Technical Approach: AI Medical Appointment Scheduling Agent

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Architecture Overview

- **Workflow**: [Start] → Greeting → Lookup → Scheduler → Insurance → Confirmation → Forms → Reminders → [End].
- **Agents**: Greeting, Lookup, Scheduler, Insurance, Confirmation, Forms, Reminder (specialized for each booking stage).
- **UI**: Streamlit chatbot interface for interactive, natural conversation.
- **State**: Shared typed state across agents for demographics, patient type, doctor/location, duration, insurance, and confirmations.
- **IO**: Pandas for CSV data; OpenPyXL for Excel exports and admin review logs.

Framework Choice & Justification

- **Orchestration**: LangGraph multi-agent workflow with deterministic stage transitions.
- **Agent Framework**: LangChain tools/integrations for file ops and HTTP APIs.
- **LLM**: Google Gemini for natural, reliable conversations.
- **Rationale**: Modular agents, predictable control flow, and integration-friendly patterns for CSV/Excel and APIs.

Integration Strategy

- **Patient Data**: Synthetic records in `data/patients.csv` with name, DOB, contact, preferred doctor/location, and last_visit_date; used for new vs. returning detection and prefill.
- **Doctor Schedules**: `data/doctor_schedule.csv` as reference for doctor/location options; Calendly handles booking.
- **Calendar**: Duration-aware Calendly links (30/60 minutes) shared by the Scheduler; post-"booked" details retrieved when available.
- **Insurance**: Structured capture (carrier, member ID, group number) with format validation.
- **Exports**: Appointment confirmations appended to `data/appointment_confirmations.xlsx` for admin review.
- **Communications**: Simulated SendGrid email and Twilio SMS with logs for confirmations and reminders.
- **Forms**: New Patient Intake Form (PDF) emailed to new patients after confirmation; status tracked.

Key Challenges & Solutions

- **Patient Type Detection**: Name + DOB lookup in CSV to classify new or returning and prefill returning details.
- **Scheduling Logic**: Automatic 60-minute slots for new and 30-minute for returning patients.
- **Calendar Flow**: Provide Calendly link, then capture booking confirmation; attempt details retrieval from Calendly after user confirms.
- **Data Handling**: Consistent CSV/Excel reads/writes; resilient logging for email/SMS and forms in local files.

MVP Feature Implementation

- **Patient Greeting**: Collect full name, DOB, contact, preferred doctor, and location with validation.
- **Patient Lookup**: Search `data/patients.csv` to detect new vs. returning; prefill known data for returning.
- **Smart Scheduling**: Assign 60-min (new) or 30-min (returning) and provide a unique Calendly link.
- **Insurance Collection**: Capture carrier, member ID, and group number with structured checks.
- **Appointment Confirmation**: Generate summary, export to Excel, and simulate email/SMS confirmations.
- **Form Distribution**: Email New Patient Intake Form (PDF) only after confirmation for new patients.
- **Reminder System**: Three reminders (T-3d, T-1d with form/visit actions, T-0) with confirmation and cancellation tracking.

Deployment & Security

- **Deployment**: Streamlit Community Cloud with secrets stored via `.streamlit/secrets.toml` or cloud settings.
- **Privacy**: Synthetic patient data; simulated communications; local processing with no external data sharing beyond APIs.
- **Scalability**: Clear path to DB-backed EMR, calendar webhooks, and production-grade email/SMS providers.
- **Live Demo**: `https://medical-appointment-scheduling-age streamlit.app/`