Digital Patient Feedback & Experience Agent

The **NHS Patient Feedback Agent** is a conversational AI system built to collect, analyze, and process patient feedback in real-time via a chatbot interface. It is designed to improve patient engagement and identify service gaps by intelligently interacting with patients, categorizing feedback, and providing structured insight to healthcare administrators.

Overview:

● Automates collection of post-visit feedback and satisfaction surveys
● Implements sentiment analysis on patient reviews and comments
● Generates trend analysis reports for service quality metrics
● Identifies recurring issues and improvement opportunities
● Tracks feedback resolution and follow-up actions
● Provides real-time alerts for critical patient concerns

Tech Stack

🔧 Backend

Core Framework

● **Microsoft AutoGen Core**: Tool-equipped agent architecture
● **OpenAI GPT-4o-mini**: Language model for conversation generation
● **FastAPI**: Async web framework for API endpoints
● **WebSockets**: Real-time bidirectional communication

Data Layer

● **MongoDB**: Document-based feedback storage
● **TextBlob**: Natural language processing for sentiment analysis
● **Pydantic**: Data validation and serialization

Observability & Monitoring

● **OpenTelemetry**: Distributed tracing and metrics collection
● **AgentOps**: Agent-specific performance monitoring and analytics

💻 Frontend

- React (Vite setup)
- Tailwind CSS for design
- WebSocket API for real-time chat

📊 Database Collections Overview

Users_collection

Field	Type	Description
name	str	Patient's name
password	str	Hashed password
nhs number	dict	{ number, age, gender, treatment, issue }

Feedback_collection

Field	Type
patient_name	str
nhs_number	str
satisfaction_rating	int
comments	str
category	str

Key Features

Intelligent Conversation Management

- Stateful Multi-Turn Conversations: Maintains context across WebSocket connections
- Workflow-Driven Interactions: 8-step structured feedback collection process
- Dynamic Response Generation: Context-aware responses based on sentiment and rating

🚨 Critical Issue Detection

- Real-time Alert System: Detects 24+ critical healthcare keywords
- Urgent Flag Notifications: Visual alerts for serious concerns
- Priority Review Queue: Automatic flagging for healthcare team attention

Advanced Analytics

- Sentiment Analysis: TextBlob-powered emotion detection
- Automatic Categorization: 7 predefined feedback categories
- Common Issues Tracking: Trending problem identification
- Performance Metrics: Response time and token usage monitoring

Comprehensive Observability

- Dual Tracing Systems: OpenTelemetry + AgentOps integration
- Real-time Monitoring: Console and file-based trace exports
- Performance Analytics: LLM call metrics, tool execution timing.

System Architecture Diagram:
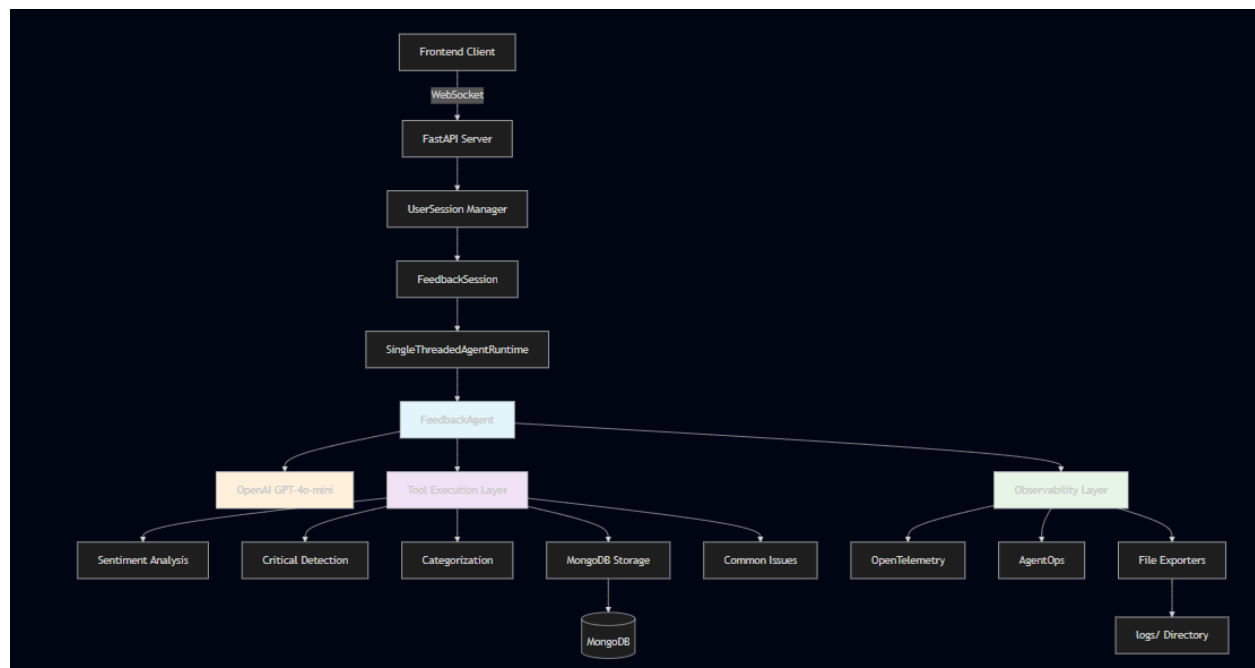
🔧 Core Components

1. FeedbackAgent (RoutedAgent)

The main conversation orchestrator that handles the complete feedback workflow.

```python
class FeedbackAgent(RoutedAgent):
    """Tool-equipped patient feedback agent using RoutedAgent and
OpenAIChatCompletionClient."""

    @message_handler
    async def handle_feedback_message(self, message: FeedbackMessage, ctx:
MessageContext) -> FeedbackMessage:
        # Handles conversation flow with tool execution
```

Key Responsibilities:

- Maintains conversation state and history
- Orchestrates tool execution based on workflow steps
- Integrates with tracing systems for observability
- Handles error recovery and session resets

2. Tool Execution Layer

Specialized functions for different aspects of feedback processing.

Core Tools:

Tool	Purpose	Input	Output
quick_sentiment_check	Sentiment analysis	feedback_text (str)	Sentiment + polarity score
start_feedback_rating_prompt	Rating request	patient_name (str)	Standardized rating prompt
ask_for_feedback_comments	Detailed feedback	rating (int)	Context-based follow-up question
categorize_feedback	Classification	comments (str)	Category (Staff/Billing/etc.)
detect_critical_issues	Urgent detection	comments (str)	Critical alert or empty string
save_feedback_and_show_insights	Combined operation	All feedback data	Save confirmation + common issues

Critical Keywords Detection

The system monitors for 24+ critical healthcare indicators:

```python
critical_keywords = {
    "emergency": "Emergency response concerns",
    "mistake": "Potential medical error",
    "allergic reaction": "Adverse reaction",
    "neglect": "Patient neglect concern",
    "bleeding": "Excessive bleeding reported",
    # ... 19+ more keywords
}
```

3. Session Management

Multi-layered session handling for scalable concurrent conversations.

```
UserSession (WebSocket level)
├── FeedbackSession (Agent runtime)
│   ├── SingleThreadedAgentRuntime
│   ├── OpenAIChatCompletionClient
│   └── FeedbackAgent
└── Conversation History & State
```

4. Observability Infrastructure

OpenTelemetry Integration

- **Distributed Tracing**: End-to-end request tracking
- **Custom Metrics**: LLM calls, tool executions, conversation duration
- **Multiple Exporters**: Console, File, Jaeger (optional), OTLP (optional)

AgentOps Integration

- **Agent Performance Monitoring**: Specialized metrics for AI agent behavior
- **Conversation Analytics**: Turn-by-turn interaction analysis
- **Cost Tracking**: Token usage and API call optimization
- **Real-time Dashboards**: Visual performance monitoring
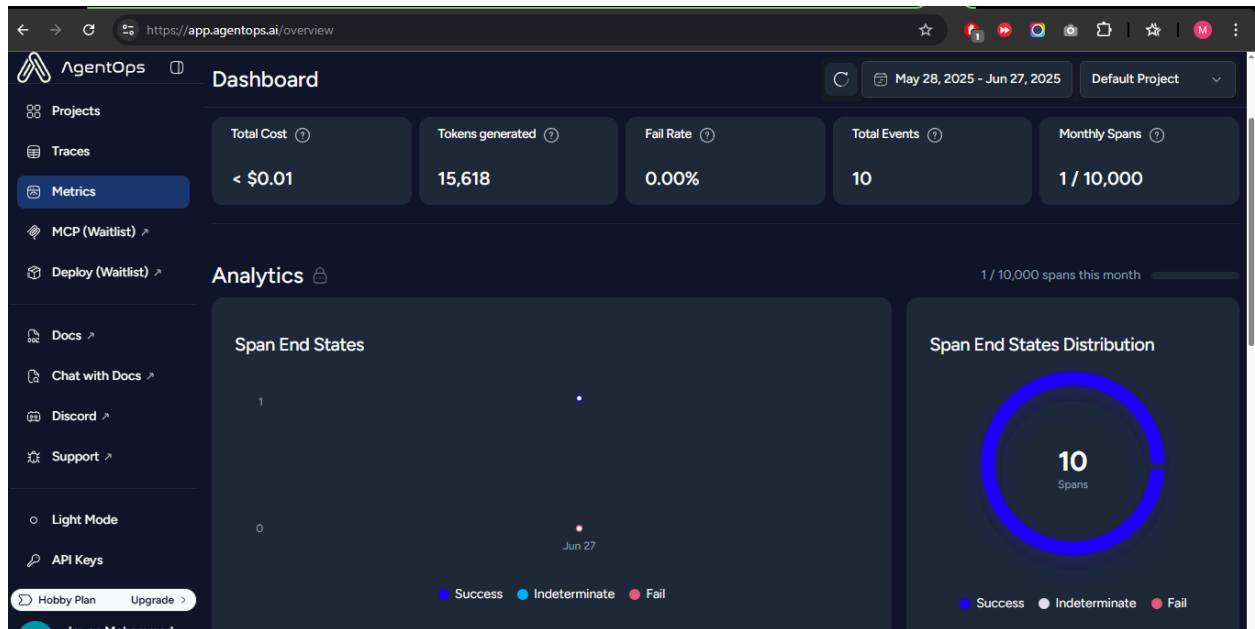
File-Based Tracing

```
logs/
├── traces_YYYYMMDD.log      # Detailed operation logs
└── metrics_YYYYMMDD.json    # Daily aggregated metrics
```

5. "New Chat" Flow

- Clears context and agent memory using a `new_chat` message
- Ensures a fresh conversation every time without confusion

6. Scheduled Reporting

- `APScheduler` to:

    - Send trend analysis daily
    - Critical Alerts for admins if critical issue keywords spike, implemented through slack app interaction and shortcuts feature.

alerts

📢 **Scheduled Feedback Summary:**

📊 ****Feedback Trend Summary for Admin:****

Thursday, 12 June ⌄

- Total feedback received: 19
- Average satisfaction rating: 2.00/5
- Most discussed category: Staff.
- Rating distribution:
  - 1: 6
  - 2: 8
  - 3: 4
  - 4: 1
  - 5: 0

🔁 **Top Recurring Issues:**

- Facility cleanliness and comfort (11 mentions)
- Long waiting times (5 mentions)
- Staff communication and attitude concerns (1 mentions)

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alerts   👤 1   🎧 ⌄

👁 View Patient   ✅ Acknowledge   ✕ Reject   Thursday, 12 June ⌄

🚨 **Critical Feedback Alert:**

Medication overdose incident

👁 View Patient   ✅ Acknowledge   ✕ Reject

✅ **imran** acknowledged this feedback alert.

👤 **Patient Details:**

Name: Henry
NHS Number: 1234567895
Age: 25
Gender: Male
Health Issue: Breathing/lungs issue
Date of Treatment: 2025-06-10

📝 **Feedback Details:**

Submitted On: 2025-06-12 17:41:04
Rating: 2/5
Category: Treatment.
Comment: Due to a serious medication error (misdiagnosed), i was mistakenly administered an overdose of insulin injection, which led to a dangerous drop in my blood sugar levels and required immediate intervention.

✅ **imran** acknowledged alert for feedback `684b1130d4c3e9642c886085`