

# Generative AI in Insurance and Actuarial

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**Avoid filling this space with text, will not be seen by audience**

## Presentation Disclaimer

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# What is Generative AI, or “Gen AI”?

**Technology  
Appearance**

**1943 Artificial Intelligence**

AI, or artificial intelligence, is a field of computer science that focuses on creating intelligent machines capable of tasks requiring human intelligence.

**1959 Machine Learning**

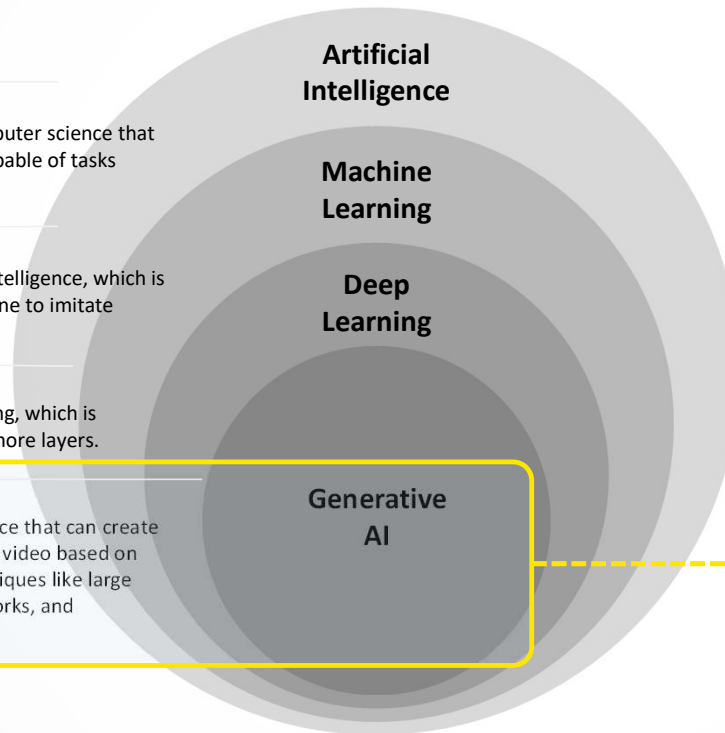
Machine learning is a subfield of artificial intelligence, which is broadly defined as the capability of a machine to imitate intelligent human behaviour.

**2006 Deep Learning**

Deep learning is a subset of machine learning, which is essentially a neural network with three or more layers.

**2017 Generative AI**

Generative AI is a type of artificial intelligence that can create new content such as images, text, audio, or video based on the data it has been trained on, using techniques like large language models, transformer neural networks, and generative adversarial networks



**70%**

of financial services leaders reported that GenAI tools have the potential for benefits rather than risks

**TEXT**

Generate human-like text responses and participate in the contextual conversation



**IMAGE**

Generate photorealistic images based on a text prompt



**SPEECH**

Text-to-speech models, mimic voice and removal of filler sounds, stuttering, and mouth sounds



**CODE**

AI-assisted bots write code and provide recommendations to development teams



**MULTI**

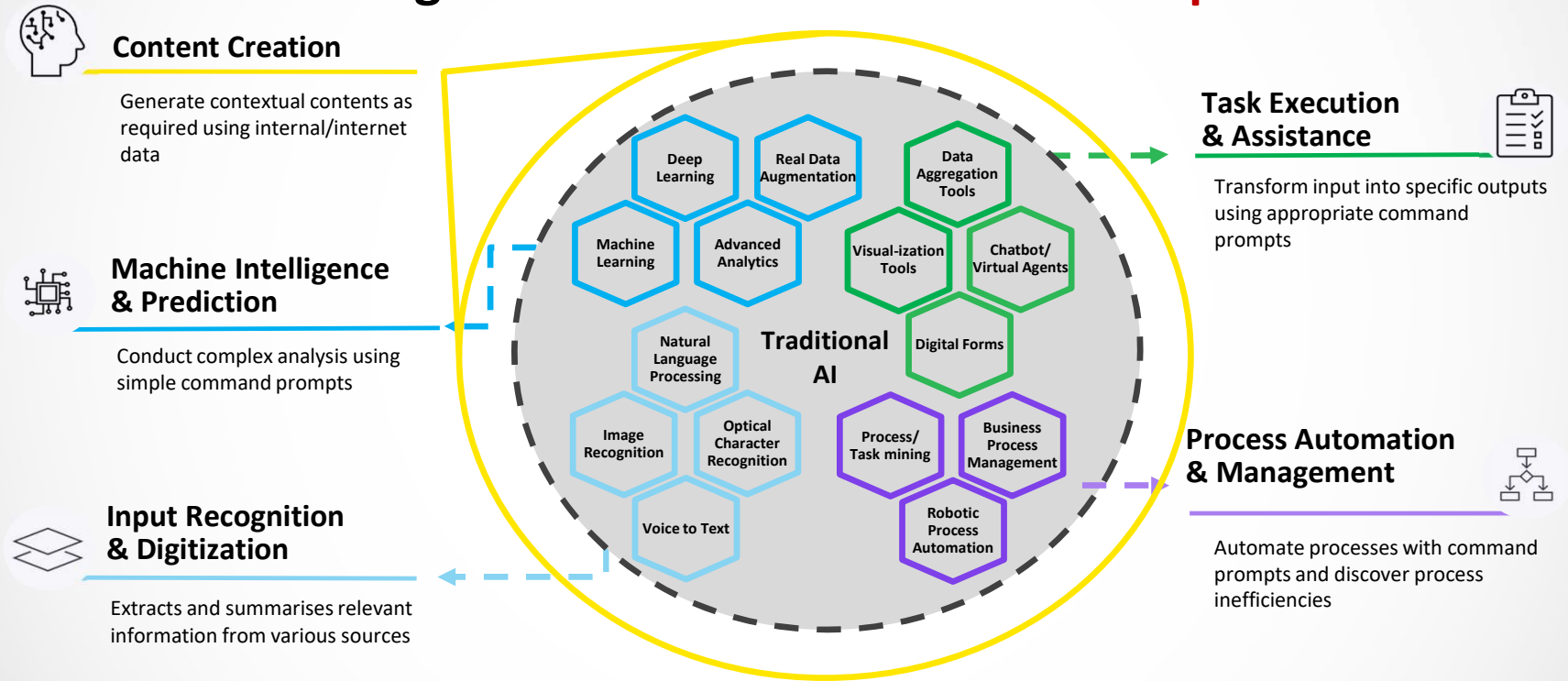
The model learns from a variety of data sources, including images, texts, and audio



# Generative AI Initiatives in Financial Services

Banking & Capital Markets	Wealth & Asset Management	Insurance	Payments & Fintech
<p><b>Bank A</b></p> <ul style="list-style-type: none"> <li>▶ Currently beta-testing <b>OpenAI-enabled chatbots</b></li> <li>▶ Source responses from 100k pre-vetted financial and operations documents to help advisors navigate large data repositories</li> </ul>	<p><b>WAM provider A</b></p> <ul style="list-style-type: none"> <li>▶ <b>Conversational AI assistant</b> that aids portfolio managers and quantitative analysts in automating the equity investment process</li> <li>▶ In proof-of-concept stage; goal is to equip assistant with speech capabilities and train using differing scenarios</li> </ul>	<p><b>Insurer A</b></p> <ul style="list-style-type: none"> <li>▶ Single-click, fully-automated E2E processing for stage 3 injury claims</li> <li>▶ Leverages Lauri, <b>the first true AI lawyer for insurance, and natural language processing</b></li> </ul>	<p><b>Payment service A</b></p> <ul style="list-style-type: none"> <li>▶ Utilization of <b>generative adversarial networks (GANs)</b> for risk and fraud readiness</li> <li>▶ <b>Generates virtual fraudsters</b>, pitting them against existing anti-fraud tools to identify gaps in fraud detection models</li> </ul>
<p><b>Financial data provider B</b></p> <ul style="list-style-type: none"> <li>▶ <b>Created their own Large language Model</b> supports sentiment analysis, named entity recognition, news classification, and Q&amp;A</li> </ul>	<p><b>WAM provider B</b></p> <ul style="list-style-type: none"> <li>▶ Infosys Cobalt-powered, cloud-native <b>record maintenance platform</b></li> <li>▶ <b>Enables real-time data solutions</b> and customization for sponsors of retirement planning; leverages VR and <b>conversational AI</b></li> </ul>	<p><b>Insurer B</b></p> <ul style="list-style-type: none"> <li>▶ <b>ChatGPT-driven automated code generation for statistical models</b>, information extraction (e.g., claims), and analysis of claims data to identify causes of loss</li> </ul>	<p><b>Payment service B</b></p> <ul style="list-style-type: none"> <li>▶ <b>Proprietary generative AI virtual assistant</b> with ChatGPT-like capabilities</li> <li>▶ Working with startup to train own LLMs on its code base to <b>automate code generation for product development</b></li> </ul>
<p><b>Bank C</b></p> <ul style="list-style-type: none"> <li>▶ <b>Virtual financial assistant</b> (e.g., "Erica") enables hyper-personalization</li> <li>▶ Delivers <b>real-time financial advice, personal finance insights, and portfolio performance</b></li> </ul>	<p><b>WAM provider C</b></p> <ul style="list-style-type: none"> <li>▶ <b>Digital assistant</b> designed to field complex questions from registered investment advisors / clients</li> <li>▶ Provides <b>human-like guidance for processes</b>, incl. lead generation through onboarding and acct. management</li> </ul>	<p><b>Insurer C</b></p> <ul style="list-style-type: none"> <li>▶ Personalized financial &amp; retirement planning (based on <b>Gen. AI mortality predictions accurate within 88-90%</b>)</li> <li>▶ Innovation-focused, independent Prudential-backed / funded startups now offering doctor-less <b>Underwriting-as-a-Service</b></li> </ul>	<p><b>Payment service C</b></p> <ul style="list-style-type: none"> <li>▶ <b>NLP-based customer service automation</b></li> <li>▶ Enables <b>voice-to-text transcription</b>, travel booking processing, classifying emails for delivery to the correct departments, and <b>automation of customer service chat</b></li> </ul>

# Gen AI Transforms Traditional AI by Integrating and Enhancing Their Abilities to Enable Five Capabilities



## Polling question 1

Have you used Gen AI in your daily work, e.g. ChatGPT, Copilot?

*Please choose one option.*

- 1 Frequently, e.g. more than once a week
- 2 Occasionally, e.g. several times in total only
- 3 Never

# Gen AI Can Drive Actuarial and Finance Productivity

## Generative AI's 5 Capabilities for Actuarial and Finance



### Content Creation

- Generate content for simulations and analysis robustness
- Generate synthetic data for testing
- Generate appropriate responses in human-like behaviour



### Machine Intelligence & Prediction

- Detect data inconsistencies, anomalies, and fraud
- Derive valuable insights from financial data and self-service analytics
- Enhance data quality / lineage and transparency to source
- Generate actionable insights for decision-making



### Task Execution & Assistance

- Reduce human error by automating data input, data aggregation and data reconciliation
- Produce business intelligence visualisations for management reporting
- Automate finance help desks and improve chatbots



### Input Recognition & Digitization

- Reduce time spent reviewing and summarising information.
- Extract key financial data from documents for finance operation and accounting



### Process Automation & Management

- Free up workforce by increasing productivity
- Focus on more valuable and engaging activities, by automating manual and repetitive tasks

## Sample Gen-AI Use Cases for Actuaries

S/N	Use Case	Description	Gen Ai Capabilities Required				
			Content Creation	Machine Intelligence & Prediction	Task Execution & Assistance	Input Recognition & Digitization	Process Automation & Management
1	<b>Actuarial Data and Model Process</b>	Replacing manual process of generating data and tables in the model. Use Gen AI to prepare and compare the data, table or coding.	✓	✓	✓		✓
2	<b>Preparation of reports, commentaries, presentations</b>	Automated preparation of reports using historical templates and current year data  Generation of infographics and commentary analysis for presentations	✓		✓	✓	
3	<b>Reconciliation of Data</b>	Generative AI can help financial entities establishing the desired rules-based systems in machine learning models to automate their reconciliation processes	✓	✓	✓		✓
4	<b>Automating Experience Analysis and Identifying Deeper Trends</b>	Link policyholder data with other non-financial datasets like distribution behavior, customer experience etc., and leverage machine learning/AI capabilities to create microsegments of cohorts and identify deeper understanding of trends.	✓	✓	✓		✓



## Gen AI Use Cases – Actuarial Data and Model

### Main Problems

- ▶ Manual and prone to human errors to generate coding and queries.
- ▶ Time consuming to learn and form initial coding and queries, especially for new requests.

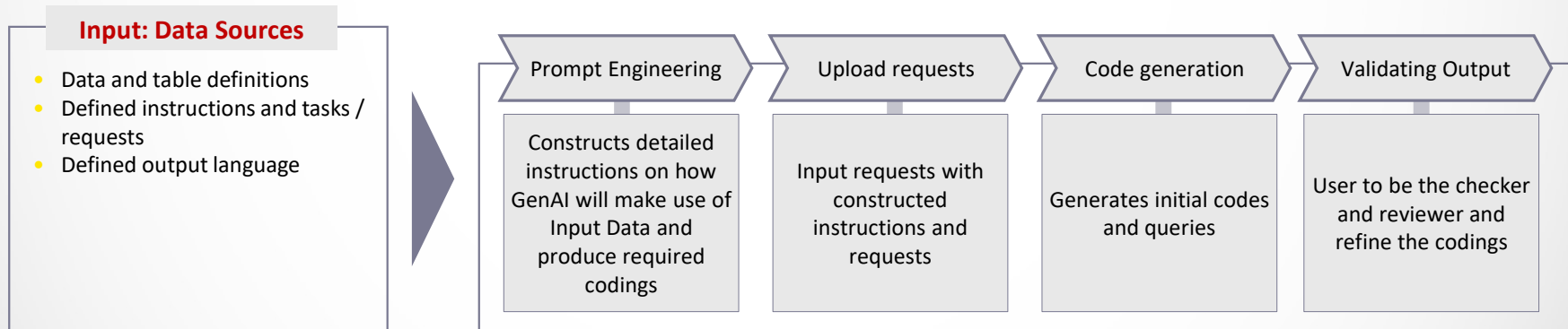
### Gen AI Solution

- ▶ AI automated process to generate and check data and tables
- ▶ AI to generate codes and queries by instruction input
- ▶ AI to convert codes between languages

### Business Impact

- Reduce in effort on gaining coding knowledges for new requests
- Reduce in human errors for generating tables and data for different purposes.

### How would it work?



## Code Generation

**1. Click on Browse files to upload the required input documents**

Input section

Upload the STTMs



Drag and drop files here  
Limit 200MB per file • XLSX

Browse files



harmonized\_to\_curated\_tb\_fpsl\_fx\_rate\_v6.xlsx 284.6KB

**2. Showcase input files uploaded by the user before processing**



Run

**3. Click on Run to trigger LLM model and generate postgres SQL code**

**4. Processing status showcased during backend code execution**

*Illustrative*

Output section

Input Mapping File Loaded !!!

Preprocessing/Standardization Completed !!!

SQL Queries Generated !!!

**5. Output screen containing generated code, which can be copied back as per requirement**

```
INSERT INTO cl_ifrs17.tb_fpsl_fx_rate (EXCHANGE_RATE, FROM_CURR, KEY_DATE, STATUS, TO_CURR)
SELECT
(1/bnym_fxrpt.current_fx_value + fpsl_factor.from_factor / fpsl_factor.to_factor) AS EXCHANGE_RATE,
bnym_fxrpt.currency_from AS FROM_CURR,
TO_CHAR(DATE_TRUNC('MONTH', bnym_fxrpt.effective_date) + INTERVAL '1 MONTH - 1 day', 'YYYYMMDD') AS KEY_DATE,
logic_ind_fx_rate.logical_indicator AS STATUS,
bnym_fxrpt.currency_to AS TO_CURR
FROM
tds_finance_accounting.tb_s13_bnym_fxrpt_d_ntuc AS bnym_fxrpt
LEFT JOIN
tds_finance_accounting.tb_fx_rate_fpsl_factor AS fpsl_factor
ON
fpsl_factor.From_Currency = bnym_fxrpt.Currency_from
CROSS JOIN
tds_finance_accounting.tb_logic_ind_fx_rate AS logic_ind_fx_rate
WHERE
bnym_fxrpt.PERIOD_DESCRIPTION = 'Spot'
```

Export

**6. Export results as a flat or pdf file**

	T	U	V	W	X	Y
	Target Column Name	Mapping Status	Last Update Date	Transformation Type	Transformation Logic	
rate	DateKey	SIGNED-OFF	5/24/2023	DERIVED	Step 1: From Source Table 2: exc S13_TABLE_ddmmyyyy, filter the information with the following logic: IF PERIOD_DESCRIPTION = "Spot", THEN proceed to Step 2.	
rate	DateKey	SIGNED-OFF	4/24/2023	DERIVED	Refer to the above	
rate	SourceCurrency	SIGNED-OFF	5/24/2023	DERIVED	Step 1: From Source Table 2: exc S13_TABLE_ddmmyyyy, filter the information with the following logic: IF PERIOD_DESCRIPTION = "Spot", THEN proceed to Step 2.	
rate	SourceCurrency	SIGNED-OFF	5/24/2023	DERIVED	Refer to the above	
rate	TargetCurrency	SIGNED-OFF	5/24/2023	DERIVED	Step 1: From Source Table 2: S13_TABLE_ddmmyyyy, filter the information with the following logic: IF PERIOD_DESCRIPTION = "Spot", THEN proceed to Step 2.	
rate	TargetCurrency	SIGNED-OFF	5/24/2023	DERIVED	Refer to the above	
rate	ConversionRate	SIGNED-OFF	5/24/2023	DERIVED	Step 1: From Source Table 2: exc S13_TABLE_ddmmyyyy_<38 char timestamp>, filter the information with the following logic: IF PERIOD_DESCRIPTION = "Spot", THEN proceed to Step 2.	
rate	ConversionRate	SIGNED-OFF	5/24/2023	DERIVED	Refer to the above	
rate	ConversionRate	SIGNED-OFF	8/1/2022	DERIVED	Refer to the above	
rate	ConversionRate	SIGNED-OFF	8/1/2022	DERIVED	Refer to the above	
rate	state	SIGNED-OFF	8/1/2022	DERIVED	Fetch the logical indicator from Manual Table 7: LOGIC_EXCHANGE_RATE. IF the value is "", THEN Market Date state for all values are "".	

Step 1: From Source Table 2: exc S13\_TABLE\_ddmmyyyy, filter the information with the following logic:  
IF PERIOD\_DESCRIPTION = "Spot", THEN proceed to Step 2

Step 2: Fetch the CURRENCY\_FROM value, such that:  
SourceCurrency (Data Object: FX Rate) = CURRENCY\_FROM (Source Table 2: excS13\_TABLE\_ddmmyyyy)

Table Metadata | Column Metadata | Table Mapping | **Column Mapping** (+)

## Code Conversion

*Illustrative*

2. Click on Brose files to upload the required input codes

Input section

1. Select the language of input code being passed and output file expected/generated

Output section

Select Source Language

Postgres SQL

Extract from input file (optional)



Drag and drop file here  
Limit 200MB per file

Browse files

fx\_rate\_ground\_truth.sql 1.2KB

Enter code here

```
with cte as (
  select date_format(
    to_date(effective_date, 'MMM dd yyyy'),
    'yyyyMMdd'
  ) as key_date,
    currency_from as from_curr,
    current_fx_value,
    from_factor,
    to_factor,
    (1 / current_fx_value) * (cast(from_factor as numeric)) / cast(to_factor as numeric) as
    exchange_rate,
    logical_indicator as status
  from tb_p_s13_bnym_fx rpt_d_ntuc s2
  left join tb_p_fx_rate_fpsl_factor cf15 on s2.currency_from = cf15.from_currency
  left join tb_p_logic_ind_fx_rate on 1 = 1
  where period_description = 'Spot'
)
select key_date,
  from_curr,
  to_curr,
  status,
  exchange_rate
```

3. Input scripts copied here for potential user modifications. User can also enter code directly without passing any input files

4. Click Convert to execute conversion of input code from source formatting language to target formatting language as per filters selected

Convert

Select Target Language

Spark SQL

Generated Target Code :

```
WITH cte AS (
  SELECT
    TO_CHAR(TO_DATE(effective_date, 'Mon DD YYYY'), 'YYYYMMDD') AS key_date,
    currency_from AS from_curr,
    current_fx_value,
    from_factor,
    to_factor,
    (1 / current_fx_value) * (CAST(from_factor AS numeric)) / CAST(to_factor AS numeric) AS
    logical_indicator AS status
  FROM
    tb_p_s13_bnym_fx rpt_d_ntuc s2
  LEFT JOIN tb_p_fx_rate_fpsl_factor cf15 ON s2.currency_from = cf15.from_currency
  LEFT JOIN tb_p_logic_ind_fx_rate ON TRUE
  WHERE
    period_description = 'Spot'
)
SELECT
  key_date,
  from_curr,
  to_curr,
  status,
  exchange_rate,
  CASE
    WHEN from_factor IS NULL OR to_factor IS NULL THEN 'y'
    ELSE 'n'
  END AS err_indicator,
```

5. Output window containing Target language Spark SQL generated code

Export

6. Export the final output



# Software Development Life Cycle Generative AI Solutions

[Code Generation](#) | [Code Conversion](#) | [Code Documentation](#) | [Test Case/Script Generation](#)

Upload the STTMs



Drag and drop files here  
Limit 200MB per file • XLSX

Browse files

Run



A	B	C
1 Variables	Formula	Source
2 DEATH_RATE	DEATH_RATE = IF t <= dur_m or t > POL_TERM_M THEN 0 ELSE ; 1 - (1 - ANN_DEATH(t))^(1/12) (1 - (1 - MIN(1,ANN_DEATH(t)))^(1/12))*MORT_IMPROV(t)*LONGEVITY_TREND(t)*NEUTRALIZE_TREND(t)	
3 DUR_M	EB_OFFSET	
4 EB_OFFSET	IF DURATIONIF_M <> 0 AND SPCODE > LAST_SPCODE_FOR_EXISTING_BUS THEN 0 + WARNING("Non-zero DURATIONIF_M for new business has been set to zero") ELSE IF DURATIONIF_M < 0 AND SPCODE <= LAST_SPCODE_FOR_EXISTING_BUS THEN 1 + WARNING("Negative DURATIONIF_M for existing business has been set to 1") ELSE IF DURATIONIF_M > POL_TERM_M THEN POL_TERM_M + WARNING( "DURATIONIF_M after maturity has been set to month prior to maturity") ELSE IF DUR_START <= 0 OR ((CURRENT_START_YEAR - ENTRY_YEAR) * 12 + CURRENT_START_MONTH - ENTRY_MONTH + 1 = DURATIONIF_M) THEN DURATIONIF_M ELSE DURATIONIF_M + WARNING( "Definitions for DURATIONIF_M, ENTRY_MONTH and ENTRY_YEAR are inconsistent")	
5 POL_TERM_M	POL_TERM_Y * 12 + ADD_TERM_M	
6 INDICATOR_PRODUCT		Parameter Table
7 POL_TERM_Y		Model Point File
8 PREM_FREQ		Model Point File
9 ADD_TERM_M		Model Point File
10 ANN_DEATH	IF t = 0 OR t > POL_TERM_M THEN 0 ELSE IF mult(t+11,12) THEN Q_EXP(t) ELSE ANN_DEATH(t-1)	
11 Q_EXP	IF ZERO_MORT = 1 AND AGE_AT_ENTRY < ZERO_TOL_AGE THEN 0 ELSE IF WL_POLICY = 1 AND t >= POL_TERM_Y * 12 - 11 THEN 1 ELSE IF t <= DUR_M + SHOCK_MORT_PERIOD1_M and t > DUR_M + SHOCK_MORT_START_M AND SPCODE <= LAST_SP_EBUS THEN MIN(Q_EXP_PN(t) * PROP_EXPO_PC/100 * CLAIMS_SY * RELATIVE_MORT_LF(t) + SHOCK_MORT, 1) ELSE MIN(Q_EXP_PN(t) * PROP_EXPO_PC/100 * CLAIMS_SY * RELATIVE_MORT_LF(t), 1)	
	IF SELECT_TABLE = 0 THEN IF MORT_TABLE_EXP = "TMO2017" THEN READ_MORT_TABLE("TMO2017") ELSE IF MORT_TABLE_EXP = "TMO2017" THEN READ_MORT_TABLE("TMO2017") ELSE IF MORT_TABLE_EXP = "TMO2017" THEN READ_MORT_TABLE("TMO2017")	

```

sample_script.txt - Notepad
File Edit Format View Help
# Import necessary libraries

import math

# Define functions

def Read_Mort_Table(table_name, age_at_entry):
    # Logic to read mortality table
    pass

def Read_Generic_Table(table_name, age_at_entry):
    # Logic to read generic table
    pass

def WARNING(message):
    # Logic to display warning message
    pass

# Define variables

LONGEVITY_TREND = 1
NEUTRALIZE_TREND = 1

# Execute variables in order

INDICATOR_PRODUCT = "Parameter Table"

POL_TERM_Y = "Model Point File"

ADD_TERM_M = "Model Point File"

PREM_FREQ = "Model Point File"

Q_EXP_PN = Read_Mort_Table("Mort_Table.fac", Age_At_Entry)

PROP_EXPO_PC = Read_Generic_Table("Mort_Exp.fac", Age_At_Entry)

MORT_IMPROV_PC = "Global Table"

def Read_Mort_Table(table_name, age_at_entry, mort_improv_age):
    if t < DUR_M or t > POL_TERM_M or AGE_AT_ENTRY > MORT_IMPROV_AGE:

```

## Gen AI Use Cases – Document Drafting

### Main Problems

- Manual and prone to human error
- Time consuming to extract and format data
- Traditional AI cannot generate texts required

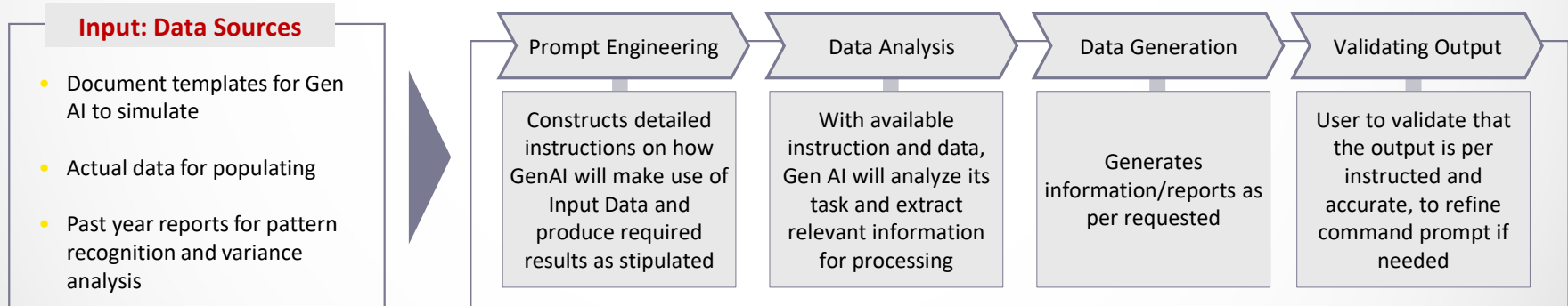
### Gen AI Solution

- Automated process that eliminates human error
- AI processing to greatly reduce preparation time
- Natural Language Processing to generate human-like texts

### Business Impact

- Greater stakeholder confidence due to high degree of data accuracy
- Increased operational efficiency and time savings

### How would it work?



## Gen AI Use Cases – Reconciliation of Data to Source

### Main Problems

- ▶ Significant effort spent each day to reconcile data that could be spent on higher value work
- ▶ Excel is unable/slow to handle massive data sources
- ▶ Reconciliation process is highly dynamic, making it hard to code using traditional AI

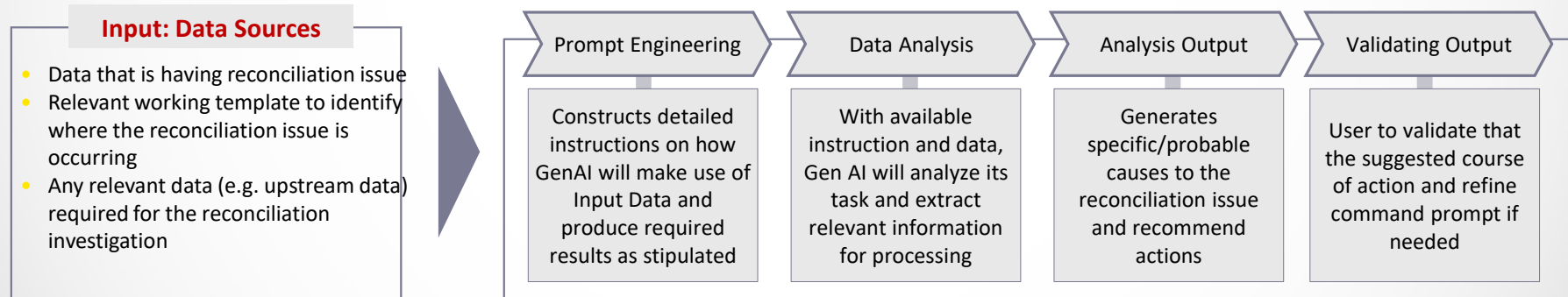
### Gen AI Solution

- ▶ Natural Language processing to understand current reconciliation issue and suggest the best course of action
- ▶ Machine learning model to improve the reconciliations process through pattern recognition
- ▶ Able to process massive data sources and adapts to all requests

### Business Impact

- Significantly reduce the effort spent each day on reconciling, allowing for more time to be spent on other higher value work

### How would it work?





## Gen AI Use Cases – Experience Analysis

### Main Problems

- ▶ Granularity of analysis not updated frequently enough to capture changes in trend
- ▶ Trial and Error method used to identify the reason for variance: Investigation based on a few hypothesis which is then validated during experience analysis
- ▶ Manual updates queries written to perform the experience analysis

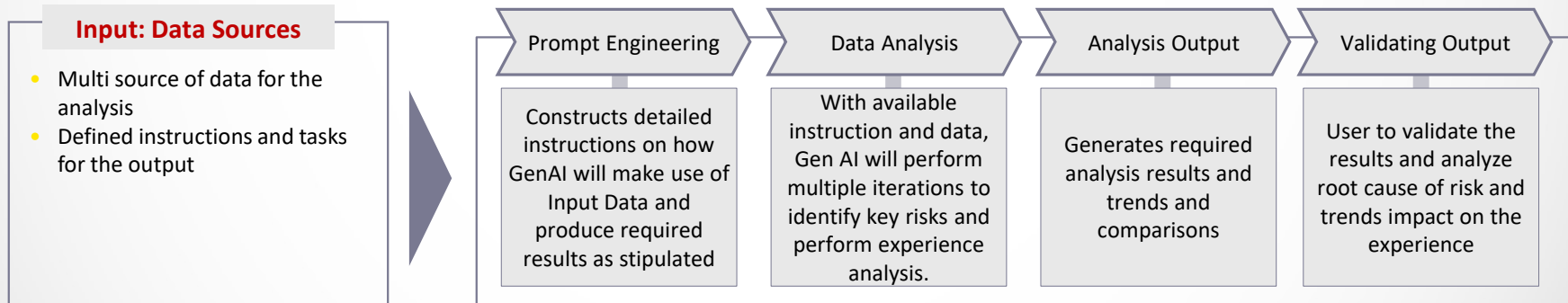
### Gen AI Solution

- ▶ Automated process that eliminates human error and expedite iterations of analysis
- ▶ AI executed machine learning model to identify key risks and parameters dynamically over the years.
- ▶ Able to process massive data sources and adapts to all requests

### Business Impact

- Significantly reduce the effort spent on data processing and iterations of analysis, allowing for more time to be spent on other higher value work
- Dynamic granularity of the analysis and insights enabled vs. predefined structure.

### How would it work?



## Polling question 2

Which areas will you be interested to explore and try using Gen AI going forward?

*Please choose the top two options.*

- 1 Content creation
- 2 Machine intelligence and prediction
- 3 Task execution and assistance
- 4 Input recognition and digitization
- 5 Process automation and management
- 6 None

# Polling question 3

When do you plan to explore opportunities to implement Gen AI technology, e.g., ChatGPT?

*Please choose one option.*

- 1** Already implemented
- 2** Building and/or testing phase
- 3** Starting soon (next two to three months)
- 4** Want to implement but no concrete plans yet
- 5** Not interested and/or not relevant to my Company



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26 - 29 August 2024

**Thanks for your attendance and feel free to reach out to us in case you are interested in discussing further**