

Agentic AI for Medical Imaging and Diagnosis Support

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Background and Motivation

- **Current Challenge:** Healthcare professionals struggle to analyze complex medical images and retrieve relevant knowledge due to data overload and time constraints.
- **Why Study This?:**
 - Medical image segmentation is very accurate in real world scenarios.
 - LLMs and Graph RAG can enhance decision-making by improving context-aware knowledge retrieval from vast medical data.
 - This project can improve diagnostic precision and reduce healthcare costs.
- **Proposed Solution:** Develop an AI system that integrates image segmentation, and LLM-based knowledge retrieval with a simple user interface.

Problem Formulation

- **Research Field:** Computer Vision (CV), and Natural Language Processing (NLP).
- **Representative Method Taxonomy:**
 - Computer Vision: Supervised learning for image segmentation.
 - NLP: Task specific supervised finetuning for LLM models
 - NLP: Creating RAG pipelines for information retrieval.
- **Problem Type:** Classification (Image Segmentation), Information Retrieval (Retrieval Augmented Generation) and Transfer Learning (LLM Model Finetuning).

Proposed Solution

Task	Models
Medical Image Segmentation	U-Net, Attention U-Net, Swin Unet
Large Language Models	Llama 3.1 8b, Llama 3.2 1b
Knowledge Retrieval	Neo4j (Graph Search) + FAISS (similarity search).

■ Baseline Section

- Segmentation – Faster RCNN (benchmarked via Dice coefficient, IoU, Hausdorff distance).
- LLM - Llama 3.2 1B model.(evaluated on F1-score, BLEU, Meteor)

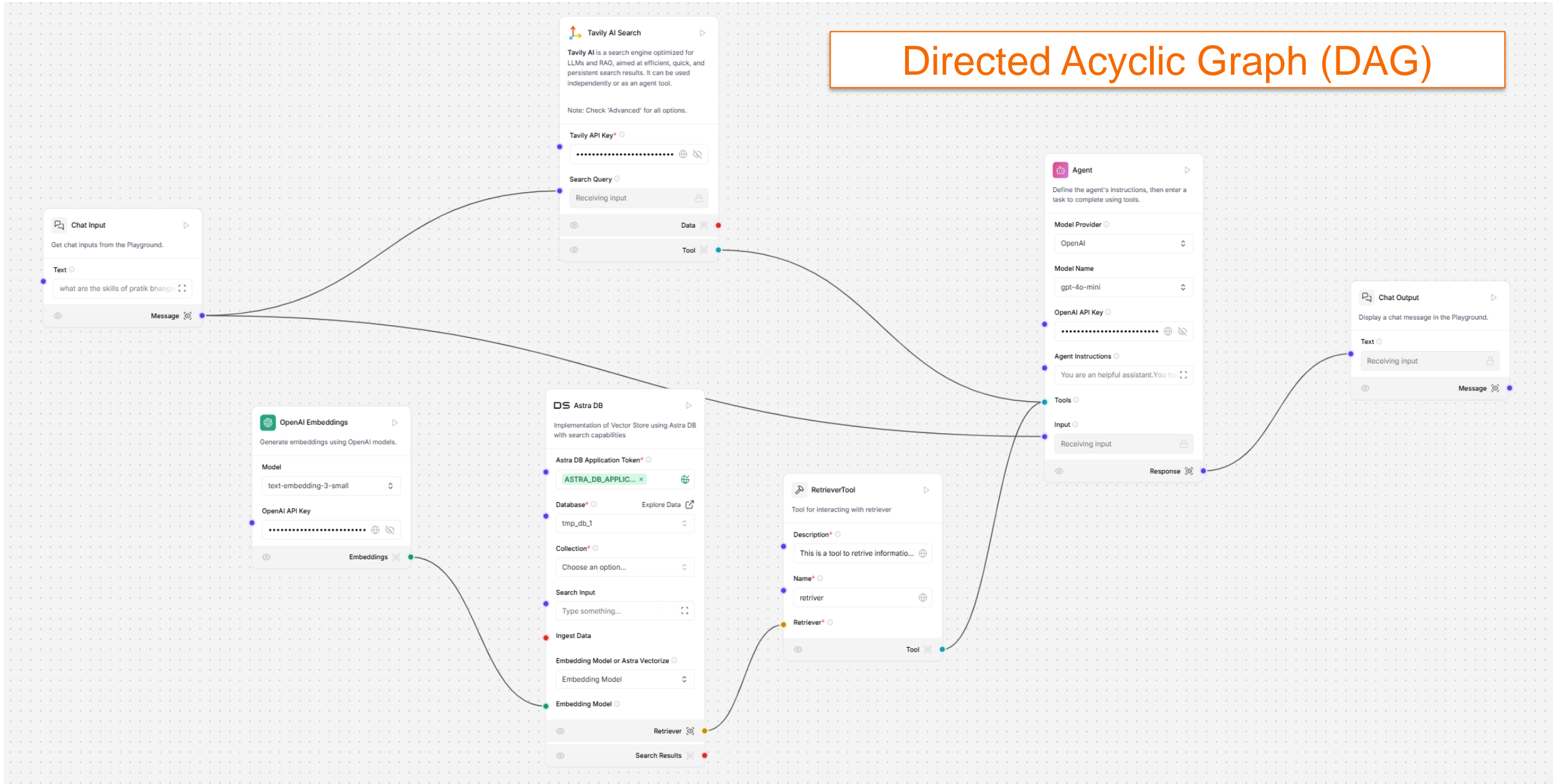
Expected Outcomes:

- Enhanced image segmentation performance using U-Net Models.
- Development of a Directed Acyclic Graph (DAG) framework for accurate knowledge retrieval.
- Demonstrate the effectiveness of Agentic AI in improving clinical decision-making.

Key Metrics:

- Dice coefficient in image segmentation.
- Meteor and Bleu Scores in LLM Finetuning.
- User feedback on system usability and clinical impact.

Directed Acyclic Graph (DAG)



Data Sources

■ Public Datasets:

- Image Segmentation: NIH Chest X-ray, BraTS, LUNA16.
- LLM Fine-Tuning: BioMedLM (Knowledge Distillation) and MedDialog for conversations related to this domain.
- Knowledge Retrieval: PubMed, MIMIC-IV

■ Privacy Concerns:

- All datasets are publicly available and pre-anonymized.
- Compliance: Adheres to HIPAA and GDPR regulations to ensure privacy protection for all patient data.

Thank You

Any Questions?