Revamp of the Underwriting Workflow

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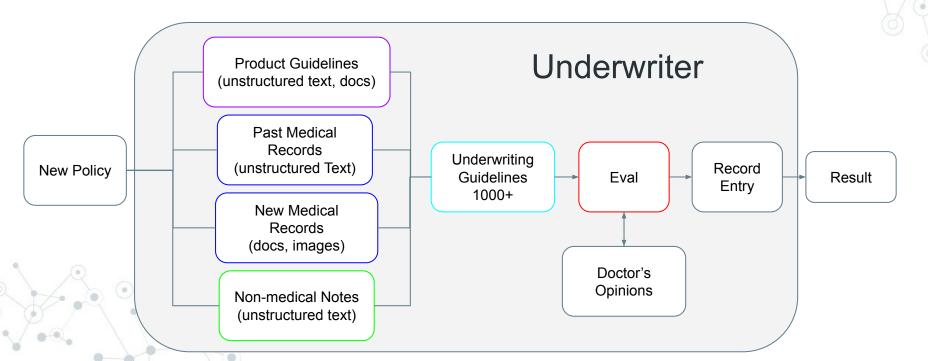**Cathay Life Insurance (2024/12 - Present)**

*Due to confidentiality, all confidential information has been modified or removed.
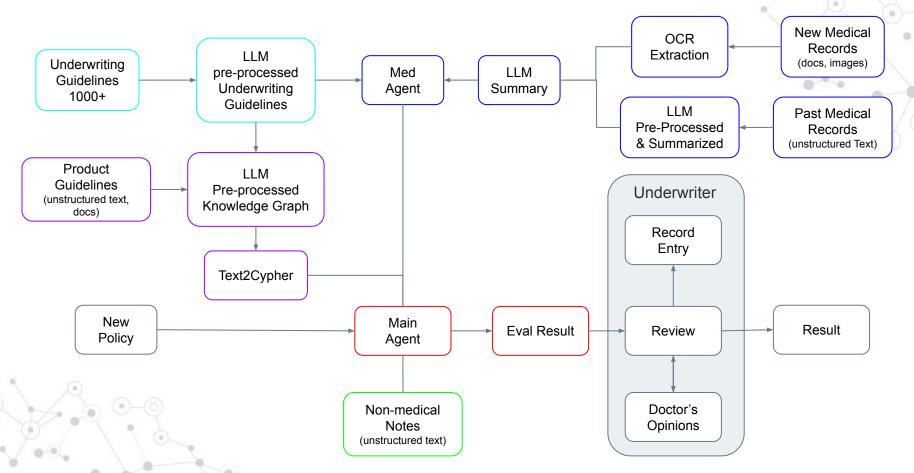
Project Description

◎ This project aims to build an AI-driven underwriting workflow that ingests unstructured medical documents, product guidelines, and legacy rulebooks, outputting consistent, auditable risk evaluations.

◎ Issue: The traditional underwriting process is slowed by scattered product and underwriting guidelines, along with the manual interpretation of complex medical records. This leads to long turnaround times, data entry errors, and inconsistent decisions.

◎ Target Users: The Underwriting Department

Past workflow

◎ Under current guidelines, all policyholders with medical records must be reviewed by an underwriter.

◎ The review process can take two to four weeks.

New Workflow

New Workflow Description

◎ The new workflow is streamlined by AI to create consistent and auditable risk evaluations.

◎ Main Agent

 ○ This agent is powered by an LLM to automatically query necessary information and produce risk evaluations for underwriters.

◎ Med Agent

 ○ This agent queries relevant underwriting guidelines and combines them with a policyholder's medical history to conduct a medical evaluation.

◎ Text2Cypher

 ○ This component queries relevant product and underwriting guidelines for the main agent based on the policy being reviewed.

◎ Processing of the Underwriting guidelines

 ○ This component leveraged an LLM to digitize unstructured underwriting guidelines for different components and applications.

Processing of Underwriting Guidelines

　壽險核保標準(xxxxxx修訂)：1.無甲狀腺惡性病變： (1)現症： 　A.伴有結節-----依甲狀腺結節{{A101}}評估。 　B.無結節，僅甲狀腺腫大： 　(a)近期病灶體積xxx，無症狀： 　I.伴有甲狀腺功能xx-----依甲狀腺機能xx{{A10B}}評估。 　II.伴有甲狀腺功能xx-----依甲狀腺機能xx{{A1033}}評估。 　III.甲狀腺功能xx-----100。 　(b)近期病灶體積或疾病症狀有xx-----醫鑑。 (2)既往症： 　A.目前甲狀腺機能xx-----50。 　B.目前甲狀腺機能xx：(a)甲狀腺功能xx-----依甲狀腺機能xx{{A10B}}評估。 　(b)甲狀腺功能xx-----依甲狀腺機能xx{{A103}}評估。2.伴甲狀腺惡性病變-----依甲狀腺癌評估。

Cont.

◎ Text contains semi-recursive structure

◎ Can be processed with this recursive data structure

Ex:

Disease ->

    Conditions or result ->
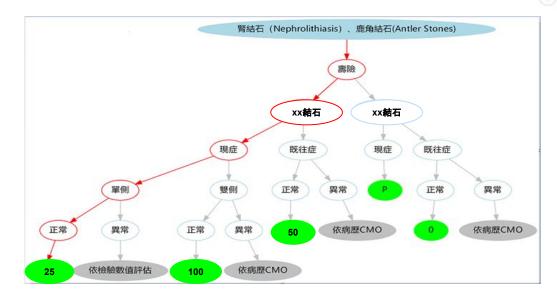
        Conditions or result ->

        … ->

            Only result -> end

```
甲狀腺腫
├── 無甲狀腺惡性病變
│ ├── 現症
│ │ ├── 伴有結節
│ │ │ └── 依甲狀腺結節{{A101}}評估
│ │ └── 無結節, 僅甲狀腺腫大
│ │ ├── 近期病灶體積xxx, 無症狀
│ │ │ ├── 伴有甲狀腺功能xx
………
│ │ │ └── 甲狀腺功能xx
│ │ │ └── 100
│ │ └── 近期病灶體積或疾病症狀xxx
│ │ └── 醫鑑
│ └── 既往症
│ ├── 目前甲狀腺機能xx
│ │ └── 50
│ └── 目前甲狀腺機能xx
│ ├── 甲狀腺功能xx
│ │ └── 依甲狀腺機能xx{{A10B}}評估
│ └── 甲狀腺功能xx
│ └── 依甲狀腺機能x{{A103}}評估
└── 伴甲狀腺惡性病變
└── 依甲狀腺癌評估
```
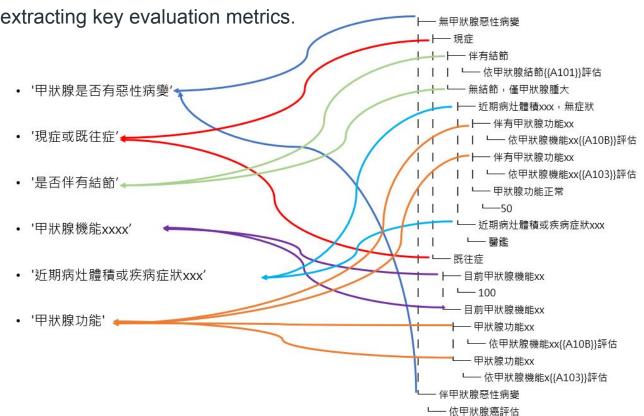
Application 1: Tools

◎ Health Risk Calculator
  ○ Remove unnecessary human variance
  ○ Speed up evaluation process
  ○ Usage Rate: 100%
◎ Visualization
  ○ Increase interpretability
  ○ Enhance maintainability

Application 2: Med Agent

◎ The processed underwriting guidelines can be used for extracting key evaluation metrics.

Application 2: Med Agent

◎ Extracted key evaluation metrics can be used for summarizing medical records
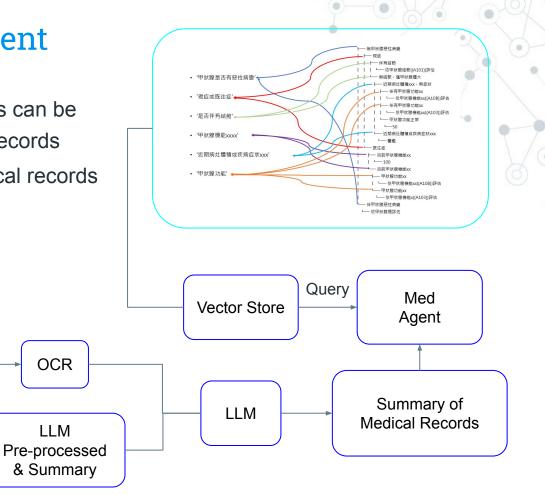
◎ Processed 30 millions old medical records
  ○ 95%+ accuracy

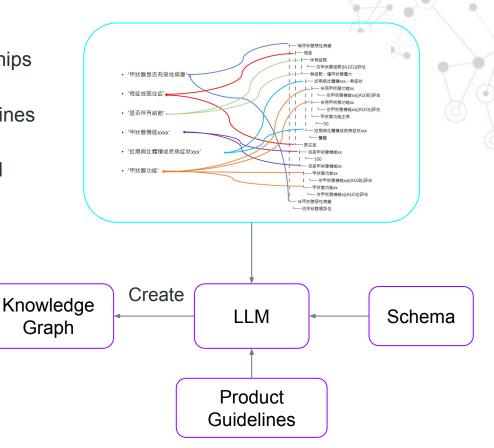◎ Automation of Document OCR
  ○ 88%+ accuracy

Application 3: Text2Cypher

◎ Knowledge Graph
- ○ Captures the complex relationships and dependencies between product and underwriting guidelines

◎ Text2Cypher (LLM)
- ○ Queries all relevant product and underwriting guidelines

Text2Cypher — Query — Knowledge Graph — Create — LLM — Schema

Product Guidelines

Summary

◎ Key Applications & Results

  ○ Health Risk Calculator

    ◉ A dynamic visualization tool that speeds up the evaluation process and enhances interpretability.

    ◉ Achieved a 100% usage rate among underwriters.

◎ Automated Document Analysis

  ○ Processes new medical records from images and documents with over 88% OCR accuracy.

  ○ An LLM summarized 30 million old medical records with over 95% accuracy, enabling quick queries by a medical agent.

◎ Text2Cypher (Work In Progress)

  ○ Development is underway for a Text2Cypher pipeline that will query product guidelines stored as a knowledge graph, allowing for natural language interaction.

The End