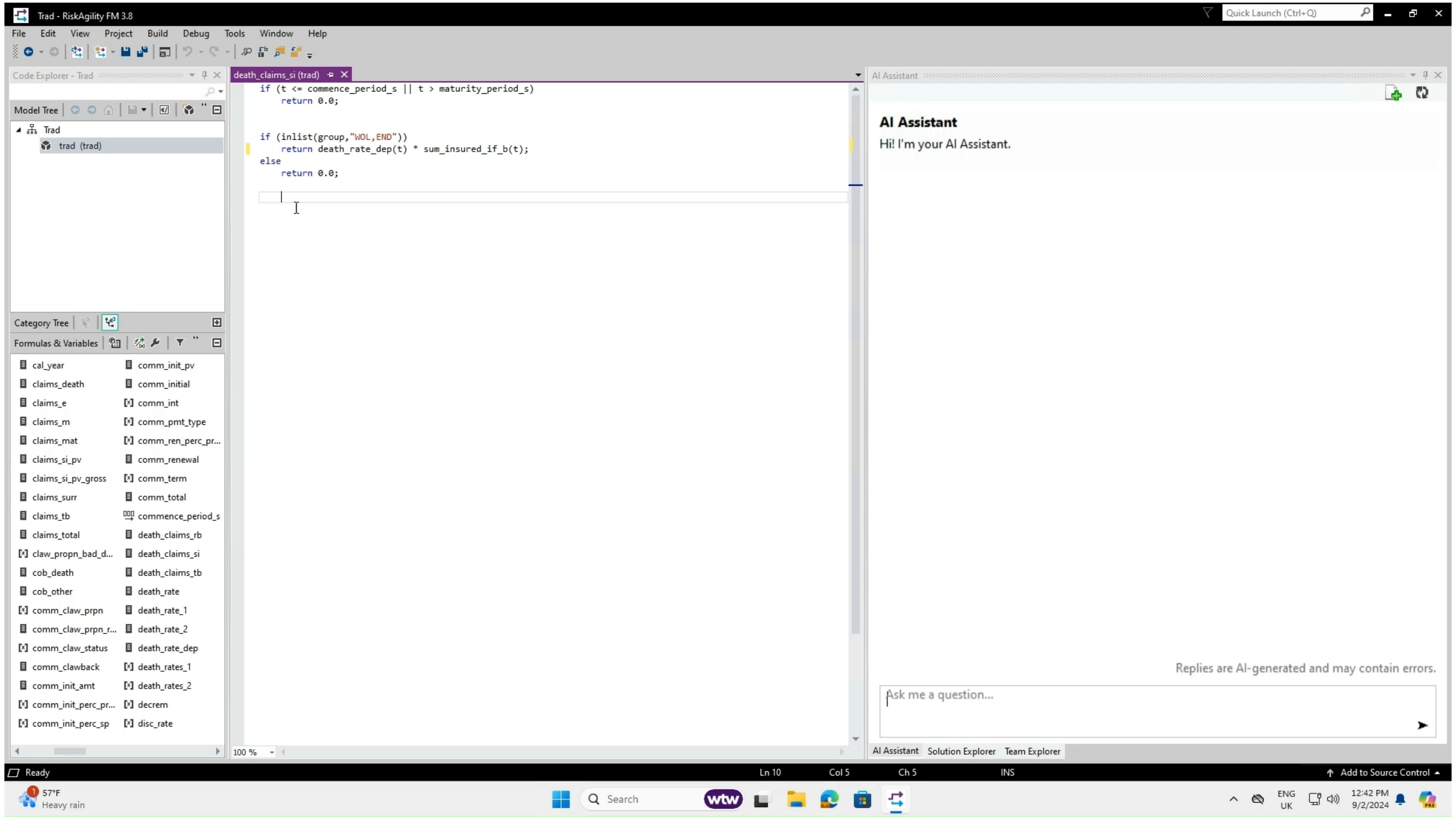
```python
import pandas as pd

def annuity_factors(
        sex, age, immediate_annuity_age, deferred_annuity_age, ir_curve,ma_adjustment, mort_m_filepath,
        mort_f_filepath, mort_m_sheetname, mort_f_sheetname
        ):
    mort_m = pd.read_excel(mort_m_filepath, mort_m_sheetname, header=10, index_col=1)
    mort_f = pd.read_excel(mort_f_filepath, mort_f_sheetname, header=10, index_col=1)

    mort = mort_m if sex == "M" else mort_f

    survival_prob = mort.loc[age].values[0]

    immediate_payment = 1 if age >= immediate_annuity_age else 0
    deferred_payment = 1 if age >= deferred_annuity_age else 0

    discount_rf = (1 + ir_curve) ** (-age)
    discount_rf_ma = (1 + ir_curve + ma_adjustment / 10000) ** (-age)

    annuity_factor_rf = survival_prob * immediate_payment * discount_rf
    annuity_factor_rf_ma = survival_prob * deferred_payment * discount_rf_ma

    return annuity_factor_rf, annuity_factor_rf_ma
```

Prompt: Please explain the code I have selected



Explain code

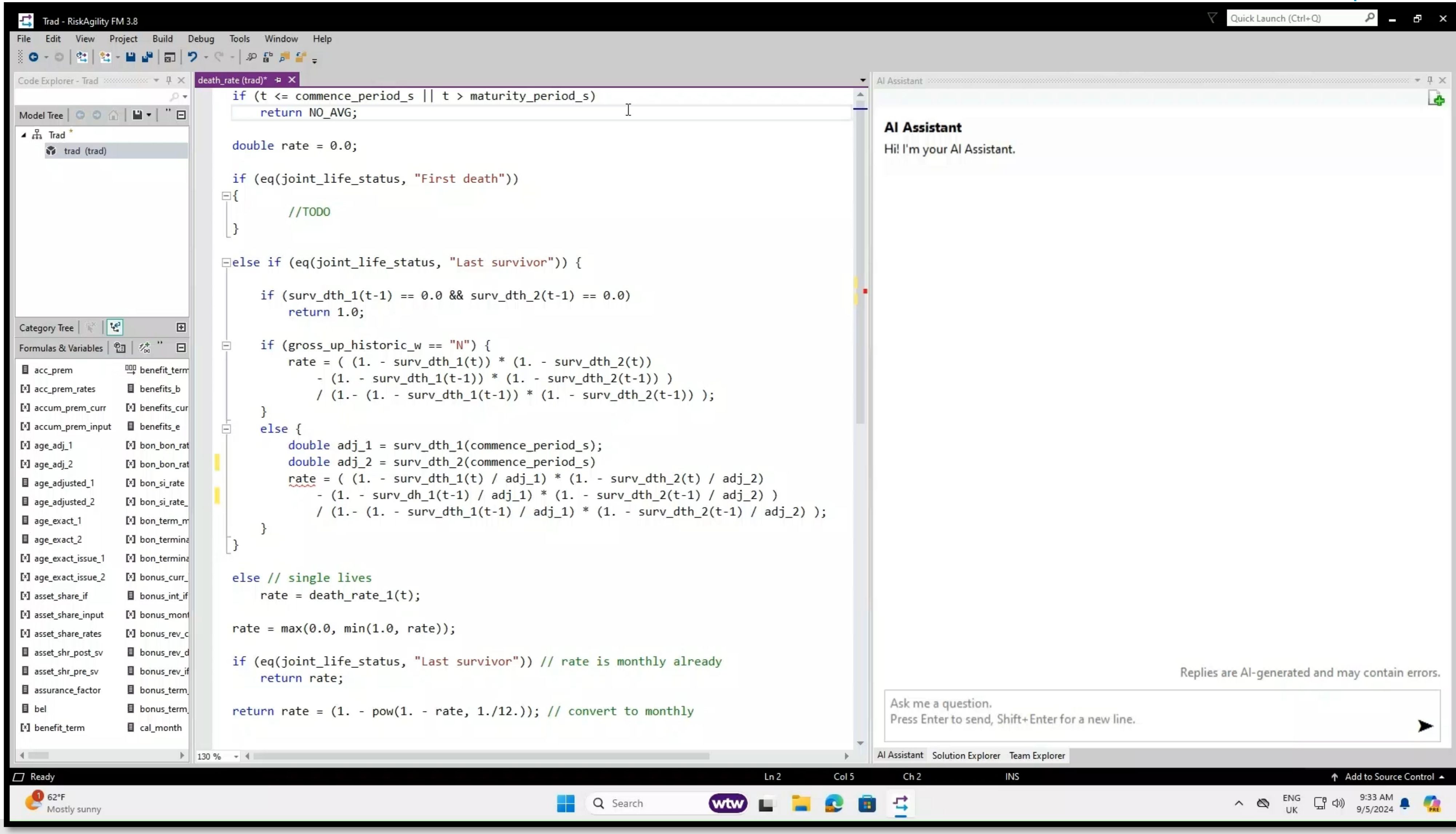
AI Assistant translates actuarial and financial code into natural language



Prompt: There is a problem with the selected code, fix it for me.

Fix Code

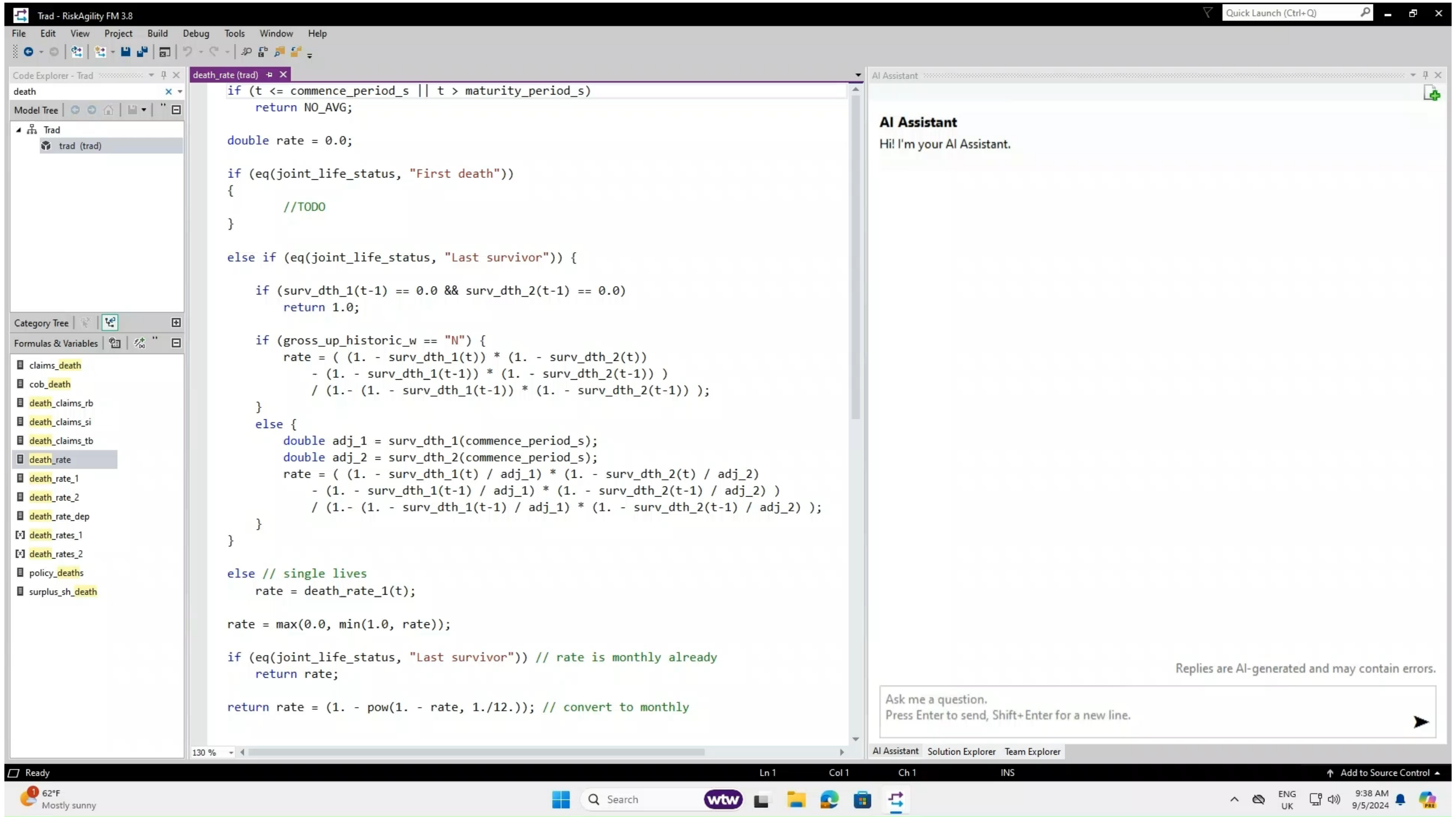
AI assistant detects errors and provide suggestions with the code fixed



Prompt: Can you write the code for a join_life_status equal to "First Death" using death rate for life 1 and life 2

Write Code

An AI Assistant can help to write actuarial code, resulting in a flat learning curve.



Modelling use case #2:
AI for actuarial testing

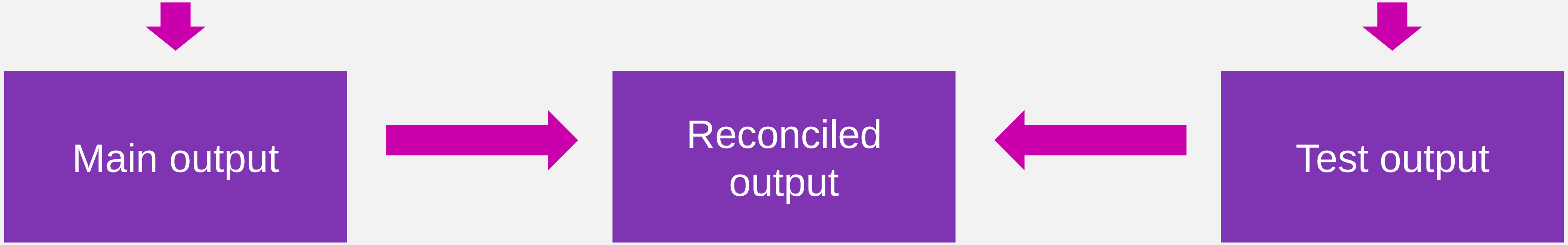
Model reconciliation is a manual and time-consuming process

simple_cashflow.py

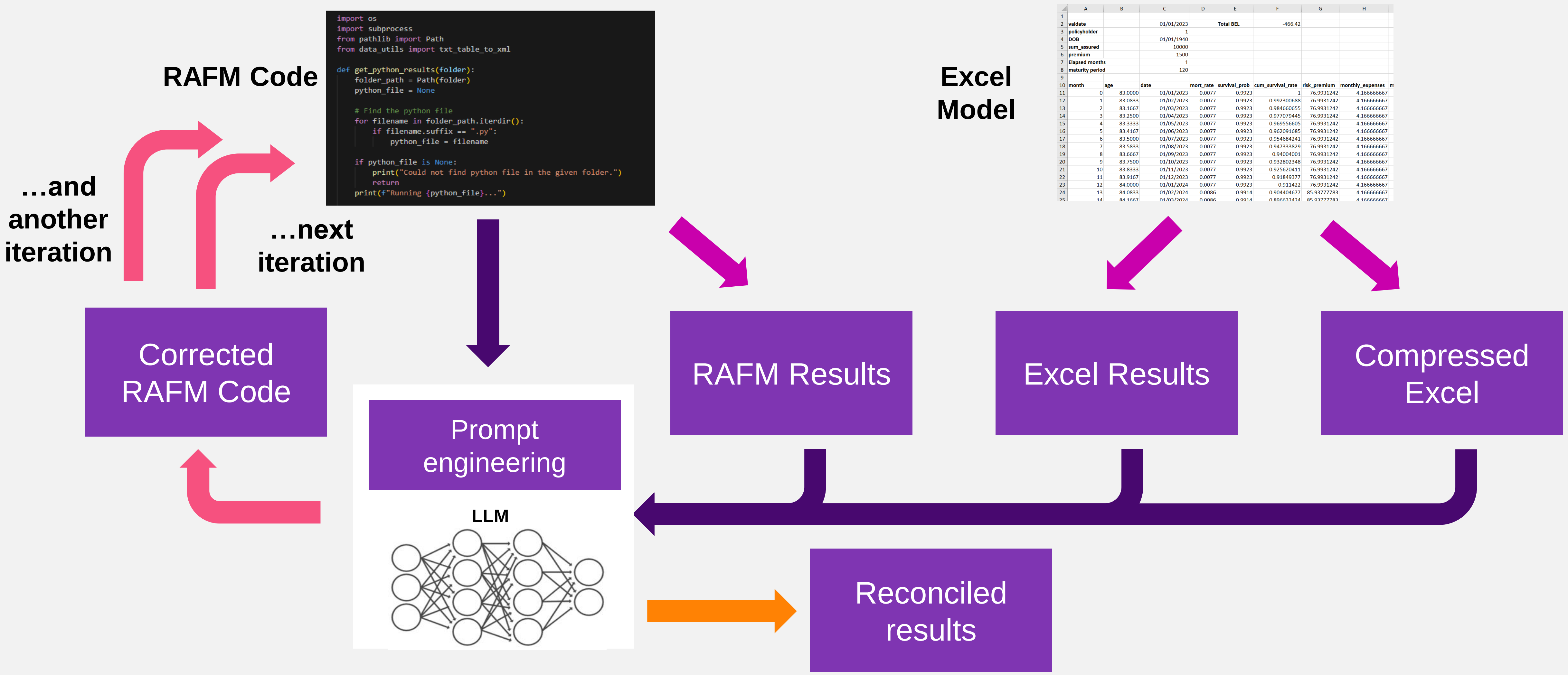
auto_recon > test_files > test2 > simple_cashflow.py > cashflow_model

```python
import pandas as pd
import numpy as np
from datetime import datetime
import os
import shutil


def datedif_years(date1, date2):
    years = date2.year - date1.year
    if (date2.month, date2.day) < (date1.month, date1.day):
        years -= 1
    return years


def cashflow_model(valdate, policyholder, dob, sum_assured, premium, elapsed_months, maturity_perio
    data = pd.read_excel(excel_workbook_path, sheet_name="data", index_col=0)

    # Load the three tables in the 'assumptions' worksheet separately
    mort_table = pd.read_excel(
        excel_workbook_path, sheet_name="assumptions", header=1, nrows=101, index_col=0
    )

```

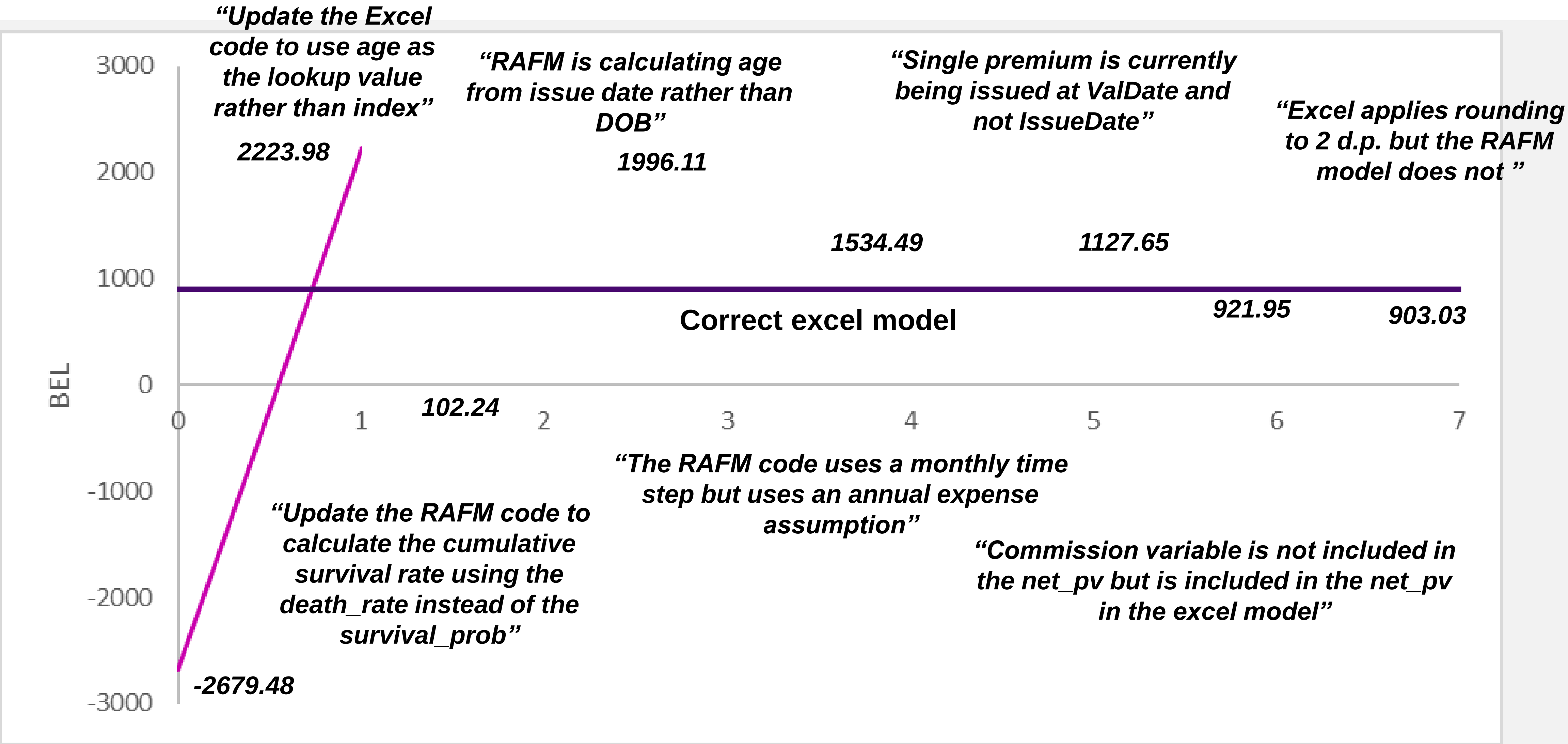
	A	B	C	D	E	F	G	H	
1									
2	**valdate**		01/01/2023		**Total BEL**	-466.42			
3	**policyholder**		1						
4	**DOB**		01/01/1940						
5	**sum_assured**		10000						
6	**premium**		1500						
7	**Elapsed months**		1						
8	**maturity period**		120						
9									
10	**month**	**age**	**date**	**mort_rate**	**survival_prob**	**cum_survival_rate**	**risk_premium**	**monthly_expenses**	**m**
11	0	83.0000	01/01/2023	0.0077	0.9923	1	76.9931242	4.166666667	
12	1	83.0833	01/02/2023	0.0077	0.9923	0.992300688	76.9931242	4.166666667	
13	2	83.1667	01/03/2023	0.0077	0.9923	0.984660655	76.9931242	4.166666667	
14	3	83.2500	01/04/2023	0.0077	0.9923	0.977079445	76.9931242	4.166666667	
15	4	83.3333	01/05/2023	0.0077	0.9923	0.969556605	76.9931242	4.166666667	
16	5	83.4167	01/06/2023	0.0077	0.9923	0.962091685	76.9931242	4.166666667	
17	6	83.5000	01/07/2023	0.0077	0.9923	0.954684241	76.9931242	4.166666667	
18	7	83.5833	01/08/2023	0.0077	0.9923	0.947333829	76.9931242	4.166666667	
19	8	83.6667	01/09/2023	0.0077	0.9923	0.94004001	76.9931242	4.166666667	
20	9	83.7500	01/10/2023	0.0077	0.9923	0.932802348	76.9931242	4.166666667	
21	10	83.8333	01/11/2023	0.0077	0.9923	0.925620411	76.9931242	4.166666667	
22	11	83.9167	01/12/2023	0.0077	0.9923	0.91849377	76.9931242	4.166666667	
23	12	84.0000	01/01/2024	0.0077	0.9923	0.911422	76.9931242	4.166666667	
24	13	84.0833	01/02/2024	0.0086	0.9914	0.904404677	85.93777783	4.166666667	
25	14	84.1667	01/03/2024	0.0086	0.9914	0.896632424	85.93777783	4.166666667	



AI for auto-reconciliation



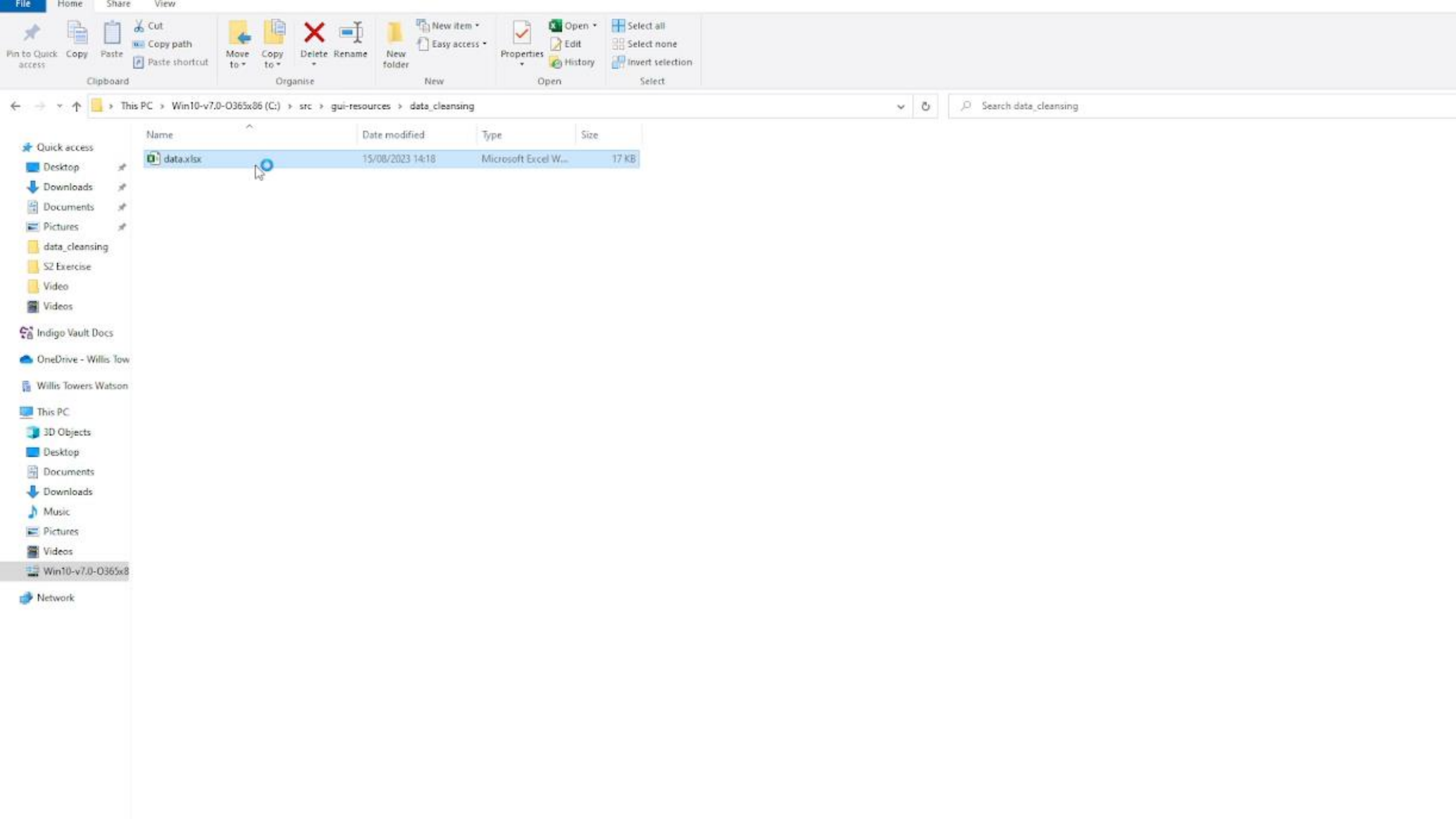
Self-healing code



Modelling use case #3: AI for data cleansing

Identifying errors, formatting issues, missing values is highly manual

	A	B	C	D	E	F
1	DOB	GENDER	POSTCODE	PRODUCT	MARITAL STATUS	PREMIUM
2	03/01/1994	F	CM12 0HD	PROD3	Single	3867.2
3	13/01/1948	Male	OX9 2BN	PROD2	Yes	3634.07
4	15/01/2002	Female	E15 3LN	1	Single	3847.35
5	12/03/2017	M	BH3 7NE	PROD1	Married	3926.7
6	03/11/2020	F	CR44 1AP	PROD2	maried	3781.02
7	30/08/1951	M	3311 ER	PROD3	out of wed	MALE
8	04/01/1998	F	PL4 0AL	product 1	S	3919.83
9	06/04/1996	F	TR24 0QB	PROD3	Married	3639.61
10	14/11/1936	U	DH1 4JU	PROD 3	Married	3831
11	Alan	M	GL4 6DG	2	Engaged	4058.26
12	11/02/1990	M	LD2 3ND	PROD2	Married	n/a
13	21/04/1974	F		PROD2	no	4275.75
14	31/12/1974	Mr.	LL47 6TW	PROD3	Married	4152.53
15	19/01/1929	F	ME12 3TB	PROD3	not married	"3988.99"
16	14/12/1958	M	EH6 4RZ	PROD2	Married	4210.6
17	21/07/1996	male	OX29 4JX	product 2	civil partnership	£4,298.42
18	22/05/1986	M	LA2 0PB	PROD2	Single	3879.98
19	02/03/1933	F	24 Barry Lane	PROD3	Married	3587.15
20	23/04/1996	FEMALE	EX31 1JF	PROD3	M	n/a


File
Home
Share
View
Pin to Quick access
Copy
Paste
Cut
Copy path
Paste shortcut
Clipboard
Move to
Copy to
Delete
Rename
Organise
New folder
New item
Easy access
New
Properties
Open
Edit
History
Open
Select all
Select none
Invert selection
Select
This PC > Win10-v7.0-O365x86 (C:) > src > gui-resources > data_cleansing
Search data_cleansing
Name
Date modified
Type
Size
data.xlsx
15/08/2023 14:18
Microsoft Excel W...
17 KB
Quick access
Desktop
Downloads
Documents
Pictures
data_cleansing
S2 Exercise
Video
Videos
Indigo Vault Docs
OneDrive - Willis Tow
Willis Towers Watson
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Win10-v7.0-O365x8
Network

Data cleansing process

Raw excel input

	A	B	C	D	E	F
1	DOB	GENDER	POSTCODE	PRODUCT	MARITAL STATUS	PREMIUM
2	03/01/1994	F	CM12 0HD	PROD3	Single	3867.2
3	13/01/1948	Male	OX9 2BN	PROD2	Yes	3634.07
4	15/01/2002	Female	E15 3LN	1	Single	3847.35
5	12/03/2017	M	BH3 7NE	PROD1	Married	3926.7
6	03/11/2020	F	CR44 1AP	PROD2	maried	3781.02
7	30/08/1951	M	3311 ER	PROD3	out of wed	MALE
8	04/01/1998	F	PL4 0AL	product 1	S	3919.83
9	06/04/1996	F	TR24 0QB	PROD3	Married	3639.61
10	14/11/1936	U	DH1 4JU	PROD 3	Married	3831
11	Alan	M	GL4 6DG	2	Engaged	4058.26
12	11/02/1990	M	LD2 3ND	PROD2	Married	n/a
13	21/04/1974	F		PROD2	no	4275.75
14	31/12/1974	Mr.	LL47 6TW	PROD3	Married	4152.53
15	19/01/1929	F	ME12 3TB	PROD3	not married	"3988.99"
16	14/12/1958	M	EH6 4RZ	PROD2	Married	4210.6
17	21/07/1996	male	OX29 4JX	product 2	civil partnership	£4,298.42
18	22/05/1986	M	LA2 0PB	PROD2	Single	3879.98
19	02/03/1933	F	24 Barry Lane	PROD3	Married	3587.15
20	23/04/1996	FEMALE	EX31 1JF	PROD3	M	n/a

Generate cleaning rules for each column

File upload

LangChain

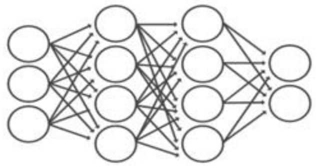
GENDER

F

DOB

03/01/1994

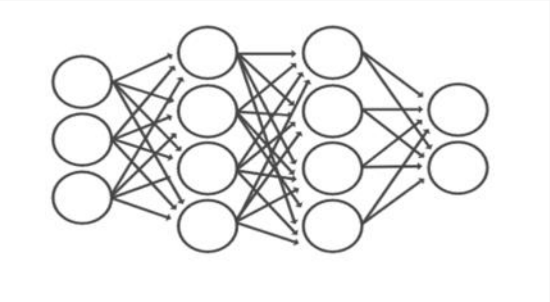
LLM



Output python rules

```python
import pandas as pd
import numpy as np
import re
from datetime import datetime

def clean_GENDER(df, column):
    df[column+'_original'] = df[column]
    df[column+'_clean'] = df[column]
    df[column+'_comment'] = 'OK'

    male_formats = ['Male', 'male', 'M']
    female_formats = ['Female', 'female', 'F', 'feemale']
    unfixable_errors = ['U', 'Labour', 'Darren']

    for i in df.index:
        try:
            if df.loc[i, column] in male_formats:
                df.loc[i, column+'_clean'] = 'M'
                if df.loc[i, column] != 'M':
                    df.loc[i, column+'_comment'] = 'CLEANED'
            elif df.loc[i, column] in female_formats:
                df.loc[i, column+'_clean'] = 'F'
                if df.loc[i, column] != 'F':
                    df.loc[i, column+'_comment'] = 'CLEANED'
            elif df.loc[i, column] in unfixable_errors or pd.isnull(df.loc[i, column]):
                df.loc[i, column+'_clean'] = ''
                df.loc[i, column+'_comment'] = 'ERROR' if df.loc[i, column] in unfixable_errors else 'BLANK'
        except Exception as e:
            df.loc[i, column+'_clean'] = ''
            df.loc[i, column+'_comment'] = 'ERROR'
            print('Error processing row', i, ':', str(e))

    return df[[column+'_original', column+'_clean', column+'_comment']]
```

Merge python rules



Run python rules

python

Clean excel output

	A	B	C	D	E	F
1	GENDER_origina	GENDER_clea	GENDER_commer	POSTCODE_origina	POSTCODE_clea	POSTCODE_commer
2	F	F	OK	CM12 0HD	CM12 0HD	OK
3	Male	M	CLEANED	OX9 2BN	OX9 2BN	OK
4	Female	F	CLEANED	E15 3LN	E15 3LN	OK
5	M	M	OK	BH3 7NE	BH3 7NE	OK
6	F	F	OK	CR44 1AP	CR44 1AP	OK
7	M	M	OK	3311 ER		ERROR
8	F	F	OK	PL4 0AL	PL4 0AL	OK
9	F	F	OK	TR24 0QB	TR24 0QB	OK
10	U		ERROR	DH1 4JU	DH1 4JU	OK
11	M	M	OK	GL4 6DG	GL4 6DG	OK
12	M	M	OK	LD2 3ND	LD2 3ND	OK
13	F	F	OK			BLANK
14	Mr.	M	CLEANED	LL47 6TW	LL47 6TW	OK
15	F	F	OK	ME12 3TB	ME12 3TB	OK
16	M	M	OK	EH6 4RZ	EH6 4RZ	OK
17	male	M	CLEANED	OX29 4JX	OX29 4JX	OK
18	M	M	OK	LA2 0PB	LA2 0PB	OK
19	F	F	OK	24 Barry Lane		ERROR

Python rules generated

```python
def clean_GENDER(df, column):
    df[column+'_original'] = df[column]
    df[column+'_clean'] = df[column]
    df[column+'_comment'] = 'OK'

    male_formats = ['Male', 'male', 'M', 'Mr.']
    female_formats = ['Female', 'female', 'F', 'feemale']
    unfixable_errors = ['U', 'Labour', 'Darren']

    for i in df.index:
        try:
            if df.loc[i, column] in male_formats:
                df.loc[i, column+'_clean'] = 'M'
                if df.loc[i, column] != 'M':
                    df.loc[i, column+'_comment'] = 'CLEANED'
            elif df.loc[i, column] in female_formats:
                df.loc[i, column+'_clean'] = 'F'
                if df.loc[i, column] != 'F':
                    df.loc[i, column+'_comment'] = 'CLEANED'
            elif df.loc[i, column] in unfixable_errors or pd.isnull(df.loc[i, column]):
                df.loc[i, column+'_clean'] = ''
                df.loc[i, column+'_comment'] = 'ERROR' if df.loc[i, column] in unfixable_errors else 'BLANK'
        except Exception as e:
            df.loc[i, column+'_clean'] = ''
            df.loc[i, column+'_comment'] = 'ERROR'
            print('Error processing row', i, ':', str(e))
    return df[[column+'_original', column+'_clean', column+'_comment']]
```

Cleansed output

	A	B	C	D	E	F	G	H	I
1	GENDER_origina	GENDER_clea	GENDER_commer	POSTCODE_origina	POSTCODE_clea	POSTCODE_commer	PRODUCT_origina	PRODUCT_clea	PRODUCT_commer
2	F	F	OK	CM12 0HD	CM12 0HD	OK	PROD3	PROD3	OK
3	Male	M	CLEANED	OX9 2BN	OX9 2BN	OK	PROD2	PROD2	OK
4	Female	F	CLEANED	E15 3LN	E15 3LN	OK	1	PROD1	CLEANED
5	M	M	OK	BH3 7NE	BH3 7NE	OK	PROD1	PROD1	OK
6	F	F	OK	CR44 1AP	CR44 1AP	OK	PROD2	PROD2	OK
7	M	M	OK	3311 ER		ERROR	PROD3	PROD3	OK
8	F	F	OK	PL4 0AL	PL4 0AL	OK	product 1	PROD1	CLEANED
9	F	F	OK	TR24 0QB	TR24 0QB	OK	PROD3	PROD3	OK
10	U		ERROR	DH1 4JU	DH1 4JU	OK	PROD 3	PROD3	CLEANED
11	M	M	OK	GL4 6DG	GL4 6DG	OK	2	PROD2	CLEANED
12	M	M	OK	LD2 3ND	LD2 3ND	OK	PROD2	PROD2	OK
13	F	F	OK			BLANK	PROD2	PROD2	OK
14	Mr.	M	CLEANED	LL47 6TW	LL47 6TW	OK	PROD3	PROD3	OK
15	F	F	OK	ME12 3TB	ME12 3TB	OK	PROD3	PROD3	OK
16	M	M	OK	EH6 4RZ	EH6 4RZ	OK	PROD2	PROD2	OK
17	male	M	CLEANED	OX29 4JX	OX29 4JX	OK	product 2	PROD2	CLEANED
18	M	M	OK	LA2 0PB	LA2 0PB	OK	PROD2	PROD2	OK
19	F	F	OK	24 Barry Lane		ERROR	PROD3	PROD3	OK

Generative AI will be in every stage of the modelling life cycle

Data

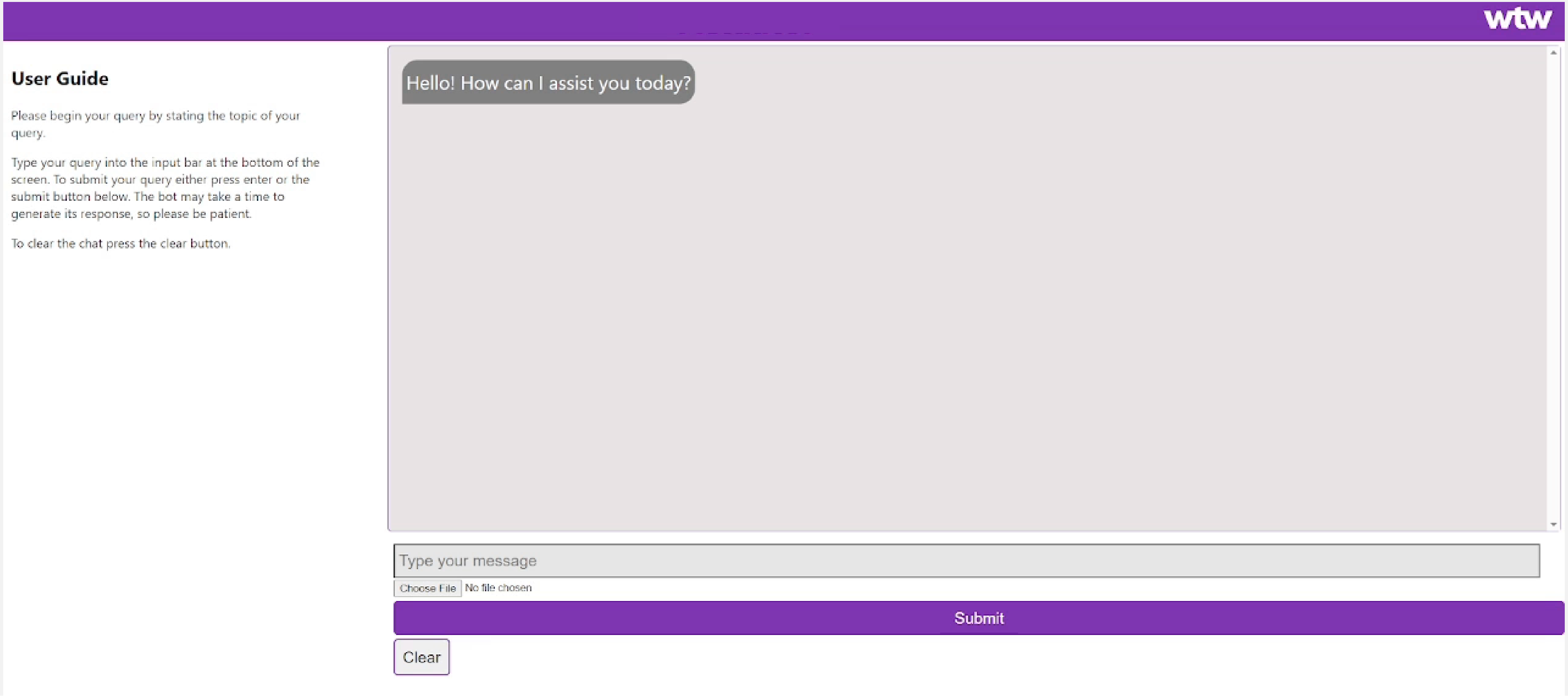
Coding

Testing

Docs

Insurance use case #1:
AI for expert systems

A customised chatbot for insurance

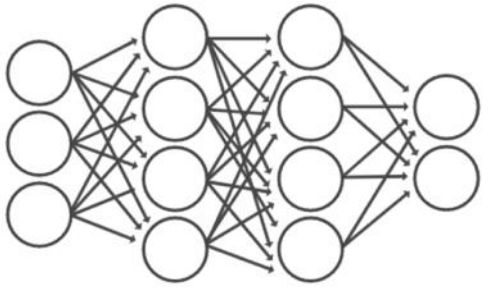


AI for expert systems

User request

Please explain…

LLM



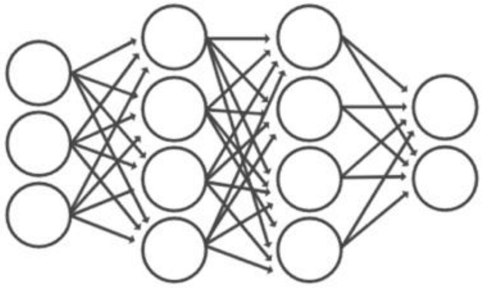
Embeddings knowledge database

IFRS17 rules
Solvency II rules
Other regulation
…

Collection of most relevant knowledge

Use this information…

LLM



Text output

IFRS17 requires you do…
This
That
…

Insurance use case #2: AI for underwriting

Medical records are often messy and unstructured

Personal Health Record

Personal Information

First Name	Last Name	Preferred Name	Patient Identifier
Martha	Steel	Martha	ABC123

Gender	Date of Birth	Blood Type	Last Updated Date
F	10/13/2001	O-	01/19/2023

Address	City	State	Zip Code
123 Sample Street	Sample City	AZ	12345

Emergency Contact

Full Name	Relationship	Contact Number
Janet Steel	Mother	555-5555
Susan Steel	Sister	555-5555

Insurance Information

Insurance Carrier	Insurance Plan	Contact Number
A1 Insurers	Comprehensive Plan	555-5555

Policy Number	Group Number	Social Security Number
12345	123	123-45-6789

Health Information

Physician Information

Name	Designation/Specialty	Phone	Address	Notes
Dr. Max Smith	Family Doctor	555-5555	Family Doctors 26 Sample Terrace	
Dr. Ella Lee	Endocrinologist	555-5555	Sample Specialist Centre, 123 Sample Road	

Personal Information

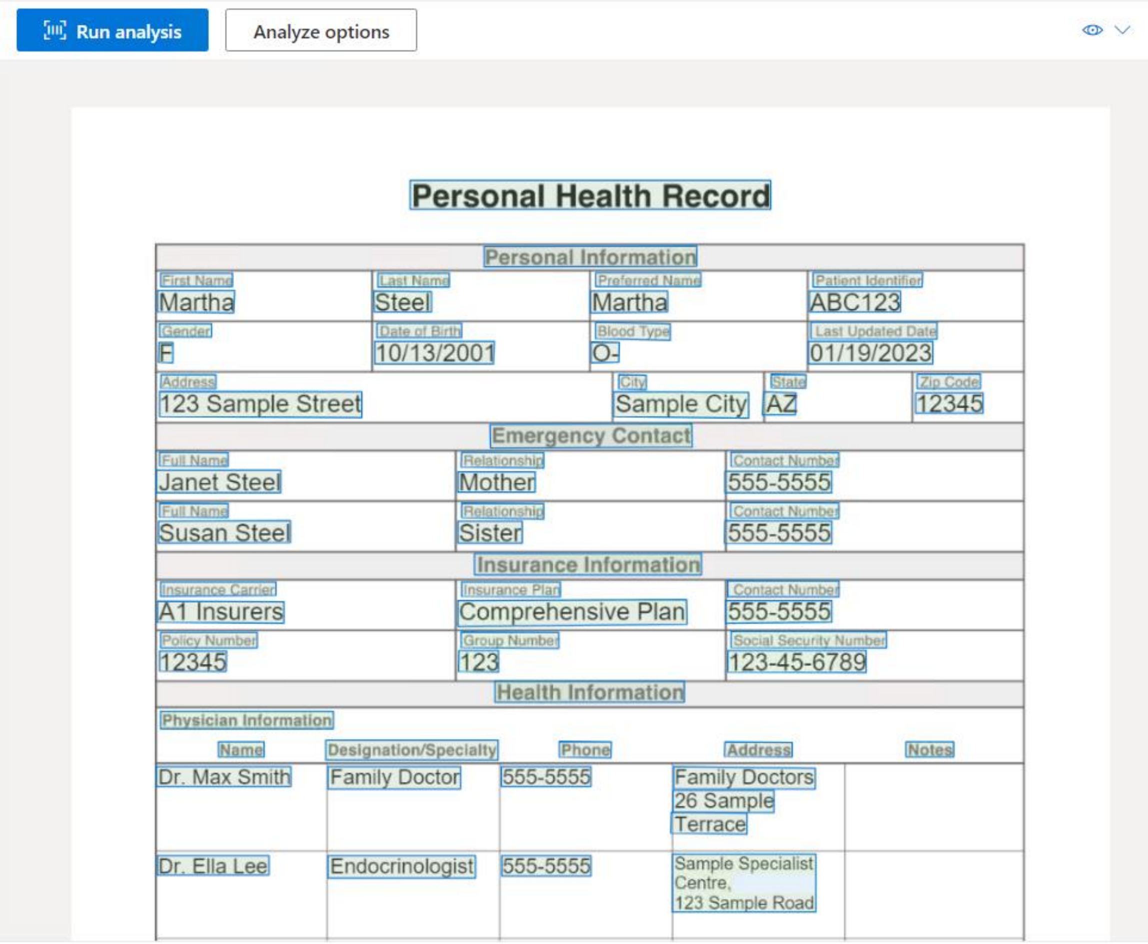
Last Name	Date of Birth	Patient Identifier
Steel	10/13/2001	ABC123

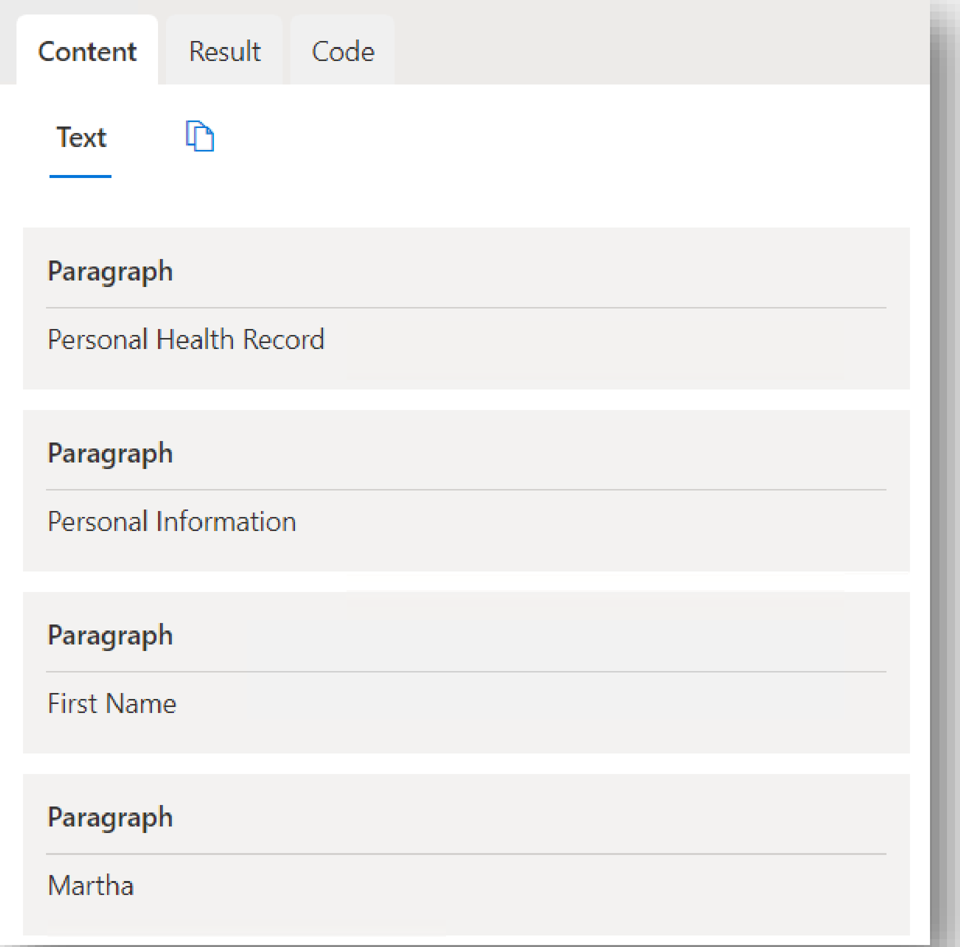
Health Information

se	Frequency	Indication	Note
mg	Daily	Thyroid hormone replacement	

	Type	Date Received
booster	Pfizer	June 2021
	Engerix-B	May 2020

Image recognition / Optical character recognition (OCR)





Using gen AI for summarisation

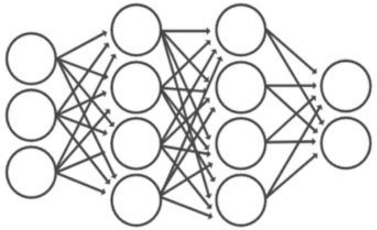
Raw JSON

JSON


```json
{
  "status": "succeeded",
  "createdDateTime": "2024-01-17T10:06:20Z",
  "lastUpdatedDateTime": "2024-01-17T10:06:21Z",
  "analyzeResult": {
    "apiVersion": "2023-10-31-preview",
    "modelId": "prebuilt-read",
    "stringIndexType": "utf16CodeUnit",
    "content": "Personal Health Record\nPersonal Informat
    "pages": [
      {
        "pageNumber": 1,
        "angle": 0.08092603087425232,
        "width": 8.2639,
        "height": 11.6944,
        "unit": "inch",
        "words": [
          {
            "content": "Personal",
            "polygon": [
              2.7054,
              0.587,
              3.7811,
              0.5872,
              3.7755,
              0.8172,
              2.6963,
              0.8172
            ],
            "confidence": 0.996,
            "span": {
              "offset": 0,
              "length": 8
```


Prompt engineering

LLM



Structured XML summary of medical history


```xml
<Patient>
  <PersonalDetails>
    <Name>Martha Steel</Name>
    <DOB>10/13/2001</DOB>
    <Address>
      <Street>123 Sample Street</Street>
      <City>Sample City</City>
      <State>AZ</State>
      <ZipCode>12345</ZipCode>
    </Address>
  </PersonalDetails>
  <Illnesses>
    <Illness>
      <Name>Grave's disease</Name>
      <Treatment>
        <Procedure>Thyroidectomy</Procedure>
        <Year>2021</Year>
        <Medication>Levothyroxine</Medication>
        <Dose>25mg</Dose>
        <Frequency>Daily</Frequency>
      </Treatment>
    </Illness>
  </Illnesses>
</Patient>
```

Using gen AI for decision-making

Medical history


```xml
<Patient>
  <PersonalDetails>
    <Name>Martha Steel</Name>
    <DOB>10/13/2001</DOB>
    <Address>
      <Street>123 Sample Street</Street>
      <City>Sample City</City>
      <State>AZ</State>
      <ZipCode>12345</ZipCode>
    </Address>
  </PersonalDetails>
  <Illnesses>
    <Illness>
      <Name>Grave's disease</Name>
      <Treatment>
        <Procedure>Thyroidectomy</Procedure>
        <Year>2021</Year>
        <Medication>Levothyroxine</Medication>
        <Dose>25mg</Dose>
        <Frequency>Daily</Frequency>
      </Treatment>
    </Illness>
  </Illnesses>
</Patient>
```


Rejection criteria

	A
1	**illness_name**
2	heartdisease
3	cancer
4	stroke
5	alzheimers
6	diabetes
7	gravesdisease

Prompt engineering

```
uw_decision_template_str = """
You are an AI life insurance underwriter, you make decisions on whether
an application should be rejected or accepeted based on the applicant's
medical history.

Here is the medical history:
{medical_history}

Here is the list of illnesses whi
{illness_df_xml}

You have two tasks
1) State why the applicant should
2) State the outcome of the appli

Follow the formatting instruction
{format_instructions}
"""
```

Outcome

Application outcome:

REJECT

Application outcome explanation:

The application was rejected because the applicant has a history of Grave's disease, which is listed among the illnesses that merit a rejection.

Total cost = $0.015 for summary + $0.005 for decision = **$0.02**

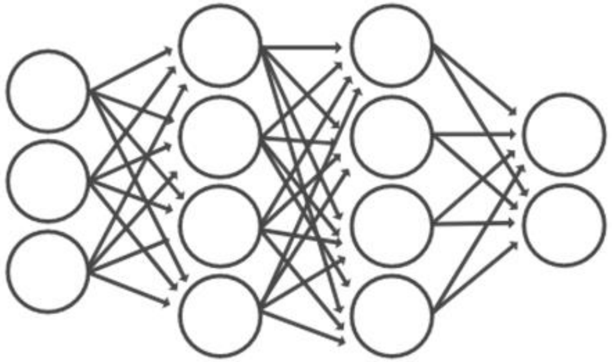
Insurance use case #3:
AI for customer feedback

LLMs for topic modelling

Collection of text

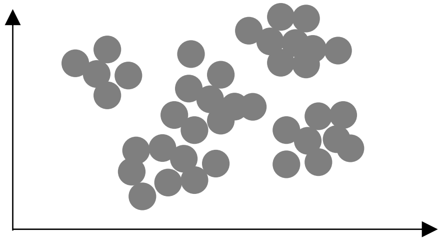
The quick brown fox jumps over the lazy dog
The slow white fox gets run into by the hyper dog
The fox and the dog both get chased by a Pokémon
…

LLM

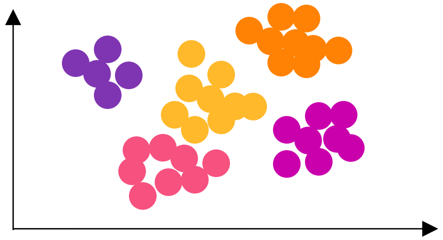


LLM Output

Embeddings



Reduce dimensionality



Cluster

The quick brown fox jumps over the lazy dog	1
The slow white fox gets run into by the hyper dog	1
The fox and the dog both get chased by a Pokémon	2
…	…

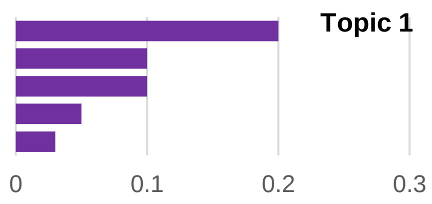
Text Modelling Output

Case study: LLMs for topic modelling

Insurer had an issue with increasing lapse rates

Highlighted a systems issue that affected a specific segment of customers: Lapses in this segment had more than doubled.

LLMs applied to call centre transcripts extracted several trending topics



"… I'm changing my cover for my … online…"

"…tried multiple times but not working frustrating"

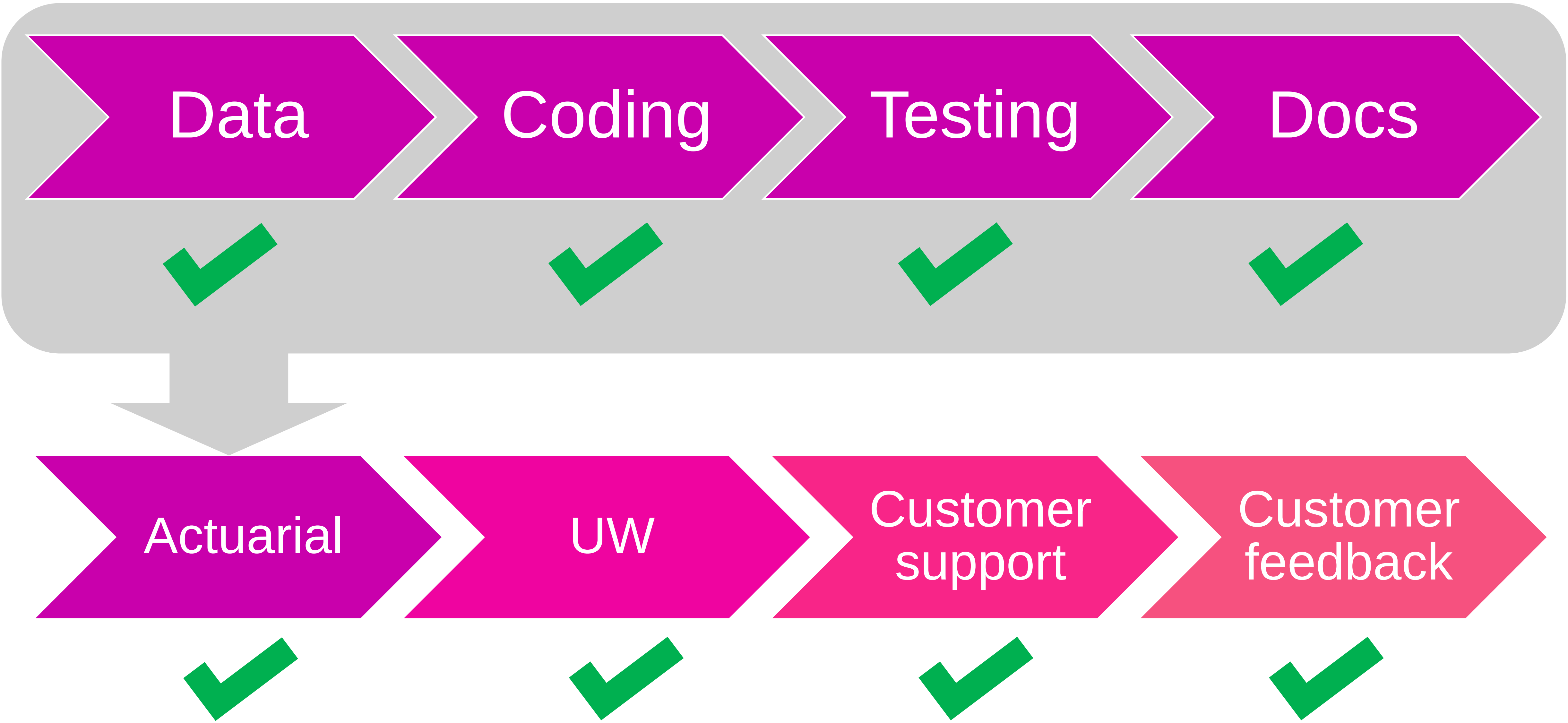
"…tried renewing but struggling to navigate…purchase not working…

"…website not responding after entering details…"

"…add a new item but won't let me…website crashed…"

"… tried to purchase online, but it didn't go through…

Generative AI will be in every stage of the insurance value chain



AI governance and strategy

AI governance - inputs

Possible model inputs

- Prompts (source code; documents; instructions; chat; scripts; email)
- Any training data provided for model tuning

Don’t submit any confidential information, including any personally identifiable information, client data or intellectual property (including source code) to any public AI service intended for personal use (e.g. ChatGPT, Bard).

Don’t submit any confidential information, including any personally identifiable information, client data or intellectual property (including source code) to an AI service intended for confidential business use unless you have written evidence of legal review, along with security and business leadership* approval.

Some AI service providers (including business service providers) may inspect, store or use this information to further train models which may violate client contract terms, breach data residency conditions and leak information to other users of the service (this may violate global privacy and wider regulatory requirements resulting in major reputational and financial damage).

Do ensure your legal contact ** confirms the data privacy and data security terms of service are compatible with the intended purpose, and ensure you fully understand service terms and conditions as they apply to inputs.

Do follow standard processes (including security checks and data residency checks) when considering use of a new IT supplier or service providing a generative AI capability. Technology teams may need to update their processes to consider the new risks posed by gen AI.

Do disable any browser option which automatically feeds content of visited web pages to an external AI service.

AI governance - outputs

Possible model outputs

- Source code; documents; chat output; scripts; email; web page content)
- Any AI-generated API calls to integrated services (risk models; file search)

Do ensure your legal contact confirms that use of generated output is not restricted by the service provider or other third parties, and there are no third-party or service provider ownership rights or access rights on generated output. Ensure you fully understand service terms and conditions as they apply to generated output and service availability characteristics.

Do always get business leadership approval that your use of generative AI output is fit for the intended purpose and risk mitigations are in place.

Don't use generated output in a fully automated process where content and quality of results are important. An AI may have been trained on data subject to bias, and may "hallucinate" facts and confidently present incorrect information. There must always be human accountability and responsibility for every line of generated output.

Do edit AI-generated drafts of client-facing material to conform to internal style guidelines, correct errors, add missing information and delete superfluous information. Making material changes to an AI-generated draft reduces the risk of third-party copyright infringement. An AI may generate content with echoes of copyrighted material used in its training).

Do consciously consider if your company needs to hold the copyright to material, and if so, ensure material improvement or revisions are made to an AI-generated draft. A work generated exclusively by an AI cannot be subject to copyright in some jurisdictions.

AI governance - outputs

Do always treat software elements generated or refactored with the assistance of an AI as third-party code which must be subject to quality, style and security reviews prior to its adoption. A human reviewer must be responsible for and review every line of adopted code and must make any necessary changes to address style, quality, performance or security issues.

Drafts of each generated code instance should be kept to short (tens of lines) fragments in larger works to reduce the risks of copyright infringement and risks of violating licence agreements (including strong copy-left agreements) of software works that may have been part of the training sets of AI models.

Basic guidelines: be sensible

Things you don't need AI for

Things you don’t need to develop in-house

What next for gen AI?

The future of gen AI

Customisation

- Your data
- Your preferences

Interactions

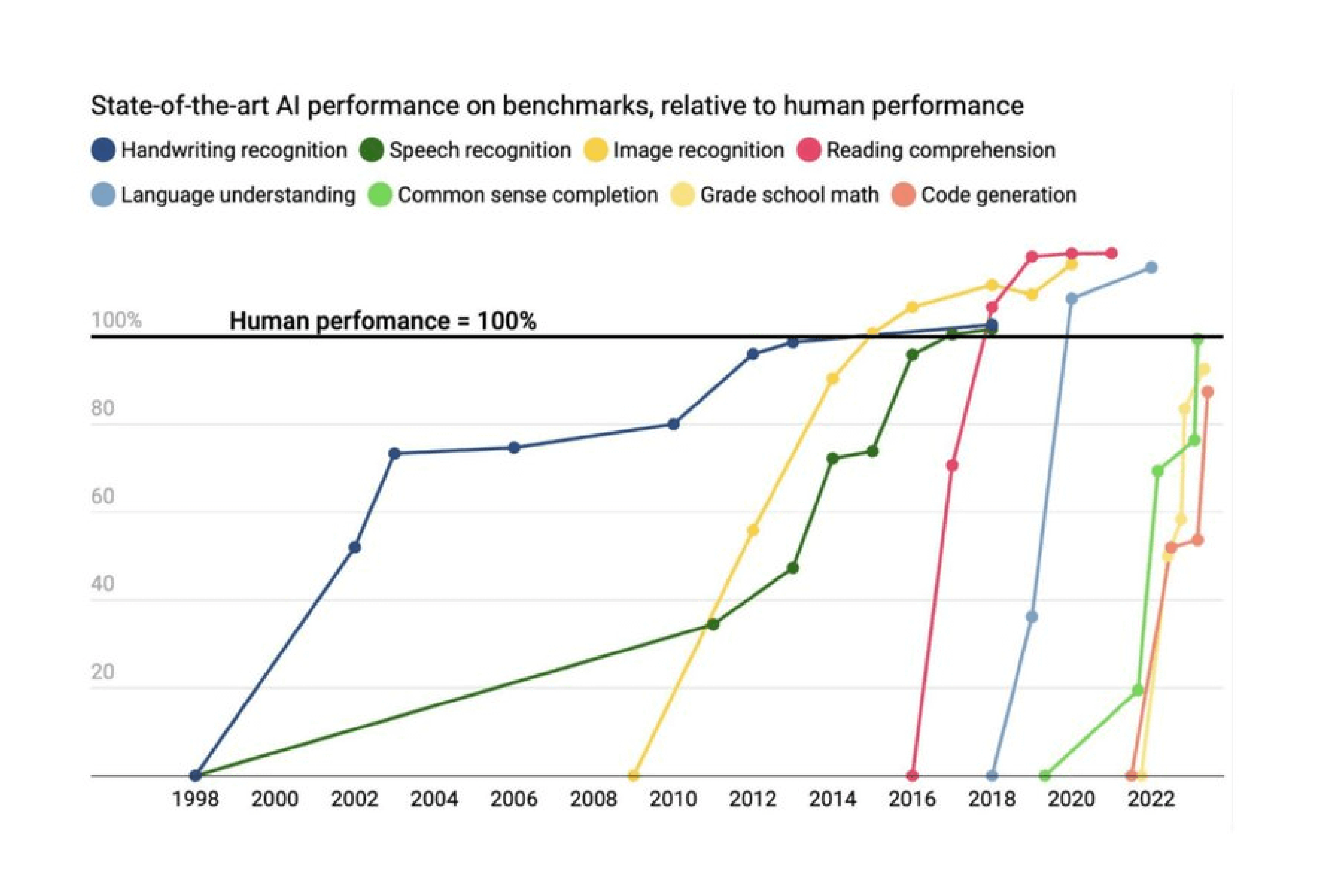
- Tools / plugins
- Copilots

Agents

- Self-prompting
- Autonomy

Improvements

- Faster, cheaper
- Smarter



Next steps

ChatGPT

- Boston Consulting Group saw a 20% uptick in productivity from use of chatbots

Brain-storm

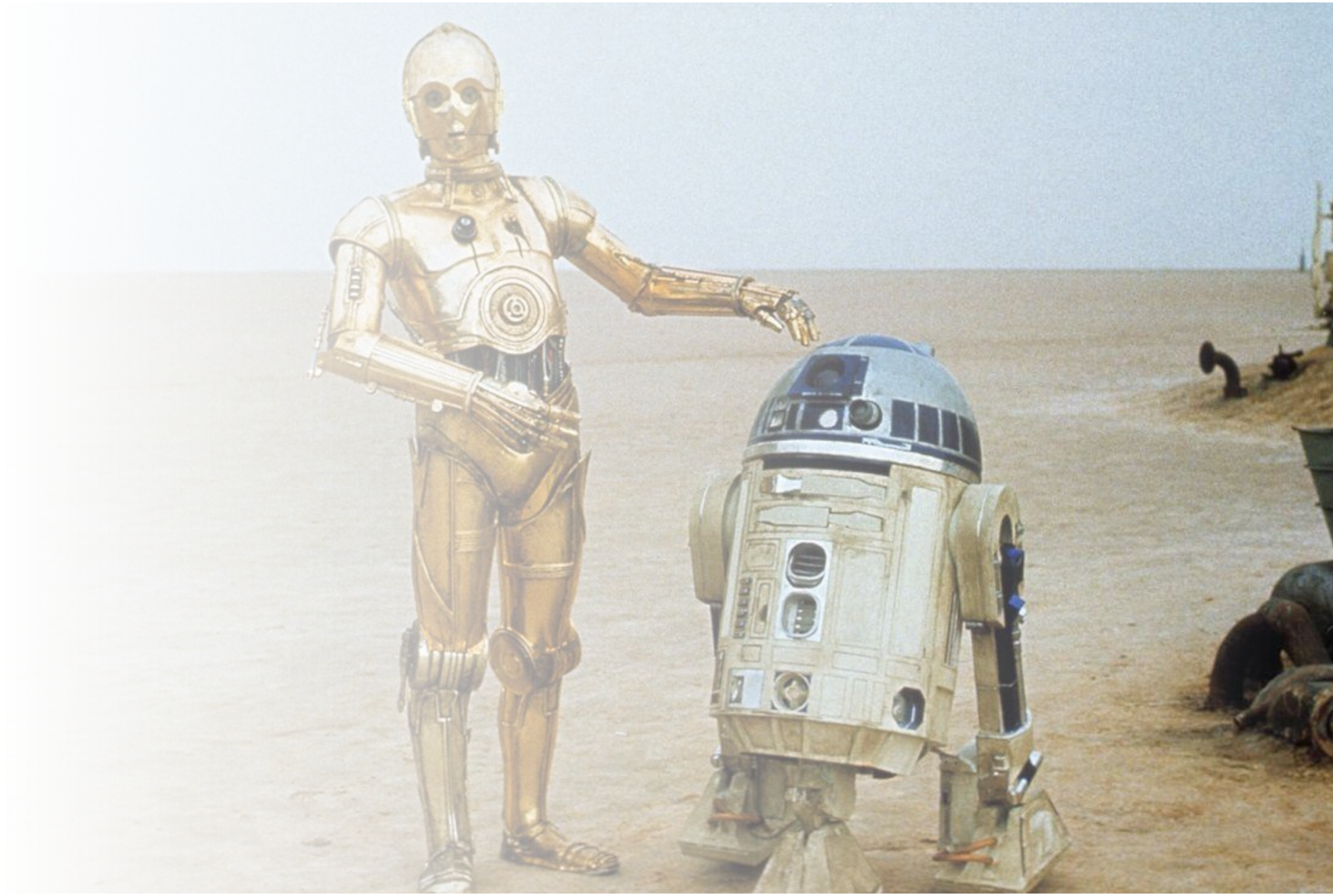
- Organise a focus group in the company to determine where what areas and processes could help the most

AI Steering Committee

- Form a group or name an individual to track developments and establish a company policy or strategy

Stay in touch

- We would love to hear from you about what areas you think would benefit most from these tools and how you are using them in practice



Questions?