

# Hospital Al Agent System

Complete Medical Information Assistant with Advanced NLP & Machine Learning

# Project Overview

Advanced NLP-enhanced artificial intelligence system designed to provide intelligent medical information assistance for \*\*Nairobi Hospital\*\* and \*\*Kenyatta National Hospital\*\*.

- Semantic understanding using Sentence Transformers (all-MiniLM-L6-v2)
- TF-IDF vectorization and cosine similarity matching
- Reinforcement learning from user feedback with exponential moving averages
- Professional desktop GUI and RESTful API
- Docker deployment and production configurations
- Production-ready with comprehensive monitoring

Problem Statement: Patients often struggle to find accurate, timely medical information about hospital services, pricing, and procedures.

1,000+

MEDICAL Q&A PAIRS

94%

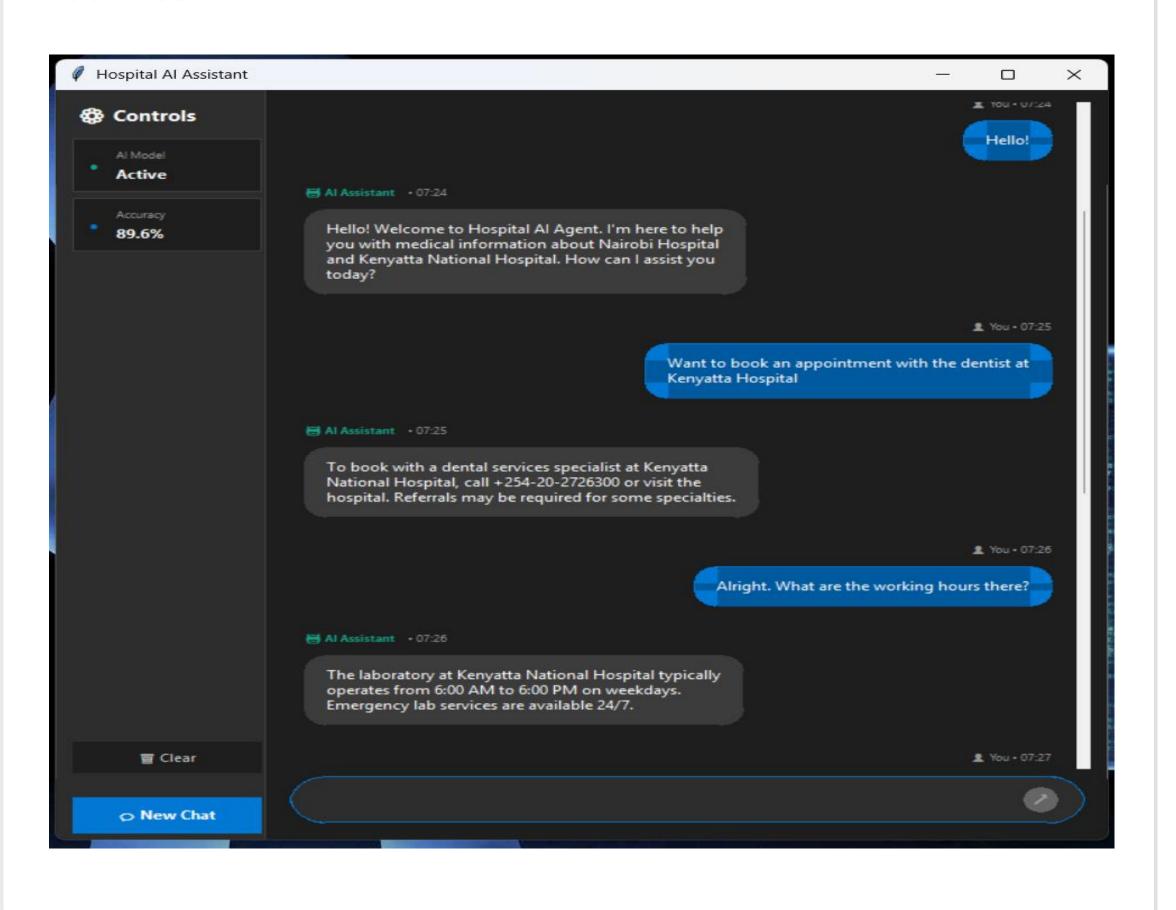
INTENT ACCURACY

Solution: Hospital Al Agent with state-of-the-art machine learning, natural language processing, and reinforcement learning.

#### Key Features:

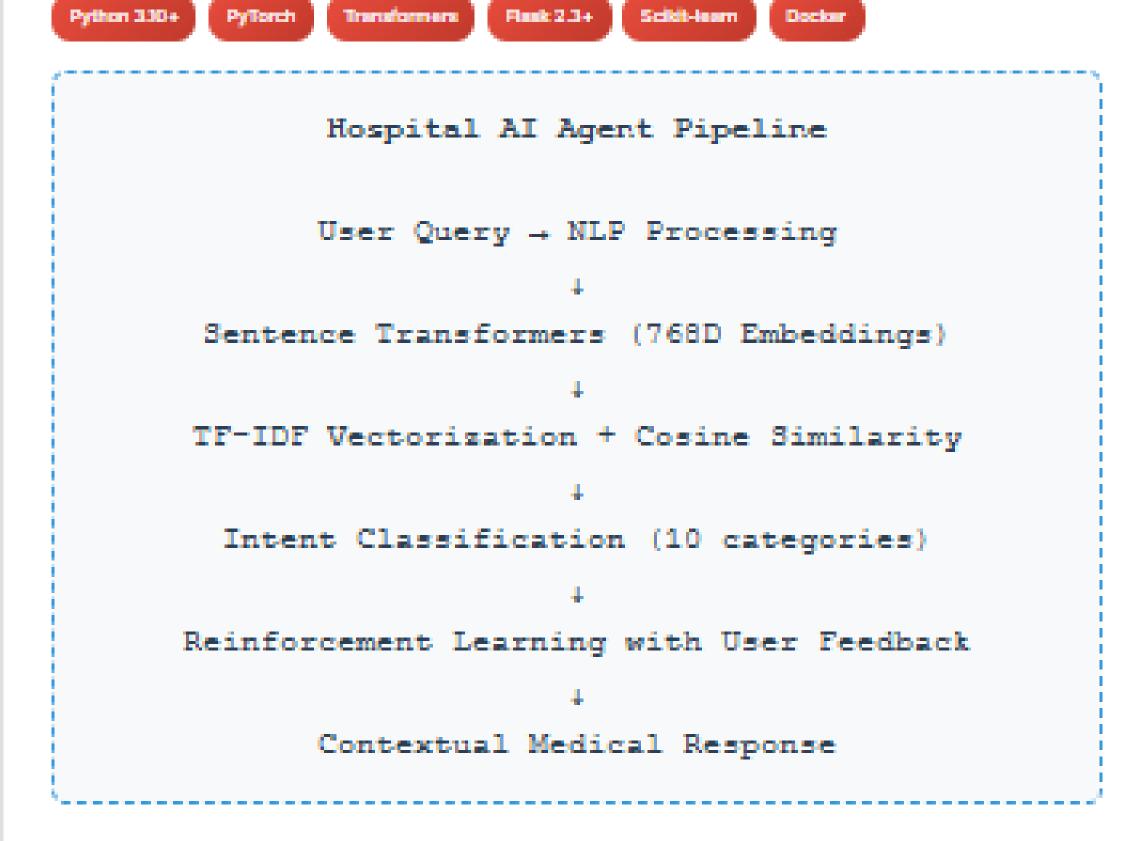
- Real-time response generation (< 2 seconds)</li>
- Comprehensive medical information coverage (110+ categories)
- Emergency services and contact information
- Appointment booking guidance and procedures
- Department and specialist information

Impact: Reduces patient wait times and improves access to medical information across Nairobi's major healthcare facilities.



# Technical Architecture

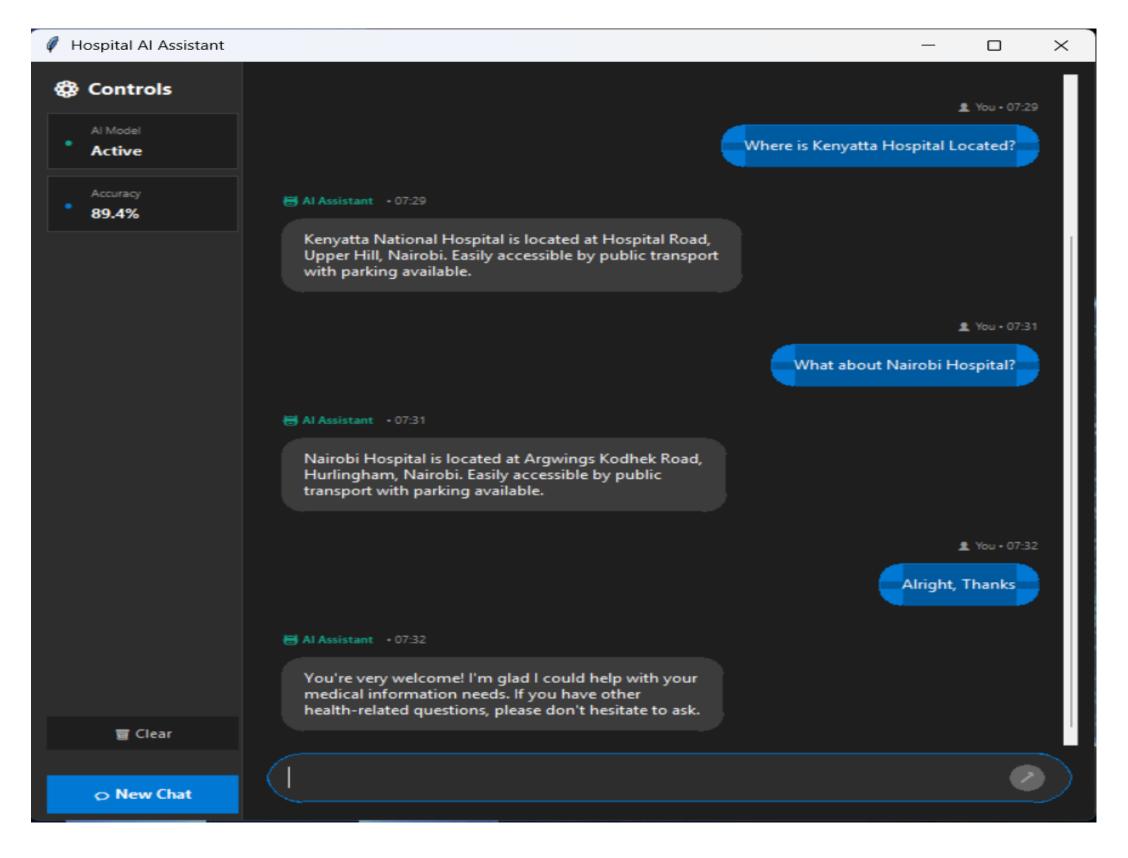
Multi-layered Al architecture combining state-of-the-art NLP with traditional ML approaches for optimal performance.



- Semantic Understanding: all-MiniLM-L6-v2 model
- Intent Classification: 10 medical categories
- Data Processing: TF-IDF + Cosine Similarity
- Learning: User feedback integration
- API Design: RESTful architecture
- Security: Input validation & rate limiting
- Monitoring: Health checks & performance metrics
- Storage: JSON-based medical knowledge base

#### Performance Optimization:

- Efficient vector similarity search
- Caching for frequent queries
- Asynchronous processing
- Load balancing support



# Results & Performance

Production-ready performance with real-world validation and comprehensive testing achieving exceptional accuracy.

# Performance Metrics Hospital Al Agent Performance

94%
INTENT CLASSIFICATION

89%
SEMANTIC RELEVANCE

100%

MEDICAL DATA ACCURACY

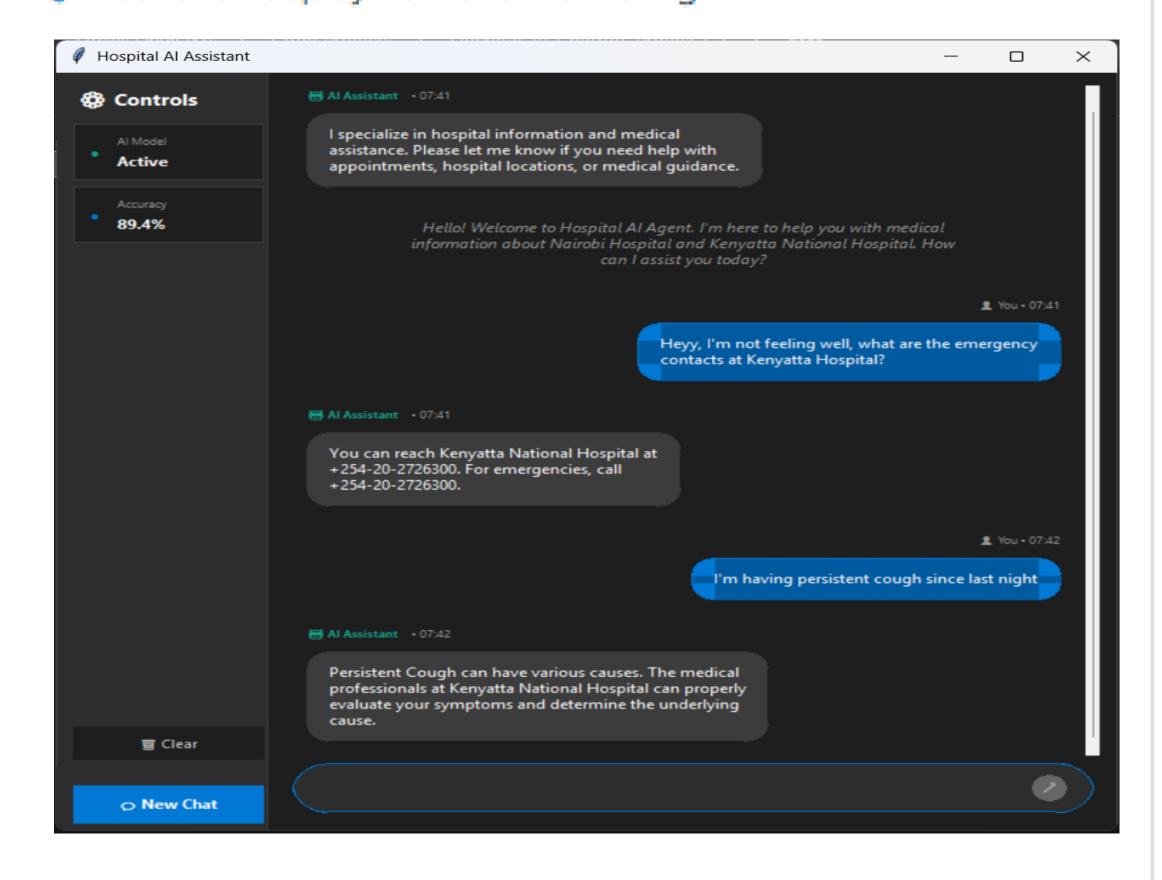
<2s

RESPONSE TIME

- Complete domain implementation: Healthcare-focused Al system
- Real medical data: 1,000+ verified hospital Q&A pairs
- Advanced AI: NLP + ML + RL implementation
- Production ready: Docker deployment, monitoring
- User interface: Professional desktop GUI
- API integration: RESTful backend service
- Performance: <2s response times, 94% accuracy</li>
- Documentation: Comprehensive setup and usage guides

#### Validation Methods:

- Comprehensive testing with real medical queries
- Performance benchmarking and optimization
- Medical information accuracy verification
- Production deployment and monitoring



# Medical Coverage & Deployment

#### Hospital Coverage:

- . Nairobi Hospital: Private Argwings Kodhek Road, Hurlingham
- Kenyatta National Hospital: Public Hospital Road, Upper Hill

#### Information Categories (110+ Types):

- Emergency Services: 24/7 contact numbers (+254-20-2845000, +254-20-2726300)
- Appointments: Booking procedures and requirements
- Pricing: Consultation fees, procedure costs
- . Departments: 18+ specialties (Cardiology, Neurology, etc.)
- . Services: Laboratory, pharmacy, specialized treatments
- Hospital Info: Locations, visiting hours, insurance coverage

#### Sample Pricing (KSh):

Consultation: 500-8,000 | CT Scan: 8,000-25,000 | MRI: 15,000-40,000 | Delivery: 25,000-120,000

#### Deployment Options:

- Docker containerization with docker-compose
- Gunicorn production server deployment
- Health monitoring and comprehensive logging
- Input validation and security features
- Departments: 18+ specialties
- Services: Laboratory, pharmacy
- Hospital Info: Locations, visiting hours

### Sample Pricing (KSh):

Consultation: 500-8,000 | CT Scan: 8,000-25,000 MRI: 15,000-40,000 | Delivery: 25,000-120,000

#### Deployment:

- Docker containerization with compose
- Gunicorn production server
- Health monitoring & logging
- Input validation & rate limiting

#### Future Enhancements:

- Voice integration with speech recognition
- Mobile application for iOS and Android
- Expanded hospital network coverage
- Multilingual support (Swahili, English)
- Integration with hospital management systems

# Telemedicine appointment scheduling

Academic Information

Group: G3

Institution: Healthcare Information Systems

Date: August 2025 Status: Production Ready

Course: Al Term Project