

Final Project Assignment – Applied Deep Learning and Generative AI in Healthcare

As the final component of our course, you will be required to complete a final project. The goal is to explore cutting-edge AI applications in healthcare.

The projects are designed to be completed individually. Each student is responsible for submitting their own codebase and presentation slides.

Wherever applicable, calculate and report relevant metrics such as SSIM, BLEU, loss, etc., and include them in your presentation.

Given the smaller dataset, perfect models are not expected. If the model does not perform well, students should still present their results, discuss the challenges, and suggest possible improvements.

All code and final presentations are due on **April 19**.

Below are **two project tracks** you can choose from:

1. Medical Image to Text Report Generation

Objective: Build a deep learning model that generates textual descriptions (e.g., diagnosis, modality) from chest X-ray images. You will train an encoder-decoder model (e.g., CNN + Transformer) to generate textual descriptions from X-ray image.

Example input: A chest X-ray image.

Example output: A generated description: *Frontal chest X-ray showing cardiomegaly with pulmonary edema.*

Dataset: Indiana University Chest X-ray Collect (IU X-Ray dataset)

Access: <https://openi.nlm.nih.gov/faq>

2. Text to Medical Image Synthesis (Image generation from Descriptions)

Objective: Build a deep learning model that generates synthetic x-ray images conditioned on textual descriptions. You will train a text-to-image model (e.g., conditional GANs, diffusion-based model) to generate images from textual descriptions.

Example input: *Fontal chest X-ray showing cardiomegaly with pulmonary edema.*

Example output: A chest X-ray image.

Dataset: Indiana University Chest X-ray Collect (IU X-Ray dataset)

Access: <https://openi.nlm.nih.gov/faq>

Final Deliverables (Due April 19)

Codebase (must be independently runnable).

Code can be submitted as compressed folder or GitHub repository.

GitHub-based submissions can earn up to 10 bonus points for completeness, clarity, and ease of reproducibility.

Instructions to run the code (via README.md) are mandatory.

Slide Deck (8-10 slides):

2-3 slides for Background and Motivation.

2-3 slides for Methodology and Architecture.

2-3 slides for Results and Discussion (with visualizations).

1 slide for Conclusion and Future Directions.

Final Presentation:

10 minutes per person to present their project during the final class session on **April 19**.