Report

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Title: Claim Process Navigator Agent for Hospital Insurance Assistance

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Introduction

Insurance claim processes in hospitals often cause confusion for patients and staff, especially when differentiating between **Cashless** and **Reimbursement** claims. Miscommunication, delays in documentation, and lack of standardized guidance can lead to patient dissatisfaction, longer processing times, and increased administrative workload.

This project presents an **AI-powered Claim Process Navigator Agent** built using **LangGraph**, **LangChain**, and **Google Gemini 1.5 Flash** to guide patients through the correct claim steps in real time. The system ensures consistent, accurate, and prompt responses to patient queries, reducing the dependency on manual explanation by hospital staff.

Problem Statement

Hospital insurance desks face challenges in delivering claim-related guidance:

- Lack of **real-time classification** of patient queries into correct claim steps.
- Repeated manual explanations by staff for common questions.
- Risk of patients **missing required documents** or steps.
- Increased **waiting time** for claim approval or settlement.

An intelligent, automated assistant is needed to understand the claim type, classify patient queries, and provide accurate process steps — improving service quality and operational efficiency.

Objective

- Automate the classification of patient queries into specific claim process nodes.
- Guide patients through **Cashless** and **Reimbursement** claims with step-by-step instructions.
- Ensure responses are **standardized** and **accurate** across all interactions.

- Reduce staff workload by handling common patient queries automatically.

Why This Problem Matters?

Mismanagement or delays in claim guidance can:

- Cause **patient dissatisfaction** and negative hospital experience.
- Lead to **missed claim deadlines** or incomplete submissions.
- Increase **administrative load** on staff.
- Reduce operational efficiency of the hospital's insurance desk.

By using AI to classify and respond to patient queries, hospitals can provide **instant, consistent, and process-compliant guidance** without overburdening staff.

Solution Overview: AI-Powered Workflow

Built on **LangGraph** with **Gemini 1.5 Flash**, the system consists of interconnected nodes to:

1. Identify claim type (Cashless or Reimbursement).
2. Accept patient queries.
3. Use the LLM to classify the query into the correct process node.
4. Respond with a predefined hospital-approved answer.

How It Works

1. **Step 0 – Install Dependencies**
    - The system installs required Python libraries (google-generativeai, langgraph, langchain, etc.).
2. **Step 1 – Secure API Key Input**
    - The user enters their **Gemini API key** securely via getpass, ensuring no sensitive data is exposed in code.
3. **Step 2 – Initialize the LLM**
    - **Gemini 1.5 Flash** is loaded with a low temperature (0.2) to provide consistent, factual responses.

4. **Step 3 – Claim Type Selection**
    - The patient is asked whether they are here for a **Cashless** or **Reimbursement** claim.
    - This choice determines which process flow the system will follow.
5. **Step 4 – Patient Query Input**
    - The patient describes their issue or question in natural language.
6. **Step 5 – Query Classification**
    - The LLM is prompted with the patient's input and a list of possible claim process steps.
    - The AI selects **exactly one matching process node**.
7. **Step 6 – Response Retrieval**
    - The classified node is matched with a **predefined hospital-approved response** in the reply map.
8. **Step 7 – Output to Patient**
    - The final, clear, and accurate guidance is displayed instantly for the patient.
9. **Step 8 – Workflow Control via LangGraph**
    - LangGraph manages the conversation flow from claim type selection to the final response, ensuring no steps are skipped.

System Architecture & Agentic Workflow

Node 1: Claim Type Selection

- Trigger: System asks patient if they are here for **Cashless** or **Reimbursement**.
- Stores claim type in session state.

Node 2: Patient Query Capture

- Accepts patient's request or question related to their claim.

Node 3: Claim Step Classification

- Prompting **Gemini 1.5 Flash** to map query to a **specific claim process node** from a predefined list based on claim type.
- Debug log outputs classified node for monitoring.

Node 4: Response Generation

- Retrieves standardized response from a **reply map** linked to the classified node.
- Displays hospital-approved instructions for the patient.

Workflow Node Categories

Cashless Claim Nodes

1. cashless_choose
2. cashless_confirm_network
3. cashless_preauth_request
4. cashless_preauth_query
5. cashless_preauth_approved
6. cashless_discharge_request
7. cashless_discharge_query
8. cashless_discharge_approved
9. cashless_posthospital_claims

Reimbursement Claim Nodes

1. reimb_choose
2. reimb_doc_collection
3. reimb_claim_form
4. reimb_hospital_part
5. reimb_submission_advice
6. reimb_end

Alignment with Hospital Service Goals

Goal Contribution

- **Service Quality:** Ensures patients receive clear, accurate, and complete claim instructions.
- **Operational Efficiency:** Reduces repetitive manual explanations by staff.

- **Process Compliance:** Standardized responses aligned with hospital policies.

Technology Stack

- **LangGraph:** Workflow automation for conversational nodes.
- **LangChain:** LLM orchestration.
- **Google Gemini 1.5 Flash:** Natural language classification and reasoning.
- **Python:** Core implementation language.

Outcomes and Impact

- **Reduced Wait Times:** Patients get immediate claim process instructions.
- **Consistent Guidance:** Eliminates variation in staff explanations.
- **Staff Efficiency:** Staff can focus on complex claim issues instead of repetitive queries.
- **Improved Patient Experience:** Clear instructions reduce confusion and delays.

Future Enhancements

- Add **multilingual support** for regional languages.
- Integrate with **hospital's claim tracking system**.
- Provide **voice-based interaction** for elderly patients.
- Enable **real-time claim status checks** via insurer APIs.

Conclusion

The **Claim Process Navigator Agent** transforms the way hospitals handle insurance claim guidance by providing **real-time, accurate, and patient-friendly** responses. By integrating AI with structured workflows, hospitals can significantly improve operational efficiency, reduce patient frustration, and ensure compliance with claim procedures.

Call to Action: Hospitals should adopt AI-powered claim assistance tools to enhance service quality, reduce operational costs, and improve patient satisfaction.
