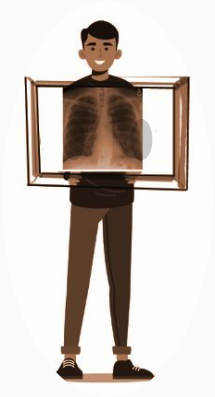
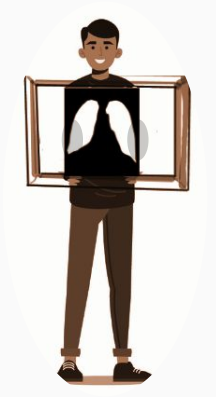


Diagnosis and Medical Imaging



Presenting OrgSeg Using
LLM and Gen Ai

The Problem Statement

To implement AI algorithms, particularly in the form of deep learning neural networks to analyze medical images, such as X-rays, MRI scans, and CT scans, to assist radiologists in detecting and diagnosing diseases. Does Gen AI, with its ability to understand complex medical data and patterns, could further enhance diagnostic accuracy by integrating information from multiple sources, such as medical imaging, electronic health records (EHRs), and genomic data.

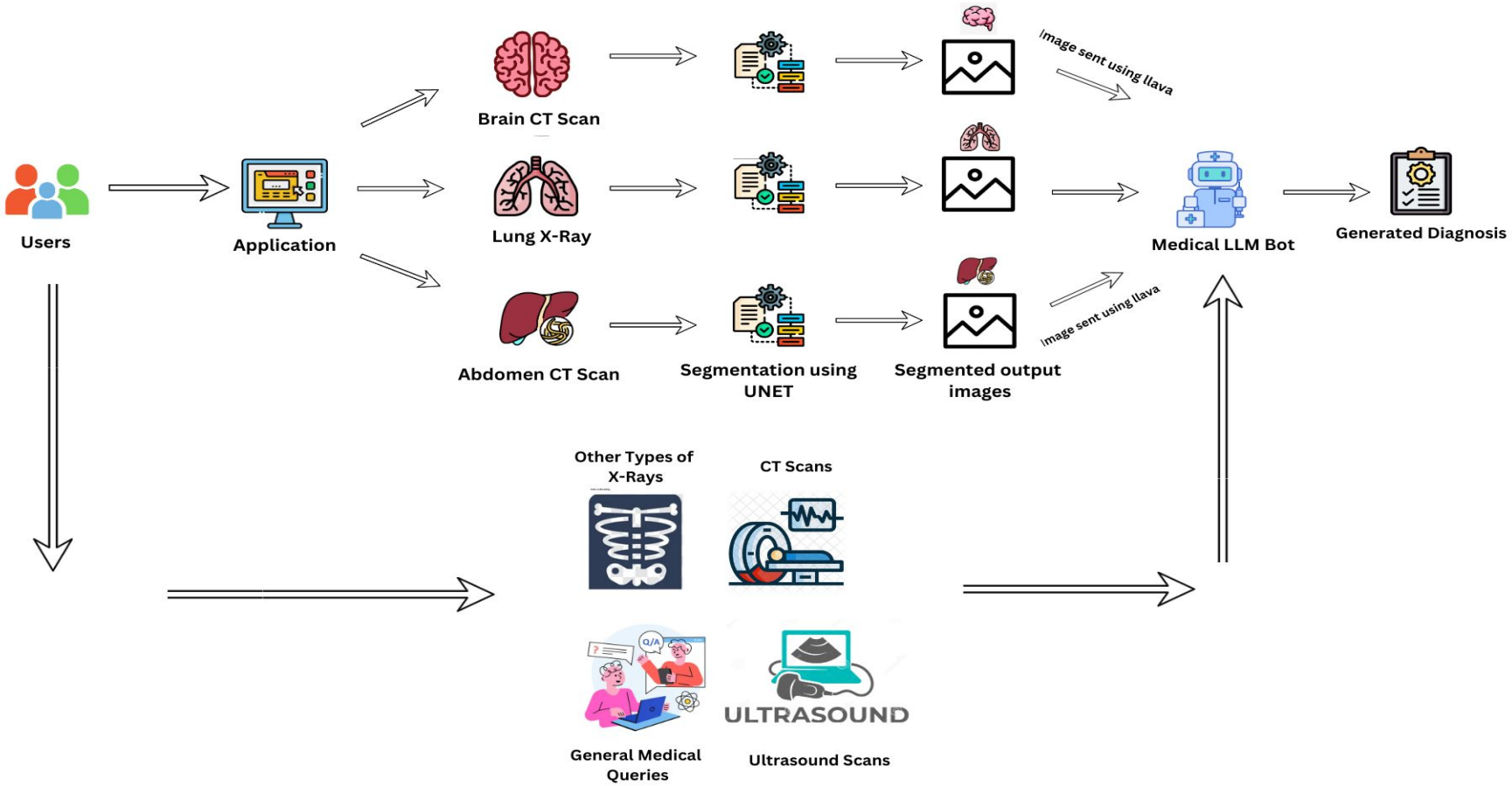
Current Scenario

With growing medical imaging data and radiologist shortages, there's an increasing need for efficient, accurate automated image analysis tools to improve diagnosis and provide timely insights. OrgSeg's GenAI medical bot integrates multidisciplinary expertise for comprehensive diagnosis and treatment planning, facilitating remote access to medical expertise. By automating image analysis, OrgSeg can reduce costs, improve patient outcomes, and enable personalized medicine. Its ability to continuously learn through advanced AI ensures it keeps pace with medical imaging advancements, making it a valuable healthcare industry tool.

Proposed Solution

Our solution ***OrgSeg*** is a web app that automates medical image analysis. It performs precise image segmentation of brain tumors, lungs, abdominal CT scans, and X-rays using the UNET transformer model. The segmented images are then processed by Large Language Models (LLM's) by FIne Tuned medical LLama-3 Bot. By automating image segmentation, processing, and diagnosis, OrgSeg addresses the growing need for efficient analysis of increasing medical imaging data amid radiologist shortages.

Application Workflow

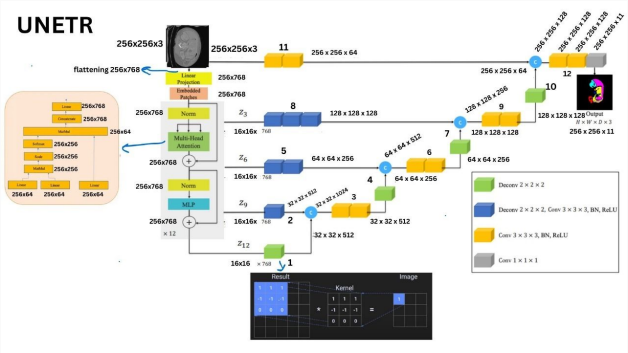


How the OrgSeg works.

Part 1: Segmentation

U-Net Architecture:

The UNET architecture is a U-shaped encoder-decoder network, consisting of four encoder blocks and four decoder blocks connected by a bridge. The encoder network (contracting path) reduces spatial dimensions and increases filters (feature channels) at each block. The decoder network increases spatial dimensions and reduces feature channels.



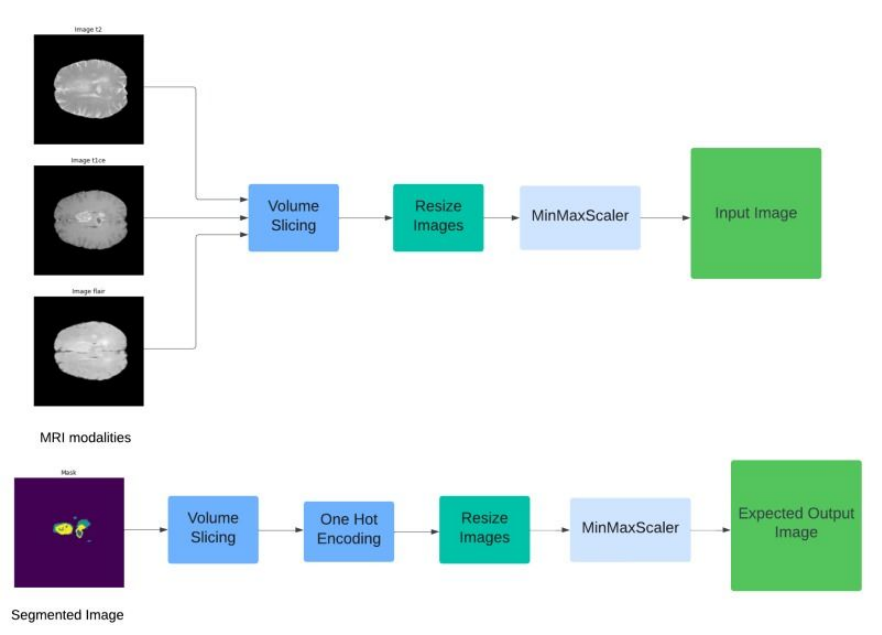


Image t2
Image t1ce
Image flair
Volume Slicing
Resize Images
MinMaxScaler
Input Image
MRI modalities
Mask
Volume Slicing
One Hot Encoding
Resize Images
MinMaxScaler
Expected Output Image
Segmented Image

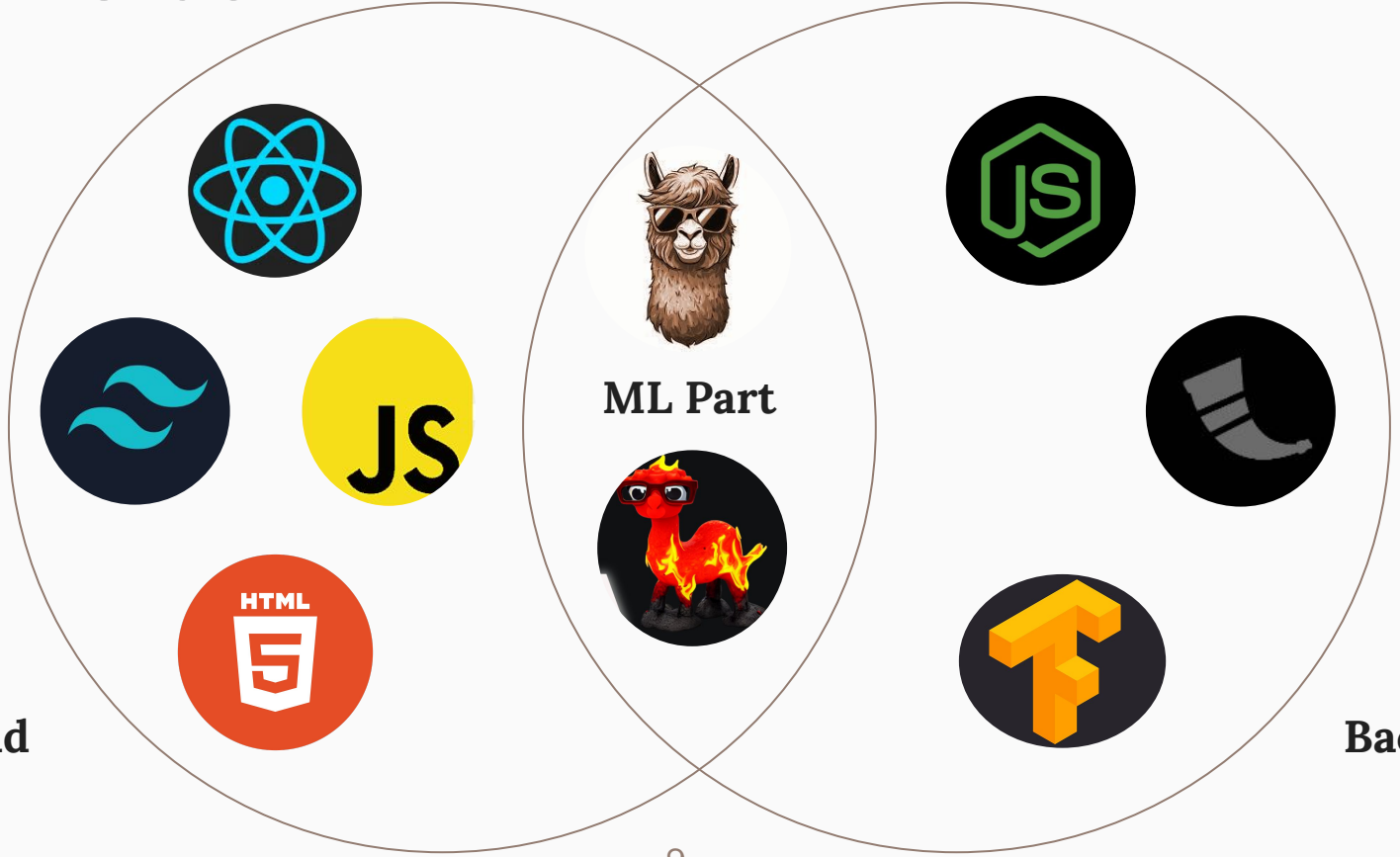
Encoder :The encoder learns an abstract representation of the input image through encoder blocks. Each block has two 3×3 convolutions with ReLU activation, followed by 2×2 max-pooling for spatial reduction.

Skip Connections : Skip connections provide additional information to the decoder for better semantic features. They act as shortcuts for gradients during backpropagation, improving representation learning.

Bridge : The bridge connects the encoder and decoder, consisting of two 3×3 convolutions with ReLU activation.

Decoder Network : The decoder generates a semantic segmentation mask from the encoder's abstract representation. Each decoder block starts with 2×2 transpose convolution, concatenated with the corresponding encoder skip connection.

Tech Stack



Use Cases of OrgSeg

1. User Authentication and Authorization
   Users (e.g., healthcare professionals, radiologists) should be able to securely log in to the web application.
   Different user roles and permissions should be defined for various functionalities.

2. Image Upload and Segmentation
   Users should be able to upload medical images (e.g., brain scans, CT scans, X-rays) for segmentation.
   The UNET Transformer model should be integrated into the application for performing precise image segmentation.

3. Segmentation Result Visualization
   The segmented images should be displayed to the user for review and analysis.
   Users should be able to interact with the segmented images (e.g., zooming, panning, adjusting contrast).

Dependencies of OrgSeg

1. Deep Learning Models
   UNET Transformer model for image segmentation
   LLaMA-2 (or similar large language model) for diagnosis and recommendation
   Other deep learning models (e.g., for image processing, classification)

2. Vector Embedding Libraries
   FaissGPU or similar libraries for efficient vector embeddings and similarity search

3. Medical Image Processing Libraries
   Libraries for handling various medical image formats (e.g., DICOM, NIfTI)
   Libraries for image preprocessing, enhancement, and visualization

4. User Authentication and Authorization
   Secure authentication and authorization mechanisms (e.g., OAuth, JWT)
   User role management and access control

Existing System	Proposed System
No GenAI Chatbot	Chatbot Feature using LLAMA-2
No diagnosis after Segmentation	Accurate analysis of Segmented image
No Web Application	Integrated Web Application
Individual platforms for different image analysis	Multiple Image Analysis choices for user