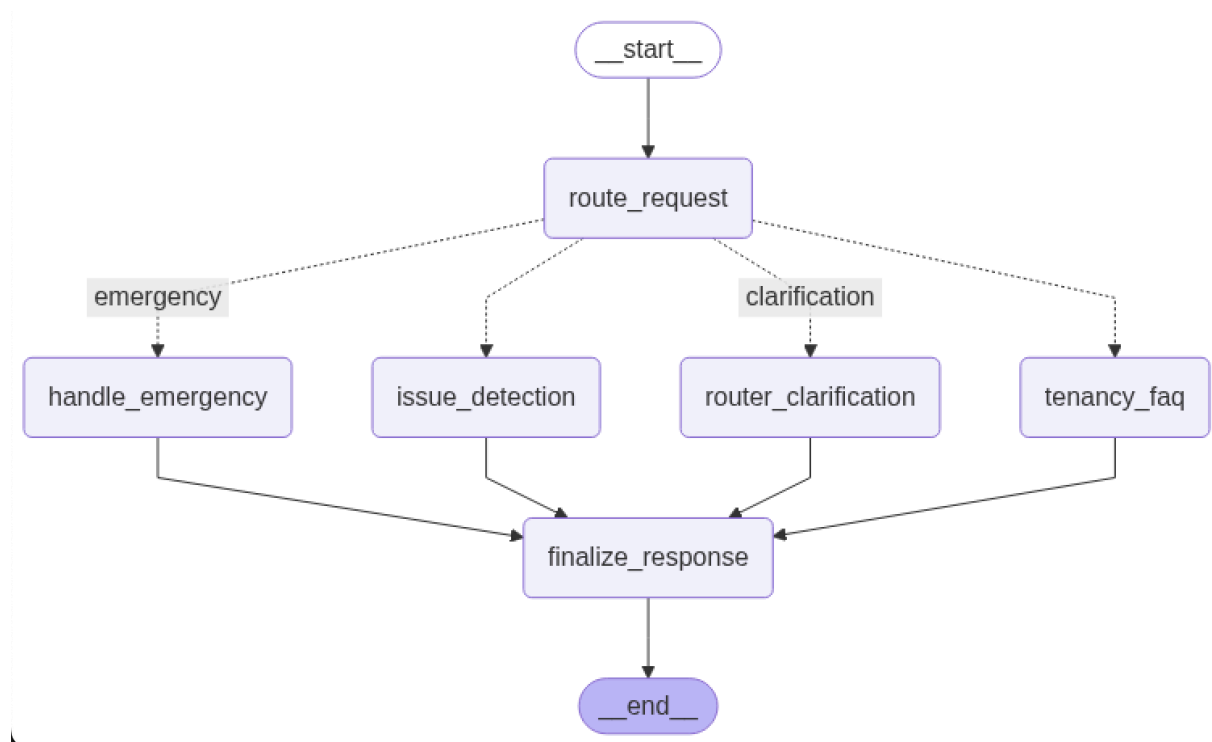


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Multi agentic real estate chatbot

Workflow visualization



Tools and technologies used

Backend- FastAPI, LangChain, LangGraph, openCV, PIL, GPT-4

Frontend - [React.js](https://react.dev/), Typescript

Agents

1. **Routing agent** - Uses GPT-4 to analyze user messages and route them to:
 - Issue detection agent : Property damage, maintenance, repairs.
 - Tenancy FAQ agent: Legal questions, rent, tenant/landlord rights.
 - Clarification - When the request is unclear

Emergency detection: Instantly detects emergency keywords (fire, flood, gas leak) and prioritizes these requests for immediate response.

Image Handling: Automatically routes any message with an image to the Issue Detection Agent for visual analysis.

Memory: Remembers conversation history to provide context-aware routing decisions.

Fast Emergency Check - Scans for emergency keywords first

Image Auto-Route - Sends image requests directly to issue detection

AI Analysis - Uses GPT-4 to understand the user's intent

Fallback System - Uses keyword matching if AI fails

Memory Update - Stores the conversation for future context

2. Tenant FAQ agent

AI agent that answers tenancy law questions using GPT-4, providing location-specific legal guidance with proper disclaimers.

Key features:

- Answers rental/landlord-tenant questions
- Location-aware legal guidance
- Smart follow-up questions
- Legal disclaimers included

3. Issue detection agent

AI agent that analyzes property damage and maintenance issues using GPT-4 Vision, with computer vision preprocessing for enhanced image analysis.

Key features:

- Image + text analysis (or text-only)
- Computer vision preprocessing (darkness, blur, crack detection)
- Severity assessment with urgency levels
- Tool integration for enhanced analysis
- Conversation memory
- Professional maintenance recommendations

Tools

1. *analyze_property_image*

Computer vision analysis of property images using OpenCV and PIL processing.

Process:

1. Decode base64 image data
2. Preprocess image (enhance quality)
3. Computer Vision Detection: Darkness/lighting issues Blur detection Crack pattern recognition Moisture indicators
4. Return analysis results

- *assess_issue_severity*

Intelligent severity scoring based on issue keywords and indicators.

Severity Logic:

- HIGH: structural, electrical, gas, flood, fire, collapse
- MEDIUM: leak, crack, mold, damage, malfunction
- LOW: wear, maintenance, cosmetic, minor

Tool Integration Flow

1. Image Upload → *analyze_property_image* tool
2. CV Processing → Quality & issue detection
3. Severity Assessment → *assess_issue_severity* tool
4. Combined Analysis → GPT-4o Vision + tool results
5. Final Response → Structured recommendations

Image Processing Pipeline

Preprocessing Steps

1. Quality Enhancement
2. Brightness/contrast adjustment
3. Noise reduction
4. Sharpening filters
5. Format Optimization
6. Resize for optimal analysis
7. Convert to standard format
8. Compress for API efficiency

Computer Vision Detection

1. Darkness Check: Analyze pixel brightness histogram
2. Blur Detection: Use Laplacian variance or edge detection
3. Crack Detection: Look for linear patterns using edge detection
4. Moisture Detection: Color/texture analysis for water damage

What GPT-4o Vision Sees

1. Enhanced Image: Preprocessed for optimal clarity
2. User Context: Description of their concern
3. CV Insights: Computer vision findings
4. System Prompt: Professional property inspection expertise

Technical Stack

Libraries Used

PIL (Pillow): Image loading and basic processing
OpenCV: Advanced computer vision analysis
Base64: Image encoding for API transmission
NumPy: Image array manipulation

Detection Techniques

Histogram Analysis: For darkness detection
Edge Detection: For cracks and structural issues
Color Space Analysis: For moisture/water damage
Texture Analysis: For surface condition assessment

API Integration

GPT-4o Vision: High-resolution image analysis
Base64 Encoding: Efficient image transmission
Multimodal Prompts: Text + image combined analysis

Analysis Capabilities

Visual Analysis

1. Image quality assessment (lighting, blur detection)
2. Damage pattern recognition (cracks, stains, deterioration) Safety hazard identification (immediate dangers)
3. Professional referral needs (when to call experts)

Severity Assessment

1. Critical/Emergency: Gas leaks, electrical fires, structural collapse
2. High Priority: Major leaks, electrical issues, significant damage
3. Medium Priority: Moderate damage, ongoing maintenance needs
4. Low Priority: Cosmetic issues, minor wear, routine maintenance

Response Types

1. Immediate action required (safety evacuation, utility shutoff)
2. Professional help needed (licensed contractors, specialists)
3. DIY guidance (safe user actions, temporary fixes)
4. Monitoring advice (watch for changes, documentation)

Input Methods Supported

Image + Text Analysis

1. Upload photos of damage/issues
2. Describe specific concerns
3. Get enhanced AI + computer vision analysis
4. Confidence: 85% with quality images

Text-Only Analysis

1. Describe issues without photos
2. Get expert guidance based on description
3. Receive recommendations for documentation
4. Confidence: 65% (prompts for photos)

Follow-up Conversations

1. Clarifying questions about timeline

2. Additional symptoms or concerns
3. Progress updates on repairs
4. Memory of previous interactions

Target Users

1. Tenants reporting issues to landlords
2. Homeowners assessing property problems
3. Property managers triaging maintenance requests
4. Real estate professionals documenting property conditions
5. Insurance claimants documenting damage